EXPRESS TERMS FOR
PROPOSED BUILDING STANDARDS
OF THE
DIVISION OF THE STATE ARCHITECT - STRUCTURAL SAFETY (DSA-SS)

REGARDING
THE ADOPTION BY REFERENCE OF THE
2009 EDITION OF THE INTERNATIONAL BUILDING CODE (IBC)
FOR USE AS THE CALIFORNIA BUILDING CODE (CBC), CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 2

Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 16A, 17A, 18A, 19, 19A, 20, 21, 21A, 22, 22A, 23, 24, 25, 26, 30, 31, 32, 33, 34, 35, and Appendix J

The California Building Standards Code (California Code of Regulations, Title 24, Part 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12) is published in its entirety every three years and is applicable to all buildings for which an application for a building permit is made during the Code's effective period. Each triennial edition of the California Building Standards Code becomes effective 180 days after its publication.

These proposed regulations will make effective the 2009 edition of the International Building Code (IBC) as the 2010 edition California Building Code, for application by DSA-SS to public elementary and secondary schools, community colleges, and state-owned or state-leased essential services buildings.

These proposed regulations will also make effective the 2009 edition of the International Building Code (IBC) as the 2010 edition California Building Code, for application by DSA-SS/CC to community colleges, which a community college district may elect to use in lieu of standards promulgated by DSA-SS (refer to Education Code Section 81053).

Further, these proposed regulations will repeal the 2006 edition IBC articles adopted as the 2007 edition California Building Code.

LEGEND FOR EXPRESS TERMS:

1. **California amendments:** California amendment (CA) language being continued without modification is shown in Ariel 9 point *italics*. New language is *underlined.* Deleted language is shown in ~~*strikeout*~~.
2. **IBC language:** IBC language is shown in normal Arial 9 point;
3. **Repealed IBC text**: All model code text that is not adopted appears in normal Ariel 9 pt. ~~strikeout.~~
4. **Notation:** Authority and Reference citations are provided at the end of each chapter.

~~CALIFORNIA CHAPTER 1~~
~~GENERAL CODE PROVISIONS~~

CHAPTER 1

CALIFORNIA ADMINISTRATION

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below	**X**	**X**	
1.1	X	X	
1.9.2	X	-	
1.9.2.2	-	X	New Amendment
102.1	X	X	
102.1.1	X	X	
102.3	X	X	
102.4	X	X	
102.4.1	X	X	New Amendment
102.5	X	X	
104.9	X	X	
106.1.1	X	X	Relocated from ***1603A.3.1***

EXPRESS TERMS

DIVISION I

SECTION ~~101~~ 1.1 GENERAL

~~101.1~~ 1.1.1 Title. *These regulations shall be known as the California Building Code, may be cited as such and will be referred to herein as "this code." The California Building Code is Part 2 of twelve parts of the official compilation and publication of the adoption~~s~~, amendment, and repeal of building regulations to the California Code of Regulations, Title 24, also referred to as the California Building Standards Code. This part incorporates by adoption the ~~2006~~ 2009 International Building Code of the International Code Council with necessary California amendments.*

~~101.2~~ 1.1.2 Purpose. *The purpose of this code is to establish the minimum requirements to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, stability, access to persons with disabilities, sanitation, adequate lighting and ventilation, and energy conservation; safety to life and property from fire and other hazards attributed to the built environment; and to provide safety to fire fighters and emergency responders during emergency operations.*

~~101.3~~ 1.1.3 Scope. *The provisions of this code shall apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout the State of California.*

> ***~~101.3.1~~ 1.1.3.1 Nonstate-regulated buildings, structures, and applications.*** *Except as modified by local ordinance pursuant to Section ~~101.8~~ 1.1.8, the following standards in the California Code of Regulations, Title 24, Parts 2, 2.5, 3, 4, 5, 6, 9~~, and~~ 10 and 11 shall apply to all occupancies and applications not*

regulated by a state agency.

~~101.3.2~~ 1.1.3.2 State-regulated buildings, structures, and applications. *The model code, state amendments to the model code, and/or state amendments where there are no relevant model code provisions shall apply to the following buildings, structures, and applications regulated by state agencies as referenced in the Matrix Adoption Tables and as specified in Sections ~~102~~ 1.2 through ~~114~~ 1.14, except where modified by local ordinance pursuant to Section ~~101.8~~ 1.1.8. When adopted by a state agency, the provisions of this code shall be enforced by the appropriate enforcing agency, but only to the extent of authority granted to such agency by the state legislature.*

Note: *See Preface to distinguish the model code provisions from the California provisions.*

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11. *Public elementary and secondary schools, community college buildings~~,~~ and state-owned or state-leased essential service buildings regulated by the Division of the State Architect. See Section ~~109.2~~ 1.9.2 for additional scope provisions.*
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~~101.4~~ 1.1.4 Appendices. *Provisions contained in the appendices of this code shall not apply unless specifically adopted by a state agency or adopted by a local enforcing agency in compliance with Health and Safety Code Section ~~18938 (b)~~ 18901 et. seq. for Building Standards Law, Health and Safety Code Section 17950 for State Housing Law and Health and Safety Code Section 13869.7 for Fire Protection Districts. See Section ~~101.8~~ 1.1.8 of this code.*

~~101.5~~ 1.1.5 Referenced codes. *The codes, standards and publications adopted and set forth in this code, including other codes, standards and publications referred to therein are, by title and date of publication, hereby adopted as standard reference documents of this code. When this code does not specifically cover any subject related to building design and construction, recognized architectural or engineering practices shall be employed. The National Fire Codes, standards, and the Fire Protection Handbook of the National Fire Protection Association are permitted to be used as authoritative guides in determining recognized fire prevention engineering practices.*

~~101.6~~ 1.1.6 NonBuilding standards, orders and regulations. *Requirements contained in the International Building Code, or in any other referenced standard, code or document, which are not building standards as defined in Health and Safety Code Section 18909, shall not be construed as part of the provisions of this code. For nonbuilding standards, orders, and regulations, see other titles of the California Code of Regulations.*

~~101.7~~ 1.1.7 Order of precedence and use.

~~101.7.1~~ 1.1.7.1 Differences. *In the event of any differences between these building standards and the standard reference documents, the text of these building standards shall govern.*

~~101.7.2~~ 1.1.7.2 Specific provisions. *Where a specific provision varies from a general provision, the specific provision shall apply.*

~~101.7.3~~ 1.1.7.3 Conflicts. *When the requirements of this code conflict with the requirements of any other part of the California Building Standards Code, Title 24, the most restrictive requirements shall prevail.*

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~~101.9~~ 1.1.9 Effective date of this code. *Only those standards approved by the California Building Standards Commission that are effective at the time an application for building permit is submitted shall apply to the plans and specifications for, and to the construction performed under, that permit. For the effective dates of the provisions contained in this code, see the History Note page of this code.*

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~~101.11~~ 1.1.11 Format. *This part fundamentally adopts the International Building Code by reference on a chapter-by-chapter basis. Such adoption is reflected in the Matrix Adoption Table of each chapter of this part. When the Matrix Adoption Tables make no reference to a specific chapter of the International Building Code such chapter of the International Building Code is not adopted as a portion of this code.*

~~101.12~~ 1.1.12 Validity. *If any chapter, section, subsection, sentence, clause or phrase of this code is for any reason held to be unconstitutional, contrary to statute, exceeding the authority of the state as stipulated by statutes or otherwise inoperative, such decision shall not affect the validity of the remaining portion of this code.*

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SECTION ~~109~~ 1.9
DIVISION OF THE STATE ARCHITECT

~~109.1~~ 1.9.1 (Reserved for DSA-AC)

~~109.2~~ 1.9.2 Division of the State Architect - Structural Safety

~~109.2.1~~ 1.9.2.1. DSA-SS (Division of the State Architect – Structural Safety)

Application - *Public elementary and secondary schools, community college buildings, and state-owned or state-leased essential services buildings.*

Enforcing Agency - *Division of the State Architect – Structural Safety (DSA-SS).The Division of the State Architect has been delegated the responsibility and authority by the Department of General Services to review and approve the design and oversee the construction of public elementary and secondary schools, community colleges, and state-owned or state-leased essential services buildings.*

Authority Cited - *Education Code Section 17310 and 81142, and Health & Safety Code Section 16022.*

Reference - *Education Code Sections 17280 through 17317 and 81130 through 81147, and Health & Safety Code Sections 16000 through 16023.*

~~109.2.2~~ 1.9.2.1.1 Applicable administrative standards.

1. ***Title 24, Part 1, California Code of Regulations:***

1.1 Sections 4-301 through 4-355, Group 1, Chapter 4, for public elementary and secondary schools and community colleges.

1.2 Sections 4-201 through 4-249, Chapter 4, for state-owned or state-leased essential services buildings.

2. ***Title 24, Part 2, California Code of Regulations:*** *[applies to public elementary and secondary schools, community colleges and state-owned or state-leased essential services building(s)]:*

2.1 Sections ~~101~~ 1.1 and ~~109.2~~ 1.9.2 of Chapter 1, Division I.

2.2 Sections 102.1, 102.2, 102.3, 102.4, 102.5, 104.9, 104.10 and 104.11 of ~~Appendix~~ Chapter 1, Division II.

~~109.2.3~~ 1.9.2.1.2 Applicable building standards. *California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 6, 9 and 12, California Code of Regulations, for school buildings, community colleges and state-owned or state- leased essential service buildings.*

The provisions of Title 24, Part 2, as adopted and amended by the Division of the State Architect—Structural Safety, shall apply to the applications listed in Section ~~109.2.1~~ 1.9.2.1.

The Division of the State Architect—Structural Safety adopts the following building standards in Title 24, Part 2:

Chapters 2 through 10, 12, 14, 15, 16A, 17A, 18A, 19A, 20, 21A, 22A, 23, 24, 25, 26, 30, 31, 32, 33, 34, 35 and Appendix J.

~~109.2.4~~ 1.9.2.1.3 Amendments. *Division of the State Architect—Structural Safety amendments in this code appear proceeded with the acronym* ***[DSA-SS]****.*

Exceptions:

1. *Chapters 16A, 17A, 18A, 19A, 21A, and 22A— Amendments appearing in these chapters without an acronym have been co-adopted by DSA-SS and OSHPD.*
2. *Chapter 34, Sections 3115-3421—DSA-SS adopts these sections without the use of the DSA-SS acronym.*

~~109.2.5~~ 1.9.2.1.4 Reference to other chapters. *Where reference is made within this code to sections in Chapters 16, 17, 18, 19, 21 and 22, the respective sections in Chapters 16A, 17A, 18A, 19A, 21A, and 22A shall apply instead.*

1.9.2.2. DSA-SS/CC (Division of the State Architect – Structural Safety/Community Colleges)

Application - *Community Colleges.*

The Division of the State Architect has been delegated the authority by the Department of General Services to promulgate alternate building standards for application to community colleges, which a community college may elect to use in lieu of standards promulgated by DSA-SS in accordance with Section 1.9.2.1.

Enforcing Agency - *Division of the State Architect – Structural Safety/Community Colleges (DSA-SS/CC)*

The Division of the State Architect has been delegated the authority by the Department of General Services to review and approve the design and oversee construction of community colleges electing to use the alternative building standards as provided in this section.

Authority Cited - *Education Code Section 81053.*

Reference - *Education Code Sections 81052, 81053, and 81130 through 81147.*

1.9.2.2.1 Applicable administrative standards.

1. ***Title 24, Part 1, California Code of Regulations:***

1.1 Sections 4-301 through 4-355, Group 1, Chapter 4.

2. ***Title 24, Part 2, California Code of Regulations****:*

2.1 Sections 1.1 and 1.9.2 of Chapter 1, Division I.

2.2 Sections 102.1, 102.2, 102.3, 102.4, 102.5, 104.9, 104.10 and 104.11 of Chapter 1,

Division II.

1.9.2.2.2 Applicable building standards. *California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 6, 9 and 12, California Code of Regulations.*

The Division of the State Architect—Structural Safety/Community Colleges ***[DSA-SS/CC]*** *adopts the following building standards in Title 24, Part 2:*

Chapters 2 through 10, 12, 14, 15, 16, 17A, 18A, 19, 20, 21, 22A, 23, 24, 25, 26, 30, 31, 32, 33, 34, 35 and Appendix J.

1.9.2.2.3 Amendments. *Division of the State Architect—Structural Safety/Community Colleges amendments in this code appear preceded with the acronym* ***[DSA-SS/CC].***

Exceptions:

1. *Chapters 17A, and 18A— Amendments appearing in these chapters without an acronym have been co-adopted by DSA-SS, DSA-SS/CC, and OSHPD.*
2. *Chapter 34, Sections 3115-3421—DSA-SS/CC adopts these sections without the use of the DSA-SS/CC acronym.*

1.9.2.2.4 Reference to other chapters. *Where reference is made within this code to sections in Chapters 17 and 18. the respective sections in Chapters 17A and 18A shall apply instead.*

~~*APPENDIX CHAPTER 1*~~

ADMINISTRATION

DIVISION II

*(*Chapter 1, Administration has been relocated from *Appendix Chapter 1* and renamed *Division II)*

SECTION 101
GENERAL

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

. . . .

SECTION 102
APPLICABILITY

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

102.1.1 Additional Requirements. [DSA-SS, DSA-SS/CC] *See Chapter 1, Division I, Section ~~101.7~~ 1.1.7.*

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

102.4.1 Additional Requirements. [DSA-SS, DSA-SS/CC] *All reference to International Codes or other similar codes in referenced standards shall be replaced by equivalent provisions in the California Building Standard Codes.*

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SECTION 106
FLOOR AND ROOF DESIGN LOADS

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

~~1603A.3.1~~ 106.1.1 Snow Load Posting. [DSA-SS, DSA-SS/CC] *Snow loads used in design shall be posted as for live loads.*

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

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

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

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 2 - DEFINITIONS

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 3 – USE AND OCCUPANCY CLASSIFICATION

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 4 – SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 5 – GENERAL BUILDING HEIGHTS AND AREAS

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 6 – TYPES OF CONSTRUCTION

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 7 – FIRE-RESISTANCE-RATED CONSTRUCTION

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 8 – INTERIOR FINISHES

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 9 – FIRE PROTECTION SYSTEMS

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 10 – MEANS OF EGRESS

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 12 – INTERIOR ENVIRONMENT

Adopt and/or codify entire chapter as amended below:

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 14
EXTERIOR WALLS

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	**X**	**X**	
Adopt only those sections listed below			
1405.1.1	X	X	
1409	X	X	Section 1408 in 2007 CBC

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

EXPRESS TERMS

SECTION 1405
INSTALLATION OF WALL COVERINGS

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

1405.1.1 Additional requirements. [DSA-SS, DSA-SS/CC] *In addition to the requirements of Sections ~~1405.5,~~ 1405.6, 1405.7, 1405.8, 1405.9, and 1405.10, the installation of anchored or adhered veneer shall comply with applicable provisions of Section ~~1408.~~1409.*

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SECTION 1409 ~~1408~~ [DSA-SS, DSA-SS/CC]

ADDITIONAL REQUIREMENTS FOR ANCHORED AND ADHERED VENEER.

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

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

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

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

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

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

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

Notation for [DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

Notation for [DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 15
ROOF ASSEMBLIES

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter			
Adopt entire chapter with amendments listed below	**X**	**X**	
Adopt only those sections listed below			
1507.3.10	X	**X**	
1507.7.8	X	**X**	
1511	X	**X**	

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 1603 – CONSTRUCTION DOCUMENTS– repeal amendments in following subsections:

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

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

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

EXPRESS TERMS

SECTION 1501
GENERAL

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

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SECTION 1507
REQUIREMENTS FOR ROOF COVERINGS

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

. . . .

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

. . . .

1507.3.10 Additional requirements. [DSA/SS & DSA-SS/CC] *In addition to the requirements of 1507.3.6 and 1507.3.7, the installation of clay and concrete tile roof coverings shall comply with seismic anchorage provisions of Section 1511.*

. . . .

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

. . . .

~~1507.7.7~~ 1507.7.8 Additional requirements [DSA-SS & DSA-SS/CC]. *In addition to the requirements of Section 1507.7.5, the installation of slate shingle roof coverings shall comply with the requirements of Sections 1507.3.6 and 1507.3.7, ~~the installation of slate shingle roof coverings shall comply with~~ and the seismic anchorage provisions of Section 1511.*

. . . .

SECTION 1511 [DSA-SS & DSA-SS/CC]
SEISMIC ANCHORAGE OF SLATE SHINGLE, CLAY AND CONCRETE TILE ROOF COVERINGS

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

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

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

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

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

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

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

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

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

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

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

   Attachment for continuous ties shall be nails, screws, staples or approved clips of the same material as the ties and shall not be subjected to withdrawal forces. Attachments for continuous ties shall have an allowable working stress shear resistance of not less than twice the dead weight of the tile tributary to the attachment, but not less than 300 pounds (136 kg).

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

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

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

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

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

Notation for [DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

Notation for [DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

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CHAPTER 16
STRUCTURAL DESIGN

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	-	X	
Adopt only those sections listed below			
1601.1.1		X	New Amendment
1601.1.2		X	New Amendment
1601.1.3		X	New Amendment
1601.2		X	
1601.3		X	
1603.1.10		X	New Amendment
1604.3.7		X	From 1604A.3.7 – CBC 2007
Table 1604.5		X	
1605.1.1.1		X	New amendment
1606.3		X	From 1603A.3 – CBC 2007
Table 1607.1 – m, n, o p, q		X	
1607.11.5		X	From 1607A.11.2.2 – CBC 2007
1608.3		X	From 1608A.3 – CBC 2007
1609.1.1.3		X	From 1608A.1.1.2 – CBC 2007
1609.1.3		X	From 1609A.1.3 – CBC 2007
1613.1.2		X	New Amendment
1613.2 – Active Earthquake Fault		X	From 1613A.2 – CBC 2007
Base		X	From 1613A.2 – CBC 2007
Distance for an Active Earthquake Fault		X	From 1613A.2 – CBC 2007
Irregular Structure		X	From 1613A.2 – CBC 2007
Next Generation Attenuation (NGA)		X	New Amendment
Structural Elements		X	From 1613A.2 – CBC 2007
1613.5.1 - Exception		X	New Amendment
1613.5.6 – Exception		X	From 1613A.5.6 – CBC 2007
1613.5.6.1 - Exception		X	From 1613A.5.6.1 – CBC 2007
1613.5.6.2 - Exception		X	From 1613A.5.6.2 – CBC 2007
1613.6.3 - Exception		X	New Amendment
1613.6.7 - Exception		X	New Amendment
1613.7 - Exception		X	New Amendment
Section 1615 – Entire Section		X	From Section 1615A – CBC 2007

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 1602 – DEFINITIONS AND NOTATIONS– repeal amendments in following subsections:

(Section 1602A.1 – CBC 2007) ~~***ENFORCEMENT AGENT.*** *That individual within the agency or organization charged with responsibility for agency or organization compliance with the requirements of this code. Used interchangeably with "Building official" or "Code official."*~~

2007 CBC SECTION 1603 – CONSTRUCTION DOCUMENTS– repeal amendments in following subsections:

~~***1603A.3.1 Snow Load Posting.*** *Snow loads used in design shall be posted as for live loads.*~~ *(Relocated to Chapter 1, Division 2, Section 106.1)*

2007 CBC SECTION 1604 – GENERAL DESIGN REQUIREMENTS - repeal amendments in following subsections:

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

2007 CBC SECTION 1605 – LOAD COMBINATIONS - repeal amendments in following subsections:

~~***1605A.2.1.1 [For DSA-SS] Determination of f_2.*** *The value of f2 shall conform with the requirements adopted by the city, county, or city and county in which the project is located, if more restrictive than prescribed in Section 1605A.2.1.*~~

2007 CBC SECTION 1609 – WIND LOADS – repeal amendments in following subsections:

~~***1609A.6 Alternate all-heights method….***~~

2007 CBC SECTION 1613 – EARTHQUAKE LOADS - repeal amendments in following subsections:

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

2007 CBC SECTION 1614 – MODIFICATIONS TO ASCE 7 - repeal amendments in following subsections:

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

> ~~*13.6.1.1 HVAC Ductwork, Plumbing/Piping and Conduit Systems. Ductwork shall be constructed in accordance with provisions contained in Part 4, Title 24, California Mechanical Code. Where possible, pipes, conduit, and their connections shall be constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections). Pipes, conduits and their connections, constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic), shall have the brace spacing reduced to satisfy requirements of ASCE 7 Section 13 and not to exceed one-half of the spacing allowed for ductile materials.*~~
>
> ~~*13.6.1.2 Trapeze Assemblies. All trapeze assemblies supporting pipes, ducts and conduit shall be braced to resist the forces and relative displacements per ASCE 7 Chapter 13, considering the total weight of the elements on the trapeze.*~~
>
> ~~*Pipes, ducts and conduit supported by a trapeze where none of those elements would individually be braced need not be braced if connections to the pipe/conduit/ductwork or directional changes do not restrict the movement of the trapeze. If this flexibility is not provided, bracing will be required when the aggregate weight of the pipes and conduit exceed 10 pounds/feet (146 N/m). The weight shall be determined assuming all pipes and conduit are filled with water.*~~

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

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

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

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

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

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

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

1614A.1.22 ASCE 7, Section 17.2.4. *Modify ASCE 7, Section 17.2.4. by adding Section 17.2.4.10 as follows:*

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

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

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

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

1614A.1.26 ASCE 7, Section 17.4.1. *Modify ASCE 7, Section 17.4.1 by adding the following:*

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

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

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

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

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

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

1614A.1.29 ASCE 7, Section 17.7*Modify ASCE 7, Section 17.7 by adding Section 17.7.1 as follows: the following:*

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

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

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

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

~~***Required tests of energy dissipation devices - production tests.*** *Production testing and associated acceptance criteria shall be as approved by the enforcement agent.*~~

(Chapter 16 Repealer and Express Terms are based on 2007 CBC Chapter 16A and 2009 IBC Chapter 16.)

(All existing CBC 2007 CA amendments that are not revised below shall continue without any change)

EXPRESS TERMS

SECTION ~~1601A~~ 1601
GENERAL

~~**1601A.1**~~ **1601.1 Scope.** The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof regulated by this code.

~~***1601A.1.1***~~ ***1601.1.1 Application.*** *The scope of application of Chapter ~~16A~~ 16 is as follows:*

1. *Community college buildings regulated by the Division of the State Architect-Structural Safety/Community Colleges (DSA-SS/CC), as listed in Section 1.9.2.2.*

2. *(Reserved for OSHPD).*

1601.1.2 Identification of amendments. [DSA-SS/CC] *Division of the State Architect-Structural Safety/Community Colleges amendments appear in this chapter proceeded with the appropriate acronym, as follows:*

1. *Division of the State Architect - Structural Safety/Community Colleges:*
   [DSA-SS-CC] *- For community college buildings listed in Section 1.9.2.2*

2. *(Reserved for OSHPD).*

1601.1.3 Reference to other chapters. [DSA-SS-CC] *Where reference within this chapter is made to sections in Chapters 17and 18, the provisions in Chapters 17A and 18A respectively shall apply instead.*

~~***1601A.2***~~ ***1601.2 References. [DSA-SS/CC]*** *All referenced codes and standards listed in Chapter 35 shall include all the modifications contained in this code to referenced standards. In the event of any discrepancy between this code and a referenced standard, refer to Section ~~101.7~~ 1.1.7.*

~~***1601A.3***~~ ***1601.3 Enforcement agency approval. [DSA-SS/CC]*** *In addition to requirements of California Code of Regulations (C.C.R.) Title 24, Parts 1 & 2, any aspect of project design, construction, quality assurance, or quality control programs for which this code requires approval by the design professional, are also subject to approval by the enforcement agency.*

SECTION ~~1602A~~ 1602
DEFINITIONS AND NOTATIONS

. . . .

SECTION ~~1603A~~ 1603
CONSTRUCTION DOCUMENTS

. . . .

~~1603A.1.9~~ 1603.1.9 Systems and components requiring special inspections for seismic resistance. *Construction documents* or specifications shall be prepared for those systems and components requiring *special inspection* for seismic resistance as specified in Section 1707.1 by the *registered design professional* responsible for their design and shall be submitted for approval in accordance with Section 107.1, *Chapter 1, Division 2*. Reference to seismic standards in lieu of detailed drawings is acceptable.

1603.1.10 Additional requirements. [DSA-SS/CC]

1. *(Relocated from Section 1603A.1 – CBC 2007) Additional requirements for construction documents are included in Section 4-210 and 4-317 of the Building Standards Administrative Code (Part 1, Title 24, C.C.R).*

2. ***~~1603A.1.5.1 Connections.~~*** *Connections that resist design seismic forces shall be designed and detailed on the design drawings.*

3. ***~~1604A.11Construction procedures.~~*** *Where unusual erection or construction procedures are considered essential by the project structural engineer or architect in order to accomplish the intent of the design or influence the design, such procedure shall be indicated on the plans or in the specifications.*

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SECTION ~~1604A~~ 1604
GENERAL DESIGN REQUIREMENTS

. . . .

TABLE ~~1604A.3~~ 1604.3 - DEFLECTION LIMITS [a, b, c, h, i]

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

. . . .

~~1604A.3.7~~ 1604.3.7 ~~Lateral Load Deflections.~~ Additional requirements. [DSA-SS/CC]

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

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

1. ~~***1604A.3.7.2 Horizontal diaphragms.*~~ *The maximum span-width ratio for any roof or floor diaphragm shall not exceed those given in Table ~~2305.2.3~~ 2305.2. Table 4.2.4 of AF & PA SDPWS for wood sheathed diaphragms. For other diaphragms, ~~or ICC-ES AC 43 unless~~ test data and design calculations acceptable to the enforcement agency ~~are~~ shall be submitted and approved for ~~the use of other~~ span-width ratios. ~~Concrete diaphragm shall not exceed span-width ratios for equivalent composite floor diaphragm in ICC-ES AC 43.~~*

2. *The deflection shall not exceed the limits in Section 1405.10 for (Relocated from Table 1604A.3) veneered walls, anchored veneers and adhered veneers over 1 inch (25 mm) thick, including the mortar backing.*

. . . .

TABLE ~~1604A.5~~ 1604.5 - OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES

OCCUPANCY CATEGORY	NATURE OF OCCUPANCY
I	. . . .
II	. . . .
III	. . . .
IV	. . . . • Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response. ~~***[DSA-SS]:** as defined in C.C.R. Title 24, Part 1, Section 4-207 and all structures required for their continuous operation and access.*~~ ***Additional requirement. [DSA-SS/CC]** Includes structures as defined in C.C.R. Title 24, Part 1, Section 4-207 and all structures required for their continuous operation ~~and~~ or access/egress.* . . . .

a. For purposes of occupant load calculation, occupancies required by Table 1004.1.1 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

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SECTION ~~1605A~~ 1605
LOAD COMBINATIONS

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~~1605A.1.1~~ 1605.1.1 Stability. Regardless of which load combinations are used to design for strength, where overall structure stability (such as stability against overturning, sliding, or buoyancy) is being verified, use of the load combinations specified in Section ~~1605A.2~~ 1605.2 or ~~1605A.3~~ 1605.3 shall be permitted. Where the load combinations specified in Section ~~1605A.2~~ 1605.2 are used, strength reduction factors applicable to soil resistance shall be provided by a *registered design professional*. The stability of retaining walls shall be verified in accordance with Section ~~*1807A.2.3.*~~ 1807.2.3

***1605.1.1.1 Additional requirement. [DSA-SS/CC]** When using allowable stress design, the factor of safety for soil bearing values shall not be less than the overstrength factor of the structures supported.*

. . . .

~~1605A.3.2~~ **1605.3.2 Alternative basic load combinations.** In lieu of the basic load combinations specified in Section ~~1605A.3.1~~ 1605.3.1, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. When using these alternative basic load combinations that include wind or seismic loads, allowable stresses are permitted to be increased or load combinations reduced where permitted by the material chapter of this code or the referenced standards.

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

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SECTION ~~1606A~~ 1606
DEAD LOADS

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~~***1606A.3 Roof Dead Loads.***~~ ***1606.3 Additional requirement. [DSA-SS/CC]*** *The design dead load shall provide for the weight of at least one additional roof covering in addition to other applicable loadings if the new roof covering is permitted to be applied over the original roofing without its removal, in accordance with Section 1510.*

SECTION ~~1607A~~ 1607
LIVE LOADS

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TABLE ~~1607A.1~~ 1607.1 - MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS [g]

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (lbs.)
. . . .	. . . .	. . . .
30. Schools [m] Classrooms Corridors above first floor First-floor corridors	 40 [e] 80 100	 1,000 1,000 1,000
. . . .	. . . .	. . . .
~~42~~ 41. Storage racks and wall-hung cabinets.	Total Loads [m]	

. . . .

m. ***Additional requirements. [DSA-SS/CC]*** *The minimum vertical design live load shall be as follows:*

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

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

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

n ***Additional requirements. [DSA-SS/CC]*** *The following minimum loads for stage accessories apply:*

1. Gridirons and fly galleries: 75 pounds per square foot uniform live load.

2. *Loft block wells: 250 pounds per lineal foot vertical load and lateral load.*

3. *Head block wells and sheave beams: 250 pounds per lineal foot vertical load and lateral load. Head block wells and sheave beams shall be designed for all tributary loft block well loads. Sheave blocks shall be designed with a safety factor of five.*

4. *Scenery beams where there is no gridiron: 300 pounds per lineal foot vertical load and lateral load.*

5. *Ceiling framing over stages shall be designed for a uniform live load of 20 pounds per square foot. - For members supporting a tributary area of 200 square feet or more, this additional load may be reduced to 15 pounds per square foot (0.72 kN/m^2).*

o. ***Reserved*** ~~*The minimum uniform live load for classroom occupancies is 50 psf.*~~

p. ***Additional requirement. [DSA-SS/CC]*** *The minimum uniform live load for a press box floor or accessible roof with railing is 100 psf.*

q. ***Additional requirement. [DSA-SS/CC]*** *Item ~~41~~ 40 applies to pedestrian bridges and walkways that are not ~~subjected~~ subject to uncontrolled vehicle access.*

. . . .

~~**1607A.11.2.2**~~ **1607.11.2.2 Special-purpose roofs.** Roofs used for promenade purposes, roof gardens, assembly purposes or other special purposes, and marquees, shall be designed for a minimum live load, L_o, as specified in Table ~~1607A.1~~ 1607.1. Such live loads are permitted to be reduced in accordance with Section ~~1607A.9~~ 1607.9. Live loads of 100 psf (4.79 kN/m^2) or more at areas of roofs classified as Group A occupancies shall not be reduced.

. . . .

~~***1607A.11.2.2***~~ ***1607.11.5 Additional requirement [DSA-SS/CC].*** *Uncovered open-frame roof structures shall be designed for a vertical live load of not less than 10 pounds per square foot (0.48 kN/m^2) of the total area encompassed by the framework.*

. . . .

1607.13 Interior walls and partitions. Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m^2). (2007 CBC, Section 1607A.13) ~~*The 5 psf (0.24 kN/m^2) load need not be applied simultaneously with wind or seismic loads. The deflection of such walls under a load of 5 psf (0.24 kN/m^2) shall not exceed 1 / 240 of the span for walls with brittle finishes and 1 / 120 of the span for walls with flexible finishes.*~~

Exception Fabric partitions complying with Section 1607.13.1 shall not be required to resist the minimum horizontal load of 5 psf (0.24 kN/m^2).

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SECTION ~~1608A~~ 1608
SNOW LOADS

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~~*1608A.3 Determination of Snow Loads. [DSA-SS]*~~ *1608.3 Additional requirement. [DSA-SS/CC] 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.*

SECTION ~~1609A~~ 1609
WIND LOADS

. . . .

~~*1609A.1.1.2 Special wind regions. [DSA-SS]*~~ *1609.1.1.3 Additional requirement. [DSA–SS/CC] The basic wind speed for projects located in special wind regions as defined in Figure 1609A 1609 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-SS~~ DSA.*

. . . .

~~*1609A.1.3 Story drift for wind loads*~~ *1609.1.3 Additional requirement. [DSA–SS/CC] The calculated story drift due to wind pressures shall not exceed 0.005 times the story height for buildings less than 65 feet (19,812 mm) in height or 0.004 times the story height for buildings 65 feet (19,812 mm) or greater in height.*

. . . .

~~**1609A.4**~~ **1609.4 Exposure category.** For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features.

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

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SECTION ~~1610A~~ 1610
SOIL LATERAL LOADS

. . . .

SECTION ~~1611A~~ 1611
RAIN LOADS

. . . .

SECTION ~~1612A~~ 1612
FLOOD LOADS

. . . .

~~**1612A.3**~~ **1612.3 Establishment of flood hazard areas.** To establish *flood hazard areas*, the applicable governing authority shall adopt a flood hazard map and supporting data. The flood hazard map shall include, at a minimum,

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

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SECTION ~~1613A~~ 1613
EARTHQUAKE LOADS

~~1613A.1~~ 1613.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE 7 ~~*with all the modifications incorporated herein*~~, excluding Chapter 14 and Appendix 11A. The *seismic design category* for a structure ~~*shall*~~ is permitted to be determined in accordance with Section ~~1613A~~ 1613 or ASCE 7.

. . . .

1613.1.2 Additional requirements [DSA-SS/CC]

1. *The modifications to ASCE 7 in Section 1615 shall apply.*
2. *(Relocated from 2007 CBC, Section 1613A.1.2) The seismic design category for a structure shall be determined in accordance with Section 1613.*

~~1613A.2~~ 1613.2 Definitions. The following words and terms shall, for the purposes of this section, have the meanings shown herein. ~~*Definition provided in Section 3402A.1 and ASCE 7 Section 11.2 shall apply when appropriate in addition to terms defined in this section.*~~

(2007 CBC, Section 1613A.2) ***ACTIVE EARTHQUAKE FAULT. [DSA-SS/CC]*** *A fault that has been the source of earthquakes or is recognized as a potential source of earthquakes, including those that have exhibited surface displacement within Holocene time (about 11,000 years) as determined by California Geological Survey (CGS) under the Alquist-Priolo Earthquake Fault Zoning Act ~~or other~~, those included as type A or type B faults for the U.S. Geological Survey (USGS) National Seismic Hazard Maps, and faults considered to have been active in Holocene time by an authoritative source, Federal, State or Local Governmental Agency.*

(2007 CBC, Section 1613A.2) ***BASE. [DSA-SS/CC]*** *The level at which the horizontal seismic ground motions are considered to be imparted to the structure or the level at which the structure as a dynamic vibrator is supported. This level does not necessarily coincide with the ground level.*

. . . .

(2007 CBC, Section 1613A.2) ***DISTANCE FROM AN ACTIVE EARTHQUAKE FAULT. [DSA-SS/CC]*** *Distance measured from the nearest point of the building to the closest edge of an Alquist-Priolo Earthquake fault zone for an active fault, if such a map exists, or to the closest mapped splay of the fault.*

. . . .

(2007 CBC, Section 1613A.2) ***IRREGULAR STRUCTURE. [DSA-SS/CC]*** *A structure designed as having one or more plan or vertical irregularities per ASCE 7 Section 12.3.*

. . . .

NEXT GENERATION ATTENUATION (NGA). [DSA-SS/CC] *Attenuation relations used for the 2008 United States Geological Survey (USGS) seismic hazards maps (for the Western United States) or their equivalent as determined by the enforcement agency.*

. . . .

(2007 CBC, Section 1613A.2) ***~~SOIL-STRUCTURE RESONANCE.~~*** *~~The coincidence of the natural period of a structure with a dominant frequency of the ground motion~~.*

(2007 CBC, Section 1613A.2) ***STRUCTURAL ELEMENTS. [DSA-SS/CC]*** *Floor or roof diaphragms, decking, joists, slabs, beams, or girders, columns, bearing walls, retaining walls, masonry or concrete nonbearing walls exceeding one story in height, foundations, shear walls or other lateral-force-resisting members, and any other elements necessary to the vertical and lateral strength or stability of either the building as a whole or any of its parts, including connection between such elements.*

. . . .

~~1613A.5.1~~ 1613.5.1 Mapped acceleration parameters. The parameters S_s and S_1 shall be determined from the 0.2 and 1-second spectral response accelerations shown on Figures 1613.5(1) through 1613.5(14). Where S_1 is less than or equal to 0.04 and S_s is less than or equal to 0.15, the structure is permitted to be assigned to *Seismic Design Category* A.

Exception [DSA-SS/CC]: *Seismic Design Category shall be determined in accordance with Section 1613.5.6.*

. . . .

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

(Relocated from 2007 CBC, Section 1613A.5.6) ***Exception: [DSA-SS/CC]*** *Structures not assigned to Seismic Design Category E or F above* shall be assigned to *Seismic Design Category D.*

~~1613A.5.6.1~~ 1613.5.6.1 Alternative seismic design category determination. ~~*Not permitted by DSA-SS*~~. Where S_1 is less than 0.75, the seismic design category is permitted to be determined from Table 1613.5.6(1) alone when all of the following apply:

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

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

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

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

(Relocated from 2007 CBC, Section 1613A.5.6.1) ***Exception: [DSA-SS/CC]*** *The alternative Seismic Design Category determination procedure of Section 1613.5.6.1 is not permitted by ~~DSA-SS~~ DSA-SS/CC.*

~~1613A.5.6.2~~ 1613.5.6.2 Simplified design procedure. ~~*Not permitted by DSA-SS*~~. Where the alternate simplified design procedure of ASCE 7 is used, the seismic design category shall be determined in accordance with ASCE 7.

(Relocated from 2007 CBC,Section 1613A.5.6.2) ***Exception: [DSA-SS/CC]*** *The simplified design procedure is not permitted by ~~DSA-SS~~ DSA-SS/CC.*

. . . .

~~1613A.6.2~~ 1613.6.2 Additional seismic-force-resisting systems for seismically isolated structures. Add the following exception to the end of Section 17.5.4.2 of ASCE 7:

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

1. The value of R_1 as defined in Chapter ~~17A~~ 17 is taken as 1.

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

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

1613.6.3 Automatic sprinkler systems. *Automatic sprinkler systems* designed and installed in accordance with NFPA 13 shall be deemed to meet the requirements of Section 13.6.8 of ASCE 7.

Exception: [DSA-SS/CC] *The allowable values for design of anchors, hangers, and bracing elements shall be determined in accordance with material chapters of this code in lieu of those in NFPA 13.*

. . . .

1613.6.7 Minimum distance for building separation. All buildings and structures shall be separated from adjoining structures. Separations shall allow for the maximum inelastic response displacement (δ_M). δ_M shall be determined at critical locations with consideration for both translational and torsional displacements of the structure using Equation 16-44.

(Equation 16-44)
(Equation not shown for clarity)

where:

C_d = Deflection amplification factor in Table 12.2-1 of ASCE 7.

δ_{max} = Maximum displacement defined in Section 12.8.4.3 of ASCE 7.

I = Importance factor in accordance with Section 11.5.1 of ASCE 7.

Exception: [DSA-SS/CC] *δ_M shall be determined as:*

$$\delta_M = C_d \delta_{max} \qquad \textbf{(Equation 16-44.1)}$$

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

. . . .

1613.7 ASCE7, Section 11.7.5. Modify ASCE7, Section 11.7.5 to read as follows:

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

Exception: [DSA-SS/CC] *Modification of ASCE 7, Section 11.7.5 not adopted by DSA-SS/CC.*

SECTION 1614
STRUCTURAL INTEGRITY

. . . .

SECTION ~~1614A~~ 1615 [DSA-SS/CC]
MODIFICATIONS TO ASCE 7

~~1614A.1~~ 1615.1 General. *The text of ASCE 7 shall be modified as indicated in Sections ~~1614A.1.1~~ 1615.1.1 through ~~1614A.1.31~~ 1615.1.26.*

~~1614A.1.1~~ 1615.1.1 ASCE 7, Section 11.1. *Modify ASCE 7 Section 11.1 by adding Section 11.1.5 as follows:*

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

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

~~1614A.1.2~~ 1615.1.2 ASCE 7, Section 11.4.7. *~~Replace~~ Modify ASCE 7 Section 11.4.7 ~~as follows~~ by adding the following:*

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

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

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

~~a) Structure located in Type E soils and mapped MCE spectral acceleration at short periods (S_s) exceeds 2.0g.~~

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

~~Exception:~~

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

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

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

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

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

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

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

~~1614A.1.3~~ 1615.1.3 ASCE 7, Table 12.2 -1. *Modify ASCE 7 Table 12.2-1 as follows:*

A. BEARING WALL SYSTEMS

14. Light-framed walls with shear panels of all other materials – Not permitted by ~~DSA-SS~~ DSA-SS/CC.

B. BUILDING FRAME SYSTEMS

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

Exception:

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

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

3) Systems listed in this section can be used for seismically isolated buildings when permitted by Section ~~1613A.6.2~~ 1613.6.2.

~~1614A.1.4~~ 1615.1.4 ASCE 7, Section 12.2.3.1. *Modify ASCE 7 Section 12.2.3.1 by adding the following additional requirements for a two stage equivalent lateral force procedure or modal response spectrum procedure:*

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

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

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

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

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

~~1614A.1.5~~ 1615.1.5 ASCE 7, Section 12.3.3. *Modify ~~first sentence of~~ ASCE 7 Section 12.3.3.1 as follows:*

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

~~1614A.1.6~~ 1615.1.6 ASCE 7, Section 12.7.2. *Modify ASCE 7 Section 12.7.2 by adding Item 5 to read as follows:*

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

~~***1614A.1.7 Reserved.***~~

~~***1614A.1.8***~~ ***1615.1.7 ASCE 7, Section 12.8.7.*** *Modify ASCE 7 Section 12.8.7 by replacing Equation 12.8-16 as follows:*

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

~~***1614A.1.9***~~ ***1615.1.8 ASCE 7, Section 12.9.4.*** *Replace ASCE 7 Section 12.9.4 as follows:*

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

~~***1614A.1.10***~~ ***1615.1.9 ASCE 7, Section 12.13.1.*** *Modify ASCE 7 Section 12.13.1 by adding Section 12.13.1.1 as follows:*

12.13.1.1 Foundations and Superstructure-to-Foundation Connections. *The foundation shall be capable of transmitting the design base shear and the overturning forces from the structure into the supporting soil. Stability against overturning and sliding shall be in accordance with Section ~~1605A.1.1~~ 1605.1.1.*

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

1. *The strength of the superstructure elements.*
2. *The maximum forces that would occur in the fully yielded structural system.*
3. *Forces from the Load Combinations with overstrength factor in accordance with ASCE 7 Section 12.4.3.2.*

EXCEPTIONS:

1. ~~*Where structures are designed using R ≤ 2.5 such as for inverted pendulum-type structures.*~~ *Where referenced standards specify the use of higher design loads.*
2. *When it can be demonstrated that inelastic deformation of the foundation and superstructure-to-foundation connection will not result in a weak story or cause collapse of the structure.*
3. *Where basic structural system consists of light framed walls with shear panels.*

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

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

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

1615.1.10 ASCE 7, Section 13.1.4. *Replace ASCE 7 Section 13.1.4 by the following:*

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

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

EXCEPTIONS:

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

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

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

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

i. The component weighs 400 lb (1780 N) or less and has a center of mass located 4 ft. (1.22 m) or less above the adjacent floor or roof level;

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

or

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

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

~~1614A.1.11~~ 1614.1.11 ASCE 7, Section 13.3.2. *Modify ASCE 7 Section 13.3.2 by adding the following:*

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

1615.1.12 ASCE 7, Section 13.4.5. *Replace ASCE 7 Section 13.4.5 by the following:*

13.4.5 Power Actuated Fasteners. *Power actuated fasteners in concrete shall not be used for gravity tension loads exceeding 100 lb (445 N) in Seismic Design Categories D, E, or F unless approved for seismic loading. Power actuated fasteners in steel are permitted in Seismic Design Category D, E or F if the gravity tension load on any fastener does not exceed 250 lbs (1123 N) unless approved for seismic loading. Power actuated fasteners in masonry are not permitted unless approved for seismic loading.*

1615.1.13 ASCE 7, Section 13.5.6. *Replace ASCE 7, Section 13.5.6 by the following:*

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

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

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

13.5.6.2 Industry Standard Construction for Acoustical Tile or Lay-In Panel Ceilings. *Unless designed in accordance with ASTM E 580 Section 5.2.8.8, or seismically qualified in accordance with Sections 13.2.5 or 13.2.6, acoustical tile or lay-in panel ceilings shall be designed and constructed in accordance with this section.*

13.5.6.2.1 Seismic Design Categories D through F. *Acoustical tile or lay-in panel ceilings in Seismic Design Categories D, E, and F shall be designed and installed in accordance with ASTM C635, ASTM C636, and ASTM E 580, Section 5 - Seismic Design Categories D, E, and F as modified by this section.*

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

~~***1614A.1.12 ASCE 7, Section 13.5.6.2.*** *Modify ASCE 7, Section 13.5.6.2 by adding Section 13.5.6.2.3 as follows:~~

~~*13.5.6.2.3 Additional Requirements*~~

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

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

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

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

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

~~6a.~~ 4. ***Lateral force bracing.*** *Lateral force bracing is required for all ceiling areas except that they shall be permitted to be omitted in rooms with floor areas up to 144 square feet when perimeter support in accordance with ASTM E 580 Sections 5.2.2 and 5.2.3 are provided and perimeter walls are designed to carry the ceiling lateral forces.*

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

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

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

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

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

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

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

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

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

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

1615.1.14 ASCE 7, Section 13.6.5. *Modify ASCE 7, Section 13.6.5 by deleting Item # 6 in Section 13.6.5.5 and adding Section 13.6.5.6 as follows:*

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

EXCEPTIONS:

1. *Design for the seismic forces and relative displacements of Section 13.3 shall not be required for raceways where either:*
   a. *Trapeze assemblies are used to support raceways and the total weight of the raceway supported by trapeze assemblies is less than 10 lb/ft (146 N/m), or*
   b. *The raceway is supported by hangers and each hanger in the raceway run is 12 in. (305 mm) or less in length from the raceway support point to the supporting structure. Where rod hangers are used, they shall be equipped with swivels to prevent inelastic bending in the rod.*
2. *Design for the seismic forces and relative displacements of Section 13.3 shall not be required for conduit, regardless of the value of I_p, where the conduit is less than 2.5 in. (64 mm) trade size.*

1615.1.15 ASCE 7, Section 13.6.7. *Replace ASCE 7, Section 13.6.7 by the following:*

13.6.7 Ductwork. *HVAC and other ductwork shall be designed for seismic forces and seismic relative displacements as required in Section 13.3. Ductwork designed to carry toxic, highly toxic, or explosive gases, or used for smoke control shall be designed and braced without considering the Exceptions noted below.*

EXCEPTIONS:

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

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

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

2. Design for the seismic forces and relative displacements of Section 13.3 shall not be required where provisions are made to avoid impact with larger ducts or mechanical components or to protect the ducts in the event of such impact; and HVAC ducts have a cross-sectional area of less than 6 ft^2 (0.557 m^2), or weigh 17 lb/ft (248 N/m).

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

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

1615.1.16 ASCE 7, Section 13.6.8. *Replace ASCE 7, Section 13.6.8 by the following:*

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

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

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

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

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

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

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

13.6.8.1 ASME Pressure Piping Systems. *Pressure piping systems, including their supports, designed and constructed in accordance with ASME B31 shall be deemed to meet the force, displacement, and other requirements of this section. In lieu of specific force and displacement requirements provided in ASME B31, the force and displacement requirements of Sections 13.3 shall be used.*

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

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

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

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

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

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

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

   b. *For Seismic Design Categories D, E, or F where I_p = 1.0 the nominal pipe size shall be 3 inches (80 mm) or less.*

The exceptions above shall not apply to elevator piping.

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

~~***1614A.1.15***~~ ***1615.1.17 ASCE 7, Section 13.6.10.1.*** *Modify ASCE 7 Section 13.6.10.1 by adding Section 13.6.10.1.1 as follows:*

. . . .

~~***1614A.1.16***~~ ***1615.1.18 ASCE 7, Section 13.6.10.4.*** *Replace ASCE 7, Section 13.6.10.4 as follows:*

. . . .

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

1615.1.19 ASCE 7, Section 16.1.3.2. *Modify ASCE 7 Section 16.1.3.2 by the following:*

Where next generation attenuation relations are used in accordance with CBC Section 1802A.6.2, each pair of motion shall be scaled such that for each period between 0.2T and 1.5T, the average of the SRSS spectra from all horizontal component pairs does not fall below the corresponding ordinate of the maximum considered earthquake (MCE) response spectrum determined using NGA relations.

At sites within 5 km of an active fault that controls the hazard, each pair of components shall be rotated to the fault-normal and fault-parallel direction of the causative fault, and shall be scaled so that average of the fault-normal components is not be less than the MCE response spectrum for each period between 0.2T and 1.5T.

1615.1.20 ASCE 7, Section 16.1.4. *Modify ASCE 7 Section 16.1.4 by the following:*

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

a. *Force response parameters shall be multiplied by I/R, where I is the importance factor determined in accordance with Section 11.5.1, and R is the Response Modification Coefficient selected in accordance with Section 12.2.1.*

b. *Drift quantities shall be multiplied by C_d/R, where C_d is the deflection amplification factor specified in Table 12.2-1.*

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

1615.1.21 ASCE 7, Section 16.2.4. *Modify ASCE 7 Section 16.2.4 by the following:*

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

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

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

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

~~1614A.1.18~~ 1615.1.22 ASCE 7, Section 17.2.1. *Modify ASCE 7, Section 17.2.1 by adding the following:*

. . . .

~~1614A.1.19~~ 1615.1.23 ASCE 7 Section 17.2.4.7. *Modify ASCE 7, Section 17.2.4.7 by adding the following:*

. . . .

~~1614A.1.23~~ 1615.1.24 ASCE 7, Section 17.2.5.2. *Modify ASCE 7, Section 17.2.5.2 by adding the following:*

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

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

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

~~1614A.1.25~~ 1615.1.25 ASCE 7, Section 17.3.2. *Modify ASCE 7, Section 17.3.2 by adding the following:*

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

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

Where next generation attenuation relations are used in accordance with Section 1803A.6.2, each pair of motion shall be scaled such that for each period between $0.5T_D$ and $1.25T_M$ (Where T_D and T_M are defined in

Section 17.5.3), the average of the SRSS spectra from all horizontal component pairs does not fall below the corresponding ordinate of the maximum considered earthquake (MCE) response spectrum determined using NGA relations.

At sites within 5 km of an active fault that controls the hazard, each pair of components shall be rotated to the fault-normal and fault-parallel direction of the causative fault, and shall be scaled so that average of the fault-normal components is not be less than the MCE response spectrum for each period between $0.5T_D$ and $1.25T_M$.

1615.1.26 ASCE 7, Section 21.4. *Replace ASCE 7, Section 21.4 by the following:*

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

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

Notation for [DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 16*A*
STRUCTURAL DESIGN

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter as amended	**X**	**-**	
Adopt only those sections listed below			

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 1604A – GENERAL DESIGN REQUIREMENTS – repeal amendments in following subsections:

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

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

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

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

2007 CBC SECTION 1605A – LOAD COMBINATIONS - repeal amendments in following subsections:

~~***1605A.2.1.1 [DSA-SS] Determination of f_2.*** *The value of f_2 shall conform with the requirements adopted by the city, county, or city and county in which the project is located, if more restrictive than prescribed in Section 1605A.2.1.*~~

2007 CBC SECTION 1613A – EARTHQUAKE LOADS - repeal amendments in following subsections:

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

2007 CBC SECTION 1614A – MODIFICATIONS TO ASCE 7 - repeal amendments in following subsections:

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

> ~~*13.6.1.1 HVAC Ductwork, Plumbing/Piping and Conduit Systems. Ductwork shall be constructed in accordance with provisions contained in Part 4, Title 24, California Mechanical Code. Where possible, pipes, conduit, and their connections shall be constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections). Pipes, conduits and their connections, constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic), shall have the brace spacing reduced to satisfy requirements of ASCE 7 Section 13 and not to exceed one-half of the spacing allowed for ductile materials.*~~
>
> ~~*13.6.1.2 Trapeze Assemblies. All trapeze assemblies supporting pipes, ducts and conduit shall be braced to resist the forces and relative displacements per ASCE 7 Chapter 13, considering the total weight of the elements on the trapeze.*~~

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

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

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

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

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

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

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

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

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

~~***1614A.1.22 ASCE 7, Section 17.2.4*** *Modify ASCE 7, Section 17.2.4 by adding Section 17.2.4.10 as follows:*~~

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

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

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

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

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

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

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

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

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

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

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

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

~~***Required tests of energy dissipation devices - production tests.*** *Production testing and associated acceptance criteria shall be as approved by the enforcement agent.*~~

(All existing CBC 2007 CA amendments that are not revised below shall continue without any change)

EXPRESS TERMS

SECTION 1601*A*
GENERAL

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

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

1. *Applications listed in Section ~~109.2~~ 1.9.2.1, regulated by the Division of the State Architect-Structural Safety (DSA-SS). These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*

2. *(Reserved for OSHPD).*

1601A.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 ~~109.2~~ 1.9.2.1.*

2. *(Reserved for OSHPD).*

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

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

SECTION 1602*A*
DEFINITIONS AND NOTATIONS

. . . .

SECTION 1603*A*
CONSTRUCTION DOCUMENTS

1603*A*.1 General. *Construction documents* shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603*A*.1.1 through 1603*A*.1.9 shall be indicated on the *construction documents*.

[For DSA-SS] *Additional requirements are included in Section 4-210 and 4-317 of the California ~~Building Standards~~ Administrative Code (Part 1, Title 24, C.C.R).*

. . . .

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

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

1603A.1.5.1 Connections....

. . . .

1603*A*.1.9 Systems and components requiring special inspections for seismic resistance…

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

(Relocated to CAC 2007, Div 2 Section 106.1.1) ***~~1603A.3.1 Snow Load Posting. Snow loads used in design shall be posted as for live loads.~~***

SECTION 1604*A*
GENERAL DESIGN REQUIREMENTS

. . . .

1604*A*.3.1 Deflections. The deflections of structural members shall not exceed the more restrictive of the limitations of Sections 1604*A*.3.2 through ~~*1604A.3.8*~~ *1604A.3.6* or that permitted by Table 1604*A*.3.

. . . .

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

CONSTRUCTION	*L*	*S* or *W* [f]	*D* + *L* [d,g]
Roof members:[e]			
Supporting plaster ceiling	*l*/360	*l*/360	*l*/240
Supporting nonplaster ceiling	*l*/240	*l*/240	*l*/180
Not supporting ceiling	*l*/180	*l*/180	*l*/120
Floor members	*l*/360	—	*l*/240
Exterior walls and interior partitions:			
With brittle finishes	—	*l*/240	—
With flexible finishes	—	*l*/180	—

Veneered walls, anchored veneers and adhered veneers over 1 inch (25 mm) thick, including the mortar backing		~~*l/480*~~ *Section 1405.10*	
Farm buildings	—	—	*l*/180
Greenhouses	—	—	*l*/120

. . . .

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

. . . .

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

OCCUPANCY CATEGORY	NATURE OF OCCUPANCY
I	. . . .
II	. . . .
III	. . . . • ~~Group I-2 occupancies with an occupant load of 50 or more resident patients, but not having surgery or emergency treatment facilities~~. . . . .
IV	Buildings and other structures designated as essential facilities, including but not limited to: • ~~Group I-2 occupancies having surgery or emergency treatment facilities.~~ • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response ***[DSA-SS]*** *as defined in C.C.R. Title 24, Part 1, Section 4-207 and all structures required for their continuous operation ~~and~~ or access/egress.* . . . .

a. For purposes of occupant load calculation, occupancies required by Table 1004.1.1 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

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SECTION 1605*A*
LOAD COMBINATIONS

. . . .

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

. . . .

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

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

. . . .

1605*A*.4 Heliports and helistops. Heliport and helistop landing areas shall be designed for the following loads, combined in accordance with Section 1605*A*:

1. Dead load, *D*, plus the gross weight of the helicopter, D_h, plus snow load, *S*.

2. Dead load, *D*, plus two single concentrated impact loads, *L*, approximately 8 feet (2438 mm) apart applied anywhere on the touchdown pad (representing each of the helicopter's two main landing gear, whether skid type or wheeled type), having a magnitude of 0.75 times the gross weight of the helicopter. Both loads acting together total 1.5 times the gross weight of the helicopter.

3. Dead load, *D*, plus a uniform live load, *L*, of 100 psf (4.79 kN/m^2).

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

SECTION 1606*A*
DEAD LOADS

. . . .

1606A.3 Roof Dead Loads . . .

SECTION 1607*A*
LIVE LOADS

. . . .

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

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (lbs.)
1. Apartments (see residential)	—	—
...		—
~~42~~ 41. *Storage racks and wall-hung cabinets.*	*Total Loads* [m]	

. . . .

q. ***[DSA-SS]*** *Item ~~41~~ 40 applies to pedestrian bridges and walkways that are not subjected to uncontrolled vehicle access.*

. . . .

1607*A*.11.2.2 Special-purpose roofs. Roofs used for promenade purposes, roof gardens, assembly purposes or other special purposes, and marquees, shall be designed for a minimum live load, L_o, as specified in Table 1607*A*.1. Such live loads are permitted to be reduced in accordance with Section 1607*A*.9. Live loads of 100 psf (4.79 kN/m^2) or more at areas of roofs classified as Group A occupancies shall not be reduced. ~~*Uncovered open-frame roof structures shall be designed for a vertical live load of not less than 10 pounds per square foot (0.48 kN/m^2) of the total area encompassed by the framework.*~~

. . . .

1607A.11.5 Uncovered open-frame roof structures. *(Relocated form 1607A.11.2.2) Uncovered open-frame roof structures shall be designed for a vertical live load of not less than 10 pounds per square foot (0.48 kN/m^2) of the total area encompassed by the framework.*

. . . .

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

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SECTION 1608*A*
SNOW LOADS

. . . .

1608A.3 Determination of snow loads . . .

SECTION 1609*A*
WIND LOADS

. . . .

~~1609A.1.1.2~~ 1609A.1.1.3 *Special Wind Regions. [DSA–SS] The basic wind speed for projects located in special wind regions as defined in Figure 1609A 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.*

. . . .

1609A.1.3 Story drift for wind loads....

. . . .

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

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

. . . .

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

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

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

I = Importance Factor in accordance with ASCE 7 Section 6.5.5

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

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

q_s = Wind stagnation pressure in pounds per square foot (N/m^2) in accordance with Table 1609*A*.6.2(1).

. . . .

SECTION 1612*A*
FLOOD LOADS

. . . .

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

. . . .

SECTION 1613*A*
EARTHQUAKE LOADS

1613*A*.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects

of earthquake motions in accordance with ASCE 7 *with all the modifications incorporated herein*, excluding Chapter 14 and Appendix 11A. The *seismic design category* for a structure *shall* be determined in accordance with Section 1613*A.*

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

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

. . . .

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

. . . .

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

. . . .

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

. . . .

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

1613*A*.5.1 Mapped acceleration parameters....

(Figures 1613.5(1) through 1613.5(14) were stricken in the CBC 2007, Chapter 16A, and will not be shown in CBC 2010, Chapter 16A.)

. . . .

1613*A*.5.6 Determination of seismic design category. Structures classified as *Occupancy Category* I, II or III that are located where the mapped spectral response acceleration parameter at 1-second period, S_1, is greater than or equal to 0.75 shall be assigned to *Seismic Design Category* E. Structures classified as *Occupancy Category* IV that are located where the mapped spectral response acceleration parameter at 1-second period, S_1, is greater than or equal to 0.75 shall be assigned to *Seismic Design Category* F. All other structures shall be assigned to *Seismic Design Category D.* ~~a seismic design category based on their occupancy category and the design spectral response acceleration coefficients, S_{DS} and SD_1, determined in accordance with Section 1613.5.4 or the site-specific procedures of ASCE 7. Each building and structure shall be assigned to the more severe seismic design category in accordance with Table 1613.5.6(1) or 1613.5.6(2), irrespective of the fundamental period of vibration of the structure, T.~~

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

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

1613*A*.5.6.1 Alternative seismic design category determination. *Not permitted by DSA-SS.*

1613*A*.5.6.2 Simplified design procedure. *Not permitted by DSA-SS.*

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1613*A*.6.2 Additional seismic-force-resisting systems for seismically isolated structures....

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

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

. . . .

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

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

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

. . . .

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

$$\delta_M = \frac{C_d \delta_{max}}{~~I~~} \qquad \textbf{(Equation 16}\textit{A}\textbf{-44)}$$

where:

C_d = Deflection amplification factor in Table 12.2-1 of ASCE 7.

δ_{max} = Maximum displacement defined in Section 12.8.4.3 of ASCE 7.

~~I = Importance factor in accordance with Section 11.5.1 of ASCE 7.~~

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

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

where:

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

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

Exceptions:

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

. . . .

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

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

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

1613.7 ASCE7, Section 11.7.5. Modify ASCE7, Section 11.7.5 to read as follows:

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

. . . .

SECTION 1614A 1615A
MODIFICATIONS TO ASCE 7

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

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

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

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

1614A.1.2 1615A.1.2 ASCE 7, Section 11.4.7. *Replace Modify ASCE 7 Section 11.4.7 as follows by adding the following:*

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

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

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

a) Structure located in Type E soils and mapped MCE spectral acceleration at short periods (S_s) exceeds 2.0g.

b) Structures located in Type F soils.

Exception:

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

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

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

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

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

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

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

~~1614A.1.3~~ 1615A.1.3 ASCE 7, Table 12.2 -1. . . .

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

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

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

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

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

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

~~1614A.1.5~~ 1615A.1.5 ASCE 7, Section 12.3.3. . . .

~~1614A.1.6~~ 1615A.1.6 ASCE 7, Section 12.7.2. . . .

~~1614A.1.8~~ 1615A.1.7 ASCE 7, Section 12.8.7. . . .

~~1614A.1.9~~ 1615A.1.8 ASCE 7, Section 12.9.4. . . .

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

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

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

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

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

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

1. *The strength of the superstructure elements.*

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

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

EXCEPTIONS:

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

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

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

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

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

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

1615A.1.11 Reserved.

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

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

1. *Furniture (except storage cabinets as noted in Table 13.5-1).*

2. *Temporary or moveable equipment.*

EXCEPTIONS:

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

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

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

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

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

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

or

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

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

~~1614A.1.11~~ 1615A.1.13 ASCE 7, Section 13.3.2 . . . .

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

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

13.4.2 Anchors in Concrete or Masonry.

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

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

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

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

EXCEPTIONS:

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

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

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

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

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

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

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

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

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

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

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

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

~~*13.5.6.2.3 Additional Requirements*~~

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

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

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

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

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

~~6a.~~ *4.* ***Lateral force bracing.*** *Lateral force bracing is required for all ceiling areas except that they shall be permitted to be omitted in rooms with floor areas up to 144 square feet when*

perimeter support in accordance with ASTM E 580 Sections 5.2.2 and 5.2.3 are provided and perimeter walls are designed to carry the ceiling lateral forces.

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

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

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

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

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

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

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

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

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

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

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1615A.1.17 *(Reserved for OSHPD)*

1615A.1.18 *Reserved.*

1615A.1.19 *Reserved.*

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

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

EXCEPTIONS:

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

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

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

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

13.6.7 Ductwork. *HVAC and other ductwork shall be designed for seismic forces and seismic relative displacements as required in Section 13.3. Ductwork designed to carry toxic, highly toxic, or explosive gases, or used for smoke control shall be designed and braced without considering the Exceptions noted below.*

EXCEPTIONS:

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

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

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

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

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

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

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

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

13.6.8 Piping Systems. *Unless otherwise noted in this section, piping systems shall be designed for the*

seismic forces and seismic relative displacements of Section 13.3. ASME pressure piping systems shall satisfy the requirements of Section 13.6.8.1. Fire protection sprinkler piping shall satisfy the requirements of Section 13.6.8.2. Elevator system piping shall satisfy the requirements of Section 13.6.10.

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

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

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

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

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

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

13.6.8.1 ASME Pressure Piping Systems. *Pressure piping systems, including their supports, designed and constructed in accordance with ASME B31 shall be deemed to meet the force, displacement, and other requirements of this section. In lieu of specific force and displacement requirements provided in ASME B31, the force and displacement requirements of Sections 13.3 shall be used.*

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

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

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

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

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

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

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

    b. *For Seismic Design Categories D, E, or F, where $I_p = 1.0$ the nominal pipe size shall be 3 inches (80 mm) or less.*

The exceptions above shall not apply to elevator piping.

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

~~1614A.1.15~~ 1615A.1.23 ASCE 7, Section 13.6.10.1. . . .

~~1614A.1.16~~ 1615A.1.24 ASCE 7, Section 13.6.10.4 . . . .

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

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

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

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

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

a. Force response parameters shall be multiplied by I/R, where I is the importance factor determined in accordance with Section 11.5.1, and R is the Response Modification Coefficient selected in accordance with Section 12.2.1.

b. Drift quantities shall be multiplied by C_d/R, where C_d is the deflection amplification factor specified in Table 12.2-1.

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

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

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

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

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

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

1615A.1.28 *(Reserved for OSHPD)*

~~1614A.1.18~~ 1615A.1.29 ASCE 7, Section 17.2.1. . . .

~~1614A.1.19~~ 1615A.1.30 ASCE 7 Section 17.2.4. . . .

. . . .

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

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

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

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

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

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

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

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

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

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

Linear procedures shall be limited to structures located at sites with S_1 less than 0.6g

. . . .

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

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

For the response spectrum and linear response history procedures, V_b and V_s, shall not be taken less than those calculated in accordance with Eq. 17.5-7 & 17.5.8.

. . . .

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

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

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

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

the spectral acceleration, S_a, at a period of 2 sec.

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

1615A.1.37. *(Reserved for OSHPD)*

1615A.1.38 *(Reserved for OSHPD)*

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

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CHAPTER 17*A*
STRUCTURAL TESTS AND SPECIAL INSPECTIONS

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter as amended	**X**	**X**	
Adopt only those sections listed below			

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 1704A – SPECIAL INSPECTIONS – repeal amendments in following subsections:

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

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

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

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

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

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

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

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

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

EXPRESS TERMS

SECTION 1701*A*
GENERAL

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

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

1. *Structures regulated by the Division of the State Architect—Structural Safety ~~(DSA-SS)~~, which include those applications listed in Section~~s~~ ~~109.2~~ 1.9.2.1 (DSA-SS), and 1.9.2.2 (DSA-SS/CC). These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings*

2. *[Reserved for OSHPD]*

1701A.1.2 Amendments in this chapter. *DSA-SS 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 ~~109.2~~ 1.9.2.1*
   [DSA-SS/CC] *For applications listed in Section 1.9.2.2.*

2. *[Reserved for OSHPD].*

1701A.1.3 Reference to other chapters.

1701A.1.3.1 [DSA-SS/CC] Where *reference within this chapter is made to sections in Chapters 16A, 19A, 21A, 22A, and 34A, the provisions in Chapters 16, 19, 21, 22, and 34 respectively shall apply instead.*

. . . .

1701A.5 Special inspectors. [DSA-SS & DSA-SS/CC] *In addition to the project inspector required by Title 24, Part 1, Section 4-333, the owner shall employ one or more special inspectors who shall provide inspections during construction on the types of work listed under Chapters 17A, 18A, 19A, 20, 21A, 22A, 23, 25, 34 and noted in the special test, inspection and observation plan required by Section 4-335 of Title 24, Part 1, of the California ~~Building Standards~~ Administrative Code.*

. . . .

SECTION 1702*A*
DEFINITIONS

1702A.1 General. The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

. . . .

PROJECT INSPECTOR [DSA-SS & DSA-SS/CC] *The person approved to provide inspection in accordance with Title 24, Part 1, California Administrative Code Section 4-333(b). The term "project inspector" is synonymous with "inspector of record."*

. . . .

SECTION 1703*A*
APPROVALS

. . . .

SECTION 1704*A*
SPECIAL INSPECTIONS

1704*A*.1 General. Where application is made for construction as described in this section, the owner ~~or the registered design professional in responsible charge acting as the owner's agent~~ shall employ one or more *approved*

agencies to perform inspections during construction on the types of work listed under Section 1704. These inspections are in addition to the inspections identified in Section 110.

. . . .

1704*A*.1.1 Statement of special inspections. . . .

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

~~***Exception: [DSA-SS]*** *The term "inspector of record" is synonymous with "project inspector."*~~

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

1704*A*.2.1 Fabrication and implementation procedures. The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to *approved construction documents* and referenced standards. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.

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

~~**1704*A*.2.2 Fabricator approval.** *Special inspections* required by Section 1704*A* are not required where the work is done on the premises of a fabricator registered and *approved* to perform such work without *special inspection*. Approval shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an *approved special inspection* agency. At completion of fabrication, the *approved* fabricator shall submit a *certificate of compliance* to the *building official* stating that the work was performed in accordance with the *approved construction documents*.~~

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

. . . .

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

TABLE 1704A.3
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

(Table not shown for clarity)

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

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

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

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

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

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

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

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

1. *Identification marks of welders.*
2. *List of defective welds.*
3. *Manner of correction of defects.*

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

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

~~1704A.3.2.2~~ 1704A.3.2.1 Steel Joist and Joist Girder Inspection . . . .

~~1704A.3.2.3~~ 1704A.3.2.2 Light-Framed Steel Truss Inspection . . . .

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

. . . .

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

Exceptions: ***[DSA-SS & DSA-SS/CC]*** *Special inspections* shall not be required for:

~~1. Isolated spread concrete footings of buildings three stories or less above *grade plane* that are fully supported on earth or rock.~~

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

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

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

~~2.3. The structural design of the footing is based on a specified compressive strength, *f'c*, no greater than 2,500 pounds per square inch (psi) (17.2 Mpa), regardless of the compressive strength specified in the *construction documents* or used in the footing construction.~~

~~3.~~ *1.* Nonstructural concrete slabs supported directly on the ground, including prestressed slabs on grade, where the effective prestress in the concrete is less than 150 psi (1.03 Mpa).

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

~~5.~~ *2.* Concrete patios, driveways and sidewalks, on grade.

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

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

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

2. *For ~~one-story wood frame or one~~ single-story light-~~steel~~ framed buildings and isolated ~~mat-type~~ foundations supporting equipment only, where the specified compressive strength f_c of the concrete delivered to the jobsite is 3,500 psi (24.13 MPa) and where the f'_c used in design is not greater than ~~2500~~ 3,000 psi (~~17.24~~ 20.68 MPa).*

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

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

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

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

   ~~*Exception: [DSA-SS] The term "inspector of record" is synonymous with "project inspector."*~~

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

1704A.4.5 Inspection of prestressed concrete.

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

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

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

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

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

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

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

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

VERIFICATION AND INSPECTION	Continuous	Periodic	Referenced [a] Standard	~~IBC~~ CBC Reference
. . . .	. . . .	. . . .	. . . .	. . . .
3. Inspection of bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased or where strength design is used.	X	—	~~*ACI 318: Appendix D*~~ ACI 318: 8.1.3, 21.2.8	1911*A*.5, 1912*A*.1
. . . .	. . . .	. . . .	. . . .	. . . .
~~*12. Post-Installed Anchors.*~~	~~X~~	—	—	—

1704*A*.5 Masonry construction. Masonry construction shall be inspected and verified in accordance with the requirements of Sections 1704*A*.5.1 through 1704*A*.5.3, depending on the *occupancy category* of the building or structure.

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

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

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

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

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

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

VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA		
	Continuous	Periodic	~~IBC~~ *CBC* section	TMS 402/ACI 530/ASCE 5/[a]	TMS 602/ACI 530.1/ASCE 6[a]
. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
~~7.~~ *9. Post-Installed Anchors*	X	—	*1615A.1.14 [DSA-SS] 1615.1.12 [DSA-SS/CC]*	—	—

1704*A*.5.2 Engineered masonry in Occupancy Category I ~~, II or III~~. The minimum special inspection program for masonry designed by Section 2107*A* or 2108*A* or by chapters other than Chapter 5, 6 or 7 of TMS402/ACI 530/ASCE 5 in structures classified as Occupancy Category I~~, II or III~~, in accordance with Section 1604*A*.5, shall comply with Table 1704*A*.5.1.

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

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

VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA		
	Continuous	Periodic	~~IBC~~ *CBC* section	TMS 402/ACI 530/ASCE 5/[a]	TMS 602/ACI 530.1/ASCE 6[a]
. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
~~5.~~ *7. Post-Installed Anchors*	X	—	*1615A.1.14 [DSA-SS] 1615.1.12[DSA-SS/CC]*	—	—

. . . .

1704*A*.6 Wood construction . . . .

1704*A*.6.1 High-load diaphragms . . . .

1704*A*.6.2 Metal-plate-connected wood trusses spanning 60 feet or greater . . . .

~~1704A.6.2~~ 1704A.6.3 Wood structural elements and assemblies . . . .

~~1704A.6.2.1~~ 1704A.6.3.1 Structural glued- laminated timber . . . .

~~1704A.6.2.2~~ 1704A.6.3.2 Manufactured open web trusses . . . .

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

1704*A*.7 Soils . . . .

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

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

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

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

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

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

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

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

. . . .

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

~~1704A.15.1~~ 1704A.17.1 Visual examination for structural soundness of in-place shotcrete . . . .

SECTION 1705A
STATEMENT OF SPECIAL INSPECTIONS

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

Exception: Seismic requirements are permitted to be excluded from the statement of special inspections for structures designed and constructed in accordance with the following:

1. The structure consists of light-frame construction; the design spectral response acceleration at short periods, *SDS*, as determined in Section 1613.5.4, does not exceed 0.5g; and the height of the structure does not exceed 35 feet (10 668 mm) above *grade plane*; or

2. The structure is constructed using a reinforced masonry structural system or reinforced concrete structural system; the design spectral response acceleration at short periods, *SDS*, as determined in Section 1613.5.4, does not exceed 0.5g, and the height of the structure does not exceed 25 feet (7620 mm) above *grade plane*; or

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

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

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SECTION 1707*A*
SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

. . . .

1707*A*.3 Structural wood...

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

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

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

. . . .

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

Exceptions: *[DSA-SS &DSA-SS/CC]*

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

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

3. *Special inspection* is not required for interior nonbearing walls weighing 15 psf (73.5 N/m^2) or less.

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~~**1707*A*.10**~~ **1707*A*.9 Seismic isolation *and damping* system*s*.** Periodic special inspection is required during the fabrication and installation of isolator units and *damping devices.* ~~energy dissipation devices that are part of the seismic isolation system.~~ *Continuous special inspection is required for prototype and production testing of isolator units and damping devices. ~~and energy dissipation devices that are part of the seismic isolation system.~~*

SECTION 1708*A*
STRUCTURAL TESTING FOR SEISMIC RESISTANCE

1708*A*.1 Testing and qualification for seismic resistance. The testing and qualification specified in Sections 1708*A*.2 through 1708*A*.5, unless exempted from *special inspections* by the exceptions of Section 1704*A*.1, or 1705*A*.3.1 are required as follows:

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

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

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

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

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1708.3 Structural steel. Testing for structural steel shall be in accordance with the quality assurance plan requirements of AISC 341.

Exception~~s~~:

~~1. Testing for structural steel in structures assigned to *Seismic Design Category C* that are not specifically detailed for seismic resistance, with a response modification coefficient, *R*, of 3 or less, excluding cantilever column systems.~~

~~2.~~ For ordinary moment frames, ultrasonic and magnetic particle testing of complete joint penetration groove welds are only required for demand critical welds.

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1.
2. **1708*A*.4 Seismic certification of nonstructural components. . . .**

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

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

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SECTION 1710*A*
STRUCTURAL OBSERVATIONS

1710*A*.1 General. Where required by the provisions of Section 1710.2 or 1710.3, the owner shall employ a *registered design professional* to perform structural observations as defined in Section 1702. Prior to the commencement of observations, the structural observer shall submit to the building official a written statement identifying the frequency and extent of structural observations. At the conclusion of the work included in the , the structural observer shall

submit to the building official a written statement that the site visits have been made and identify any reported deficiencies which, to the best of the structural
observer's knowledge, have not been resolved.

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

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

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

~~2. The height of the structure is greater than 75 feet (22 860 mm) above the base.~~

~~3. The structure is assigned to *Seismic Design Category* E, is classified as *Occupancy Category* I or II in accordance with Table 1604.5, and is greater than two *stories above grade plane*.~~

~~4. When so designated by the *registered design professional* responsible for the structural design.~~

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

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

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

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

~~2. The *building height* of the structure is greater than 75 feet (22 860 mm).~~

~~3. When so designated by the *registered design professional* responsible for the structural design.~~

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

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

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CHAPTER 18*A*
SOILS AND FOUNDATIONS

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

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter as amended	**X**	**X**	
Adopt only those sections listed below			

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 1802A – DEFINITIONS - repeal amendments in following subsections:

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

~~***1808A.2.23.2.4 Deformation.*** *Piles and piers used to support lateral loads from structures shall be designed with due consideration to the deformation of the piles, piers, pile caps and connecting grade beams.*~~

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

EXPRESS TERMS

SECTION 1801*A*
GENERAL

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

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

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

1. ~~*Applications listed in Section 109.2*~~ *Structures regulated by the Division of the State Architect—Structural Safety* ~~*(DSA-SS)*~~, *which include those applications listed in Section* ~~*109.2*~~ *1.9.2.1 (DSA-SS), and 1.9.2.1 (DSA-SS/CC). These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings*

2. *[Reserved for OSHPD]*

1801A.1.2 Amendments in this chapter. *DSA-SS, and DSA-SS/CC 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* ~~*109.2*~~ *1.9.2.1.*

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

2. *[Reserved for OSHPD]*

1801A.1.3 Reference to other chapters.

1801A.1.3.1 [DSA-SS/CC] *Where reference within this chapter is made to sections in Chapters 16A, 19A, 21A, 22A, and 34A, the provisions in Chapters 16, 19, 21, 22, and 34 respectively shall apply instead.*

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SECTION 1802*A*
DEFINITIONS

. . . .

SECTION 1803*A*
GEOTECHNICAL INVESTIGATIONS

1803*A*.1 General. Geotechnical investigations shall be conducted in accordance with Section 1803*A*.2 and reported in accordance with Section ~~1803.6~~ *1803A.7*. ~~Where required by the *building official* or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a *registered design professional*.~~ *(Relocated from Section 1802A.1, CBC 2007) The classification and investigation of the soil shall be made under the responsible charge of a California registered geotechnical engineer. All recommendations contained in geotechnical and engineering geology reports shall be subject to the approval of the enforcement agency ~~in consultation with the California Geological Survey (CGS)~~. All reports shall be prepared and signed by a registered geotechnical engineer and an engineering geologist where applicable.*

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

Exception: ~~The *building official* shall be permitted to waive the requirement for a geotechnical investigation where satisfactory data from adjacent areas is available that demonstrates an investigation is not necessary for any of the conditions in Sections 1803.5.1 through 1803.5.6 and Sections 1803.5.10 and 1803.5.11.~~ *(Relocated from Section 1802A.2, CBC 2007) Geotechnical reports are not required for one-story, wood-frame and light-steel-frame buildings of Type II or Type V construction and 4,000 square feet (371 m^2) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from the California Geological Survey (CGS). Allowable foundation and lateral soil pressure values may be determined from Table ~~1804A.2~~ 1806A.2.*

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

1803*A*.3.1 Scope of investigation. The scope of the geotechnical investigation including the number and types of borings or soundings, the equipment used to drill or sample, the in-situ testing equipment and the laboratory testing program shall be determined by a *registered design professional*.

(Relocated from Section 1802A.4.1, CBC 2007) There shall not be less than one boring or exploration shaft for each 5,000 square feet (465 m^2) of building area at the foundation level with a minimum of two provided for any one building. A boring may be considered to reflect subsurface conditions relevant to more than one building, subject to the approval of the enforcement agency.

Borings shall be of sufficient size to permit visual examination of the soil in place or, in lieu thereof, cores shall be taken.

Borings shall be of sufficient depth and size to adequately characterize sub-surface conditions.

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

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

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

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

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

Exceptions:

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

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

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

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

1. *Geologic investigation.*
2. *Evaluation of the known active and potentially active faults, both regional and local.*
3. *Ground-motion parameters, as required by Section 1613A, ~~1614A~~ 1615A & ASCE 7.*
4. ~~*Evaluation of slope stability at or near the site.*~~
5. ~~*The liquefaction and settlement potential of the earth materials in the foundation.*~~

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

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

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

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

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

1. *Elastic structural response spectra.*

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

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

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

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

~~1803.6~~ 1803A.7 Geotechnical **Reporting.** Where geotechnical investigations are required, a written report of the investigations shall be submitted to the *building official* by the owner or authorized agent at the time of *permit* application. *(Relocated from Section 1802A.7, CBC 2007) The geotechnical report shall provide completed evaluations of the foundation conditions of the site and the potential geologic / seismic hazards affecting the site. The geotechnical report shall include, but shall not be limited to, site-specific evaluations of design criteria related to the nature and extent of foundation materials, groundwater conditions, liquefaction potential, settlement potential and slope stability. The report shall contain the results of the analyses of problem areas identified in the engineering geologic report. The geotechnical report shall incorporate estimates of the characteristics of site ground motion provided in the engineering geologic report.* This geotechnical report shall include, but need not be limited to, the following information:

1. A plot showing the location of the soil investigations.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of the soil profile.
4. Elevation of the water table, if encountered. *Historic high ground water elevations shall be addressed in the report to adequately evaluate liquefaction and settlement potential.*
5. Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; and the effects of adjacent loads.
6. Expected total and differential settlement.
7. Deep foundation information in accordance with Section 1803*A*.5.5.

8. Special design and construction provisions for foundations of structures founded on expansive soils, as necessary.

9. Compacted fill material properties and testing in accordance with Section 1803*A*.5.8.

10. Controlled low-strength material properties and testing in accordance with Section 1803*A*.5.9.

~~*10.*~~ *11. The report shall consider the effects of stepped footings addressed in Section ~~1805A.1.~~ 1809A.3.*

~~*11.*~~ *12. The report shall consider the effects of seismic hazards in accordance with ~~per~~ Section ~~1802A.6.~~ 1803A.6.*

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SECTION 1805*A*
DAMPPROOFING AND WATERPROOFING

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1805*A*.2 Dampproofing. Where hydrostatic pressure will not occur as determined by Section 1803*A*.5.4, floors and walls ~~for other than wood foundation systems~~ shall be dampproofed in accordance with this section. ~~Wood foundation systems shall be constructed in accordance with AF&PA PWF.~~

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SECTION 1806*A*
PRESUMPTIVE LOAD-BEARING VALUES OF SOILS

. . . .

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

1807*A*.1 Foundation walls. Foundation walls shall be designed and constructed in accordance with Sections 1807*A*.1.1 through 1807*A*.1.6. Foundation walls shall be supported by foundations designed in accordance with Section 1808*A*.

(2007 CBC) ~~**1805A.6 Foundation plate or sill bolting.** Wood foundation plates or sills shall be bolted or strapped to the foundation or foundation wall as provided in Chapter 23. *Cold formed steel stud foundation plates or sills shall be bolted or fastened to the foundation or foundation wall as provided in Section 2210A.4.*~~

1807*A*.1.1 Design lateral soil loads. Foundation walls shall be designed for the lateral soil loads ~~set forth in Section 1610~~ *determined by a geotechnical investigation in accordance with Section 1803A.*

1807*A*.1.2 Unbalanced backfill height. Unbalanced backfill height is the difference in height between the exterior finish ground level and the lower of the top of the concrete footing that supports the foundation wall or the interior finish ground level. Where an interior concrete slab on grade is provided and is in contact with the interior surface of the foundation wall, the unbalanced backfill height shall be permitted to be measured from the exterior finish ground level to the top of the interior concrete slab.

1807*A*.1.3 Rubble stone foundation walls. *Not permitted by DSA-SS or DSA-SS/CC.* ~~Foundation walls of rough or random rubble stone shall not be less than 16 inches (406 mm) thick. Rubble stone shall not be used for foundation walls of structures assigned to *Seismic Design Category* C, D, E or F.~~

1807*A*.1.4 Permanent wood foundation systems. *Not permitted by DSA-SS or DSA-SS/CC.* ~~Permanent wood foundation systems shall be designed and installed in accordance with AF&PAPWF. Lumber and plywood shall be treated in accordance with AWPA U1 (Commodity Specification A, Use Category 4B and Section 5.2) and shall be identified in accordance with Section 2303A.1.8.1.~~

1807*A*.1.5 Concrete and masonry foundation walls. Concrete and masonry foundation walls shall be designed in accordance with Chapter 19*A* or 21*A*, as applicable.

~~**Exception:** Concrete and masonry foundation walls shall be permitted to be designed and constructed in accordance with Section 1807.1.6.~~

1807.1.6 Prescriptive design of concrete and masonry foundation walls. Concrete and masonry foundation walls that are laterally supported at the top and bottom shall be permitted to be designed and constructed in accordance with this section.

1807.1.6.1 Foundation wall thickness. The thickness of prescriptively designed foundation walls shall not be less than the thickness of the wall supported, except that foundation walls of at least 8-inch (203 mm) nominal width shall be permitted to support brick-veneered frame walls and 10-inch-wide (254 mm) cavity walls provided the requirements of Section 1807.1.6.2 or 1807.1.6.3 are met.

1807.1.6.2 Concrete foundation walls. Concrete foundation walls shall comply with the following:

1. The thickness shall comply with the requirements of Table 1807.1.6.2.
2. The size and spacing of vertical reinforcement shown in Table 1807.1.6.2 is based on the use of reinforcement with a minimum yield strength of 60,000 psi (414 Mpa). Vertical reinforcement with a minimum yield strength of 40,000 psi (276 Mpa) or 50,000 psi (345 Mpa) shall be permitted, provided the same size bar is used and the spacing shown in the table is reduced by multiplying the spacing by 0.67 or 0.83, respectively.

TABLE 1807.1.6.2
CONCRETE FOUNDATION WALLS [b, c]

(Table deleted)

3. Vertical reinforcement, when required, shall be placed nearest the inside face of the wall a distance, *d*, from the outside face (soil face) of the wall. The distance, *d*, is equal to the wall thickness, *t*, minus 1.25 inches (32 mm) plus one-half the bar diameter, *db*, [d = *t* – (1.25 + *db* / 2)]. The reinforcement shall be placed within a tolerance of ± 3/8 inch (9.5 mm) where *d* is less than or equal to 8 inches (203 mm)or ± 1/2 inch (12.7 mm)where *d* is greater than 8 inches (203 mm).
4. In lieu of the reinforcement shown in Table 1807.1.6.2, smaller reinforcing bar sizes with closer spacings that provide an equivalent cross-sectional area of reinforcement per unit length shall be permitted.
5. Concrete cover for reinforcement measured from the inside face of the wall shall not be less than ¾ inch (19.1 mm). Concrete cover for reinforcement measured from the outside face of the wall shall not be less than 11/2 inches (38 mm) for No. 5 bars and smaller, and not less than 2 inches (51 mm) for larger bars.
6. Concrete shall have a specified compressive strength, *fc'*, of not less than 2,500 psi (17.2 MPa).
7. The unfactored axial load per linear foot of wall shall not exceed 1.2 *t fc'* where *t* is the specified wall thickness in inches.

1807.1.6.2.1 Seismic requirements. Based on the *seismic design category* assigned to the structure in accordance with Section 1613, concrete foundation walls designed using Table 1807.1.6.2 shall be subject to the following limitations:

1. *Seismic Design Categories* A and B. No additional seismic requirements, except provide reinforcement around openings in accordance with Section 1909.6.3.
2. *Seismic Design Categories* C, D, E and F. Tables shall not be used except as allowed for plain concrete members in Section 1908.1.8.

1807.1.6.3 Masonry foundation walls. Masonry foundation walls shall comply with the following:

1. The thickness shall comply with the requirements of Table 1807.1.6.3(1) for plain masonry walls or Table 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4) for masonry walls with reinforcement.
2. Vertical reinforcement shall have a minimum yield strength of 60,000 psi (414 Mpa).
3. The specified location of the reinforcement shall equal or exceed the effective depth distance, *d*, noted in Tables 1807.1.6.3(2), 1807.1.6.3(3) and 1807.1.6.3(4) and shall be measured from the face of the exterior (soil) side of the wall to the center of the vertical reinforcement. The reinforcement shall be placed within the tolerances specified in TMS 602/ACI 530.1/ASCE 6, Article 3.3.B.8 of the specified location.

~~TABLE 1807.1.6.3(1)~~
~~PLAIN MASONRY FOUNDATION WALLS~~ [a,b,c]

(Table deleted)

~~4. Grout shall comply with Section 2103.12.~~

~~5. Concrete masonry units shall comply with ASTM C 90.~~

~~6. Clay masonry units shall comply with ASTM C 652 for hollow brick, except compliance with ASTM C 62 or ASTM C 216 shall be permitted where solid masonry units are installed in accordance with Table 1807.1.6.3(1) for plain masonry.~~

~~7. Masonry units shall be laid in running bond and installed with Type M or S mortar in accordance with Section 2103.8.~~

~~8. The unfactored axial load per linear foot of wall shall not exceed 1.2 *t f'm* where *t* is the specified wall thickness in inches and *f'm* is the specified compressive strength of masonry in pounds per square inch.~~

~~9. At least 4 inches (102 mm) of solid masonry shall be provided at girder supports at the top of hollow masonry unit foundation walls.~~

~~10. Corbeling of masonry shall be in accordance with Section 2104.2. Where an 8-inch (203 mm) wall is corbeled, the top corbel shall not extend higher than the bottom of the floor framing and shall be a full course of headers at least 6 inches (152 mm) in length or the top course bed joint shall be tied to the vertical wall projection. The tie shall be W2.8 (4.8 mm) and spaced at a maximum horizontal distance of 36 inches (914 mm). The hollow space behind the corbelled masonry shall be filled with mortar or grout.~~

~~TABLE 1807.1.6.3(2)~~
~~8-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE d ≥ 5 INCHES~~ [a,b,c]

(Table deleted)

~~1807.1.6.3.1 Alternative foundation wall reinforcement.~~ ~~In lieu of the reinforcement provisions for masonry foundation walls in Table 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4), alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per linear foot (mm) of wall shall be permitted to be used, provided the spacing of reinforcement does not exceed 72 inches (1829 mm) and reinforcing bar sizes do not exceed No. 11.~~

~~1807.1.6.3.2 Seismic requirements.~~ ~~Based on the *seismic design category* assigned to the structure in accordance with Section 1613, masonry foundation walls designed using Tables 1807.1.6.3(1) through 1807.1.6.3(4) shall be subject to the following limitations:~~

~~1. *Seismic Design Categories* A and B. No additional seismic requirements.~~

~~2. *Seismic Design Category* C. A design using Tables 1807.1.6.3(1) through 1807.1.6.3(4) is subject to the seismic requirements of Section 1.17.4.3 of TMS 402/ACI 530/ASCE 5.~~

~~TABLE 1807.1.6.3(3)~~
~~10-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE d ≥ 6.75 INCHES~~ [a, b, c]

(Table deleted)

~~3. *Seismic Design Category* D. A design using Tables 1807.1.6.3(2) through 1807.1.6.3(4) is subject to the seismic requirements of Section 1.17.4.4 of TMS 402/ACI 530/ASCE 5.~~

~~4. *Seismic Design Categories* E and F. A design using Tables 1807.1.6.3(2) through 1807.1.6.3(4) is subject to the seismic requirements of Section 1.17.4.5 of TMS 402/ACI 530/ASCE 5.~~

~~TABLE 1807.1.6.3(4)~~
~~12-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE d ≥ 8.75 INCHES~~ [a,b,c]

(Table deleted)

1807*A*.2 Retaining walls. Retaining walls shall be designed in accordance with Sections 1807*A*.2.1 through 1807*A*.2.3. *Freestanding cantilever walls shall be design in accordance with Section 1807A.2.4.*

1807*A*.2.1 General. Retaining walls shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, lateral soil pressures on both sides of the keyway shall be considered in the sliding analysis.

1807*A*.2.2 Design lateral soil loads. Retaining walls shall be designed for the lateral soil loads ~~set forth in Section 1610*A*~~ *determined by a geotechnical investigation in accordance with Section 1803A.*

(Relocated from Section 1806A.1, CBC 2007) ~~*Retaining walls higher than 12 feet (3658 mm), as measured from the top of the foundation, shall be designed to resist the additional earth pressure caused by seismic ground shaking.*~~

~~*The resultant of the vertical loads and lateral pressures using load combination of section 1605A.3 acting on the wall and its base shall pass through the middle half of the bottom of the footing.*~~

~~*Retaining walls shall be restrained against sliding by friction of the base against the earth, by passive resistance of the soil or by a combination of the two. When used, keys may be assumed to lower the plane of frictional resistance and depth of passive resistance to the level of the bottom of the key. Passive resistance pressures shall be assumed to act on a vertical plane located at the toe of the footing. Overturning shall be computed about the bottom of the spread footing. Passive resistance on the face of the wall may be included in computing resistance to overturning. Frictional resistance on the face of the wall may be included in computing resistance to overturning, except when lateral loads include seismic forces.*~~

~~*Gravity-type retaining walls utilizing precast concrete units may be used as an alternative to the conventional cantilever retaining systems only after they have been accepted by the enforcement agency.*~~

1807*A*.2.3 Safety factor. Retaining walls shall be designed to resist the lateral action of soil to produce sliding and overturning with a minimum safety factor of 1.5 in each case. The load combinations of Section 1605*A* shall not apply to this requirement. Instead, design shall be based on 0.7 times nominal earthquake loads, 1.0 times other *nominal loads*, and investigation with one or more of the variable loads set to zero. The safety factor against lateral sliding shall be taken as the available soil resistance at the base of the retaining wall foundation divided by the net lateral force applied to the retaining wall.

Exception: Where earthquake loads are included, the minimum safety factor for retaining wall sliding and overturning shall be 1.1.

~~1806A.2~~ 1807A.2.4 Freestanding Cantilever Walls. *A stability check against the possibility of overturning shall be performed for isolated spread footings which support freestanding cantilever walls. The stability check shall be made by dividing R_p used for the wall by 2.0. The allowable soil pressure may be doubled for this evaluation.*

Exception: *For overturning about the principal axis of rectangular footings with symmetrical vertical loading and the design lateral force applied, a triangular or trapezoidal soil pressure distribution which covers the full width of the footing will meet the stability requirement.*

. . . .

SECTION 1808*A*
FOUNDATIONS

1808*A*.1 General. Foundations shall be designed and constructed in accordance with Sections 1808*A*.2 through 1808*A*.9. Shallow foundations shall also satisfy the requirements of Section 1809*A*. Deep foundations shall also satisfy the requirements of Section 1810*A*.

1808*A*.2 Design for capacity and settlement. Foundations shall be so designed that the allowable bearing capacity of the soil is not exceeded, and that differential settlement is minimized. Foundations in areas with expansive soils shall be designed in accordance with the provisions of Section 1808*A*.6.

(Relocated from Section 1805A.4.1, CBC 2007) The enforcing agency may require an analysis of foundation ~~footing and grade beam~~ elements to determine subgrade deformations in order to evaluate their effect on the superstructure including story drift ~~values in Chapter 16A~~.

. . . .

~~**FIGURE 1805A.3.1**~~
~~**FOPUNDATION CLEARANCES FROM SLOPES**~~

FIGURE 1808A.7.1
FOUNDATION CLEARANCES FROM SLOPES

(Figure not shown for clarity)

. . . .

1808A.8 Concrete foundations. The design, materials and construction of concrete foundations shall comply with Sections1808A.8.1 through 1808A.8.6 and the provisions of Chapter 19A.

~~**Exception:** Where concrete footings supporting walls of light-frame construction are designed in accordance with Table 1809.7, a specific design in accordance with Chapter 19 is not required.~~

. . . .

1808A.8.5 Forming of concrete. Concrete foundations are permitted to be cast against the earth where, in the opinion of the *building official*, soil conditions do not require formwork. Where formwork is required, it shall be in accordance with Chapter 6 of ACI 318.

(Relocated from Section 1805A.4.2.6, CBC 2007) ~~*The horizontal dimensions of unformed concrete footings shall be increased 1 inch (25 mm) at every vertical surface at which concrete is placed directly against the soil.*~~

1808A.8.6 Seismic requirements. See Section 1908A for additional requirements for foundations of structures assigned to *Seismic Design Category* ~~C,~~ D, E or F.

For structures assigned to *Seismic Design Category* D, E or F, provisions of ACI 318, Sections 21.12.1 through 21.12.4, shall apply where not in conflict with the provisions of Sections 1808A through 1810A.

~~**Exceptions:**~~

~~1. Detached one- and two-family dwellings of light-frame construction and two stories or less above *grade plane* are not required to comply with the provisions of ACI 318, Sections 21.12.1 through 21.12.4.~~

~~2. Section 21.12.4.4(a) of ACI 318 shall not apply.~~

TABLE 1808A.8.1
MINIMUM SPECIFIED COMPRESSIVE STRENGTH f'_c OF CONCRETE OR GROUT

FOUNDATION ELEMENT OR CONDITION	SPECIFIED COMPRESSIVE STRENGTH, f'_c
~~1. Foundations for structures assigned to Seismic Design Category A, B or C~~	~~2,500 psi~~
~~2a. Foundations for Group R or U occupancies of light-frame construction, two stories or less in height, assigned to Seismic Design Category D, E or F~~	~~2,500 psi~~
~~2b~~ 1.Foundations for other structures assigned to Seismic Design Category D, E or F	3,000 psi
~~3~~ 2. Precast nonprestressed ~~drived~~ driven piles	4,000 psi

4 *3*. Socketed drilled shafts	4,000 psi
~~5~~ *4*. Micropiles	4,000 psi
~~6~~ *5*. Precast prestressed driven piles	5,000 psi

For SI: 1 pound per square inch = 0.00689MPa.

TABLE 1808*A*.8.2
MINIMUM CONCRETE COVER

(Table not shown for clarity)

. . . .

SECTION 1809*A*
SHALLOW FOUNDATIONS

. . . .

1809*A*.3 Stepped footings. The top surface of footings shall be level. The bottom surface of footings shall be permitted to have a slope not exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footing or where the surface of the ground slopes more than one unit vertical in 10 units horizontal (10-percent slope).

(Relocated from 1805.A.1, CBC 2007) Individual steps in continuous footings shall not exceed 18 inches (457 mm) in height and the slope of a series of such steps shall not exceed 1 unit vertical to 2 units horizontal (50% slope) unless otherwise recommended by a ~~soils~~ geotechnical report. The steps shall be detailed on the drawings. The local effects due to the discontinuity of the steps shall be considered in the design of the foundation.

. . . .

1809*A*.7 Prescriptive footings for light-frame construction. *Not permitted by DSA-SS or DSA-SS/CC .* ~~Where a specific design is not provided, concrete or masonry unit footings supporting walls of light-frame construction shall be permitted to be designed in accordance with Table 1809.7.~~

~~TABLE 1809.7~~
~~PRESCRIPTIVE FOOTINGS SUPPORTING WALLS OFLIGHT-FRAME CONSTRUCTION~~ ~~a,b,c,d,e~~

(Table deleted)

1809*A*.8 Plain concrete footings. *Not permitted by DSA-SS or DSA-SS/CC .* ~~The edge thickness of plain concrete footings supporting walls of other than light-frame construction shall not be less than 8 inches (203 mm) where placed on soil or rock.~~

> ~~**Exception:** For plain concrete footings supporting Group R-3 occupancies, the edge thickness is permitted to be 6 inches (152 mm), provided that the footing does not extend beyond a distance greater than the thickness of the footing on either side of the supported wall.~~

1809*A*.9 Masonry-unit footings. *Not permitted by DSA-SS or DSA-SS/CC .* ~~The design, materials and construction of masonry unit footings shall comply with Sections 1809.9.1 and 1809.9.2, and the provisions of Chapter 21.~~

> ~~**Exception:** Where a specific design is not provided, masonry unit footings supporting walls of light-frame construction shall be permitted to be designed in accordance with Table 1809.7.~~

~~**1809.9.1 Dimensions.** Masonry unit footings shall be laid in Type M or S mortar complying with Section 2103.8 and the depth shall not be less than twice the projection beyond the wall, pier or column. The width shall not be less than 8 inches (203 mm) wider than the wall supported thereon.~~

~~**1809.9.2 Offsets.** The maximum offset of each course in brick foundation walls stepped up from the footings shall be 11/2 inches (38 mm) where laid in single courses, and 3 inches (76 mm) where laid in double courses.~~

1809*A*.10 *Reserved* ~~**Pier and curtain wall foundations.** Except in *Seismic Design Categories* D, E and F, pier and curtain wall foundations shall be permitted to be used to support light-frame construction not more than two *stories above grade plane*, provided the following requirements are met:~~

~~1. All load-bearing walls shall be placed on continuous concrete footings bonded integrally with the *exterior wall* footings.~~

~~2. The minimum actual thickness of a load-bearing masonry wall shall not be less than 4 inches (102 mm) nominal or 35/8 inches (92 mm) actual thickness, and shall be bonded integrally with piers spaced 6 feet (1829 mm) on center (o.c.).~~

~~3. Piers shall be constructed in accordance with Chapter 21 and the following:~~

~~3.1. The unsupported height of the masonry piers shall not exceed 10 times their least dimension.~~

~~3.2. Where structural clay tile or hollow concrete masonry units are used for piers supporting beams and girders, the cellular spaces shall be filled solidly with concrete or Type M or S mortar.~~

~~**Exception:** Unfilled hollow piers shall be permitted where the unsupported height of the pier is not more than four times its least dimension.~~

~~3.3. Hollow piers shall be capped with 4 inches (102 mm) of solid masonry or concrete or the cavities of the top course shall be filled with concrete or grout.~~

~~4. The maximum height of a 4-inch (102 mm) load-bearing masonry foundation wall supporting wood frame walls and floors shall not be more than 4 feet (1219 mm) in height.~~

~~5. The unbalanced fill for 4-inch (102 mm) foundation walls shall not exceed 24 inches (610 mm) for solid masonry, nor 12 inches (305 mm) for hollow masonry.~~

1809*A*.11 Steel grillage footings...

1809*A*.12 Timber footings. *Not permitted by DSA-SS or DSA-SS/CC.* ~~Timber footings shall be permitted for buildings of Type V construction and as otherwise *approved* by the *building official*. Such footings shall be treated in accordance with AWPA U1 (Commodity Specification A, Use Category 4B). Treated timbers are not required where placed entirely below permanent water level, or where used as capping for wood piles that project above the water level over submerged or marsh lands. The compressive stresses perpendicular to grain in untreated timber footings supported upon treated piles shall not exceed 70 percent of the allowable stresses for the species and grade of timber as specified in the AF&PA NDS.~~

. . . .

~~***1805A.4.7***~~ ***1809A.14* Pipes and trenches.** *Unless otherwise recommended by the soils report, open or backfilled trenches parallel with a footing shall not be below a plane having a downward slope of 1 unit vertical to 2 units horizontal (50% slope) from a line 9 inches (229 mm) above the bottom edge of the footing, and not closer than 18 inches (457 mm) from the face of such footing.*

Where pipes cross under footings, the footings shall be specially designed. Pipe sleeves shall be provided where pipes cross through footings or footing walls and sleeve clearances shall provide for possible footing settlement, but not less than 1 inch (25 mm) all around pipe.

***Exception:** Alternate trench locations and pipe clearances are permitted when accepted by the registered design professional in responsible charge and the enforcement agent.*

. . . .

SECTION 1810*A*
DEEP FOUNDATIONS

. . . .

1810*A*.3.1.5 Helical piles. Helical piles shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by installation into the ground and service loads.

1810A.3.1.5.1 Helical Piles Seismic Requirements. *For structures assigned to Seismic Design Category D, E or F, capacities of helical piles shall be determined in accordance with Section 1810A.3.3 by at least two project specific pre-production tests for each soil profile, size and depth of helical pile. At least two percent of all production piles shall be proof tested to the load determined in accordance with Section 1615A.1.10.*

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

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

. . . .

1810*A*.3.2 Materials. The materials used in deep foundation elements shall satisfy the requirements of Sections 1810*A*.3.2.1 through 1810*A*.3.2.8, as applicable.

. . . .

~~**1810.3.2.1.2 ACI 318 Equation (10-5).** Where this chapter requires detailing of concrete deep foundation elements in accordance with Section 21.6.4.4 of ACI 318, compliance with Equation (10-5) of ACI 318 shall not be required.~~

. . . .

1810*A*.3.2.4 Timber. *Not permitted by DSA-SS or DSA-SS/CC.* ~~Timber deep foundation elements shall be designed as piles or poles in accordance with AF&PA NDS. Round timber elements shall conform to ASTM D 25. Sawn timber elements shall conform to DOC PS 20.~~

~~**1810.3.2.4.1 Preservative treatment.** Timber deep foundation elements used to support permanent structures shall be treated in accordance with this section unless it is established that the tops of the untreated timber elements will be below the lowest ground water level assumed to exist during the life of the structure. Preservative and minimum final retention shall be in accordance with AWPA U1 (Commodity Specification E, Use Category 4C) for round timber elements and AWPA U1 (Commodity Specification A, Use Category 4B) for sawn timber elements. Preservative treated timber elements shall be subject to a quality control program administered by an *approved agency*. Element cutoffs shall be treated in accordance with AWPA M4.~~

. . . .

1810*A*.3.8.3 Precast prestressed piles. Precast prestressed concrete piles shall comply with the requirements of Sections 1810*A*.3.8.3.1 through 1810*A*.3.8.3.3.

. . . .

1810*A*.3.8.3.2 Seismic reinforcement in Seismic Design Category C. *Not permitted by DSA-SS or DSA-SS/CC* ~~.For structures assigned to *Seismic Design Category* C in accordance with Section 1613, precast prestressed piles shall have transverse reinforcement in accordance with this section. The volumetric ratio of spiral reinforcement shall not be less than the amount required by the following formula for the upper 20 feet (6096 mm) of the pile.~~

~~$\rho_s = 0.12 f'_c / f_{yh}$ **(Equation 18-5)**~~

~~where:~~

~~f'_c = Specified compressive strength of concrete, psi (MPa).~~

~~f_{yh} = Yield strength of spiral reinforcement ≤ 85,000 psi (586 MPa).~~

~~ρ_s = Spiral reinforcement index (vol. spiral/vol. core).~~

~~At least one-half the volumetric ratio required by Equation 18-5 shall be provided below the upper 20 feet (6096 mm) of the pile.~~

1810*A*.3.8.3.3 Seismic reinforcement in Seismic Design Categories D through F. For structures assigned to *Seismic Design Category* D, E or F in accordance with Section 1613*A*, precast prestressed piles shall have transverse reinforcement in accordance with the following:

. . . .

~~This required amount of spiral reinforcement is permitted to be obtained by providing an inner and outer spiral.~~

. . . .

1810*A*.3.9.4.2.1 Site Classes A through D. For Site Class A, B, C or D sites, transverse confinement reinforcement shall be provided in the element in accordance with Sections 21.6.4.2, 21.6.4.3 and 21.6.4.4 of ACI 318 within three times the least element dimension of the bottom of the pile cap. A transverse spiral reinforcement ratio of not less than one-half of that required in Section 21.6.4.4(a) of ACI 318 shall be permitted *for concrete deep foundation elements.*

. . . .

1810*A*.3.10 Micropiles. Micropiles shall be designed and detailed in accordance with Sections 1810*A*.3.10.1 through 1810*A*.3.10.4.

. . . .

1810*A*.3.10.2 Materials. Reinforcement shall consist of deformed reinforcing bars in accordance with ASTM A 615 Grade 60 or 75 or ASTM A 722 Grade 150.

The steel pipe or tube shall have a minimum wall thickness of ~~3/16 inch (4.8 mm)~~ *3/8 inch (10 mm)*. Splices shall comply with Section 1810*A*.3.6. The steel pipe or tube shall have a minimum yield strength of 45,000 psi (310 MPa) and a minimum elongation of 15 percent as shown by mill certifications or two coupon test samples per 40,000 pounds (18 160 kg) of pipe or tube.

. . . .

~~**1810.3.10.4 Seismic reinforcement.** For structures assigned to *Seismic Design Category* C, a permanent steel casing shall be provided from the top of the micropile down to the point of zero curvature. For structures assigned to *Seismic Design Category* D, E or F, the micropile shall be considered as an alternative system in accordance with Section 104.11. The alternative system design, supporting documentation and test data shall be submitted to the *building official* for review and approval.~~

1810A.3.10.4 Seismic Requirements*. For structures assigned to Seismic Design Category D, E or F, a permanent steel casing having a minimum thickness of 3/8" shall be provided from the top of the micropile down to a minimum of 120 percent of the point of zero curvature. Capacity of micropiles shall be determined in accordance with Section 1810A.3.3 by at least two project specific pre-production tests for each soil profile, size and depth of micropile. At least two percent of all production piles shall be proof tested to the load determined in accordance with Section 1615A.1.10.*

Steel casing length in soil shall be considered as unbonded and shall not be considered as contributing to friction. Casing shall provide confinement at least equivalent to hoop reinforcing required by ACI 318 Section 21.12.4.
Reinforcement shall have Class 1 corrosion protection in accordance with PTI Recommendations for Prestressed Rock and Soil Anchors. Steel casing design shall include at least 1/16" corrosion allowance.

Micropiles shall not be considered as carrying any horizontal loads.

. . . .

1810*A*.4.1.5 Defective timber piles. *Not permitted by DSA-SS or DSA-SS/CC.* ~~Any substantial sudden increase in rate of penetration of a timber pile shall be investigated for possible damage. If the sudden increase in rate of penetration cannot be correlated to soil strata, the pile shall be removed for inspection or rejected.~~

. . . .

1810*A*.4.7 Enlarged base cast-in-place elements. Enlarged bases for cast-in-place deep foundation elements formed by compacting concrete or by driving a precast base shall be formed in or driven into granular soils. Such elements shall be constructed in the same manner as successful prototype test elements driven for the project. Shafts extending through peat or other organic soil shall be encased in a permanent steel casing. Where a cased shaft is used, the shaft shall be adequately reinforced to resist column action or the annular space around the shaft shall be filled sufficiently to reestablish lateral support by the soil. Where heave occurs, the element shall be replaced unless it is demonstrated that the element is undamaged and capable of carrying twice its design load. *(Relocated from Section 1810A.2, CBC 2007)* ~~*Enlarged base piles shall be considered as an alternative system.*~~

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SECTION ~~1813A~~ 1811A
PRESTRESSED ROCK AND SOIL FOUNDATION ANCHORS

~~1813A.1~~ 1811A.1 General. . . .

~~1813A.2~~ 1811A.2 Adoption. *Except for the modifications as set forth in Sections ~~1813A.3~~ 1811A.3 and ~~1813A.4~~, 1811A.4 all Prestressed Rock and Soil Foundation Anchors shall be designed in accordance with PTI Recommendations for Prestressed Rock and Soil Anchors.*

~~1813A.3~~ 1811A.3 Geotechnical Requirements....

~~1813A.4~~ 1811A.4 Structural Requirements*.*

1. *Tendons shall be thread-bar anchors conforming to ASTM A 722.*
2. *The anchors shall be placed vertical.*
3. *Design Loads shall be based upon the load combinations in Section 1605A.3.1 and shall not exceed 60 percent of the specified minimum tensile strength of the tendons.*
4. *Ultimate Load shall be based upon Section ~~1614A.1.10~~ 1615A.1.10 and shall not exceed 80 percent of the specified minimum tensile strength of the tendons.*

. . . .

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 19
CONCRETE

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	-	X	
Adopt only those sections listed below			
1901.1.1		X	New Amendment
1901.1.2		X	New Amendment
1901.1.3		X	New Amendment
1903.3.1		X	From 1903A.5 – CBC 2007
1903.3.2		X	From 1903A.3 – CBC 2007
1903.3.3		X	New Amendment
1905.2.1		X	New Amendment
1905.6.2.1		X	From 1905A.6.2.1 – CBC 2007
1906.2.1		X	New Amendment
1906.3.1.1		X	From 1906A.3.1 – CBC 2007
1906.3.1.2		X	From 1906A.3.2 – CBC 2007
1906.4.1		X	New Amendment
1908.1.11.1		X	From 1908A.1.12 – CBC 2007
1908.1.11.2		X	From 1908A.1.27 – CBC 2007
1908.1.11.3		X	From 1908A.1.28 – CBC 2007
1908.1.11.4		X	From 1908A.1.37 – CBC 2007
1908.1.11.5		X	From 1908A.1.38 – CBC 2007
1908.1.11.6		X	From 1908A.1.41 – CBC 2007
1908.1.11.7		X	From 1908A.1.42 – CBC 2007
1908.1.11.8		X	New Amendment
1908.1.11.9		X	New Amendment
1913.11.1		X	From 1913A.1 – CBC 2007
1913.11.2		X	New Amendment
1913.11.3		X	From 1913A.7 – CBC 2007
1913.11.4		X	From 1913A.12 – CBC 2007
1913.11.5		X	From 1913A.13 – CBC 2007
1916.1		X	From 1916A.1 – CBC 2007
1916.2		X	From 1916A.2 – CBC 2007
1916.3		X	From 1916A.3 – CBC 2007

1916.4		X	From 1916A.5 – CBC 2007
1916.5		X	From 1916A.6 – CBC 2007
1916.6		X	From 1916A.7 – CBC 2007
1916.7		X	From 1916A.8 – CBC 2007
1916.7.1		X	New Amendment
1916.7.2		X	New Amendment
1916.7.3		X	From 1916A.8 – CBC 2007
1916.7.4		X	New Amendment
1916.7.5		X	New Amendment
1917.1		X	1917A.1

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

For DSA-SS/CC

2007 CBC SECTION 1903A – SPECIFICATIONS FOR TEST MATERIALS - repeal amendments in following subsections:

~~***1903A.4 Welding of reinforcing bars.*** *Modify ACI 318 Section 3.5.2 by adding the following:*~~

~~*If mill test reports are not available, chemical analysis shall be made of bars representative of the bars to be welded. Bars with a carbon equivalent (C.E.) above 0.75 shall not be welded. Welding shall not be done on or within two bar diameters of any bent portion of a bar that has been bent cold. Welding of crossing bars shall not be permitted for assembly of reinforcement unless authorized by the structural engineer and approved by the enforcement agency per approved procedures.*~~

2007 CBC SECTION 1905A – CONCRETE QUALITY, MIXING AND PLACING - repeal amendments in following subsections:

~~***1905A.10.1 Consolidation in congested areas.***~~

~~*Where conditions make consolidation difficult, or where reinforcement is congested, a mix design with smaller size aggregates, shall be used as approved by the architect, structural engineer and the enforcement agency.*~~

2007 CBC SECTION 1907A – DETAILS OF REINFORCEMENT - repeal amendments in following subsections:

~~***1907A.5.1 Prestressing tendons.*** *Prestressing tendons shall be placed within plus or minus 1/4-inch (6.4mm) tolerance for member depths equal to and less than 8 inches (203 mm) and not to exceed the lesser of 3/8 inch (9.5 mm) or one third the minimum concrete cover for member depths greater than 8 inches (203 mm).*~~

2007 CBC SECTION 1908 – MODIFICATIONS TO ACI 318 - repeal amendments in following subsections:

~~***1908A.1.1 ACI 318, Section 8.11.5.*** *Replace ACI 318 Section 8.11.5 as follows:*~~

~~*8.11.5 - Permanent burned clay or concrete tile fillers shall be considered only as forms and shall not be included in the calculations involving shear or bending moments.*~~

~~*The thickness of the concrete slab on the permanent fillers shall be designed as described in ACI Section 8.11.6 as modified in Section 1908A.1.2.*~~

~~***1908A.1.2 ACI 318, Section 8.11.6****. Replace ACI 318 Section 8.11.6 as follows:*~~

~~*8.11.6 - Where removable forms or fillers are used, the thickness of the concrete slab shall not be less than 1/12 of the clear distance between joists and in no case less than 2 1/2 inches (64 mm). Such slab shall be reinforced at right angles to the joists with at least the amount of reinforcement required for flexure.*~~

~~considering load concentrations, if any, but in no case shall the reinforcement be less than that required by ACI 318 Section 7.12.~~

~~**1908A.1.3 ACI 318, Section 8.11.** Add Section 8.11.9 to ACI 318 as follows:~~

~~8.11.9 Concrete bridging. Concrete bridging shall be provided as follows: one near the center of spans for 20 to 30 feet (6096 mm to 9144 mm) spans and two near the third points of spans over 30 feet (9144 mm). Such bridging shall be either:~~

~~(a) A continuous concrete web having a depth equal to the joist and a width not less than 3 1/2 inches (89 mm) reinforced with a minimum of one No. 4 bar in the top and bottom; or~~

~~(b) Any other concrete element capable of transferring a concentrated load of 1,000 pounds (4.5 kN) from any joist to the two adjacent joists.~~

~~Such bridging shall not be required in roof framing if an individual member is capable of carrying dead load plus a concentrated load of 1,500 pounds (6.7 kN) at any point.~~

~~**1908A.1.4 ACI 318, Section 10.5.3**. Modify ACI 318 Section 10.5.3 by adding the following:~~

~~This section shall not be used for members that resist seismic loads, except that reinforcement provided for foundation elements for one-story wood-frame or one-story light steel buildings need not be more than one-third greater than that required by analysis for all loading conditions.~~

~~**1908A.1.5 ACI 318, Section 12.14.3.** Add Section 12.14.3.6 to ACI 318 as follows:~~

~~12.14.3.6 - Welded splices and mechanical connections shall maintain the clearance and coverage requirements of ACI Sections 7.6 and 7.7.~~

~~**1908A.1.6 ACI 318, Section 13.5.3.3.** Modify ACI 318 Section 13.5.3.3 by adding the following:~~

~~Provision of ACI 318 Section 13.5.3.3 shall not be used, unless approved otherwise by the enforcement agent.~~

~~**1908A.1.7 ACI 318, Section 14.2.6.** Replace ACI 318 Section 14.2.6 as follows:~~

~~14.2.6 - Walls shall be anchored to intersecting elements such as floors or roofs or to columns, pilasters, buttresses, and intersecting walls and footings with reinforcement at least equivalent to No. 4 bars at 12 inches (305 mm) on center for each layer of reinforcement.~~

~~**1908A.1.8 ACI 318, Section 14.3.5.** Replace ACI 318 Section 14.3.5 as follows:~~

~~14.3.5 - Vertical and horizontal reinforcement shall not be spaced farther apart than three times the wall thickness, nor 18 inches (457 mm). Unless otherwise required by the engineer, the upper- and lowermost horizontal reinforcement shall be placed within one half of the specified spacing at the top and bottom of the wall.~~

~~**1908A.1.9 ACI 318, Section 14.3.8.** Add Section 14.3.8 to ACI 318 as follows:~~

~~14.3.8 - The minimum requirements for horizontal and vertical steel of ACI 318 Sections 14.3.2 and 14.3.3 may be interchanged for precast panels which are not restrained along vertical edges to inhibit temperature expansion or contraction.~~

~~**1908A.1.10 ACI 318, Section 14.5 - Empirical design method.** Not permitted by DSA-SS.~~

~~**1908A.1.11 ACI 318, Section 14.6.1.** Replace ACI 318 Section 14.6.1 as follows:~~

~~14.6.1 - Nonbearing walls or nonbearing shear walls shall have a thickness of not less than 4 inches (102 mm) nor a thickness less than 1 / 30 of the shorter unsupported distance between vertical or horizontal stiffening elements.~~

Where walls are supported laterally by vertical elements, the stiffness of each vertical element shall exceed that of the tributary area of the wall.

1908A.1.13 ACI 318, Section 15.2.1. *Modify ACI 318 Section 15.2.1 by adding the following:*

The appropriate induced reactions for strength design may be computed as those due to a factor of 1.4 times the soil pressures from gravity load combinations and the seismic load combinations of Section 1605A.3.

1908A.1.14 ACI 318, Section 15.2.2. Modify *ACI 318 Section 15.2.2 by adding the following:*

External forces and moments are those resulting from the load combinations of Section 1605A.3

1908A.1.15 ACI 318, Section 15.8.3.2. *Replace ACI 318 Section 15.8.3.2 as follows:*

15.8.3.2 - Connection between pre-cast walls and supporting members shall meet the requirements of ACI 318 Sections 16.5.1.3(b) & (c) but not less than required by Section 1604A.

EXCEPTION: *In tilt-up construction, this connection may be to an adjacent floor slab. In no case shall the connection provided be less than that required by Section 1604A.*

1908A.1.16 ACI 318, Section 16.3. *Add Section 16.3.3 to ACI 318 as follows:*

16.3.3 - Nonbearing, nonshear panels such as nonstructural architectural cladding panels or column covers are not required to meet the provisions of Section 1908A.1.17 1908A.1.14.

1908A.1.17 ACI 318 Section 16. *Add Section 16.11 to ACI 318 as follows:*

16.11 - Reinforcement. Perimeters of precast walls shall be reinforced continuously with a minimum of one No. 5 bar extending the full height and width of the wall panel. Bars shall be continuous around corners. Where wall panels do not abut columns or other wall panels, perimeter bars shall be retained by hooked wall bars. Edges of openings in precast walls shall be reinforced with a minimum of one No. 5 bar continuous past corners sufficient to develop the bar.

A continuous tie or bond beam shall be provided at the roof line either as a part of the roof structure or part of the wall panels as described in the next paragraph below. This tie may be designed as the edge member of the roof diaphragm but, in any case, shall not be less than equivalent to two No. 6 bars continuous. A continuous tie equivalent to two No. 5 bars minimum shall also be provided either in the footing or with an enlarged section of the floor slab.

Wall panels of shear wall buildings shall be connected to columns or to each other in such a manner as to develop at least 75 percent of the horizontal wall steel. Half of this continuous horizontal reinforcing may be concentrated in bond or tie beams at the top and bottom of the walls and at points of intermediate lateral support. If possible, cast in-place joints with reinforcing bars extending from the panels into the joint a sufficient distance to meet the splice requirements of ACI 318 Section 12.15 for Class A shall be used. The reinforcing bars or welded tie details shall not be spaced over eight times the wall thickness vertically nor fewer than four used in the wall panel height. Where wall panels are designed for their respective overturning forces, the panel connections need not comply with the requirements of this paragraph.

Where splicing of reinforcement must be made at points of maximum stress or at closer spacing than permitted by ACI 318 Section 7.6, welding may be used when the entire procedure is suitable for the particular quality of steel used and the ambient conditions. Unless the welds develop 125 percent of the specified yield strength of the steel used, reinforcement in the form of continuous bars or fully anchored dowels shall be added to provide 25 percent excess steel area and the welds shall develop not less than the specified yield strength of the steel.

Where reinforcing bars are used to transfer shear across a joint the shear value for bolts set forth in Table 1912A.2 may be used.

Wall panels shall be positively connected to all floors and roofs as specified in CBC Sections 1604A, 1607A.13 and ASCE 7 Section 13.5. They shall be connected to the foundations when not anchored to the floor slab or otherwise properly anchored.

~~*See ACI 318 Sections 10.10, 10.11, 10.12 and 10.13 for design of compression forces in the precast walls.*~~

~~***1908A.1.18 ACI 318, Section 16.*** *Add Section 16.12 to ACI 318 as follows:*~~

~~*16.12 - On-site Cast Precast Wall Panels.*~~

~~*16.12.1 - The provisions of ACI 318 Sections 16.1, 16.2, 16.3, 16.4, 16.5, 16.6 and 16.11 shall apply to precast wall panels cast on site.*~~

~~*16.12.2 - Precast bearing and nonbearing walls shall be designed in accordance with the provisions of ACI 318 Chapter 14. Panel concrete shall have attained the specified compressive strength (f'_c) before erection unless calculations provided by the structural engineer or architect demonstrate adequate serviceability during handling and erection for concrete panels of lesser strength.*~~

~~*16.12.3 - In lieu of unsupported height limitations, the panel may be supported laterally by vertical elements provided the panel thickness is not less than 1 / 36 the distance between the panel edges and the stiffness of the vertical elements exceeds that of the tributary area of the wall panels. See ASCE 7 Section 13.5 for exterior elements.*~~

~~*16.12.4 - All embedded items shall be securely anchored in place prior to placing the concrete.*~~

~~*16.12.5 - Panels shall be allowed as much time as possible in the erect position before making longitudinal connections with an elapsed time of 28 days minimum between casting and connecting the panels.*~~

~~*16.12.6 - All details of reinforcement, connections, bearing seats, inserts, anchors, concrete cover, openings, fabrication and erection tolerances shall be shown on contract drawings.*~~

~~***1908A.1.19 ACI 318, Section 17.5.1****. Modify ACI 318 Section 17.5.1 by adding Sections 17.5.1.1 and 17.5.1.2 as follows:*~~

~~*17.5.1.1 - Full transfer of horizontal shear forces may be assumed when all of the following are satisfied:*~~

~~*1. Contact surfaces are clean, free of laitance, and intentionally roughened to a full amplitude of approximately 1/4 inch (6.4 mm).*~~

~~*2. Minimum ties are provided in accordance with ACI 318 Section 17.6.*~~

~~*3. Web members are designed to resist total vertical shear, and*~~

~~*4. All shear reinforcement is fully anchored into all interconnected elements.*~~

~~*17.5.1.2 - If all requirements of ACI 318 Section 17.5.1.1 are not satisfied, horizontal shear shall be investigated in accordance with ACI 318 Section 17.5.3 or 17.5.4.*~~

~~***1908A.1.20 ACI 318, Section 18.2.3.*** *Modify ACI 318 Section 18.2.3 by adding the following:*~~

~~*For prestressed concrete members with recessed or dapped ends, an analysis of the connections shall be made in accordance with procedures given in Part 6 of the PCI Design Handbook, 6th Edition.*~~

~~***1908A.1.21 ACI 318 Section 18.2.4.*** *Modify ACI 318 Section 18.2.4 by adding the following:*~~

~~*Where prestressed concrete elements are restrained from movement, an analysis of the stresses in the prestressed elements and loads in the adjoining structural system induced by the above-described effects shall be made in accordance with Part 3 of the PCI Design Handbook, 6th Edition.*~~

~~***1908A.1.22 ACI 318, Section 18.2.*** *Add Section 18.2.7 to ACI 318 as follows:*~~

18.2.7 - Span to Depth Ratio. Span to depth ratios for prestressed concrete members shall not exceed the following, except when calculations of deflections prove that greater values may be used without adverse effects:

Beams	*30*
One-way Slabs	*40*
Two-way Floor Slabs	*40*
Two-way Roof Slabs	*44*
Flat Slabs	*See CBC Section 1908A.1.28 1908A.1.21*

These ratios should be decreased for special conditions such as heavy loads and simple spans.

Maximum deflection criteria shall be in accordance with ACI 318 Section 9.5

1908A.1.23 ACI 318, Section 18.6. *Add Section 18.6.4 to ACI 318 as follows:*

18.6.4 - Presumptive Loss of Prestress. In lieu of an analysis to determine the loss of prestress from the above sources the loss may be assumed to be 35,000 psi (241 MPa) for pretensioned prestressed members. For posttensioned prestressed members the loss due to elastic shortening of concrete, creep of concrete, shrinkage of concrete, and relaxation of steel stress may be assumed to be 25,000 psi (172 MPa).

1908A.1.24 ACI 318, Section 18.9.2.2. *Modify ACI 318 Section 18.9.2.2 by adding the following:*

One-way, unbonded, posttensioned slabs and beams shall be designed to carry the dead load of the slab or beam plus 25 percent of the unreduced superimposed live load by some method other than the primary unbonded posttensioned reinforcement. Design shall be based on the strength method of design with a load factor and capacity reduction factor of one. All reinforcement other than the primary unbonded reinforcement provided to meet other requirements of this section may be used in the design.

1908A.1.25 ACI 318, Section 18.9.2. *Modify ACI 318 Section 18.9.2 by adding Section 18.9.2.3 as follows:*

18.9.2.3 - Maximum spacing limitations of ACI 318 Sections 7.6.1 and 8.10.5.2, for bonded reinforcement in slabs are not applicable to spacing of bonded reinforcement in members with unbonded tendons.

1908A.1.26 ACI 318, Section 18.12*. Add Section 18.12.7 to ACI 318 as follows:*

18.12.7 - Openings in Flat Plates. The requirements of ACI 318 Section 13.4 apply in principle to openings in posttensioned flat plates. Tendons should be continuous and splayed horizontally to get around smaller openings. If tendons are terminated at edges of larger openings, such as at stairwells, an analysis shall be made to ensure sufficient strength and proper behavior. Edges around openings may be reinforced in a manner similar to conventionally reinforced slabs, or, in the case of larger openings, supplementary, posttensioning tendons may be used to strengthen the edges.

1908A.1.30 *(Chapter 19, Section 1908.1.4)* **ACI 318, Section 21.2.1.** Modify ACI 318 Sections 21.2.1.2, and *21.2.1.4*, to read as follows:

21.2.1.2 - The provisions of ACI 318 Chapters 1 through 18 shall apply except as modified by the provisions of ACI 318 Chapter 21 and this Chapter.

21.2.1.4 - For structures assigned to Seismic Design Category D, E or F, special moment frames, *special reinforced concrete structural walls*, diaphragms and trusses *and foundations* complying with 21.2 through 21.10 *or intermediate precast structural walls complying with* 21.13 shall be used to resist forces induced by earthquake motions. Members not proportioned to resist earthquake forces shall comply with 21.11.

1908A.1.33 **ACI 318, Section 21.3.** Modify ACI 318, Section 21.3, by adding new Section 21.3.2.5 to read as follows:

21.3.2.5 - Unless the special moment frame is qualified for use through structural testing as required by 21.6.3, for flexural members prestressing steel shall not provide more than one-quarter of the strength for either positive or negative moment at the critical section in a plastic hinge location and shall be anchored at or beyond the exterior face of a joint.

Shear strength provided by prestressing tendons shall not be considered in design.

1908A.1.34 ACI 318, Section 21.4.4.1. *Modify ACI 318 section 21.4.4.1 as follows:*

Where the calculated point of contraflexure is not within the middle half of the member clear height, provide transverse reinforcement as specified in ACI 318 Sections 21.4.4.1, Items (a) through (c), over the full height of the member.

1908A.1.35 ACI 318, Section 21.4.4. *Modify ACI 318 by adding Section 21.4.4.7 as follows:*

21.4.4.7 - At any section where the design strength, φP_n, of the column is less than the sum of the shears V_e computed in accordance with ACI 318 Sections 21.3.4.1 and 21.4.5.1 for all the beams framing into the column above the level under consideration, transverse reinforcement as specified in ACI 318 Sections 21.4.4.1 through 21.4.4.3 shall be provided. For beams framing into opposite sides of the column, the moment components may be assumed to be of opposite sign. For the determination of the design strength, φP_n, of the column, these moments may be assumed to result from the deformation of the frame in any one principal axis.

1908A.1.36 ACI 318, Section 21.5.4. *Modify ACI 318 by adding Section 21.5.4.5 as follows:*

21.5.4.5 - Splices shall be based on the development length, ℓ_d, for a straight bar as determined by ACI 318 Sections 21.5.4.1 and 21.5.4.2 and modified by the factors in ACI 318 Chapter 12.

1908A.1.47 **ACI 318, Section D.3.3.** Modify ACI 318, Sections D.3.3.2 through D.3.3.5, to read as follows:

D.3.3.2 - In structures assigned to Seismic Design Category D, E or F, post installed anchors for use under D.2.3 shall have passed the Simulated Seismic Tests of ACI 355.2.

D.3.3.3 - In structures assigned to Seismic Design Category D, E or F, the design strength of anchors shall be taken as $0.75\varphi N_n$ and $0.75\varphi V_n$, where φ is given in D.4.4 or D.4.5, and N_n and V_n are determined in accordance with D.4.1.

D.3.3.4 - In structures assigned to Seismic Design Category D, E or F, anchors shall be designed to be governed by tensile or shear strength of a ductile steel element, unless D.3.3.5 is satisfied.

Exception: Anchors in concrete designed to support non-structural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.4.

D.3.3.5 - Instead of D.3.3.4, the attachment that the anchor is connecting to the structure shall be designed so that the attachment will undergo ductile yielding at a load level corresponding to anchor forces no greater than the design strength of anchors specified in D.3.3.3, *or the minimum design strength of the anchors shall be at least 2.5 times the factored forces transmitted by the attachment*.

Exception: *Anchors in concrete designed to support non-structural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.5.*

2007 CBC SECTION 1913A – SHOTCRETE - repeal amendments in following subsections:

1913A.11 Equipment. *The equipment used in preconstruction testing shall be the same equipment used in the work requiring such testing, unless substitute equipment is approved by the enforcement agency.*

2007 CBC SECTION 1916A – CONCRETE TESTING - repeal amendments in following subsections:

1916A.4 Waiver of material testing. *Tests of reinforcing bars may be waived by the architect or structural engineer with the approval of the enforcement agency for one-story buildings where the specified compressive strength of the concrete f'_c, delivered to the jobsite is 3,500 psi (24.13 MPa) and where the f'_c used in design is 2,500 psi (17.24 MPa).*

(Chapter 19 Repealer and Express Terms are based on 2007 CBC Chapter 19A and 2009 IBC Chapter 19.)

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

EXPRESS TERMS

Italics are used for text within Sections 1903 through 1908 of this code to indicate provisions that differ from ACI 318. State of California amendments in these sections are shown in italics and underlined.

SECTION ~~1901A~~ 1901
GENERAL

~~**1901A.1**~~ **1901.1 Scope.** The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

1901.1.1 Application. *The scope of application of Chapter 19 is as follows:*

1. *Community college buildings regulated by the Division of the State Architect—Structural Safety/Community Colleges (DSA-SS/CC), as listed in Section 1.9.2.2.*

2. *(Reserved for OSHPD)*

1901.1.2 Amendments in this chapter. *DSA-SS/CC adopts this chapter and all amendments.*

Exceptions: *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/Community Colleges:

[DSA-SS/CC] *For applications listed in Section ~~109.2~~ 1.9.2.2.*

2. *(Reserved for OSHPD)*

1901.1.3 Reference to other chapters. [DSA-SS/CC] *Where reference within this chapter is made to sections in Chapters 17 and 18, the provisions in Chapters 17A, and 18A respectively shall apply instead.*

~~**1901A.2**~~ **1901.2 Plain and reinforced concrete.** Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section ~~1908A~~ 1908 of this code. Except for the provisions of Sections ~~1904A~~ 1904 and ~~1910A~~ 1910, 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.

~~**1901A.3**~~ **1901.3 Source and applicability**. The format and subject matter of Sections ~~1902A~~ 1902 through ~~1907A~~ 1907 of this chapter are patterned after, and in general conformity with, the provisions for structural concrete in ACI 318.

~~**1901A.4**~~ **1901.4 Construction documents…**

~~**1901A.5**~~ **1901.5 Special inspection.** The special inspection of concrete elements of buildings and structures and concreting operations shall be as required by Chapter ~~17A~~ 17.

SECTION ~~1902A~~ 1902
DEFINITIONS

~~1902A.1~~ 1902.1 General. The words and terms defined in ACI 318 shall, for the purposes of this chapter and as used elsewhere in this code for concrete construction, have the meanings shown in ACI 318 as modified by Section ~~1908A.1.1~~ 1908.1.1.

SECTION ~~1903A~~ 1903
SPECIFICATIONS FOR TESTS AND MATERIALS

~~1903A.1~~ 1903.1 General. Materials used to produce concrete, concrete itself and testing thereof shall comply with the applicable standards listed in ACI 318. *Where required, special inspections and tests shall be in accordance with Chapter ~~17A~~ 17 and Section ~~1916A~~ 1916.*

1903.2 Glass fiber reinforced concrete. *Glass fiber reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCIMNL128 standard.*

1903.3 Additional Requirements. [DSA-SS/CC]

~~1903A.5~~ 1903.3.1 Fly ash. *Replace ACI 318 Section ~~3.6.6~~ 3.2.2 as follows:*

Fly ash or other pozzolan can be used as a partial substitute for ASTM C 150 portland cement, as follows:

1. Fly ash or other pozzolan shall conform to ASTM C 618 for Class N or Class F materials (Class C is not permitted), and

2. More than 15 percent by weight of fly ash or other pozzolans shall be permitted to be substituted for ASTM C 150 portland cement if the mix design is proportioned per Section ~~1905A.3~~ 1905.3. See Section ~~1904A~~ 1904 for durability requirements.

3. More than 40 percent by weight of ground-granulated blast-furnace slag conforming to ASTM C 989 shall be permitted to be substituted for ASTM C 150 portland cement if the mix design is proportioned per Section ~~1905A.3~~ 1905.3. See Section ~~1904A~~ 1904 for durability requirements.

~~1903A.3~~ 1903.3.2 ACI 318, Section 3.3.2. *Modify ACI 318 Section 3.3.2 by adding the following:*

Aggregate size limitations waiver shall be approved by the enforcement agency.

Evidence that the aggregate used is not reactive in the presence of cement alkalis may be required by the enforcement agency. If new aggregate sources are to be used or if past experience indicates problems with existing aggregate sources, test the aggregate for potential reactivity according to ASTM C 289 to determine potential reactivity in the presence of cement.

If the results of the test are other than innocuous, selected concrete proportions using the aggregate (see Section ~~1905A.2~~ 1905.2) shall be tested in accordance with ASTM C 1567. If the results of this test indicate an expansion greater than 0.10 percent at 16-days age, provide mitigation with one of the cementitious material systems noted below such that an expansion of less than 0.10 percent at 16-days age is obtained:

1. Low-alkali portland cement containing not more than 0.6 percent total alkali when calculated as sodium oxide, as determined by the method given in ASTM C 114.

2. Blended hydraulic cement, Type IS or IP, conforming to ASTM C 595, except that Type IS cement shall not contain less than 40 percent slag constituent.

3. Replacement of not less than 15 percent by weight of the portland cement used by a mineral admixture conforming to ASTM C 618 for Class N or F materials (Class C is not permitted).

4. Replacement of not less than 40 percent by weight of the portland cement used by a ground granulated blast-furnace slag conforming to ASTM C 989.

1903.3.3 ***Discontinuous Steel Fibers -*** *Modify ACI 318 Section 3.5.1 by adding the following:*

Discontinuous steel fibers shall not be permitted.

SECTION ~~1904A~~ 1904
DURABILITY REQUIREMENTS

~~1904A.1~~ 1904.1 Water-cementitious materials ratio. Where maximum water-cementitious materials ratios are specified in ACI 318, they shall be calculated in accordance with ACI 318, Section 4.1.

~~1904A.2~~ 1904.2 Exposure categories and classes. Concrete shall be assigned to exposure classes in accordance with ACI 318, Section 4.2, based on:

1. Exposure to freezing and thawing in a moist condition or deicer chemicals;
2. Exposure to sulfates in water or soil;
3. Exposure to water where the concrete is intended to have low permeability; and
4. Exposure to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater or spray from these sources, where the concrete has steel reinforcement.

~~1904A.3~~ 1904.3 Concrete properties. Concrete mixtures shall conform to the most restrictive maximum water-cementitious materials ratios and minimum specified concrete compressive strength requirements of ACI 318, Section 4.3, based on the exposure classes assigned in Section ~~1904A.2~~ 1904.2.

Exception: *For occupancies and appurtenances thereto in Group R occupancies that are in buildings less than four stories above grade plane, normal-weight aggregate concrete is permitted to comply with the requirements of Table ~~1904A.3~~ 1904.3 based on the weathering classification (freezing and thawing) determined from Figure ~~1904A.3~~ 1904.3 in lieu of the requirements of ACI 318, Table 4.3.1.*

TABLE ~~1904A.3~~ 1904.3
MINIMUM SPECIFIED COMPRESSIVE STRENGTH (f'_c)
(Table not shown for clarity)

FIGURE ~~1904A.3~~ 1904.3
WEATHERING PROBABILITY MAP FOR CONCRETE [a, b, c]
(Figure not shown for clarity)

~~1904A.4~~ 1904.4 Freezing and thawing exposures. Concrete that will be exposed to freezing and thawing, in the presence of moisture, with or without deicing chemicals being present, shall comply with Sections ~~1904A.4.1~~ 1904.4.1 and ~~1904A.4.2~~ 1904.4.2.

~~1904A.4.1~~ 1904.4.1 Air entrainment. Concrete exposed to freezing and thawing while moist shall be air entrained in accordance with ACI 318, Section 4.4.1.

~~1904A.4.2~~ 1904.4.2 Deicing chemicals. For concrete exposed to freezing and thawing in the presence of moisture and deicing chemicals, the maximum weight of fly ash, other pozzolans, silica fume or slag that is included in the concrete shall not exceed the percentages of the total weight of cementitious materials permitted by ACI 318, Section 4.4.2.

~~1904A.5~~ 1904.5 Alternative cementitious materials for sulfate exposure. Alternative combinations of cementitious materials for use in sulfate-resistant concrete to those listed in ACI 318, Table 4.3.1 shall be permitted in accordance with ACI 318, Section 4.5.1.

SECTION ~~1905A~~ 1905
CONCRETE QUALITY, MIXING AND PLACING

~~1905A.1~~ 1905.1 General. The required strength and durability of concrete shall be determined by compliance with the proportioning, testing, mixing and placing provisions of Sections ~~1905A.1.1~~ 1905.1.1 through ~~1905A.13~~ 1905.13.

~~1905A.1.1~~ 1905.1.1 Strength. Concrete shall be proportioned to provide an average compressive strength as prescribed in Section ~~1905A.3~~ 1905.3 and shall satisfy the durability criteria of Section ~~1904A~~ 1904. Concrete shall be produced to minimize the frequency of strengths below f'_c, as prescribed in Section ~~1905A.6.3~~ 1905.6.3. *For concrete designed and constructed in accordance with this chapter, f'_c, shall not be less than 2500 psi (17.22 MPa)* ~~*except that 2,500 psi (17.2 MPa) concrete may be used in the design of footings for light one-story wood- or steel-framed buildings or other minor structures.*~~ No maximum specified compressive strength shall apply unless restricted by a specific provision of this code or ACI 318. ~~*Reinforced concrete with specified compressive strength higher than 8000 psi shall require prior approval of structural design method and acceptance criteria by the enforcement agency.*~~

~~1905A.2~~ 1905.2 Selection of concrete proportions. Concrete proportions shall be determined in accordance with the provisions of ACI 318, Section 5.2.

1905.2.1 Additional Requirement. [DSA-SS/CC] *A registered civil engineer with experience in concrete mix design shall select the relative amounts of ingredients to be used as basic proportions of the concrete mixes proposed for use under this provision and testing shall be performed in a laboratory acceptable to the enforcement agency.*

~~1905A.3~~ 1905.3 Proportioning on the basis of field experience and/or trial mixtures. . . .

~~1905A.4~~ 1905.4 Proportioning without field experience or trial mixtures. . . .

~~1905A.5~~ 1905.5 Average strength reduction. . . .

~~1905A.6~~ 1905.6 Evaluation and acceptance of concrete. The criteria for evaluation and acceptance of concrete shall be as specified in Sections ~~1905A.6.2~~ 1905.6.2 through ~~1905A.6.5~~ 1905.6.5.

~~1905A.6.1~~ 1905.6.1 Qualified technicians. Concrete shall be tested in accordance with the requirements in Sections ~~1905A.6.2~~ 1905.6.2 through ~~1905A.6.5~~ 1905.6.5. Qualified field testing technicians shall perform tests on fresh concrete at the job site, prepare specimens required for curing under field conditions, prepare specimens required for testing in the laboratory and record the temperature of the fresh concrete when preparing specimens for strength tests. Qualified laboratory technicians shall perform all required laboratory tests.

~~1905A.6.2~~ 1905.6.2 Frequency of testing. The frequency of conducting strength tests of concrete and the minimum number of tests shall be as specified in ACI 318, Section 5.6.2. ~~*except as modified in Section 1905A.6.2.1.*~~

Exception: When the total volume of a given class of concrete is less than 50 cubic yards (38m3), strength tests are not required when evidence of satisfactory strength is submitted to and approved by the building official.

~~1905A.6.2.1~~ 1905.6.2.1 Additional requirements. [DSA-SS, DSA-SS/CC] ~~Sample Frequency.~~ *Replace ACI 318 Section 5.6.2.1 as follows:*

5.6.2.1 Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards (345m^3) of concrete, or not less than once for each 2,000 square feet (186 m^2) of surface area for slabs or walls. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.

~~1905A.6.3~~ 1905.6.3 Strength test specimens. Specimens prepared for acceptance testing of concrete in accordance with Section ~~1905A.6.2~~ 1905.6.2 and strength test acceptance criteria shall comply with the provisions of ACI 318, Section 5.6.3.

~~1905A.6.4~~ 1905.6.4 Field-cured specimens. . . .

~~1905A.6.5~~ 1905.6.5 **Low-strength test results. . . .**

~~1905A.7~~ 1905.7 **Preparation of equipment and place of deposit. . . .**

~~1905A.8~~ 1905.8 **Mixing.** Mixing of concrete shall be performed in accordance with ACI 318, Section 5.8.

~~*The capacity of the mixer shall be such that it will handle one or more full sack batches. No split sack batches will be permitted, except when all materials are weighed.*~~

~~1905A.9~~ 1905.9 **Conveying. . . .**

~~1905A.10~~ 1905.10 **Depositing. . . .**

~~1905A.11~~ 1905.11 **Curing. . . .**

~~1905A.12~~ 1905.12 **Cold weather requirements.** Concrete to be placed during freezing or near-freezing weather shall comply with the requirements of ACI 318, Section 5.12.

~~*When mixing concrete during cold weather, the mix shall have a temperature of at least 50°F (10.0°C), but not more than 90°F (32.2°C). The concrete shall be maintained at a temperature of at least 50°F (10.0°C) for not less than 72 hours after placing. When necessary, concrete materials shall be heated before mixing. Special precautions shall be taken for the protection of transit-mixed concrete to maintain a temperature of at least 50°F (10.0°C).*~~

~~1905A.13~~ 1905.13 **Hot weather requirements. . . .**

SECTION ~~1906A~~ 1906
FORMWORK, EMBEDDED PIPES AND CONSTRUCTION JOINTS

~~1906A.1~~ 1906.1 **Formwork. . . .**

~~1906A.2~~ 1906.2 **Removal of forms, shores and reshores.** The removal of forms and shores, including from slabs and beams (except where cast on the ground), and the installation of reshores shall comply with ACI 318, Section 6.2.

1906.2.1 Additional requirement. [DSA-SS/CC] *No portion of the forming and shoring system may be removed less than 12 hours after placing. When stripping time is less than the specified curing time, measures shall be taken to provide adequate curing and thermal protection of the stripped concrete.*

~~1906A.3~~ 1906.3 **Conduits and pipes embedded in concrete.** Conduits, pipes and sleeves of any material not harmful to concrete and within the limitations of ACI 318, Section 6.3, are permitted to be embedded in concrete with approval of the registered design professional.

1906.3.1 Additional requirements. [DSA-SS/CC]

~~***1906A.3.1***~~ ***1906.3.1.1 Large Openings.*** *Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural plans. Nothing in this section shall be construed to permit work in violation of fire and panic or other safety standards*

~~***1906A.3.2***~~ ***1906A.3.1.2 Adequate Support.*** *Pipes and conduits shall be adequately supported and secured against displacement before concrete is placed.*

~~1906A.4~~ 1906.4 **Construction joints.** Construction joints, including their location, shall comply with the provisions of ACI 318, Section 6.4.

1906.4.1 Additional requirements. [DSA-SS/CC]

1906.4.1.1 Joint Details. *Typical details and proposed locations of construction joints shall be indicated on the plans.*

~~1906A4.1~~ 1906A.4.1.2 Surface Preparation. *The surface of all horizontal construction joints shall be cleaned and roughened by exposing clean aggregate solidly embedded in mortar matrix.*

In the event that the contact surface becomes coated with earth, sawdust, etc., after being cleaned, the entire surface so coated shall be recleaned.

SECTION ~~1907A~~ 1907
DETAILS OF REINFORCEMENT

~~1907A.1~~ 1907.1 Hooks. . . .

~~1907A.2~~ 1907.2 Minimum bend diameters. . . .

~~1907A.3~~ 1907.3 Bending. . . .

~~1907A.4~~ 1907.4 Surface conditions of reinforcement. . . .

~~1907A.5~~ 1907.5 Placing reinforcement. The placement of reinforcement, including tolerances on depth and cover, shall comply with the provisions of ACI 318, Section 7.5. Reinforcement shall be accurately placed and adequately supported before concrete is placed.

~~1907A.6~~ 1907.6 Spacing limits for reinforcement. The clear distance between reinforcing bars, bundled bars, tendons and ducts shall comply with ACI 318, Section 7.6.

~~1907A.7~~ 1907.7 Concrete protection for reinforcement. The minimum specified concrete cover for reinforcement shall comply with Sections ~~1907A.7.1~~ 1907.7.1 through ~~1907A.7.8~~ 1907.7.8.

~~1907A.7.1~~ 1907.7.1 Cast-in-place concrete (nonprestressed). Minimum specified concrete cover shall be provided for reinforcement in nonprestressed, cast-in-place concrete construction in accordance with ACI 318, Section 7.7.1.

~~*Concrete tilt-up panels cast against a rigid horizontal surface, such as a concrete slab, exposed to the weather shall have 1" (25 mm) concrete cover for No. 8 or smaller bar and 2" (51 mm) cover for No. 9 or larger bars.*~~

~~1907A.7.2~~ 1907.7.2 Cast-in-place concrete (prestressed). . . .

~~1907A.7.3~~ 1907.7.3 Precast concrete (manufactured under plant control conditions). . . .

~~1907A.7.4~~ 1907.7.4 Bundled bars. . . .

~~1907A.7.5~~ 1907.7.5 Headed shear stud reinforcement. . . .

~~1907A.7.6~~ 1907.7.6 Corrosive environments. . . .

~~1907A.7.7~~ 1907.7.7 Future extensions. . . .

~~1907A.7.8~~ 1907.7.8 Fire protection. When this code requires a thickness of cover for fire protection greater than the minimum concrete cover in Section ~~1907A.7~~ 1907.7, such greater thickness shall be specified.

~~1907A.8~~ 1907.8 Special reinforcement details for columns. . . .

~~1907A.9~~ 1907.9 Connections. . . .

~~1907A.10~~ 1907.10 Lateral reinforcement for compression members. . . .

~~1907A.11~~ 1907.11 Lateral reinforcement for flexural members. . . .

~~1907A.12~~ 1907.12 **Shrinkage and temperature reinforcement. . . .**

~~1907A.13~~ 1907.13 **Requirements for structural integrity. . . .**

SECTION ~~1908A~~ 1908
MODIFICATIONS TO ACI 318

~~1908A.1~~ 1908.1 **General.** The text of ACI 318 shall be modified as indicated in Sections ~~1908A.1.1~~ 1908.1.1 through ~~1908A.1.47~~ 1908.1.11.

~~1908A.1.1~~ 1908.1.1 **ACI 318, Section 2.2.** Modify existing definitions and add the following definitions to ACI 318, Section 2.2.

DESIGN DISPLACEMENT. Total lateral displacement expected for the design-basis earthquake, *as specified by Section 12.8.6 of ASCE 7.*

DETAILED PLAIN CONCRETE STRUCTURAL WALL. *A wall complying with the requirements of Chapter 22, including 22.6.7.*

ORDINARY PRECAST STRUCTURAL WALL. *A precast wall complying with the requirements of Chapters 1 through 18.*

ORDINARY REINFORCED CONCRETE STRUCTURAL WALL. A *cast-in-place* wall complying with the requirements of Chapters 1 through 18.

ORDINARY STRUCTURAL PLAIN CONCRETE WALL. A wall complying with the requirements of Chapter 22, *excluding 22.6.7*.

SPECIAL STRUCTURAL WALL. A cast-in-place or precast wall complying with the requirements of 21.1.3 through 21.1.7, 21.9 and 21.10, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls *or ordinary precast structural walls, as applicable*. *Where ASCE 7 refers to a "special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."*

WALL PIER. *A wall segment with a horizontal length-to-thickness ratio of at least 2.5, but not exceeding 6, whose clear height is at least two times its horizontal length.*

. . . .

~~***1908A.1.12 ACI 318, Section 14.9.***~~ *(Relocated to Section 1908.1.11.1)* ~~*Modify ACI 318 by adding Section 14.9 as follows:*~~

~~*14.9 – Foundation Walls. Horizontal reinforcing of concrete foundation walls for wood-frame or light-steel buildings shall consist of the equivalent of not less than one No. 5 bar located at the top and bottom of the wall. Where such walls exceed 3 feet (914 mm) in height, intermediate horizontal reinforcing shall be provided at spacing not to exceed 2 feet (610 mm) on center. Minimum vertical reinforcing shall consist of No. 3 bars at 24 inches (610 mm) on center.*~~

~~*Where concrete foundation walls or curbs extend above the floor line and support wood-frame or light-steel exterior, bearing or shear walls, they shall be doweled to the foundation wall below with a minimum of No. 3 bars at 24 inches (610 mm) on center. Where the height of the wall above the floor line exceeds 18 inches (457 mm), the wall above and below the floor line shall meet the requirements of ACI 318 Section 14.3.*~~

. . . .

~~***1908A.1.27 ACI 318, Section 18.21.***~~ *(Relocated to Section 1908.1.11.2)* ~~*Add Section 18.21.5 to ACI 318 as follows:*~~

~~*18.21.5 – Prequalification of anchorages and coupler. Posttensioned anchorages and couplers for unbonded tendons shall be prequalified for use in prestressed concrete. Data shall be submitted by the posttensioning*~~

~~*materials fabricator from an approved independent testing agency to show compliance with the following dynamic test requirements:*~~

~~*A dynamic test shall be performed on a representative specimen and the tendon shall withstand, without failure, 500,000 cycles from 60 percent to 66 percent of its minimum specified ultimate strength and 50 cycles from 40 percent to 80 percent of its minimum specified ultimate strength. The period of each cycle involves the change from the lower stress level to the upper stress level and back to the lower. The specimen used for the second dynamic test need not be the same used for the first dynamic test. Systems utilizing multiple strands, wires or bars may be tested utilizing a test tendon of smaller capacity than the full-size tendon. The test tendon shall duplicate the behavior of the full-size tendon and generally shall not have less than 10 percent of the capacity of the full-size tendon.*~~

~~*The above test data must be on file at the enforcement agency for posttensioning systems to be used. General approval will be based on satisfactory performance. Tests shall be required for pre-stressing steel and anchorages.*~~

~~*The average bearing stress, P/A_b, on the concrete created by the anchorage plates shall not exceed the following:*~~

~~*At service load*~~

~~*$f_{cB} = 0.6\, f'_c \sqrt{(A'_b/A_b)}$*~~

~~*but not greater than f'_c*~~

~~*At transfer load*~~

~~*$f_{cB} = 0.8\, f'_{ci} \sqrt{(A'_b/A_b - 02)}$*~~

~~*but not greater than $1.25\, f'_{ci}$ where:*~~

~~*f_{cB} = permissible compressive concrete stress.*~~

~~*f'_c = compressive strength of concrete.*~~

~~*f'_{ci} = compressive strength of concrete at time of initial prestress.*~~

~~*A'_b = maximum area of the portion of the concrete anchorage surface that is geometrically similar to and concentric with the area of the anchorage.*~~

~~*A_b = bearing area of the anchorage.*~~

~~*P = prestress force in tendon.*~~

~~***1908A.1.28 ACI 318, Section 18.***~~ *(Relocated to Section 1908.1.11.3)* ~~*Add Section 18.23 to ACI 318 as follows:*~~

~~*18.23 – Prestressed Flat Slab.*~~

~~*18.23.1 - Span depth ratio. The ratio of the span to depth of the slab continuous over at least three supports with cantilevers at the ends shall not be greater than 40 for floor slabs or 44 for roof slabs.*~~

~~*18.23.2 - Distribution of tendons. The use of banded tendons is acceptable. Maximum tendon spacing shall be six times the slab thickness, not to exceed 42 inches (1067 mm). A minimum prestress level of 125 psi (861 kPa) on the local slab section tributary to the tendon or tendon group is required. A minimum of two tendons in flat slabs shall be placed over columns in each direction. Tendons at slab edges shall be placed 6 inches (152 mm) clear of the slab edge. Tendons shall be firmly supported at intervals not exceeding 42 inches (1067 mm) to prevent displacement during concrete placement. Tendons shall not be bundled in groups greater than five monostrand tendons. At horizontal plane deviations grouped tendons at curved portions must be separated with 1-inch minimum (25 mm) clear between each tendon.*~~

~~*18.23.3 - Slab edge reinforcement. The slab edges, including interior openings with anchorages, shall be reinforced with two No. 5 bars, one top and one bottom, minimum, with a No. 3 hairpin placed each side of each anchorage or tendon carrying an effective prestressing force of 50,000 pounds (223 kN) or less. These hairpins shall be increased to No. 4 hairpins if the effective force per anchorage or tendon is greater than 50,000 pounds (223 kN).*~~

. . . .

1908.1.2 ACI 318, Section 21.1.1. Modify ACI 318 Sections 21.1.1.3 and 21.1.1.7 to read as follows:

21.1.1.3 – Structures assigned to Seismic Design Category A shall satisfy requirements of Chapters 1 to 19 and 22; Chapter 21 does not apply. Structures assigned to *Seismic Design Category* B, C, D, E or F also shall satisfy 21.1.1.4 through 21.1.1.8, as applicable. *Except for structural elements of plain concrete complying with Section 1908.1.8 of the International Building Code, structural elements of plain concrete are prohibited in structures assigned to Seismic Design Category C, D, E or F.*

21.1.1.7 – Structural systems designated as part of the seismic-force-resisting system shall be restricted to those *permitted by ASCE 7*. Except for *Seismic Design Category* A, for which Chapter 21 does not apply, 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 21.2.

(b) Ordinary reinforced concrete structural walls *and ordinary precast structural walls* need not satisfy any provisions in Chapter 21.

(c) Intermediate moment frames shall satisfy 21.3.

(d) Intermediate precast *structural* walls shall satisfy 21.4.

(e) Special moment frames shall satisfy 21.5 through 21.8.

(f) Special structural walls shall satisfy 21.9.

(g) Special structural walls constructed using precast concrete shall satisfy 21.10.

All special moment frames and special structural walls shall also satisfy 21.1.3 through 21.1.7.

1908.1.3 ACI 318, Section 21.4. Modify ACI 318, Section 21.4, by renumbering Section 21.4.3 to become 21.4.4 and adding new Sections 21.4.3, 21.4.5 and 21.4.6 to read as follows:

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

21.4.4 – Elements of the connection that are not designed to yield shall develop at least 1.5 *Sy*.

21.4.5 – Wall piers not designed as part of a moment frame shall have transverse reinforcement designed to resist the shear forces determined from 21.3.3. Spacing of transverse reinforcement shall not exceed 8 inches (203 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).

Exceptions:

1. *Wall piers that satisfy 21.13.*
2. *Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.*

21.4.6 –Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as columns.

1908.1.3.1 Additional Requirements [DSA-SS/CC]. *In addition to the requirements of Section 1908.1.3, Wall piers in Seismic Design Category D, E or F shall comply with Section 1908.1.4.*

1908.1.4 ACI 318, Section 21.9. Modify ACI 318, Section 21.9, by adding new Section 21.9.10 to read as follows:

21.9.10 – Wall piers and wall segments.

21.9.10.1 –Wall piers not designed as a part of a special moment frame shall have transverse reinforcement designed to satisfy the requirements in 21.9.10.2.

Exceptions:

1. *Wall piers that satisfy 21.13.*
2. *Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.*

21.9.10.2 – Transverse reinforcement with seismic hooks at both ends shall be designed to resist the shear forces determined from 21.6.5.1. Spacing of transverse reinforcement shall not exceed 6 inches (152 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).

21.9.10.3 – Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as column.

1908.1.5 ACI 318, Section 21.10. Modify ACI 318, Section 21.10.2, to read as follows:

21.10.2 – Special structural walls constructed using precast concrete shall satisfy all the requirements of 21.9 for cast-in-place special structural walls in *addition* to Sections 21.4.2 *through 21.4.4*.

1908.1.6 ACI 318, Section 21.12.1.1. Modify ACI 318, Section 21.12.1.1, to read as follows:

21.12.1.1 – Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and ground shall comply with the requirements of Section 21.12 and other applicable provisions of ACI 318 *unless modified by Chapter 18 of the International Building Code*.

1908.1.7 ACI 318, Section 22.6. Modify ACI 318, Section 22.6, by adding new Section 22.6.7 to read as follows: **. . .**

1908.1.8 ACI 318, Section 22.10. Delete ACI 318, Section 22.10, and replace with the following: **. . .**

1908.1.9 ACI 318, Section D.3.3. Modify ACI 318, Sections, D.3.3.4 and D.3.3.5 to read as follows: **. . .**

1908.1.10 ACI 318, Section D.4.2.2. Delete ACI 318, Section D.4.2.2, and replace with the following: **. . .**

1908.1.11 Additional requirements. [DSA-SS/CC]

~~***1908A.1.12***~~ ***1908.1.11.1 ACI 318, Section 14.9.*** *Modify ACI 318 by adding Section 14.9 as follows:* **. . .**

~~***1908A.1.27***~~ ***1908.1.11.2 ACI 318, Section 18.21.*** *Add Section 18.21.5 to ACI 318 as follows:* **. . .**

~~***1908A.1.28***~~ ***1908.1.11.3 ACI 318, Section 18.*** *Add Section 18.23 to ACI 318 as follows:*

18.23 - ~~Prestressed~~ Post-tensioned-Flat Slab. **. . .**

~~***1908A.1.37***~~ ***1908A.1.11.4 ACI 318, Section ~~21.7.2.2~~ 21.9.2.2***. *Modify ACI 318, Section ~~21.7.2.2~~ 21.9.2.2 by adding the following:*

Where boundary members are not required by ACI 318 Section ~~21.7.6~~ 21.9.6, minimum reinforcement parallel to the edges of all structural walls and the boundaries of all openings shall consist of twice the cross-sectional area of the minimum shear reinforcement required per lineal foot of wall. Horizontal extent of boundary element shall be per ACI 318 Section ~~21.7.6.4~~ 21.9.6.4 (a) & (b).

~~1908A.1.38~~ 1908A.1.11.5 ACI 318, Section ~~21.7.4~~ 21.9.4. *Modify ACI 318 by adding Section ~~21.7.4.6~~ 21.9.4.6 as follows:*

~~21.7.4.6~~ 21.9.4.6 - Walls and portions of walls with $P_u > 0.35P_o$ shall not be considered to contribute to the calculated strength of the structure for resisting earthquake-induced forces. Such walls shall conform to the requirements of ACI 318 Section ~~21.11~~ 21.13.

~~1908A.1.41~~ 1908.1.11.6 ACI 318, Section ~~21.9.4.~~ 21.11.4. *Modify ACI 318 Section ~~21.9.4~~ 21.11.4 by adding the following:*

Collector and boundary elements in topping slabs placed over precast floor and roof elements shall not be less than 3 inches (76 mm) or 6 d_b thick, where d_b is the diameter of the largest reinforcement in the topping slab.

~~1908A.1.42~~ 1908.1.11.7. ACI 318, Section ~~21.9.5.6.~~ 21.11.7. *Modify ACI 318 Section ~~21.9.5.6~~ 21.11.7 by adding Section ~~21.9.5.6~~ 21.11.7.7 as follows:*

~~21.9.5.6~~ 21.11.7.7 - Where boundary members are not required by ACI 318 Section ~~21.9.5.3~~ 21.11.7.5, minimum reinforcement parallel to the edges of all diaphragms and the boundaries of all openings shall consist of twice the cross-sectional area of the minimum shear reinforcement required per linear foot of diaphragm.

1908.1.11.8 ACI 318, Chapter 22. *Plain concrete is not permitted.*

1908.1.11.9 ACI 318, Section D.3.3. *Modify ACI 318, Section, D.3.3.1 and add Section D.3.3.7 to read as follows:*

D.3.3.1 – The provisions of Appendix D do not apply to the design of anchors in plastic hinge zones of concrete structures under earthquake forces or to anchors that meet the requirements of Section D.3.3.7.

D.3.3.7 – For wood sill plates a minimum of 1 ½ inches (38 mm) in net thickness, the allowable lateral design values of cast-in anchors in shear parallel to the grain of the wood sill plate are permitted to be determined in accordance with Section 2305 of the International Building Code, provided they comply with all of the following:

1. *Their maximum nominal diameter is 5/8 inches (16 mm);*
2. *They are embedded into the concrete a minimum of 7 inches (178 mm);*
3. *They are located a minimum of 2 ½ anchor diameters from the edges of the concrete parallel to the grain of the wood sill plate; and*
4. *They are located a minimum of 15 anchor diameters from the edges of the concrete perpendicular to the grain of the wood sill plate,*

SECTION ~~1909A~~ 1909
STRUCTURAL PLAIN CONCRETE

~~1909A.1~~ 1909.1 Scope. *~~Plain concrete shall not be used other than as fill. The minimum specified compression strength of concrete used as fill shall be 1,500 psi (10.3 MPa) at 28 days.~~* The design and construction of structural plain concrete, both cast-in-place and precast, shall comply with the minimum requirements of Section 1909 and ACI 318, Chapter 22, as modified in Section 1908.

. . . .

SECTION ~~1910A~~ 1910
MINIMUM SLAB PROVISIONS

~~1910A.1~~ 1910.1 General… .

SECTION ~~1911A~~ 1911
ANCHORAGE TO CONCRETE—
ALLOWABLE STRESS DESIGN

. . . .

SECTION ~~1912A~~ 1912
ANCHORAGE TO CONCRETE—
STRENGTH DESIGN

. . . .

SECTION ~~1913A~~ 1913
SHOTCRETE

~~**1913A.1**~~ **1913.1 General.** Shotcrete is mortar or concrete that is pneumatically projected at high velocity onto a surface. Except as specified in this section, shotcrete shall conform to the requirements of this chapter for plain or reinforced concrete~~*. and the provisions of ACI 506. The specified compressive strength of shotcrete shall not be less than 3,000 psi (20.69 MPa).*~~

~~*Concrete or masonry to receive shotcrete shall have the entire surface thoroughly cleaned and roughened by sand blasting, and just prior to receiving shotcrete, shall be thoroughly cleaned of all debris, dirt and dust. Concrete and masonry shall be wetted before shotcrete is deposited, but not so wet as to overcome suction. Sand for sand blasting shall be clean, sharp and uniform in size, with no particles that will pass a 50-mesh screen.*~~

. . . .

~~**1913A.7**~~ **1913.7 Joints.** Except where permitted herein, unfinished work shall not be allowed to stand for more than 30 minutes unless edges are sloped to a thin edge. For structural elements that will be under compression and for construction joints shown on the approved construction documents, square joints are permitted. Before placing additional material adjacent to previously applied work, sloping and square edges shall be cleaned and wetted.

(Relocated to 1913.11.3)~~*The film of laitance which forms on the surface of the shotcrete shall be removed within approximately two hours after application by brushing with a stiff broom. If this film is not removed within two hours, it shall be removed by thorough wire brushing or sand blasting. Construction joints over eight hours old shall be thoroughly cleaned with air and water prior to receiving shotcrete.*~~

~~**1913A.8**~~ **1913.8 Damage. . . .**

. . . .

~~**1913A.10**~~ **1913.10 Strength tests.** Strength tests for shotcrete shall be made *in accordance with ASTM standards* by an approved agency on specimens that are representative of the work and which have been water soaked for at least 24 hours prior to testing. When the maximum-size aggregate is larger than $^3/_8$ inch (9.5 mm), specimens shall consist of not less than three 3-inch-diameter (76 mm) cores or 3-inch (76 mm) cubes. When the maximum-size aggregate is $^3/_8$ inch (9.5 mm) or smaller, specimens shall consist of not less than 2-inch-diameter (51 mm) cores or 2-inch (51 mm) cubes.

~~**1913A.10.1**~~ **1913.10.1 Sampling.** Specimens shall be taken from the in-place work or from test panels, and shall be taken at least once each shift, but not less than one for each 50 cubic yards (38.2 m^3) of shotcrete.

~~**1913A.10.2**~~ **1913.10.2 Panel criteria.** When the maximum-size aggregate is larger than $^3/_8$ inch (9.5 mm), the test panels shall have minimum dimensions of 18 inches by 18 inches (457 mm by 457 mm). When the maximum size aggregate is $^3/_8$ inch (9.5 mm) or smaller, the test panels shall have minimum dimensions of 12 inches by 12 inches (305 mm by 305 mm). Panels shall be shot in the same position as the work, during the course of the work and by the nozzlemen doing the work. The conditions under which the panels are cured shall be the same as the work. ~~*Approval from the enforcement agency must be obtained prior to performing the test panel method.*~~

~~1913A.10.3~~ 1913.10.3 **Acceptance criteria.** The average compressive strength of three cores from the in-place work or a single test panel shall equal or exceed 0.85 f'_c *with* no single core less than 0.75 f'_c. The average compressive strength of three cubes taken from the in-place work or a single test panel shall equal or exceed f'_c with no individual cube less than 0.88 f'_c. To check accuracy, locations represented by erratic core or cube strengths shall be retested.

~~***1913A.11 Equipment.*** *The equipment used in preconstruction testing shall be the same equipment used in the work requiring such testing, unless substitute equipment is approved by the enforcement agency.*~~

1913.11 Additional requirements [DSA-SS/CC]

(Relocated from 1913A.1, CBC 2007) ***1913.11.1 Surface preparation.*** *Concrete or masonry to receive shotcrete shall have the entire surface thoroughly cleaned and roughened by sand blasting, and just prior to receiving shotcrete, shall be thoroughly cleaned of all debris, dirt and dust. Concrete and masonry shall be wetted before shotcrete is deposited, but not so wet as to overcome suction.*

1913.11.2 Preconstruction tests. *A test panel prepared in accordance with Section 1913.5 is required.*

(Relocated from 1913A.7, CBC 2007) ***1913.11.3 Joints.*** *The film of laitance which forms on the surface of the shotcrete shall be removed within approximately two hours after application by brushing with a stiff broom. If this film is not removed within two hours, it shall be removed by thorough wire brushing or sand blasting. Construction joints over eight hours old shall be thoroughly cleaned with air and water prior to receiving shotcrete.*

~~***1913A.12***~~ ***1913.11.4 Forms and ground wires for shotcrete.*** *Forms for shotcrete shall be substantial and rigid. Forms shall be built and placed so as to permit the escape of air and rebound.*

Adequate ground wires, which are to be used as screeds, shall be placed to establish the thickness, surface planes and form of the shotcrete work. All surfaces shall be rodded to these wires.

~~***1913A.13***~~ ***1913.11.5 Placing.*** *Shotcrete shall be placed in accordance with ACI 506.*

SECTION ~~1914A~~ 1914
REINFORCED GYPSUM CONCRETE

~~1914A.1~~ 1914.1 **General.** Reinforced gypsum concrete shall comply with the requirements of ASTM C 317 and ASTM C 956. ~~*Reinforced gypsum concrete shall be considered as an alternative system.*~~

~~1914A.2~~ 1914.2 **Minimum thickness. . . .**

SECTION ~~1915A~~ 1915
CONCRETE-FILLED PIPE COLUMNS

~~1915A.1~~ 1915.1 **General. . . .**

~~1915A.2~~ 1915.2 **Design. . . .**

~~1915A.3~~ 1915.3 **Connections. . . .**

~~1915A.4~~ 1915.4 **Reinforcement. . . .**

~~1915A.5~~ 1915.5 **Fire-resistance-rating protection. . . .**

~~1915A.6~~ 1915.6 **Approvals. . . .**

SECTION ~~1916A~~ 1916
CONCRETE TESTING [DSA-SS/CC]

~~*1916A.1*~~ *1916.1 Cementitious material. . . .*

~~*1916A.2*~~ ***1916.2 Tests of reinforcing bars***. *Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number and provided the mill analyses accompany the report, one tensile test and one bend test shall be made from a specimen from each 10 tons (9080 kg) or fraction thereof of each size of reinforcing steel.*

Where positive identification of the heat number cannot be made or where random samples are to be taken, one series of tests shall be made from each 2 1/2 tons (2270 kg) or fraction thereof of each size of reinforcing steel. ~~*See Section 1916A.4 for waiver of tests.*~~

Tests of reinforcing bars may be waived by the structural engineer with the approval of the Building Official for one-story buildings provided certified mill test reports are provided for each shipment of such reinforcement.

~~***1916A.3***~~ ***1916.3 Tests for prestressing steel and anchorage. . . .***

~~***1916A.5***~~ ***1916.4 Composite construction cores. . . .***

~~***1916A.6***~~ ***1916.5 Tests of shotcrete. . . .***

~~***1916A.7***~~ ***1916.6 Gypsum field tests. . . .***

~~***1916A.8***~~ ***1916.7 Tests for post-installed anchors in concrete.*** *When* ~~*drilled-in expansion-type anchors or other*~~ *post-installed anchors* ~~*acceptable to the enforcement agency*~~ *are used in lieu of cast-in-place bolts, the* ~~*allowable shear and tension values and*~~ *installation verification test loads frequency and acceptance criteria shall be in accordance with this section.*

(Relocated to 1916.7.3) ~~*When expansion-type anchors are listed for sill plate bolting applications, 10 percent of the anchors shall be tension tested.*~~

~~*When expansion-type anchors are used for other structural applications, all such expansion anchors shall be tension tested. Expansion-type anchors shall not be used as hold-down bolts.*~~

~~*When expansion-type anchors are used for nonstructural applications such as equipment anchorage, 50 percent or alternate bolts in a group, including at least one-half the anchors in each group, shall be tension tested.*~~

~~*The tension testing of the expansion anchors shall be done in the presence of the special inspector and a report of the test results shall be submitted to the enforcement agency. If any anchors fail the tension testing requirements, the additional testing requirements shall be acceptable to the enforcement agency. The above requirements shall also apply to other post-installed anchors acceptable to the enforcement agency and bolts or anchors set in concrete with chemical if the long-term durability and stability of the chemical material and its resistance to loss of strength and chemical change at elevated temperatures are established to the satisfaction of the enforcement agency.*~~

1916.7.1 General. *Test loads or torques and acceptance criteria shall be shown on the construction documents.*

If any anchor fails testing, all anchors of the same type shall be tested, which are installed by the same trade, not previously tested until twenty (20) consecutive anchors pass, then resume the initial test frequency.

1916.7.2 Test Loads. *Required test loads shall be determined by one of the following methods:*

1. *Twice the maximum allowable tension load or one and a quarter (1- 1/4) times the maximum design strength of anchors as provided in International Code Council – Evaluation Service Report (ICC-ESR) or determined in accordance with Appendix D of ACI 318.*

   Tension test load need not exceed 80% of the nominal yield strength of the anchor element (= 0.8 A_{se} f_{ya}).

2. *The manufacturer's recommended installation torque as approved in an ICC-ESR.*

1916.7.3 Test Frequency. *(Relocated from Section 1916.8) When* ~~*expansion-type*~~ *post-installed anchors are* ~~*listed*~~ *used for sill plate bolting applications, 10 percent of the anchors shall be* ~~*tension*~~ *tested.*

When ~~expansion-type~~ post-installed anchors are used for other structural applications, all such ~~expansion~~ anchors shall be ~~tension~~ tested. ~~Expansion-type anchors shall not be used as hold-down bolts.~~

When ~~expansion-type~~ post-installed anchors are used for nonstructural applications such as equipment anchorage, 50 percent or alternate bolts in a group, including at least one-half the anchors in each group, shall be ~~tension~~ tested.

The ~~tension~~ testing of the ~~expansion~~ post-installed anchors shall be done in the presence of the special inspector and a report of the test results shall be submitted to the enforcement agency. ~~The above requirements shall also apply to other post-installed anchors acceptable to the enforcement agency and bolts or anchors set in concrete with chemical if the long-term durability and stability of the chemical material and its resistance to loss of strength and chemical change at elevated temperatures are established to the satisfaction of the enforcement agency.~~

Exceptions:

1. *Undercut anchors that allow visual confirmation of full set shall not require testing.*

2. *Where the factored design tension on anchors is less than 100 lbs. and those anchors are clearly noted on the approved construction documents, only 10 percent of those anchors shall be tested.*

3. *Where adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, only 25% of the dowels shall be tested if all the following conditions are met:*

    a. *The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.*

    b. *The number of dowels in any one member equals or exceeds 12.*

    c. *The dowels are uniformly distributed across seismic force resisting members (such as shear walls, collectors and diaphragms).*

    Anchors to be tested shall be selected at random by the special inspector/ Inspector Of Record (IOR).

4. *Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting system shall not required.*

5. *Testing is not required for power actuated fasteners used to attach tracks of interior non-shear wall partitions for shear only, where there are at least three fasteners per segment of track.*

1916.7.4 Test Acceptance Criteria. *Acceptance criteria for post-installed anchors shall be based on ICC-ESR or manufacturers written instruction, acceptable to the enforcement agency. Field test shall satisfy following minimum requirements.*

1. *Hydraulic Ram Method:*

    Anchors tested with a hydraulic jack or spring loaded devices shall maintain the test load for a minimum of 15 seconds and shall exhibit no discernable movement during the tension test, e.g., as evidenced by loosening of the washer under the nut.

    For adhesive anchors, where other than bond is being tested, the testing device shall not restrict the concrete shear cone type failure mechanism from occurring.

2. *Torque Wrench Method:*

    Anchors tested with a calibrated torque wrench must attain the specified torque within ½ turn of the nut.

    Exceptions:

        1. Wedge or Sleeve type:

One-quarter (1/4) turn of the nut for a 3/8 in. sleeve anchor only.

2. *Threaded Type:*
   One-quarter (1/4) turn of the screw after initial seating of the screw head.

1916.7.5. Testing procedure. *Test procedure shall be as required by the ICC-ESR. Manufacturer's recommendation for testing may be approved by the enforcement agency, when ICC-ESR does not provide a testing procedure.*

SECTION ~~1917A~~ 1917
EXISTING CONCRETE STRUCTURES [DSA-SS/CC]

~~1917A.1~~. 1917.1. Existing concrete structures. *The structural use of existing concrete with a core strength less than 1,500 psi (10.3MPa) is not permitted in rehabilitation work.*

For existing concrete structures, sufficient cores shall be taken at representative locations throughout the structure, as designated by the architect or structural engineer, so that knowledge will be had of the in-place strength of the concrete. At least three cores shall be taken from each building for each 4,000 square feet (372 m^2) of floor area, or fraction thereof. Cores shall be at least 4 inches (102 mm) in diameter. Cores as small as 2.75 inches (70 mm) in diameter may be allowed by the enforcement agency when reinforcement is closely spaced and the coarse aggregate does not exceed 3/4 inch (19 mm).

Notation for [DSA-SS/CC]

Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

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CHAPTER 19*A*
CONCRETE

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter as amended	**X**	**-**	
Adopt only those sections listed below			

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 1908A – MODIFICATIONS TO ACI 318 - repeal amendments in following subsections:

1908A.1.6 ACI 318, Section 13.5.3.3. *Modify ACI 318 Section 13.5.3.3 by adding the following:*

Provision of ACI 318 Section 13.5.3.3 shall not be used, unless approved otherwise by the enforcement agent.

1908A.1.8. ACI 318, Section 14.3.5. *Replace ACI 318 Section 14.3.5 as follows:*

14.3.5 – Vertical and horizontal reinforcement shall not be spaced farther apart than three times the wall thickness, nor 18 inches (457 mm). Unless otherwise required by the engineer, the upper- and lowermost horizontal reinforcement shall be placed within one half of the specified spacing at the top and bottom of the wall.

1908A.1.9. ACI 318, Section 14.3.8. *Add Section 14.3.8 to ACI 318 as follows:*

14.3.8 - The minimum requirements for horizontal and vertical steel of ACI 318 Sections 14.3.2 and 14.3.3 may be interchanged for precast panels which are not restrained along vertical edges to inhibit temperature expansion or contraction.

1908A.1.13 ACI 318, Section 15.2.1. *Modify ACI 318 Section 15.2.1 by adding the following:*

The appropriate induced reactions for strength design may be computed as those due to a factor of 1.4 times the soil pressures from gravity load combinations and the seismic load combinations of Section 1605A.3.

1908A.1.14 ACI 318, Section 15.2.2. *Modify ACI 318 Section 15.2.2 by adding the following:*

External forces and moments are those resulting from the load combinations of Section 1605A.3

1908A.1.15 ACI 318, Section 15.8.3.2. *Replace ACI 318 Section 15.8.3.2 as follows:*

15.8.3.2 - Connection between pre-cast walls and supporting members shall meet the requirements of ACI 318 Sections 16.5.1.3(b) & (c) but not less than required by Section 1604A.

EXCEPTION: *In tilt-up construction, this connection may be to an adjacent floor slab. In no case shall the connection provided be less than that required by Section 1604A.*

1908A.1.16 ACI 318, Section 16.3. *Add Section 16.3.3 to ACI 318 as follows:*

16.3.3 – Nonbearing, nonshear panels such as nonstructural architectural cladding panels or column covers are not required to meet the provisions of Section 1908A.1.17 1908A.1.14.

1908A.1.18 ACI 318, Section 16. *Add Section 16.12 to ACI 318 as follows:*

16.12 - On-site Cast Precast Wall Panels.

16.12.1 - The provisions of ACI 318 Sections 16.1, 16.2, 16.3, 16.4, 16.5, 16.6 and 16.11 shall apply to precast wall panels cast on site.

16.12.2 - Precast bearing and nonbearing walls shall be designed in accordance with the provisions of ACI 318 Chapter 14. Panel concrete shall have attained the specified compressive strength (f'_c) before erection unless calculations provided by the structural engineer or architect demonstrate adequate serviceability during handling and erection for concrete panels of lesser strength.

16.12.3 - In lieu of unsupported height limitations, the panel may be supported laterally by vertical elements provided the panel thickness is not less than 1 / 36 the distance between the panel edges and the stiffness of the vertical elements exceeds that of the tributary area of the wall panels. See ASCE 7 Section 13.5 for exterior elements.

16.12.4 -All embedded items shall be securely anchored in place prior to placing the concrete.

16.12.5 - Panels shall be allowed as much time as possible in the erect position before making longitudinal connections with an elapsed time of 28 days minimum between casting and connecting the panels.

16.12.6 - All details of reinforcement, connections, bearing seats, inserts, anchors, concrete cover, openings, fabrication and erection tolerances shall be shown on contract drawings.

1908A.1.23 ACI 318, Section 18.6. *Add Section 18.6.4 to ACI 318 as follows:*

18.6.4 - Presumptive Loss of Prestress. In lieu of an analysis to determine the loss of prestress from the above sources the loss may be assumed to be 35,000 psi (241 MPa) for pretensioned prestressed members. For posttensioned prestressed members the loss due to elastic shortening of concrete, creep of concrete, shrinkage of concrete, and relaxation of steel stress may be assumed to be 25,000 psi (172 MPa).

1908A.1.24 ACI 318, Section 18.9.2.2. *Modify ACI 318 Section 18.9.2.2 by adding the following:*

One-way, unbonded, posttensioned slabs and beams shall be designed to carry the dead load of the slab or beam plus 25 percent of the unreduced superimposed live load by some method other than the primary unbonded posttensioned reinforcement. Design shall be based on the strength method of design with a load factor and capacity reduction factor of one. All reinforcement other than the primary unbonded reinforcement provided to meet other requirements of this section may be used in the design.

1908A.1.25 ACI 318, Section 18.9.2. *Modify ACI 318 Section 18.9.2 by adding Section 18.9.2.3 as follows:*

18.9.2.3 - Maximum spacing limitations of ACI 318 Sections 7.6.1 and 8.10.5.2, for bonded reinforcement in slabs are not applicable to spacing of bonded reinforcement in members with unbonded tendons.

1908A.1.26 ACI 318, Section 18.12*. Add Section 18.12.7 to ACI 318 as follows:*

18.12.7 - Openings in Flat Plates. The requirements of ACI 318 Section 13.4 apply in principle to openings in posttensioned flat plates. Tendons should be continuous and splayed horizontally to get around smaller openings. If tendons are terminated at edges of larger openings, such as at stairwells, an analysis shall be made to ensure sufficient strength and proper behavior. Edges around openings may be reinforced in a manner similar to conventionally reinforced slabs, or, in the case of larger openings, supplementary, posttensioning tendons may be used to strengthen the edges.

1908A.1.34 ACI 318, Section 21.4.4.1. *Modify ACI 318 section 21.4.4.1 as follows:*

Where the calculated point of contraflexure is not within the middle half of the member clear height, provide transverse reinforcement as specified in ACI 318 Sections 21.4.4.1, Items (a) through (c), over the full height of the member.

~~***1908A.1.35 ACI 318, Section 21.4.4.*** *Modify ACI 318 by adding Section 21.4.4.7 as follows:*~~

~~*21.4.4.7 - At any section where the design strength, ϕP_n, of the column is less than the sum of the shears V_e computed in accordance with ACI 318 Sections 21.3.4.1 and 21.4.5.1 for all the beams framing into the column above the level under consideration, transverse reinforcement as specified in ACI 318 Sections 21.4.4.1 through 21.4.4.3 shall be provided. For beams framing into opposite sides of the column, the moment components may be assumed to be of opposite sign. For the determination of the design strength, ϕP_n, of the column, these moments may be assumed to result from the deformation of the frame in any one principal axis.*~~

~~***1908A.1.36 ACI 318, Section 21.5.4.*** *Modify ACI 318 by adding Section 21.5.4.5 as follows:*~~

~~*21.5.4.5 - Splices shall be based on the development length, ℓ_d, for a straight bar as determined by ACI 318 Sections 21.5.4.1 and 21.5.4.2 and modified by the factors in ACI 318 Chapter 12.*~~

2007 CBC SECTION 1913A – SHOTCRETE - repeal amendments in following subsections:

~~***1913A.11 Equipment.*** *The equipment used in preconstruction testing shall be the same equipment used in the work requiring such testing, unless substitute equipment is approved by the enforcement agency.*~~

2007 CBC SECTION 1916A – CONCRETE TESTING - repeal amendments in following subsections:

~~***1916A.4 Waiver of material testing.*** *Tests of reinforcing bars may be waived by the architect or structural engineer with the approval of the enforcement agency for one-story buildings where the specified compressive strength of the concrete f'_c, delivered to the jobsite is 3,500 psi (24.13 MPa) and where the f'_c used in design is 2,500 psi (17.24 MPa).*~~

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

EXPRESS TERMS

Italics are used for text within Sections 1903A through 1908A of this code to indicate provisions that differ from ACI 318. State of California amendments in these sections are shown in italics and underlined.

SECTION 1901*A*
GENERAL

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

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

1. ~~*Applications listed in Section 109.2,*~~*Structures regulated by the Division of the State Architect—Structural Safety (DSA-SS), which include those applications listed in Section 1.9.2. These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings*

2. *[Reserved for OSHPD]*

1901A.1.2 Amendments in this chapter. *DSA-SS 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 ~~109.2~~ 1.9.2.*

2. *[Reserved for OSHPD]*

. . . .

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. *Where required, special inspections and tests shall be in accordance with Chapter 17A and Section 1916A.*

1903*A*.2 Glass fiber reinforced concrete. *Glass fiber reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCIMNL128 standard.*

1903A.3 Reporting Requirements – Modify ACI 318 Section 3.2.1 by the following:

Each component (a) through (g), when present, as a percentage of total cementitiious materials shall be reported for each mix design.

~~1903A.5~~ 1903A.4 Fly ash. *Replace ACI 318 Section ~~3.6.6~~ 3.2.2 as follows:* **. . .**

~~1903A.3~~ 1903A.5 ACI 318, Section 3.3.2. *Modify ACI 318 Section 3.3.2 by adding the following:* **. . .**

1903A.6 Discontinuous Steel Fibers. *Modify ACI 318 Section 3.5.1 by adding the following:*

Discontinuous steel fibers are not permitted.

~~1903A.4~~ 1903A.7 Welding of reinforcing bars. *Modify ACI 318 Section 3.5.2 by adding the following:* **. . .**

SECTION 1905*A*
CONCRETE QUALITY, MIXING AND PLACING

1905*A*.1 General. The required strength and durability of concrete shall be determined by compliance with the proportioning, testing, mixing and placing provisions of Sections 1905A.1.1 through 1905A.13.

1905 *A*.1.1 Strength. Concrete shall be proportioned to provide an average compressive strength as prescribed in Section 1905A.3 and shall satisfy the durability criteria of Section 1904A. Concrete shall be produced to minimize the frequency of strengths below f'_c, as prescribed in Section 1905A.6.3. *For concrete designed and constructed in accordance with this chapter, f'_c, shall not be less than 3,000 psi (20.7 MPa). ~~except that 2,500 psi (17.2 MPa) concrete may be used in the design of footings for light one-story wood- or steel-framed buildings or other minor structures.~~* No maximum specified compressive strength shall apply unless restricted by a specific provision of this code or ACI 318. *Reinforced concrete with specified compressive strength higher than 8000 psi shall require prior approval of structural design method and acceptance criteria by the enforcement agency.*

1905*A*.2 Selection of concrete proportions. Concrete proportions shall be determined in accordance with the provisions of ACI 318, Section 5.2.

A registered civil engineer with experience in concrete mix design shall select the relative amounts of ingredients to be used as basic proportions of the concrete mixes proposed for use under this provision ~~and testing shall be performed in a laboratory acceptable to the enforcement agency~~.

. . . .

1905*A*.6 Evaluation and acceptance of concrete. . . .

1905*A*.6.1 Qualified technicians. . . .

1905A.6.2 Frequency of testing. The frequency of conducting strength tests of concrete and the minimum number of tests shall be as specified in ACI 318, Section 5.6.2 *except as modified in Section 1905A.6.2.1.*

~~Exception:~~ ~~When the total volume of a given class of concrete is less than 50 cubic yards (38m3), strength tests are not required when evidence of satisfactory strength is submitted to and approved by the building official.~~

1905A.6.2.1 Sample Frequency. **. . .**

. . . .

1905*A*.8 Mixing. Mixing of concrete shall be performed in accordance with ACI 318, Section 5.8.

~~*The capacity of the mixer shall be such that it will handle one or more full sack batches. No split sack batches will be permitted, except when all materials are weighed.*~~

. . . .

1905*A*.10 Depositing. . . .

1905A.10.1 Consolidation in congested areas. **. . .**

. . . .

1905*A*.12 Cold weather requirements. . . .

. . . .

SECTION 1906*A*
FORMWORK, EMBEDDED PIPES AND CONSTRUCTION JOINTS

1906*A*.1 Formwork. The design, fabrication and erection of forms shall comply with ACI 318, Section 6.1.

1906*A*.2 Removal of forms, shores and reshores. . . .

1906*A*.3 Conduits and pipes embedded in concrete. . . .

1906A.3.1 Large Openings. **. . .**

1906A.3.2 Adequate Support. **. . .**

1906*A*.4 Construction joints. . . .

1906A.4.1 Surface Preparation. **. . .**

SECTION 1907*A*
DETAILS OF REINFORCEMENT

. . . .

1907*A*.5 Placing reinforcement. . . .

1907A.5.1 Prestressing tendons. **. . .**

. . . .

1907*A*.7.1 Cast-in-place concrete (nonprestressed). Minimum specified concrete cover shall be provided for reinforcement in nonprestressed, cast-in-place concrete construction in accordance with ACI 318, Section 7.7.1.

~~*Concrete tilt-up panels cast against a rigid horizontal surface, such as a concrete slab, exposed to the weather shall have 1" (25 mm) concrete cover for No. 8 or smaller bar and 2" (51 mm) cover for No. 9 or larger bars.*~~

. . . .

SECTION 1908*A*
MODIFICATIONS TO ACI 318

1908*A*.1 General. The text of ACI 318 shall be modified as indicated in Sections 1908*A*.1.1 through ~~1908.1.10~~ *1908A.1.32*.

1908 *A*.1.1 ACI 318, Section 2.2. Modify existing definitions and add the following definitions to ACI 318, Section 2.2.

DESIGN DISPLACEMENT. Total lateral displacement expected for the design ~~basis~~ earthquake, *as specified by Section 12.8.6 of ASCE 7.*

. . . .

SPECIAL STRUCTURAL WALL. A cast-in-place or precast wall complying with the requirements of 21.1.3 through 21.1.7, 21.9 and 21.10, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls *or ordinary precast structural walls, as applicable*. *Where ASCE 7 refers to a "special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."*

. . . .

~~1908A.1.1~~ 1908A.1.2 ACI 318, Section ~~8.11.5~~ 8.13.5. *Replace ACI 318 Section ~~8.11.5~~ 8.13.5 as follows:*

~~8.11.5~~ 8.13.5 - Permanent burned clay or concrete tile fillers shall be considered only as forms and shall not be included in the calculations involving shear or bending moments.

The thickness of the concrete slab on the permanent fillers shall be designed as described in ACI Section ~~8.11.6~~ 8.13.6 as modified in Section ~~1908A.1.2~~ 1908A.1.3.

~~1908A.1.2~~ 1908A.1.3 ACI 318, Section ~~8.11.6~~ 8.13.6. *Replace ACI 318 Section ~~8.11.6~~ 8.13.6 as follows:*

~~8.11.6~~ 8.13.6 - Where removable forms or fillers are used, the thickness of the concrete slab shall not be less than 1/12 of the clear distance between joists and in no case less than 2 1/2 inches (64 mm). Such slab shall be reinforced at right angles to the joists with at least the amount of reinforcement required for flexure, considering load concentrations, if any, but in no case shall the reinforcement be less than that required by ACI 318 Section 7.12.

~~1908A.1.3~~ 1908A.1.4 ACI 318, Section ~~8.11~~ 8.13. *Add Section ~~8.11.9~~ 8.13.9 to ACI 318 as follows:*

~~8.11.9~~ 8.13.9 Concrete bridging. Concrete bridging shall be provided as follows: one near the center of spans for 20 to 30 feet (6096 mm to 9144 mm) spans and two near the third points of spans over 30 feet (9144 mm). Such bridging shall be either:

(a) A continuous concrete web having a depth equal to the joist and a width not less than 3 1/2 inches (89 mm) reinforced with a minimum of one No. 4 bar in the top and bottom; or

(b) Any other concrete element capable of transferring a concentrated load of 1,000 pounds (4.5 kN) from any joist to the two adjacent joists.

Such bridging shall not be required in roof framing if an individual member is capable of carrying dead load plus a concentrated load of 1,500 pounds (6.7 kN) at any point.

~~1908A.1.4~~ 1908A.1.5 ACI 318, Section 10.5.3. *Modify ACI 318 Section 10.5.3 by adding the following:* **. . .**

~~1908A.1.5~~ 1908A.1.6 ACI 318, Section 12.14.3. *Add Section 12.14.3.6 to ACI 318 as follows:* **. . .**

. . . .

1908A.1.7 ACI 318, Section 14.2.6. *Replace ACI 318 Section 14.2.6 as follows:* **. . .**

1908A.1.8 Reserved. ~~ACI 318, Section 14.3.5.~~ *~~Replace ACI 318 Section 14.3.5 as follows:~~*

~~14.3.5 - Vertical and horizontal reinforcement shall not be spaced farther apart than three times the wall thickness, nor 18 inches (457 mm). Unless otherwise required by the engineer, the upper and lowermost~~

~~*horizontal reinforcement shall be placed within one half of the specified spacing at the top and bottom of the wall.*~~

1908A.1.9 Reserved. ~~***ACI 318, Section 14.3.8.*** *Add Section 14.3.8 to ACI 318 as follows:*~~

~~*14.3.8 - The minimum requirements for horizontal and vertical steel of ACI 318 Sections 14.3.2 and 14.3.3 may be interchanged for precast panels which are not restrained along vertical edges to inhibit temperature expansion or contraction.*~~

. . . .

1908A.1.13 Reserved. ~~***ACI 318, Section 15.2.1.*** *Modify ACI 318 Section 15.2.1 by adding the following:*~~

~~*The appropriate induced reactions for strength design may be computed as those due to a factor of 1.4 times the soil pressures from gravity load combinations and the seismic load combinations of Section 1605A.3.*~~

~~***1908A.1.17***~~ ***1908A.1.14 ACI 318 Section 16.*** *Add Section 16.11 to ACI 318 as follows:*

16.11 - Reinforcement. Perimeters of precast walls shall be reinforced continuously with a minimum of one No. 5 bar extending the full height and width of the wall panel. Bars shall be continuous around corners. Where wall panels do not abut columns or other wall panels, perimeter bars shall be retained by hooked wall bars. Edges of openings in precast walls shall be reinforced with a minimum of one No. 5 bar continuous past corners sufficient to develop the bar.

A continuous tie or bond beam shall be provided at the roof line either as a part of the roof structure or part of the wall panels as described in the next paragraph below. This tie may be designed as the edge member of the roof diaphragm but, in any case, shall not be less than equivalent to two No. 6 bars continuous. A continuous tie equivalent to two No. 5 bars minimum shall also be provided either in the footing or with an enlarged section of the floor slab.

Wall panels of shear wall buildings shall be connected to columns or to each other in such a manner as to develop at least 75 percent of the horizontal wall steel. Half of this continuous horizontal reinforcing may be concentrated in bond or tie beams at the top and bottom of the walls and at points of intermediate lateral support. If possible, cast in-place joints with reinforcing bars extending from the panels into the joint a sufficient distance to meet the splice requirements of ACI 318 Section 12.15 for Class A shall be used. The reinforcing bars or welded tie details shall not be spaced over eight times the wall thickness vertically nor fewer than four used in the wall panel height. Where wall panels are designed for their respective overturning forces, the panel connections need not comply with the requirements of this paragraph.

Where splicing of reinforcement must be made at points of maximum stress or at closer spacing than permitted by ACI 318 Section 7.6, welding may be used when the entire procedure is suitable for the particular quality of steel used and the ambient conditions. Unless the welds develop 125 percent of the specified yield strength of the steel used, reinforcement in the form of continuous bars or fully anchored dowels shall be added to provide 25 percent excess steel area and the welds shall develop not less than the specified yield strength of the steel.

Exception: *(Relocated from 2007 CBC, Section 1908A.1.16)* ~~***ACI 318, Section 16.3.***~~ *Add Section* ~~*16.3.3 to ACI 318 as follows:*~~ ~~*Exception: 16.3.3 -*~~ *Nonbearing, nonshear panels such as nonstructural architectural cladding panels or column covers are not required to meet the provisions of this Section.* ~~*1908A.1.17.*~~

~~*Where reinforcing bars are used to transfer shear across a joint the shear value for bolts set forth in Table 1912A.2 may be used.*~~

~~*Wall panels shall be positively connected to all floors and roofs as specified in CBC Sections 1604A, 1607A.13 and ASCE 7 Section 13.5. They shall be connected to the foundations when not anchored to the floor slab or otherwise properly anchored.*~~

~~*See ACI 318 Sections 10.10, 10.11, 10.12 and 10.13 for design of compression forces in the precast walls.*~~

. . . .

1908A.1.19 ***1908A.1.15 ACI 318, Section 17.5.1****. Modify ACI 318 Section 17.5.1 by adding Sections 17.5.1.1 and 17.5.1.2 as follows:* **. . .**

1908A.1.20 ***1908A.1.16 ACI 318, Section 18.2.3.*** *Modify ACI 318 Section 18.2.3 by adding the following:*

For prestressed concrete members with recessed or dapped ends, an analysis of the connections shall be made in accordance with procedures given in ~~Part 6 of the~~ PCI Design Handbook, ~~6th~~ 7TH Edition.

1908A.1.21 ***1908A.1.17 ACI 318 Section 18.2.4.*** *Modify ACI 318 Section 18.2.4 by adding the following:*

Where prestressed concrete elements are restrained from movement, an analysis of the stresses in the prestressed elements and loads in the adjoining structural system induced by the above-described effects shall be made in accordance with ~~Part 3 of the~~ PCI Design Handbook, ~~6th~~ 7TH Edition.

1908A.1.22 ***1908A.1.18 ACI 318, Section 18.2.*** *Add Section 18.2.7 to ACI 318 as follows:*

18.2.7 - Span to Depth Ratio. Span to depth ratios for prestressed concrete members shall not exceed the following, except when calculations of deflections prove that greater values may be used without adverse effects:

Beams	*30*
One-way Slabs	*40*
Two-way Floor Slabs	*40*
Two-way Roof Slabs	*44*
Flat Slabs	*See CBC Section ~~1908A.1.28~~ 1908A.1.21*

These ratios should be decreased for special conditions such as heavy loads and simple spans.

Maximum deflection criteria shall be in accordance with ACI 318 Section 9.5

. . . .

1908A.1.19 *Reserved.* ***~~1908A.1.26 ACI 318, Section 18.12~~****. ~~Add Section 18.12.7 to ACI 318 as follows:~~*

~~18.12.7 - Openings in Flat Plates. The requirements of ACI 318 Section 13.4 apply in principle to openings in posttensioned flat plates. Tendons should be continuous and splayed horizontally to get around smaller openings. If tendons are terminated at edges of larger openings, such as at stairwells, an analysis shall be made to ensure sufficient strength and proper behavior. Edges around openings may be reinforced in a manner similar to conventionally reinforced slabs, or, in the case of larger openings, supplementary, posttensioning tendons may be used to strengthen the edges.~~

1908A.1.27 ***1908A.1.20 ACI 318, Section 18.21.*** *Add Section 18.21.5 to ACI 318 as follows:* **. . .**

1908A.1.28 ***1908A.1.21 ACI 318, Section 18.*** *Add Section 18.23 to ACI 318 as follows:* **. . .**

1908A.1.30 *(Capter 19, Section 1908.1.4)* **ACI 318, Section 21.2.1.** Modify ACI 318 Sections 21.2.1.2, and *21.2.1.4*, to read as follows:

~~21.2.1.2 -~~ The *~~provisions of ACI 318 Chapters 1 through 18 shall apply except as modified by the provisions of ACI 318 Chapter 21 and this Chapter.~~*

~~21.2.1.4 - For structures assigned to Seismic Design Category D, E or F~~, special moment frames, *~~special reinforced concrete structural walls~~*, diaphragms and trusses *~~and foundations~~* complying with 21.2 through 21.10 *~~or intermediate precast structural walls complying with~~* 21.13 shall be used to resist forces induced by earthquake motions. Members not proportioned to resist earthquake forces shall comply with 21.11.

~~1908.1.2~~ ***1908A.1.22*** *(Chapter 19, Section 1908.1.2)* **ACI 318, Section 21.1.1.** Modify ACI 318 Sections 21.1.1.3 and 21.1.1.7 to read as follows:

21.1.1.3 – Structures assigned to Seismic Design Category A shall satisfy requirements of Chapters 1 to 19. ~~and 22; Chapter 21 does not apply.~~ Structures assigned to *Seismic Design Category* ~~B, C,~~ D, E or F also shall satisfy 21.1.1.4 through 21.1.1.8, as applicable. ~~*Except for structural elements of plain concrete complying with Section 1908.1.8 of the International Building Code, s*~~ *Structural elements of plain concrete are prohibited in structures assigned to Seismic Design Category ~~C,~~ D, E or F.*

21.1.1.7 – Structural systems designated as part of the seismic-force-resisting system shall be restricted to those *permitted by ASCE 7*. ~~Except for *Seismic Design Category* A, for which Chapter 21 does not apply, t~~ 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 21.2.~~

~~(b) Ordinary reinforced concrete structural walls *and ordinary precast structural walls* need not satisfy any provisions in Chapter 21.~~

~~(c) Intermediate moment frames shall satisfy 21.3.~~

~~(d)~~ *(a)* ***[DSA-SS]*** Intermediate precast *structural* walls shall satisfy 21.4.

~~(e)~~ *(b)* Special moment frames shall satisfy 21.5 through 21.8.

~~(f)~~ *(c)* Special structural walls shall satisfy 21.9.

~~(g)~~ *(d)* Special structural walls constructed using precast concrete shall satisfy 21.10.

All special moment frames and special structural walls shall also satisfy 21.1.3 through 21.1.7.

~~**1908.1.3**~~ ***1908A.1.23*** *(Chapter 19, Section 1908.1.3)* **ACI 318, Section 21.4. *[DSA-SS]*** Modify ACI 318, Section 21.4, by renumbering Section 21.4.3 to become 21.4.4 and adding new Sections 21.4.3, 21.4.5, ~~and~~ 21.4.6, *and 21.4.7* to read as follows:

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

21.4.4 – Elements of the connection that are not designed to yield shall develop at least 1.5 *Sy*.

21.4.5 Wall piers in Seismic Design Category D, E or F shall comply with Section 1908.1.4 of this Code

~~*21.4.5*~~ *21.4.6 – Wall piers not designed as part of a moment frame shall have transverse reinforcement designed to resist the shear forces determined from 21.3.3. Spacing of transverse reinforcement shall not exceed 8 inches (203 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).*

Exceptions:

1. *Wall piers that satisfy 21.13.*
2. *Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.*

~~*21.4.6*~~ *21.4.7 –Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as columns.*

~~1908A.1.37~~ 1908A.1.24 ACI 318, Section ~~21.7.2.2~~ 21.9.2.2*. Modify ACI 318, Section 21.9.2.2 ~~21.7.2.2~~ by adding the following:*

Where boundary members are not required by ACI 318 Section ~~21.7.6~~ 21.9.6, minimum reinforcement parallel to the edges of all structural walls and the boundaries of all openings shall consist of twice the cross-sectional area of the minimum shear reinforcement required per lineal foot of wall. Horizontal extent of boundary element shall be per ACI 318 Section ~~21.7.6.4~~ 21.9.6.4 (a) & (b).

~~1908A.1.38~~ 1908A.1.25 ACI 318, Section ~~21.7.4~~ 21.9.4. *Modify ACI 318 by adding Section ~~21.7.4.6~~ 21.9.4.6 as follows:*

~~21.7.4.6~~ 21.9.4.6 - Walls and portions of walls with $P_u > 0.35P_o$ shall not be considered to contribute to the calculated strength of the structure for resisting earthquake-induced forces. Such walls shall conform to the requirements of ACI 318 Section ~~21.11~~ 21.13.

~~**1908.1.4**~~ ***1908A.1.26*** *(Chapter 19, Section 1908.1.4)* **ACI 318, Section 21.9.** Modify ACI 318, Section 21.9, by adding new Section 21.9.10 to read as follows: **. . .**

~~**1908.1.5**~~ ***1908A.1.27*** *(Chapter 19, Section 1908.1.5)* **ACI 318, Section 21.10.** Modify ACI 318, Section 21.10.2, to read as follows: **. . .**

~~***1908A.1.41***~~ ***1908A.1.28 ACI 318, Section ~~21.9.4.~~ 21.11.4.*** *Modify ACI 318 Section ~~21.9.4~~ 21.11.4 by adding the following:* **. . .**

~~***1908A.1.42***~~ ***1908A.1.29 ACI 318, Section ~~21.9.5.6.~~ 21.11.7.*** *Modify ACI 318 Section ~~21.9.5.6~~ 21.11.7 by adding Section ~~21.9.5.6~~ 21.11.7.7 as follows:*

~~21.9.5.6~~ 21.11.7.7 - Where boundary members are not required by ACI 318 Section ~~21.9.5.3~~ 21.11.7.5, minimum reinforcement parallel to the edges of all diaphragms and the boundaries of all openings shall consist of twice the cross-sectional area of the minimum shear reinforcement required per linear foot of diaphragm.

~~**1908.1.6**~~ ***1908A.1.30*** *(Chapter 19, Section 1908.1.6)* **ACI 318, Section 21.12.1.1.** Modify ACI 318, Section 21.12.1.1, to read as follows:

21.12.1.1 – Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and ground shall comply with the requirements of Section 21.12 and other applicable provisions of ACI 318 *unless modified by Chapter 18A of the ~~International~~ California Building Code.*

~~***1908A.1.33***~~ ~~**ACI 318, Section 21.3.** Modify ACI 318, Section 21.3, by adding new Section 21.3.2.5 to read as follows:~~

~~*21.3.2.5 - Unless the special moment frame is qualified for use through structural testing as required by 21.6.3, for flexural members prestressing steel shall not provide more than one-quarter of the strength for either positive or negative moment at the critical section in a plastic hinge location and shall be anchored at or beyond the exterior face of a joint.*~~

~~*Shear strength provided by prestressing tendons shall not be considered in design.*~~

~~**1908.1.7 ACI 318, Section 22.6.** Modify ACI 318, Section 22.6, by adding new Section 22.6.7 to read as follows:~~

~~*22.6.7 – Detailed plain concrete structural walls.*~~

~~*22.6.7.1 Detailed plain concrete structural walls are walls conforming to the requirements of ordinary structural plain concrete walls and 22.6.7.2.*~~

~~*22.6.7.2 Reinforcement shall be provided as follows:*~~

~~*(a) Vertical reinforcement of at least 0.20 square inch (129 mm2) in cross-sectional area shall be provided continuously from support to support at each corner, at each side of each opening and at the ends of walls. The continuous vertical bar required beside an opening is permitted to substitute for one of the two No. 5 bars required by 22.6.6.5.*~~

~~*(b) Horizontal reinforcement at least 0.20 square inch (129 mm2) in cross-sectional area shall be provided:*~~

~~*1. Continuously at structurally connected roof and floor levels and at the top of walls;*~~
~~*2. At the bottom of load-bearing walls or in the top of foundations where doweled to the wall; and*~~
~~*3. At a maximum spacing of 120 inches (3048 mm).*~~

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

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~~**1908.1.8 ACI 318, Section 22.10.** Delete ACI 318, Section 22.10, and replace with the following:~~

~~*22.10 – Plain concrete in structures assigned to Seismic Design Category C, D, E or F.*~~

~~*22.10.1 – Structures assigned to Seismic Design Category C, D, E or F shall not have elements of structural plain concrete, except as follows:*~~

~~*(a) Structural plain concrete basement, foundation or other walls below the base are permitted in detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls. In dwellings assigned to Seismic Design Category D or E, the height of the wall shall not exceed 8 feet (2438 mm), the thickness shall not be less than 71/2 inches (190 mm), and the wall shall retain no more than 4 feet (1219 mm) of unbalanced fill. Walls shall have reinforcement in accordance with 22.6.6.5.*~~

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

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

~~*(c) Plain concrete footings supporting walls are permitted, provided the footings have at least two continuous longitudinal reinforcing bars. Bars shall not be smaller than No. 4 and shall have a total area of not less than 0.002 times the gross cross-sectional area of the footing. For footings that exceed 8 inches (203 mm) in thickness, 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 detached one- and two-family dwellings three stories or less in height and constructed with stud-bearing walls, plain concrete footings without longitudinal reinforcement supporting walls are permitted.*~~

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

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

~~**1908.1.9** **_1908A.1.31_** *(Chapter 19, Section 1908.1.9)*~~ **ACI 318, Section D.3.3.** Modify ACI 318, Sections *D.3.3.1*, D.3.3.4, ~~and~~ D.3.3.5*, and add D.3.3.7* to read as follows:

D.3.3.1 – The provisions of Appendix D do not apply to the design of anchors in plastic hinge zones of concrete structures under earthquake forces *or to anchors that meet the requirements of Section D.3.3.7.*

D.3.3.4 – Anchors shall be designed to be governed by the steel strength of a ductile steel element as determined in accordance with D.5.1 and D.6.1, unless either D.3.3.5 or D.3.3.6 is satisfied.

Exceptions:

~~*1. Anchors in concrete designed to support nonstructural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.4.*~~

~~2~~. Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 need not satisfy Section D.3.3.4.

D.3.3.5 – Instead of D.3.3.4, the attachment that the anchor is connecting to the structure shall be designed so that the attachment will undergo ductile yielding at a force level corresponding to anchor forces no greater than the design strength of anchors specified in D.3.3.3.

Exceptions:

~~*1. Anchors in concrete designed to support nonstructural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.5.*~~

~~2.~~ *Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 need not satisfy Section D.3.3.5.*

D.3.3.7 – For wood sill plates a minimum of 1 ½ inches (38 mm) in net thickness, the allowable lateral design values of cast-in anchors in shear parallel to the grain of the wood sill plate are permitted to be determined in accordance with Section 2305 of the California Building Code, provided they comply with all of the following:

1. *Their maximum nominal diameter is 5/8 inches (16 mm);*
2. *They are embedded into the concrete a minimum of 7 inches (178 mm);*
3. *They are located a minimum of 2 ½ anchor diameters from the edges of the concrete parallel to the grain of the wood sill plate; and*
4. *They are located a minimum of 15 anchor diameters from the edges of the concrete perpendicular to the grain of the wood sill plate.*

~~**1908.10**~~ ***1908A.1.32*** *(Chapter 19, Section 1908.10),* **ACI 318, Section D.4.2.2.** Delete ACI 318, Section D.4.2.2, and replace with the following:

D.4.2.2 – The concrete breakout strength requirements for anchors in tension shall be considered satisfied by the design procedure of D.5.2 provided Equation D-8 is not used for anchor embedments exceeding 25 inches. The concrete breakout strength requirements for anchors in shear with diameters not exceeding 2 inches shall be considered satisfied by the design procedure of D.6.2. For anchors in shear with diameters exceeding 2 inches, shear anchor reinforcement shall be provided in accordance with the procedures of D.6.2.9.

~~***1908A.1.47*** **ACI 318, Section D.3.3.** Modify ACI 318, Sections D.3.3.2 through D.3.3.5, to read as follows:~~

~~D.3.3.2 In structures assigned to Seismic Design Category D, E or F, post-installed anchors for use under D.2.3 shall have passed the Simulated Seismic Tests of ACI 355.2.~~

~~D.3.3.3 In structures assigned to Seismic Design Category D, E or F, the design strength of anchors shall be taken as $0.75\varphi N_a$ and $0.75\varphi V_a$, where φ is given in D.4.4 or D.4.5, and N_a and V_a are determined in accordance with D.4.1.~~

~~D.3.3.4 In structures assigned to Seismic Design Category D, E or F, anchors shall be designed to be governed by tensile or shear strength of a ductile steel element, unless D.3.3.5 is satisfied.~~

~~*Exception: Anchors in concrete designed to support non-structural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.4.*~~

~~D.3.3.5 Instead of D.3.3.4, the attachment that the anchor is connecting to the structure shall be designed so that the attachment will undergo ductile yielding at a load level corresponding to anchor forces no greater than the design strength of anchors specified in D.3.3.3*, or the minimum design strength of the anchors shall be at least 2.5 times the factored forces transmitted by the attachment*.~~

~~***Exception:*** *Anchors in concrete designed to support non-structural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.5.*~~

SECTION 1909*A*
STRUCTURAL PLAIN CONCRETE

NOT PERMITTED BY DSA-SS

~~**1909*A*.1 Scope.** *Plain concrete shall not be used other than as fill. The minimum specified compression strength of concrete used as fill shall be 1,500 psi (10.3 MPa) at 28 days.* The design and construction of structural plain concrete, both cast-in-place and precast, shall comply with the minimum requirements of Section 1909 and ACI 318, Chapter 22, as modified in Section 1908.~~

~~**1909.1.1 Special structures.** For special structures, such as arches, underground utility structures, gravity walls and shielding walls, the provisions of this section shall govern where applicable.~~

~~**1909.2 Limitations.** The use of structural plain concrete shall be limited to:~~

~~1. Members that are continuously supported by soil, such as walls and footings, or by other structural members capable of providing continuous vertical support.~~

~~2. Members for which arch action provides compression under all conditions of loading.~~

~~3. Walls and pedestals.~~

~~The use of structural plain concrete columns and structural plain concrete footings on piles is not permitted. See Section 1908.1.8 for additional limitations on the use of structural plain concrete.~~

~~**1909.3 Joints.** Contraction or isolation joints shall be provided to divide structural plain concrete members into flexurally discontinuous elements in accordance with ACI 318, Section 22.3.~~

~~**1909.4 Design.** Structural plain concrete walls, footings and pedestals shall be designed for adequate strength in accordance with ACI 318, Sections 22.4 through 22.8.~~

~~**Exception:** For Group R-3 occupancies and buildings of other occupancies less than two stories above *grade plane* of light-frame construction, the required edge thickness of ACI 318 is permitted to be reduced to 6 inches (152 mm), provided that the footing does not extend more than 4 inches (102 mm) on either side of the supported wall.~~

~~**1909.5 Precast members.** The design, fabrication, transportation and erection of precast, structural plain concrete elements shall be in accordance with ACI 318, Section 22.9.~~

~~**1909.6 Walls.** In addition to the requirements of this section, structural plain concrete walls shall comply with the applicable requirements of ACI 318, Chapter 22.~~

~~**1909.6.1 Basement walls.** The thickness of exterior basement walls and foundation walls shall be not less than 71/2 inches (191 mm).~~

~~**1909.6.2 Other walls.** Except as provided for in Section 1909.6.1, the thickness of bearing walls shall be not less than 1/24 the unsupported height or length, whichever is shorter, but not less than 51/2 inches (140 mm).~~

~~**1909.6.3 Openings in walls.** Not less than one No. 5 bar shall be provided around window, door and similar sized openings. The bar shall be anchored to develop f_y in tension at the corners of openings.~~

1910A
MINIMUM SLAB PROVISIONS

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SECTION 1911*A*
ANCHORAGE TO CONCRETE—
ALLOWABLE STRESS DESIGN

. . . .

1911A.1.1 Power Actuated Fasteners: *Power actuated fasteners qualified in accordance with ICC-ES AC 70 shall be deemed to satisfy the requirements of this section.*

Power actuated fasteners shall be permitted for seismic shear when they are specifically listed in ICC-ES Report (ICC-ESR) for such service and for interior non-shear wall partitions. Power actuated fastener shall not be used to anchor exterior cladding or curtain wall systems.

. . . .

SECTION 1912*A*
ANCHORAGE TO CONCRETE—
STRENGTH DESIGN

1912.1 Scope. The provisions of this section shall govern the strength design of anchors installed in concrete for purposes of transmitting structural loads from one connected element to the other. Headed bolts, headed studs and hooked (J- or L-) bolts cast in concrete and expansion anchors and undercut anchors installed in hardened concrete shall be designed in accordance with Appendix D of ACI 318 as modified by Sections ~~1908.1.9~~ *1908A.1.30* and ~~1908.1.10~~ *1908A.1.31*, provided they are within the scope of Appendix D.

The strength design of anchors that are not within the scope of Appendix D of ACI 318, and as amended in Sections ~~1908.1.9~~ *1908A.1.30* and ~~1908.1.10~~ *1908A.1.31*, shall be in accordance with an approved procedure.

1912A.1.1 Specialty Inserts: *Specialty inserts, including cast-in-place specialty inserts, tested in accordance with ICC AC 193 shall be deemed to satisfy the requirements of this section.*

. . . .

SECTION 1913*A*
SHOTCRETE

1913*A*.1 General. Shotcrete is mortar or concrete that is pneumatically projected at high velocity onto a surface. Except as specified in this section, shotcrete shall conform to the requirements of this chapter for ~~plain or~~ reinforced concrete *and the provisions of ACI 506. The specified compressive strength of shotcrete shall not be less than 3,000 psi (20.69 MPa).*

Concrete or masonry to receive shotcrete shall have the entire surface thoroughly cleaned and roughened by sand blasting, and just prior to receiving shotcrete, shall be thoroughly cleaned of all debris, dirt and dust. Concrete and masonry shall be wetted before shotcrete is deposited, but not so wet as to overcome suction. Sand for sand blasting shall be clean, sharp and uniform in size, with no particles that will pass a 50-mesh screen.

. . . .

1913*A*.3 Aggregate. Coarse aggregate, if used, shall not exceed $^{3}/_{4}$ inch (19.1 mm).

For shear walls, when total rebar in any direction is more than 0.31 in^2 / ft. or rebar size is larger than # 5, shotcrete shall conform to course aggregate grading No. 2 per Table 1.1 of ACI 506.

. . . .

1913*A*.5 Preconstruction tests. ~~When required by the building official, a~~ A test panel shall be shot, cured, cored or sawn, examined and tested prior to commencement of the project. The sample panel shall be representative of the project and simulate job conditions as closely as possible. The panel thickness and reinforcing shall reproduce the thickest and most congested area specified in the structural design. It shall be shot at the same angle, using the same nozzleman and with the same concrete mix design that will be used on the project. The equipment used in preconstruction testing shall be the same equipment used in the work requiring such testing, unless substitute equipment is approved by the building official.

. . . .

1913*A*.7 Joints. Except where permitted herein, unfinished work shall not be allowed to stand for more than 30 minutes unless edges are sloped to a thin edge. For structural elements that will be under compression and for construction joints shown on the approved construction documents, square joints are permitted. Before placing additional material adjacent to previously applied work, sloping and square edges shall be cleaned and wetted.

The film of laitance which forms on the surface of the shotcrete shall be removed within approximately two hours after application by brushing with a stiff broom. If this film is not removed within two hours, it shall be removed by thorough wire brushing or sand blasting. Construction joints over eight hours old shall be thoroughly cleaned with air and water prior to receiving shotcrete.

. . . .

1913*A*.10 Strength tests. Strength tests for shotcrete shall be made *in accordance with ASTM standards* by an approved agency on specimens that are representative of the work and which have been water soaked for at least 24 hours prior to testing. When the maximum-size aggregate is larger than $^3/_8$ inch (9.5 mm), specimens shall consist of not less than three 3-inch-diameter (76 mm) cores or 3-inch (76 mm) cubes. When the maximum-size aggregate is $^3/_8$ inch (9.5 mm) or smaller, specimens shall consist of not less than 2-inch-diameter (51 mm) cores or 2-inch (51 mm) cubes.

1913*A*.10.1 Sampling. Specimens shall be taken from the in-place work or from test panels, and shall be taken at least once each shift, but not less than one for each 50 cubic yards (38.2 m^3) of shotcrete.

1913*A*.10.2 Panel criteria. When the maximum-size aggregate is larger than $^3/_8$ inch (9.5 mm), the test panels shall have minimum dimensions of 18 inches by 18 inches (457 mm by 457 mm). When the maximum size aggregate is $^3/_8$ inch (9.5 mm) or smaller, the test panels shall have minimum dimensions of 12 inches by 12 inches (305 mm by 305 mm). Panels shall be shot in the same position as the work, during the course of the work and by the nozzlemen doing the work. The conditions under which the panels are cured shall be the same as the work. *Approval from the enforcement agency ~~must~~ shall be obtained prior to performing the test panel method.*

. . . .

~~1913A.12~~ 1913A.11 Forms and ground wires for shotcrete. . . .

~~1913A.13~~ 1913A.12 Placing. . . .

SECTION 1914*A*
REINFORCED GYPSUM CONCRETE

1914*A*.1 General. Reinforced gypsum concrete shall comply with the requirements of ASTM C 317 and ASTM C 956. *Reinforced gypsum concrete shall be considered as an alternative system.*

. . . .

1915A
CONCRETE-FILLED PIPE COLUMNS

. . . .

SECTION 1916A
CONCRETE, REINFORCEMENT AND ANCHOR TESTING

1916A.1 Cementitious material. . . .

1916A.2 Tests of reinforcing bars*. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number and provided the mill analyses accompany the report, one tensile test and one bend test shall be made from a specimen from each 10 tons (9080 kg) or fraction thereof of each size of reinforcing steel.*

Where positive identification of the heat number cannot be made or where random samples are to be taken, one series of tests shall be made from each 2 1/2 tons (2270 kg) or fraction thereof of each size of reinforcing steel. ~~See Section 1916A.4 for waiver of tests~~.

Tests of reinforcing bars may be waived by the structural engineer with the approval of the Building Official for one-story buildings provided certified mill test reports are provided for each shipment of such reinforcement.

1916A.3 Tests for prestressing steel and anchorage. . . .

. . . .

~~1916A.5~~ 1916A.4 Composite construction cores*. . . .*

~~1916A.6~~ 1916A.5 Tests of shotcrete. . . .

~~1916A.7~~ 1916A.6 Gypsum field tests. . . .

~~1916A.8~~ 1916A.7 Tests for post-installed anchors in concrete. *When ~~drilled-in expansion-type anchors or other~~ post-installed anchors ~~acceptable to the enforcement agency~~ are used in lieu of cast-in-place bolts, the ~~allowable shear and tension values and~~ installation verification test loads frequency and acceptance criteria shall be in accordance with this section.*

(Relocated to 1916A.7.3)~~When expansion type anchors are listed for sill plate bolting applications, 10 percent of the anchors shall be tension tested.~~

~~When expansion type anchors are used for other structural applications, all such expansion anchors shall be tension tested. Expansion type anchors shall not be used as hold-down bolts.~~

~~When expansion type anchors are used for nonstructural applications such as equipment anchorage, 50 percent or alternate bolts in a group, including at least one-half the anchors in each group, shall be tension tested.~~

~~The tension testing of the expansion anchors shall be done in the presence of the special inspector and a report of the test results shall be submitted to the enforcement agency. If any anchors fail the tension testing requirements, the additional testing requirements shall be acceptable to the enforcement agency. The above requirements shall also apply to other post-installed anchors acceptable to the enforcement agency and bolts or anchors set in concrete with chemical if the long-term durability and stability of the chemical material and its resistance to loss of strength and chemical change at elevated temperatures are established to the satisfaction of the enforcement agency~~.

1916A.7.1 General. *Test loads or torques and acceptance criteria shall be shown on the construction documents.*

If any anchor fails testing, all anchors of the same type shall be tested, which are installed by the same trade, not previously tested until twenty (20) consecutive anchors pass, then resume the initial test frequency.

1916A.7.2 Test loads. *Required test loads shall be determined by one of the following methods:*

1. *Twice the maximum allowable tension load or one and a quarter (1- 1/4) times the maximum design strength of anchors as provided in International Code Council – Evaluation Service Report (ICC-ESR) or determined in accordance with Appendix D of ACI 318.*

   Tension test load need not exceed 80% of the nominal yield strength of the anchor element (= 0.8 A_{se} f_{ya}).

2. *The manufacturer's recommended installation torque as approved in an ICC-ESR.*

1916A.7.3 Test frequency. *(Relocated from Section 1916A.8, CBC 2007) When ~~expansion type~~ post-installed anchors are used ~~listed~~ for sill plate bolting applications, 10 percent of the anchors shall be ~~tension~~ tested.*

When post-installed anchors ~~expansion type anchors~~ are used for other structural applications, all such ~~expansion~~ anchors shall be ~~tension~~ tested. ~~Expansion type anchors shall not be used as hold down bolts.~~

When ~~expansion type~~ post-installed anchors are used for nonstructural applications such as equipment anchorage, 50 percent or alternate bolts in a group, including at least one-half the anchors in each group, shall be ~~tension~~ tested.

The ~~tension~~ testing of the ~~expansion~~ post-installed anchors shall be done in the presence of the special inspector and a report of the test results shall be submitted to the enforcement agency. ~~If any anchors fail the tension testing requirements, the additional testing requirements shall be acceptable to the enforcement agency. The above requirements shall also apply to other post-installed anchors acceptable to the enforcement agency and~~

~~*bolts or anchors set in concrete with chemical if the long-term durability and stability of the chemical material and its resistance to loss of strength and chemical change at elevated temperatures are established to the satisfaction of the enforcement agency*~~.

Exceptions:

1. *Undercut anchors that allow visual confirmation of full set shall not require testing.*

2. *Where the factored design tension on anchors is less than 100 lbs. and those anchors are clearly noted on the approved construction documents, only 10 percent of those anchors shall be tested.*

3. *Where adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, only 25% of the dowels shall be tested if all the following conditions are met:*

    a. *The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.*

    b. *The number of dowels in any one member equals or exceeds 12.*

    c. *The dowels are uniformly distributed across seismic force resisting members (such as shear walls, collectors and diaphragms).*

    Anchors to be tested shall be selected at random by the special inspector/ Inspector Of Record (IOR).

4. *Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting system shall not required.*

5. *Testing is not required for power actuated fasteners used to attach tracks of interior non-shear wall partitions for shear only, where there are at least three fasteners per segment of track.*

1916A.7.4 Test acceptance criteria. *Acceptance criteria for post-installed anchors shall be based on ICC-ESR or manufacturers written instruction, acceptable to the enforcement agency. Field test shall satisfy following minimum requirements.*

1. *Hydraulic Ram Method:*

    Anchors tested with a hydraulic jack or spring loaded devices shall maintain the test load for a minimum of 15 seconds and shall exhibit no discernable movement during the tension test, e.g., as evidenced by loosening of the washer under the nut.

    For adhesive anchors, where other than bond is being tested, the testing device shall not restrict the concrete shear cone type failure mechanism from occurring.

2. *Torque Wrench Method:*

    Anchors tested with a calibrated torque wrench must attain the specified torque within ½ turn of the nut.

    Exceptions:

    1. *Wedge or Sleeve type:*
       One-quarter (1/4) turn of the nut for a 3/8 in. sleeve anchor only.

    2. *Threaded Type:*
       One-quarter (1/4) turn of the screw after initial seating of the screw head.

1916A.7.5. Testing procedure. *Test procedure shall be as required by the ICC-ESR. Manufacturer's recommendation for testing may be approved by the enforcement agency, when ICC-ESR does not provide a testing procedure.*

SECTION 1917A

1917A.1. Existing concrete structures. . . .

1917A.2. *(Reserved for OSHPD)*

1917A.3. Concrete strengthening by externally bonded Fiber Reinforced Polymer (FRP). *Design and construction of externally bonded FRP systems for strengthening concrete structures shall be in accordance with ACI 440.2R.*

Exceptions:

1) Near-Surface Mounted (NSM) FRP bars shall not be permitted.

2) Strengthening of shear walls and diaphragms (including chords and collectors) shall be considered as an alternative system.

Design capacities, reliability, serviceability of FRP materials shall be permitted to be established in accordance with ICC-ES AC 125. Minimum inspection requirements of FRP composite systems shall be in accordance with ICC-ES AC 178.

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

CHAPTER 20
ALUMINUM

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	**X**	**X**	
Adopt only those sections listed below			
2003.1	X	X	

EXPRESS TERMS

SECTION 2001
GENERAL

2001.1 Scope. This chapter shall govern the quality, design, fabrication and erection of aluminum.

SECTION 2002
MATERIALS

2002.1 General. Aluminum used for structural purposes in buildings and structures shall comply with AA ASM 35 and AA ADM 1. The nominal loads shall be the minimum design loads required by Chapter 16.

SECTION 2003 - INSPECTION

2003.1 Inspection. [DSA-SS & DSA-SS/CC] *Inspection of Aluminum shall be required in accordance with the requirements for steel in Chapter 17A.*

Notation:
Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

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CHAPTER 21
MASONRY

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	-	X	
Adopt only those sections listed below			
2101.1.1		X	From 2101A.1.1 – CBC 2007
2101.1.2		X	From 2101A.1.2 – CBC 2007
2101.1.3		X	New Amendment
2101.1.4		X	New Amendment
2103.8 - Exception		X	From 2103A.8 – CBC 2007
2103.14		X	From 2103A.14 – CBC 2007
2104.1.2.1		X	From 2104A.1.2.1 – CBC 2007
2104.1.7		X	From 2104A.1.2.7 – CBC 2007
2104.5		X	From 2104A.6 – CBC 2007
2105.6		X	From 2104A.7 – CBC 2007
2105.2.1.1		X	From 2105A.2.1 – CBC 2007
2105.2.2.1.3		X	From 2105A.2.2.1.3 – CBC 2007
2105.2.2.1.4		X	From 2105A.2.2.1.4 – CBC 2007
2105.2.2.2.3		X	New Amendment
2105.3 - Exception		X	New Amendment
2105.4		X	From 2105A.4 – CBC 2007
2106.1.1		X	From 2106A.5.3 – CBC 2007
2107.6		X	From 2107A.9 – CBC 2007
2110.1 - Exception		X	From 2110A.1 – CBC 2007
2114		X	From 2114A – CBC 2007
2115		X	From 2115A – CBC 2007

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 2103A – MASONRY CONSTRUCTION MATERIALS- repeal amendments in following subsections:

~~***2103A.12.1 Water.*** *Water content shall be adjusted to provide proper workability and to enable proper placement under existing field conditions, without segregation. The water content expressed on a saturated surface-dry basis shall not exceed 0.7 times the weight (mass) of cement.*~~

~~***2103A.12.2 Selecting Proportions.*** *Proportions of ingredients and any additives shall be based on laboratory or field experience with the grout ingredients and the masonry units to be used. For coarse grout, the coarse and*~~

~~*fine aggregates shall be combined such that the fine aggregate part is not greater than 80 percent of the total aggregate weight (mass) and at least 90 percent shall pass the 1/2 inch (12.7 mm) sieve. Coarse grout proportioned by weight shall contain not less than 564 pounds of cementitious material per cubic yard (335 kg / m^3).*~~

~~***2103A.12.3 Aggregate.** Aggregate for grout shall conform to the requirements set forth in ASTM C 404, Aggregates for Grout. Coarse grout shall be used in grout spaces 2 inches (51 mm) or more in width and in all filled-cell masonry construction.*~~

~~***2103A.14.4 Colors.** Only pure mineral oxide, carbon black or synthetic colors may be used. Carbon black shall be limited to a maximum of 3 percent of the weight of the cement.*~~

~~***2104A.6.1.1 Reinforced grouted masonry.***~~

~~***2104A.6.1.1.1 General.** Reinforced grouted masonry is that form of construction made with clay or shale brick or made with solid concrete building brick in which interior joints of masonry are filled by pouring grout around reinforcing therein as the work progresses.*~~

~~*At the time of laying, all masonry units shall be free of dust and dirt.*~~

~~*All units in a masonry assembly shall have a compatible absorption rate.*~~

~~***NOTES:***~~

~~*1. For rate of absorption, see Section 2104A.5. All units in a masonry assembly shall have a compatible absorption rate.*~~

~~*2. For mortar, see Section 2103A.8.*~~

~~*3. See Section 2105A.2 for assumed masonry strength.*~~

~~***2104A.6.1.1.2 Low-lift grouted construction**. Requirements for construction shall be as follows:*~~

~~*1. All units in the two outer wythes shall be laid with full-shoved head joint and bed mortar joints. Masonry headers shall not project into the grout space.*~~

~~*2. The minimum grout space for low-lift grout masonry shall be 2 1/2 inches (64 mm). Floaters shall be used where the grout space exceeds 5 inches (127 mm) in width. The thickness of grout between masonry units and floaters shall be a minimum of 1 inch (25 mm). Floaters shall be worked into fresh puddled grout using a vibrating motion until half of the floater is embedded in the grout. All reinforcing and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and reinforcing shall be a minimum of one bar diameter.*~~

~~*3. One tier of a grouted reinforced masonry wall may be carried up 12 inches (305 mm) before grouting, but the other tier shall be laid up and grouted in lifts not to exceed one masonry unit in height. All grout shall be puddled with a mechanical vibrator or wood stick immediately after placing so as to completely fill all voids and to consolidate the grout. All vertical and horizontal steel shall be held firmly in place by a frame or suitable devices.*~~

~~*4. If the work is stopped for one hour or more, the horizontal construction joints shall be formed by stopping all wythes at the same elevation, and with the grout 1/2 inch (13 mm) below the top.*~~

~~*5. Toothing of masonry walls is prohibited. Racking is to be held to a minimum.*~~

~~*6. The wythes shall be bonded together with wall ties in accordance with Section 2104A.6.1.1.3, Item 2.*~~

~~***2104A.6.1.1.3 High-lift grouted construction**. Where high-lift grouting is used, the method shall be subject to the approval of the enforcement agency. Requirements for construction shall be as follows:*~~

~~*1. All units in the two wythes shall be laid with full head and bed mortar joints.*~~

~~*2. The two wythes shall be bonded together with wall ties. Ties shall not be less than No. 9 wire in the form of rectangles 4 inches (102 mm) wide and 2 inches (51 mm) in length less than the overall wall thickness. Kinks, water drips, or deformations shall not be permitted in the ties. One tier of the wall shall be built up not more than 16 inches (406 mm) ahead of the other tier. Ties shall be laid not to exceed 24 inches (610 mm) on center horizontally and 16 inches (406 mm) on center vertically for running bond, and not more than 24 inches (610 mm) on center horizontally and 12 inches (305 mm) on center vertically for stack bond.*~~

~~*3. Cleanouts shall be provided for each pour by leaving out every other unit in the bottom tier of the section being poured or by cleanout openings in the foundation. The foundation or other horizontal construction joints shall be cleaned of all loose material and mortar droppings before each pour. The cleanouts shall be sealed before grouting, after inspection.*~~

~~*4. The grout space in high-lift grouted masonry shall be a minimum of 3 1/2 inches (89 mm). All reinforcing and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and reinforcing shall be a minimum of one bar diameter.*~~

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

~~*6. An approved admixture of a type that reduces early water loss and produces an expansive action shall be used in high-lift grout.*~~

~~*7. Grouting shall be done in a continuous pour in lifts not exceeding 4 feet (1219 mm).Grout shall be consolidated by mechanical vibration only, and shall be reconsolidated after excess moisture has been absorbed, but before plasticity is lost. The grouting of any section of a wall between control barriers shall be completed in one day, with no interruptions greater than one hour.*~~

~~*NOTE: For special inspection requirements, Chapter 17A and for testing see Section 2105A.4.*~~

~~*8. **Stresses.** All reinforced grouted masonry shall be so constructed that the unit stresses do not exceed those set forth in Sections 2107A or 2108A.*~~

~~***2104A.6.1.2 Reinforced hollow-unit masonry.***~~

~~***2104A.6.1.2.1 General.** Reinforced hollow-unit masonry is that type of construction made with hollow-masonry units in which cells are continuously filled with grout, and in which reinforcement is embedded. All cells shall be solidly filled with grout in reinforced hollow-unit masonry, except as provided in Section 2114A.1. Construction shall be one of the two following methods: The low-lift method where the maximum height of construction laid before grouting is 4 feet (1220 mm), or the high-lift method where the full height of construction between horizontal cold joints is grouted in one operation. General requirements for construction shall be as follows:*~~

~~*1. All reinforced hollow-unit masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled. All head joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.*~~
~~*2. Mortar shall be as specified in Section 2103A.*~~

~~*3. Walls and cross webs forming such cells to be filled shall be full bedded in mortar to prevent leakage of grout.*~~

~~*4. Bond shall be provided by lapping units in successive vertical courses. Where stack bond is used in reinforced hollow-unit masonry, the open-end type of unit shall be used with vertical reinforcement spaced a maximum of 16 inches (406 mm) on center.*~~

~~*5. Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear unobstructed, continuous vertical cell measuring not less than 2 inches by 3 inches (51 mm by 76 mm), except the minimum cell dimension for high-lift grout shall be 3 inches (76 mm).*~~

~~*6. At the time of laying, all masonry units shall be free of dust and dirt.*~~

7. Grout shall be a workable mix suitable for placing without segregation and shall be thoroughly mixed. Grout shall be placed by pumping or an approved alternate method and shall be placed before initial set or hardening occurs. Grout shall be consolidated by mechanical vibration during placing and reconsolidated after excess moisture has been absorbed, but before workability is lost. The grouting of any section of a wall shall be completed in one day, with no interruptions greater than one hour.

NOTE: For special inspection requirements, see Chapter 17A. For Testing see Section 2105A.

8. All reinforcing and wire ties shall be embedded in the grout. The space between masonry unit surfaces and reinforcing shall be a minimum of one bar diameter.

9. Horizontal reinforcement shall be placed in bond beam units with a minimum grout cover of 1 inch (25 mm) above steel for each grout pour. The depth of the bond beam channel below the top of the unit shall be a minimum of 1 1/2 inches (38 mm) and the width shall be 3 inches (76 mm) minimum.

***2104A.6.1.2.2 Low-lift grouted construction**. Units shall be laid a maximum of 4 feet (1220 mm) before grouting, and all over-hanging mortar and mortar droppings shall be removed. Grouting shall follow each 4 feet (1220 mm) of construction laid and shall be consolidated so as to completely fill all voids and embed all reinforcing steel. When grouting is stopped for one hour or longer, horizontal construction joints shall be formed by stopping the pour of grout not less than 1/2 inch (13 mm) or more than 2 inches (51 mm) below the top of the uppermost unit grouted. Horizontal steel shall be fully embedded in grout in an uninterrupted pour.*

***2104A.6.1.2.3 High-lift grouted construction**. Where high-lift grouting is used, the method shall be approved by the enforcement agency. Cleanout openings shall be provided in every cell at the bottom of each pour of grout. Alternatively, if the course at the bottom of the pour is constructed entirely of inverted open-end bond beam units, cleanout openings need only be provided in every reinforced cell at the bottom of each pour of grout. The foundation or other horizontal construction joints shall be cleaned of all loose material and mortar droppings before each pour. The cleanouts shall be sealed before grouting. An approved admixture that reduces early water loss and produces an expansive action shall be used in the grout.*

***2104A.6.1.2.4 Stresses.** All reinforced hollow-unit masonry shall be so constructed that the units stressed do not exceed those set forth in 2107A or 2108A.*

Vertical barriers of masonry may be built across the grout space. The grouting of any section of wall between barriers shall be completed in one day with no interruption longer than one hour.

NOTE: See Section 2105A.4 for assumed masonry strength.

***2105A.5 Mortar and grout tests.** These tests are to establish whether the masonry components meet the specified component strengths. At the beginning of all masonry work, at least one test sample of the mortar and grout shall be taken on three successive working days and at least at one-week intervals thereafter. They shall meet the minimum strength requirement given in Sections 2103A.8 and 2103A.12 for mortar and grout, respectively. Additional samples shall be taken whenever any change in materials or job conditions occur, or whenever in the judgment of the architect, structural engineer or the enforcement agency such tests are necessary to determine the quality of the material.*

Test specimens for mortar and grout shall be made as set forth in ASTM C 1586 and ASTM C 1019

***2105A.2.2.3 Masonry Prism test record.** Compressive design strength verification by masonry prism test records shall meet the following:*

1. A masonry prism test record approved by the enforcement agency of at least 30 masonry prisms which were built and tested in accordance with ASTM C 1314. Prisms shall have been constructed under the observation of an engineer or special inspector or an approved agency and shall have been tested by an approved agency.

2. Masonry prisms shall be representative of the corresponding construction.

3. The average compressive strength of the test record shall equal or exceed 1.33 f'_m.

***2105A.6 Combination of Units.** In walls or other structural members composed of different kinds or grades of units or materials, a full-scale test panel shall be constructed before the beginning of masonry work. The test*

~~*panel will be cored and tested as approved by the enforcement agency to determine the compatibility of the materials (including bond strength between the materials). If the materials are not compatible, they will be rejected. The net thickness of any facing unit which is used to resist stress shall not be less than 1-1/2 inches (38 mm).*~~

~~***2106A.5.4 Lateral support.** Lateral support of masonry may be provided by cross walls, columns, pilasters, counterforts or buttresses where spanning horizontally or by floors, beams, girts or roofs where spanning vertically. Where walls are supported laterally by vertical elements, the stiffness of each vertical element shall exceed that of the tributary area of the wall.*~~

~~*The clear distance between lateral supports of a beam shall not exceed 32 times the least width of the compression area.*~~

~~***2107A.1.1 Design assumptions**. The allowable stress design procedure is based on working stresses and linear stress-strain distribution assumptions with all stresses in the elastic range as follows:*~~

~~*1. Plane sections before bending remain plane after bending.*~~

~~*2. Stress is proportional to strain.*~~

~~*3. Masonry elements combine to form a homogenous member.*~~

~~*4. Tensile forces are resisted only by the tensile reinforcement.*~~

~~*5. Reinforcement is completely surrounded by and bonded to the masonry materials so that they work together as a homogeneous material within the range of working stresses.*~~

~~***2107A.10 Add to ACI 530 / ASCE 5 / TMS 402 Section 2.2 as follows:***~~

~~*2.2 - **Unreinforced masonry.** Not permitted by DSA-SS.*~~

~~***2107A.12 ACI 530/ASCE 5/TMS 402, Section 2.3.7, maximum reinforcement percentage.** Add the following text to Chapter 2:~~

~~**2.3.7 Maximum reinforcement percentage.** *All reinforced masonry components that* are subjected to in-plane forces shall have a maximum reinforcement ratio, ρ_{max}, not greater than that computed as follows:~~

$$\rho_{\max} = \frac{nf'_m}{2f_y\left(n + \frac{f_y}{f'_m}\right)}$$

~~**(Equation 21A-3)**~~

~~***2108A.2 Add to ACI 530 / ASCE 5 / TMS 402 Section 3.2 as follows:***~~

~~*3.2 **Unreinforced (plane) masonry** - Not permitted by DSA-SS.*~~

EXPRESS TERMS

(Chapter 21 Repealer and Express Terms are based on 2007 CBC Chapter 21A and 2009 IBC Chapter 21.)

(All existing CBC 2007 CA amendments that are not revised below shall continue without any change)

SECTION ~~2101A~~ 2101
GENERAL

~~**2101A.1**~~ **2101.1 Scope.** This chapter shall govern the materials, design, construction and quality of masonry.

~~*2101A.1.1*~~ *2101.1.1* ***Application.*** *The scope of application of Chapter ~~21A~~ 21 is as follows:*

1. ~~*Applications listed in Section 109.2 regulated by the Division of the State Architect—Structural Safety (DSA-SS). These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*~~ *Application to community college buildings regulated by the Division of the State Architect-Structural Safety/Community Colleges (DSA-SS/CC) as listed in Section 1.9.2.2.*

~~*2101A.1.2*~~ *2101.1.2* ***Amendments in this chapter.*** *DSA-SS/CC adopts 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:*~~ *[DSA-SS/CC] Division of the State Architect-Structural Safety amendments appear in this chapter proceeded with the appropriate acronym, as follows:*

1. *(Division of the State Architect—Structural Safety/Community Colleges:*
   ~~***[DSA-SS]*** *For applications listed in Section 109.2.*~~
   [DSA-SS/CC] *- For community college buildings listed in Section 1.9.2.2.*

2101.1.3 Reference to other chapters. [DSA-SS/CC] *Where reference within this chapter is made to sections in Chapters 17 and 18, the provisions in Chapters 17A and 18A respectively shall apply instead.*

2101.1.4 Prohibition [DSA-SS/CC]: *The following design, systems, and materials are not permitted by DSA:*

1. *Unreinforced Masonry.*
2. *Autoclaved Aerated Concrete (AAC) Masonry.*
3. *Empirical Design of Masonry.*
4. *Ordinary Reinforced Masonry Shear Walls.*
5. *Intermediate Reinforced Masonry Shear Walls.*
6. *Prestressed Masonry Shear Walls.*

~~**2101A.2**~~ **2101.2 Design methods.** Masonry shall comply with the provisions of one of the following design methods in this chapter as well as the requirements of Sections ~~2101A~~ 2101 through ~~2104A~~ 2104. Masonry designed by the allowable stress design provisions of Section ~~2101A.2.1~~ 2101.2.1, the strength design provisions of Section ~~2101A.2.2~~ 2101.2.2 or the prestressed masonry provisions of Section ~~2101A.2.3~~ 2101.2.3 shall comply with Section ~~2105A~~ 2105.

~~**2101A.2.1**~~ **2101.2.1 Allowable stress design.** Masonry designed by the *allowable stress design* method shall comply with the provisions of Sections ~~2106A~~ 2106 and ~~2107A~~ 2107.

~~**2101A.2.2**~~ **2101.2.2 Strength design.** Masonry designed by the strength design method shall comply with the provisions of Sections ~~2106A~~ 2106 and ~~2108A~~ 2108, except that autoclaved aerated concrete (AAC) masonry shall comply with the provisions of Section 2106, Section 1613.6.4 and Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.

~~**2101A.2.3**~~ **2101.2.3 Prestressed masonry.** ~~*Not permitted by DSA-SS*~~. Prestressed masonry shall be designed in accordance with Chapters 1 and 4 of TMS 402/ACI 530/ASCE 5 and Section 2106. *Special inspection* during construction shall be provided as set forth in Section 1704.5.

~~**2101A.2.4**~~ **2101.2.4 Empirical design.** ~~*Not permitted by DSA-SS*~~. Masonry designed by the empirical design method shall comply with the provisions of Sections 2106 and 2109 or Chapter 5 of TMS 402/ACI 530/ASCE 5.

~~**2101A.2.5**~~ **2101.2.5 Glass unit masonry.** Glass unit masonry shall comply with the provisions of Section ~~2110A~~ 2110~~.~~ or Chapter 7 of TMS 402/ACI 530/ASCE 5.

~~**2101A.3**~~ **2101.3 Construction documents.** The *construction documents* shall show all of the items required by this code including the following:

1. Specified size, grade, type and location of reinforcement, anchors and wall ties.

2. Reinforcing bars to be welded and welding procedure.
3. Size and location of structural elements.
4. Provisions for dimensional changes resulting from elastic deformation, creep, shrinkage, temperature and moisture.
5. Loads used in the design of masonry.
6. Specified compressive strength of masonry at stated ages or stages of construction for which masonry is designed, except where specifically exempted by this code.
7. Details of anchorage of masonry to structural members, frames and other construction, including the type, size and location of connectors.
8. Size and location of conduits, pipes and sleeves.
9. The minimum level of testing and inspection as defined in Chapter 17~~A~~, or an itemized testing and inspection program that meets or exceeds the requirements of Chapter 17~~A~~.

~~2101A.3.1~~ 2101.3.1 Fireplace drawings. …

SECTION ~~2102A~~ 2102
DEFINITIONS AND NOTATIONS

~~2102A.1~~ 2102.1 General. The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

. . . .

CHIMNEY TYPES.

High-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, high-heat appliances producing combustion gases in excess of 2,000°F (1093°C) measured at the appliance flue outlet (see Section ~~2113A.11.3~~ 2113.11.3).

Low-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, low-heat appliances producing combustion gases not in excess of 1,000°F (538°C) under normal operating conditions, but capable of producing combustion gases of 1,400°F (760°C) during intermittent forces firing for periods up to 1 hour. Temperatures shall be measured at the appliance flue outlet.

Masonry type. A field-constructed chimney of solid masonry units or stones.

Medium-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, medium-heat appliances producing combustion gases not exceeding 2,000°F (1093°C) measured at the appliance flue outlet (see Section ~~2113A.11.2~~ 2113.11.2).

. . . .

MASONRY UNIT. Brick, tile, stone, glass block or concrete block conforming to the requirements specified in Section ~~2103A~~ 2103.

Clay. A building unit larger in size than a brick, composed of burned clay, shale, fired clay or mixtures thereof.

Concrete. A building unit or block larger in size than 12 inches by 4 inches by 4 inches (305 mm by 102 mm by 102 mm) made of cement and suitable aggregates.

Hollow. A masonry unit whose net cross-sectional area in any plane parallel to the load-bearing surface is less than 75 percent of its gross cross-sectional area measured in the same plane.

Solid. A masonry unit whose net cross-sectional area in every plane parallel to the load-bearing surface is 75 percent or more of its gross cross-sectional area measured in the same plane.

. . . .

SHEAR WALL.

Detailed plain masonry shear wall. A masonry shear wall designed to resist lateral forces neglecting stresses in reinforcement, and designed in accordance with Section ~~2106A.1~~ 2106.1.

Intermediate prestressed masonry shear wall. A prestressed masonry shear wall designed to resist lateral forces considering stresses in reinforcement, and designed in accordance with Section ~~2106A.1~~ 2106.1.

Intermediate reinforced masonry shear wall. A masonry shear wall designed to resist lateral forces considering stresses in reinforcement, and designed in accordance with Section ~~2106A.1~~ 2106.1.

Ordinary plain masonry shear wall. A masonry shear wall designed to resist lateral forces neglecting stresses in reinforcement, and designed in accordance with Section ~~2106A.1~~ 2106.1.

Ordinary plain prestressed masonry shear wall. A prestressed masonry shear wall designed to resist lateral forces considering stresses in reinforcement, and designed in accordance with Section ~~2106A.1~~ 2106.1.

Ordinary reinforced masonry shear wall. A masonry shear wall designed to resist lateral forces considering stresses in reinforcement, and designed in accordance with Section ~~2106A.1~~ 2106.1.

Special prestressed masonry shear wall. A prestressed masonry shear wall designed to resist lateral forces considering stresses in reinforcement and designed in accordance with Section ~~2106A.1~~ 2106.1 except that only grouted, laterally restrained tendons are used.

Special reinforced masonry shear wall. A masonry shear wall designed to resist lateral forces considering stresses in reinforcement, and designed in accordance with Section ~~2106A.1~~ 2106.1.

…

WALL. A vertical element with a horizontal length-to-thickness ratio greater than three, used to enclose space.
…

~~***Hollow unit Masonry Wall**. Type of construction made with hollow masonry units in which the units are laid and set in mortar, reinforced and grouted solid except as provided in Section 2114A.*~~

…

SECTION ~~2103A~~ 2103
MASONRY CONSTRUCTION MATERIALS

~~2103A.1~~ 2103.1 Concrete masonry units…

~~2103.A.2~~ 2103.2 Clay or shale masonry units…

~~2103A.3~~ 2103.3 AAC masonry. ~~*Not permitted by DSA-SS.*~~ AAC masonry units shall conform to ASTM C 1386 for the strength class specified.

~~2103A.4~~ 2103.4 Stone masonry units… .

~~2103A.5~~ 2103.5 Ceramic tile… .

~~2103A.6~~ 2103.6 Glass unit masonry… .

~~2103A.7~~ 2103.7 Second-hand units… .

~~2103A.8~~ 2103.8 Mortar. Mortar for use in masonry construction shall conform to ASTM C 270 ~~*Type S,*~~ and Articles 2.1 and 2.6 A of TMS 602/ACI 530.1/ASCE 6, except for mortars listed in Sections ~~2103A.9~~ 2103.9, ~~2103A.10~~ 2103.10 and 2103.11. Type S or N mortar conforming to ASTM C 270 shall be used for glass unit masonry

Exception: [DSA-SS/CC] *Mortar for use in masonry construction shall conform to ASTM C 270 Type S or M, except for mortars listed in Sections 2103.9, and 2103.10. Type S mortar conforming to ASTM C 270 shall be used for glass unit masonry*

~~*Lime shall be the last material added to the mixer. Materials for mortar and grout shall be measured in suitable calibrated devices. Shovel measurements will not be accepted. Aggregates for mortar shall conform to the provisions set forth in ASTM C 144, Aggregates for Masonry Mortar.*~~

~~**2103A.9**~~ **2103.9 Surface-bonding mortar. . . .**

~~**2103A.10**~~ **2103.10 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 ~~2103A.10~~ 2103.10.

~~**2103*A*.10.1**~~ **2103.10.1 Dry-set portland cement mortars. . . .**

~~**2103*A*.10.2**~~ **2103.10.2 Latex-modified portland cement mortar. . . .**

~~**2103*A*.10.3**~~ **2103.10.3 Epoxy mortar. . . .**

~~**2103*A*.10.4**~~ **2103.10.4 Furan mortar and grout. . . .**

~~**2103*A*.10.5**~~ **2103.10.5 Modified epoxy-emulsion mortar and grout. . . .**

~~**2103*A*.10.6**~~ **2103.10.6 Organic adhesives. . . .**

~~**2103*A*.10.7**~~ **2103.10.7 Portland cement grouts. . . .**

TABLE ~~2103A.10~~ 2103.10
CERAMIC TILE MORTAR COMPOSITIONS

(Table not shown for Clarity)

~~**2103*A*.11**~~ **2103.11 Mortar for AAC masonry.** ~~*Not permitted by DSA-SS*~~ Thin-bed mortar for AAC masonry shall comply with Article 2.1 C.1 of TMS 602/ACI 530.1/ASCE 6. Mortar used for the leveling courses of AAC masonry shall comply with Article 2.1 C.2 of TMS 602/ACI 530.1/ASCE 6.

~~**2103*A*.12**~~ **2103.12 Grout.** Grout shall comply with Article 2.2 of TMS 602/ACI 530.1/ASCE 6.

~~**2103*A*.13**~~ **2103.13 Metal reinforcement and accessories…**.

~~***2103A.14***~~ ***2103.14 Additives and Admixtures. [DSA-SS/CC]***

~~***2103A.14.1***~~ ***2103.14.1 General.*** *Additives and admixtures to mortar or grout shall not be used unless approved by the enforcement agency.*

~~***2103A.14.2***~~ ***2103.14.2 Antifreeze compounds****. Antifreeze liquids, chloride salts or other such substances shall not be used in mortar or grout.*

~~***2103A.14.3***~~ ***2103.14.3 Air entrainment.*** *Air-entraining substances shall not be used in mortar or grout unless tests are conducted to determine compliance with the requirements of this code.*

SECTION ~~2104*A*~~ 2104
CONSTRUCTION

~~**2104*A*.1**~~ **2104.1 Masonry construction.** Masonry construction shall comply with the requirements of Sections ~~2104*A*.1.1~~ 2104.1.1 through ~~2104*A*.4~~ 2104.4 and with TMS 602/ACI 530.1/ASCE 6.

~~2104A.1.1~~ **2104.1.1 Tolerances.** Masonry, except masonry veneer, shall be constructed within the tolerances specified in TMS 602/ACI 530.1/ASCE 6.

Exception: [DSA-SS/CC] *The maximum thickness of the initial bed joint in fully grouted masonry walls shall not exceed 1-1/4 in. (31.7 mm).*

~~2104A.1.2~~ **2104.1.2 Placing mortar and units.** Placement of mortar, grout, and clay, concrete, ~~*and*~~ glass, and AAC masonry units shall comply with TMS 602/ACI 530.1/ASCE 6.

2104.1.2.1 Glass unit masonry. [DSA-SS/CC] (*Relocated from Section 2104A.1.2.4, CBC 2007*) *All mortar for glass unit masonry contact surfaces shall be treated to ensure adhesion between mortar and glass.*

~~2104A.1.3~~ **2104.1.3 Installation of wall ties…**

~~2104A.1.4~~ **2104.1.4 Chases and recesses…**

~~2104A.1.5~~ **2104.1.5 Lintels.** The design for lintels shall be in accordance with the masonry design provisions of either Section ~~2107A~~ 2107 or ~~2108A~~ 2108.

~~2104A.1.6~~ **2104.1.6 Support on wood.** Masonry shall not be supported on wood girders or other forms of wood construction except as permitted in Section ~~2304A.12~~ 2304.12.

~~*2104A.1.2.7*~~ ***2104.1.7 Grouted masonry. [DSA-SS/CC]*** *Grouted masonry shall be per Section ~~2104A.6~~ 2104.5.*

~~2104A.2~~ **2104.2 Corbeled Masonry.** *(2007CBC)* **Delete section and CA amendments in CBC 2007, and adopt 2104.2 (2009 IBC) without amendment**

~~2104A.3~~ **2104.3 Cold weather constructions…**

~~2104A.4~~ **2104.4 Hot weather construction…**

~~*2104A.6*~~ ***2104.5 Grouted Masonry. [DSA-SS/CC]***

~~*2104A.6.1*~~ ***2104.5.1 General conditions.*** *(Relocated from Section 2104A.6.1, CBC 2007.)* ~~*Grouted masonry shall be constructed in such a manner that all elements of the masonry act together as a structural element.*~~ *Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections greater than 1/4 inch (6.4 mm), mortar droppings and other foreign material.* ~~*Grout shall be placed so that all spaces to be grouted do not contain voids.*~~

~~*Grout materials and water content shall be controlled to provide adequate fluidity for placement without segregation of the constituents, and shall be mixed thoroughly.*~~ *Reinforcement shall be clean, properly positioned and solidly embedded in the grout.*

The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour. At the time of laying, all masonry units shall be free of dust and dirt.

Between grout pours, a horizontal construction joint shall be formed by stopping all wythes at the same elevation and with the grout stopping a minimum of 1 1/2 inches (38 mm) below a mortar joint, except at the top of the wall. Where bond beams occur, the grout pour shall be stopped a minimum of 1/2 inch (12.7 mm) below the top of the masonry.

The construction documents shall completely describe grouting procedures, subject to approval of DSA.

~~*2104A.6.2*~~ ***2104.5.2 Construction requirements****. Reinforcement and embedded items shall be placed and securely anchored against moving prior to grouting. Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.*

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

Grout shall be consolidated by mechanical vibration during placement before loss of plasticity in a manner to fill the grout space. Grout pours greater than 12 inches (300 mm) in height shall be reconsolidated by mechanical vibration to minimize voids due to water loss. Grout not mechanically vibrated shall be puddled.

~~2104A.7~~ 2104.6 Aluminum equipment. [DSA-SS/CC] *Grout shall not be handled nor pumped utilizing aluminum equipment unless it can be demonstrated with the materials and equipment to be used that there will be no deleterious effect on the strength of the grout.*

SECTION ~~2105A~~ 2105
QUALITY ASSURANCE

~~2105A.1~~ 2105.1 General. A quality assurance program shall be used to ensure that the constructed masonry is in compliance with the *construction documents*.

The quality assurance program shall comply with the inspection and testing requirements of Chapter 17*A*.

~~2105A.2~~ 2105.2 Acceptance relative to strength requirements.

~~2105A.2.1~~ 2105.2.1 Compliance with *f ′m*. and f ′AAC. Compressive strength of masonry shall be considered satisfactory if the compressive strength of each masonry wythe and grouted collar joint equals or exceeds the value of f ′m for clay and concrete masonry and f ′AAC for AAC masonry ~~*requirements of Section 2105A.2.2 is satisfied*~~. For partially grouted clay and concrete masonry, the compressive strength of both the grouted and ungrouted masonry shall equal or exceed the applicable f′m. At the time of prestress, the compressive strength of the masonry shall equal or exceed f ′mi, which shall be less than or equal to f ′m.

2105.2.1.1 Specified compressive strength. [DSA-CC/SS] *(Relocated from Section 2105A.2.1, CBC 2007)The specified compressive strength, f ′m, assumed in design shall be not less than 1,500 psi (10.34 MPa) for all masonry construction using materials and details of construction required herein. Testing of the constructed masonry shall be provided in accordance with Section ~~2105A.4~~ 2105.4.*

~~Exception:~~ *~~Subject to the approval of the enforcement agency, higher values of f′m may be used in the design of reinforced grouted masonry and reinforced hollow-unit masonry. The approval shall be based on prism test results submitted by the architect or engineer which demonstrate the ability of the proposed construction to meet prescribed performance criteria for strength and stiffness. The design shall assume that the reinforcement will be placed in a location that will produce the largest stresses within the tolerances allowed in Section 2104A.1.1 and shall take into account the mortar joint depth.~~ In no case shall the f′m assumed in design exceed ~~2,500~~ 3,000 psi (~~17.24~~ 20.68 MPa).*

~~Where an f′m greater than 1,500 psi (10.34 MPa) is approved, the architect or structural engineer shall establish a method of quality control of the masonry construction acceptable to the enforcement agency which shall be described in the contract specifications. Compliance with the requirements for the specified compressive strength of masonry f′m shall be provided in accordance with Sections 2105A.2.2.2, 2105A.4 and 2105A.5. Substantiation for the specified compressive strength prior to the start of construction may be obtained in accordance with Section 2105A.2.2.3.~~

~~2105A.2.2~~ 2105.2.2 Determination of compressive strength. The compressive strength for each wythe shall be determined by the unit strength method or by the prism test method *before construction* as specified herein.

~~2105A.2.2.1~~ 2105.2.2.1 Unit strength method.

~~2105A.2.2.1.1~~ 2105.2.2.1.1 Clay masonry. The compressive strength of masonry shall be determined based on the strength of the units and the type of mortar specified using Table ~~2105A.2.2.1.1~~ 2105.2.2.1.1, provided:

1. Units are sampled and tested to verify conformance with ASTM C 62, ASTM C 216 or ASTM C 652.
2. Thickness of bed joints does not exceed 5/8 inch (15.9 mm).
3. For grouted masonry, the grout meets one of the following requirements:
    3.1. Grout conforms to Article 2.2 of TMS 602/ACI 530.1/ASCE 6.

3.2 Minimum grout compressive strength equals or exceeds f'_m but not less than 2,000 psi (13.79MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.

TABLE ~~2105A.2.2.1.1~~ 2105.2.2.1.1
COMPRESSIVE STRENGTH OF CLAY MASONRY

(Table not shown for Clarity)

~~2105A.2.2.1.2~~ 2105.2.2.1.2 Concrete masonry. The compressive strength of masonry shall be determined based on the strength of the unit and type of mortar specified using Table ~~2105A.2.2.1.2~~ 2105.2.2.1.2, provided:

1. Units are sampled and tested to verify conformance with ASTM C 55 or ASTM C 90.
2. Thickness of bed joints does not exceed 5/8 inch (15.9 mm).
3. For grouted masonry, the grout meets one of the following requirements:
   3.1. Grout conforms to Article 2.2 of TMS 602/ACI 530.1/ASCE 6.
   3.2 Minimum grout compressive strength equals or exceeds f'_m but not less than 2,000 psi (13.79 MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.

TABLE ~~2105A.2.2.1.2~~ 2105.2.2.1.2
COMPRESSIVE STRENGTH OF CONCRETE MASONRY

(Table not shown for Clarity)

~~2105A.2.2.1.3~~ 2105.2.2.1.3 AAC masonry. ~~*Not permitted by DSA-SS.*~~ The compressive strength of AAC masonry shall be based on the strength of the AAC masonry unit only and the following shall be met:

1. Units conform to ASTM C 1386.
2. Thickness of bed joints does not exceed 1/8 inch (3.2 mm).
3. For grouted masonry, the grout meets one of the following requirements:
   3.1. Grout conforms to Article 2.2 of TMS602/ACI 530.1/ASCE 6.
   3.2. Minimum grout compressive strength equals or exceeds f'_{AAC} but not less than 2,000 psi (13.79 MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.

~~2105A.5~~* 2105.2.2.1.4 *Mortar and grout tests. [DSA-SS/CC] ~~*These tests are to establish whether the masonry components meet the specified component strengths.*~~ *At the beginning of all masonry work, at least one test sample of the mortar and grout shall be taken on three successive working days and at least at one-week intervals thereafter. They shall meet the minimum strength requirement given in Sections ~~2103A.8~~ 2103.8 and ~~2103A.12~~ 2103.12 for mortar and grout, respectively. Additional samples shall be taken whenever any change in materials or job conditions occur, or whenever in the judgment of the architect, structural engineer or the enforcement agency such tests are necessary to determine the quality of the material. When the prism test method of Section 2105.2.2.2 is used, the tests in this section are not required.*

Test specimens for mortar and grout shall be made as set forth in ASTM C 1586 and ASTM C 1019

~~2105A.2.2.2~~ 2105.2.2.2 Prism test method.

~~2105A.2.2.2.1~~ 2105.2.2.2.1 General. The compressive strength of clay and concrete masonry shall be determined by the prism test method ~~*prior to the start of construction and during construction*~~:

1. Where specified in the construction documents.

2. Where masonry does not meet the requirements for application of the unit strength method in Section ~~2105A.2.2.1~~ 2105.2.2.1.

~~*3. Where required by Section 2105A.2.1.*~~

~~2105A.2.2.2.2~~ 2105.2.2.2.2 Number of prisms per test. ~~*Prior to the start of construction, a*~~ A prism test shall consist of ~~*five*~~ three prisms constructed and tested in accordance with ASTM C 1314. ~~*A set of three masonry prisms shall be built during construction in accordance with ASTM C 1314 for each 5,000 square feet (465m^2) of wall area, but not less than one set of three prisms for the project. Each set of prisms shall equal or exceed f'_m.*~~

2105.2.2.2.3 Frequency of tests. [DSA-SS/CC] *Prior to the start of construction, ~~five~~ three prisms shall be constructed and tested in accordance with ASTM C 1314. A set of three masonry prisms shall be built during construction in accordance with ASTM C 1314 for each 5,000 square feet (465m^2) of wall area, but not less than one set of three prisms for the project. Each set of prisms shall equal or exceed f'_m.*

~~2105A.3~~ 2105.3 Testing prisms from constructed masonry. When *approved* by the *building official*, acceptance of masonry that does not meet the requirements of Section ~~2105A.2.2.1~~ 2105.2.2.1, or ~~2105A.2.2.2~~ 2105.2.2.2, ~~*2105A.4 or 2105A.5*~~ shall be permitted to be based on tests of prisms cut from the masonry construction in accordance with Sections ~~2105A.3.1~~ 2105.3.1, ~~2105A.3.2~~ 2105.3.2 and ~~2105A.3.3~~ ~~2105.3.3~~.

Exception: [DSA-SS/CC] *Acceptance of masonry that does not meet the requirements of Sections 2105.4 or 2105.5 may be based on prism tests conducted in accordance with this section.*

~~2105A.3.1~~ 2105.3.1 Prism sampling and removal...

~~2105A.3.2~~ 2105.3.2 Compressive strength calculations...

~~2105A.3.3~~ 2105.3.3 Compliance...

~~2105A.4~~ 2105.4 Masonry core testing. [DSA-SS/CC] ~~*This test is to determine the quality of the masonry constructed.*~~ *Not less than two cores ~~having a diameter of 6 inches (152 mm) shall be taken from each project. Two cores~~ shall be taken from each building for each 5,000 square feet (465 m^2) of the greater of the masonry wall area or the floor area or fraction thereof. The architect or structural engineer in responsible charge of the project or his or her representative (inspector) shall select the areas for sampling. Cores shall be a minimum of 3-3/4" in diameter and shall be taken in such a manner as to exclude masonry unit webs and reinforcing steel. The inspector of record or testing agency shall inspect the coring of the masonry walls ~~and shall prepare a report of coring operations for the testing laboratory files and mail one copy to the enforcement agency~~.*

Visual examination of all cores shall be made ~~to ascertain if the joints are fill~~ed and the condition of the cores reported. One half of the number of cores taken shall be tested in shear. The shear ~~wall loadings~~ test shall test both joints between the grout core and the outside wythes or face shells of the masonry. Shear testing apparatus shall be of a design approved by the enforcement agency. Core samples shall not be soaked before testing. ~~Materials and workmanship shall be such that for all masonry when tested in compression, cores shall show an ultimate strength at least equal to the f'_m assumed in design, but not less than 1,500 psi (10.34 MPa). When tested in shear, the~~ The unit shear on the cross section of the core shall not be less than 2.5 $\sqrt{f'_m}$ psi.

All cores shall be submitted to the laboratory for examination~~. Such reports shall include the total number of cores cut, the location, and the condition of all cores cut on each project~~, regardless of whether the core specimens failed during cutting operation. The laboratory shall report the location where each core was taken, the findings of their visual examination of each core, identify which cores were selected for shear testing, and the results of the shear tests.

SECTION ~~2106A~~ 2106
SEISMIC DESIGN

~~2106A.1~~ **2106.1 Seismic design requirements for masonry.** Masonry structures and components shall comply with the requirements in Section 1.17 of TMS 402/ACI 530/ASCE 5 depending on the structure's *seismic design category* as determined in Section ~~1613A~~ 1613.

~~2106A.5.3~~ 2106.1.1 Modification to TMS 402 / ACI 530 / ASCE 5. ~~/ TMS 402.~~ [DSA-SS/CC]

~~2106A.5.3.1~~ 2106.1.1.1 ~~ACI 530/ASCE 5/TMS 402Section 1.4.6.3~~ ~~Replace~~ *Modify TMS 402 / ACI 530 / ASCE 5, Section ~~1.14.6.3~~ 1.17 as follows:*

*~~1.14.6.3~~ **1.- Minimum reinforcement requirements for Masonry Walls.** The total area of reinforcement in reinforced masonry walls shall not be less than 0.003 times the sectional area of the wall. Neither the horizontal nor the vertical reinforcement shall be less than one third of the total. Horizontal and vertical rebars shall be spaced at not more than 24 inches (610 mm) center to center. The minimum reinforcing shall be No. 4, except that No. 3 bars may be used for ties and stirrups. Vertical wall steel shall have dowels of equal size and equal matched spacing in all footings. Reinforcement shall be continuous around wall corners and through intersections. Only reinforcement which is continuous in the wall shall be considered in computing the minimum area of reinforcement. Reinforcement with splices conforming to TMS 402 / ACI 530 / ASCE 5 ~~/ TMS 402 Section 2.1.10.7~~ as modified by Section ~~2107A~~ 2107 shall be considered as continuous reinforcement.*

Horizontal reinforcement shall be provided in the top of footings, at the top of wall openings, at roof and floor levels, and at the top of parapet walls. For walls 12 inches (nominal) (305 mm) or more in thickness, reinforcing shall be equally divided into two layers, except where designed as retaining walls. Where reinforcement is added above the minimum requirements, such additional reinforcement need not be so divided.

In bearing walls of every type of reinforced masonry, there shall not be less than one No. 5 bar or two No. 4 bars on all sides of, and adjacent to, every opening which exceeds 16 inches (406 mm) in either direction, and such bars shall extend not less than 48 diameters, but in no case less than 24 inches (610 mm) beyond the corners of the opening. The bars required by this paragraph shall be in addition to the minimum reinforcement elsewhere required.

When the reinforcement in bearing walls is designed, placed and anchored in position as for columns, the allowable stresses shall be as for columns

Joint reinforcement shall not be used as principal reinforcement in masonry designed by the strength design method.

~~2106A.5.3.2 ACI 530 / ASCE 5 / TMS 402 Section 1.14.6.5.~~ *~~Replace Section 1.14.6.5 as follows:~~*

*~~1.14.6.5~~ **2.- Minimum reinforcement for masonry columns**. The spacing of column ties shall be as follows: not greater than 8 bar diameters, 24 tie diameters, or one half the least dimension of the column for the full column height. Ties shall be at least 3/8" in diameter & shall be embedded in grout. Top tie shall be within 2 inches (51 mm) of the top of the column or of the bottom of the horizontal bar in the supported beam.*

SECTION ~~2107A~~ 2107
ALLOWABLE STRESS DESIGN

2107A.1 2107.1 General. The design of masonry structures using *allowable stress design* shall comply with Section ~~2106A~~ 2106 and the requirements of Chapters 1 and 2 of TMS 402/ACI 530/ASCE 5 except as modified by Sections ~~2107A.2~~ 2107.2 through ~~2107.5~~ *2107.6.*

~~2107A.2~~ 2107.2 TMS 402/ACI 530/ASCE 5, Section 2.1.2, load combinations…

~~2107A.3~~ 2107.3 TMS 402/ACI 530/ASCE 5, Section 2.1.9.7.1.1, lap splices…

~~2107A.4~~ 2107.4 ~~ACI 530/ASCE 5 /TMS 402~~ TMS 402/ACI 530/ASCE 5. *Modify by adding Sections ~~2.1.4.2.3~~ 2.1.4.3.4 and 2.1.4.3.5 as follows: ~~last paragraph as follows:~~*

2.1.4.3.4 - *Edge Distance and Spacing. Where the anchor bolt edge distance, l_{be}, in the direction of load is less than 12 bolt diameters, the value of B_v in Formula ~~(2-5)~~ (2-7) shall be reduced by linear interpolation to zero at an l_{be} distance of 1 1/2 inches (38 mm) and confining reinforcement consisting of not less than No. 3 hairpins, hooks or stirrups for end bolts and between horizontal reinforcing for other bolts shall be provided. Where adjacent anchors are spaced closer than $8d_b$, the allowable shear of the adjacent anchors determined by Formula ~~(2-5)~~ (2-7) shall be reduced by linear interpolation to 0.75 times the allowable shear value at a center-to-center spacing of four bolt diameters.*

~~2107A.5 Modify ACI 530/ASCE 5 / TMS 402 by adding Section 2.1.4.2.5 as follows:~~

~~2.1.4.2.5~~ 2.1.4.3.5 - *Anchor bolts size and materials. Anchor bolts shall be hex headed bolts conforming to ASTM A 307 or F1554 with the dimensions of the hex head conforming to ANSI / ASME B18.2.1 or plain rod conforming to ASTM A 36 with threaded ends and double hex nuts at the anchored end. Bent bar anchor bolts shall not be used.*

The maximum size anchor shall be 1/2-inch (13 mm) diameter for 6-inch (152 mm) nominal masonry, 3/4-inch (19 mm) diameter for 8-inch (203 mm) nominal masonry, 7/8-inch (22 mm) diameter for 10-inch (254 mm) nominal masonry, and 1-inch (25mm) diameter for 12-inch (304.8 mm) nominal masonry.

~~2107A.6~~ 2107.5 ~~ACI 530/ASCE 5 /TMS 402~~ TMS 402/ACI 530/ASCE 5, Section ~~2.1.9.1~~ 2.1.8. *Modify by adding the following:*

Structural members framing into or supported by walls or columns shall be securely anchored. The end support of girders, beams or other concentrated loads on masonry shall have at least 3 inches (76 mm) in length upon solid bearing not less than 4 inches (102 mm) thick or upon metal bearing plate of adequate design and dimensions to distribute the loads safely on the wall or pier, or upon a continuous reinforced masonry member projecting not less than 3 inches (76 mm) from the face of the wall or other approved methods.

Joists shall have bearing at least 3 inches (76 mm) in length upon solid masonry at least 2 1/2 inches (64 mm) thick, or other provisions shall be made to distribute safely the loads on the wall or pier.

~~2107.4~~ 2107.6 *(Chapter 21, Section 2107.5, IBC 2009)* **TMS 402/ACI 530/ASCE 5, Section 2.1.9.7, splices of reinforcement...**

~~2107A.9~~ 2107.7 ~~ACI 530/ASCE 5 /TMS 402~~ TMS 402/ACI 530/ASCE 5 [DSA-SS/CC] *Modify by adding Section ~~2.1.11~~ 2.1.10 as follows:*

~~2.1.11~~ 2.1.10 - Walls and Piers.

Thickness of Walls. *For thickness limitations of walls as specified in this chapter, nominal thickness shall be used. Stresses shall be determined on the basis of the net thickness of the masonry, with consideration for reduction, such as raked joints.*

The thickness of masonry walls shall be designed so that allowable maximum stresses specified in this chapter are not exceeded. Also, no masonry wall shall exceed the height or length-to-thickness ratio or the minimum thickness as specified in this chapter and as set forth in Table ~~2107A.9~~ 2107.5. ~~unless designed in accordance with ACI 530 / ASCE 5 / TMS 402 Section 3.3.5.~~

Piers. *Every pier or wall section which width is less than three times its thickness shall be designed and constructed as required for columns if such pier is a structural member. Every pier or wall section which width is between three and five times its thickness or less than one half the height of adjacent openings shall have all horizontal steel in the form of ties except that in walls 12 inches (305 mm) or less in thickness such steel may be in the form of hair-pins.*

TABLE ~~2107A.9~~ 2107.7 - MINIMUM THICKNESS OF MASONRY WALLS[1, 2] [DSA-SS/CC]

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

[1]For walls of varying thickness, use the least thickness when determining the height or length to thickness ratio.

[2]In determining the height or length-to-thickness ratio of a cantilevered wall, the dimension to be used shall be twice the dimension of the end of the wall from the lateral support.

[3]Cantilevered walls not part of a building and not carrying applied vertical loads need not meet these minimum requirements but their design must comply with stress and overturning requirements.

~~2107A.5~~ 2107.8 **(***Chapter 21, Section 2107.5, IBC 2009)* **TMS402/ACI 530/ASCE 5, Section 2.3.6, maximum bar size.** Add the following to Chapter 2:

2.3.6 Maximum bar size. The bar diameter shall not exceed one-eighth of the nominal wall thickness and shall not exceed one-quarter of the least dimension of the cell, course or collar joint in which it is placed.

SECTION ~~2108A~~ 2108
STRENGTH DESIGN OF MASONRY

~~2108A.1~~ 2108.1 General. The design of masonry structures using strength design shall comply with Section ~~2106A~~ 2106 and the requirements of Chapters 1 and 3 of TMS 402/ACI 530/ASCE 5, except as modified by Sections 2108.2 through ~~2108A.3~~ 2108.3.

Exception: AAC masonry shall comply with the requirements of Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.

~~2108A.3~~ 2108.2 TMS 402/ACI 530/ASCE 5, Section 3.3.3.3 development…

~~2108A.4~~ 2108.3 TMS 402/ACI 530/ASCE 5, Section 3.3.3.4, splices…

SECTION ~~2109A~~ 2109
EMPIRICAL DESIGN OF MASONRY

~~Not permitted by DSA-SS.~~

2109.1 General. Empirically designed masonry shall conform to the requirements of Chapter 5 of TMS 402/ACI 530/ASCE 5, except where otherwise noted in this section.

2109.1.1 Limitations. The use of empirical design of masonry shall be limited as noted in Section 5.1.2 of TMS 402/ACI 530/ASCE 5. The use of dry-stacked, surface bonded masonry shall be prohibited in *Occupancy Category* IV structures. In buildings that exceed one or more of the limitations of Section 5.1.2 of TMS 402/ACI 530/ASCE 5, masonry shall be designed in accordance with the engineered design provisions of Section 2101.2.1, 2101.2.2 or 2101.2.3 or the foundation wall provisions of Section 1807.1.5.

2109.2 Surface-bonded walls. Dry-stacked, surface-bonded concrete masonry walls shall comply with the requirements of Chapter 5 of TMS 402/ACI 530/ASCE 5, except where otherwise noted in this section.

2109.2.1 Strength. Dry-stacked, surface-bonded concrete masonry walls shall be of adequate strength and proportions to support all superimposed loads without exceeding the allowable stresses listed in Table 2109.2.1. Allowable stresses not specified in Table 2109.2.1 shall comply with the requirements of TMS 402/ACI 530/ASCE 5.

TABLE 2109.2.1
ALLOWABLE STRESS GROSS CROSS-SECTIONALAREA FOR DRY-STACKED, SURFACE-BONDED CONCRETE MASONRY WALLS

(Table not shown for clarity)

2109.2.2 Construction. Construction of dry-stacked, surface-bonded masonry walls, including stacking and leveling of units, mixing and application of mortar and curing and protection shall comply with ASTM C 946.

2109.3 Adobe construction. Adobe construction shall comply with this section and shall be subject to the requirements of this code for Type V construction, Chapter 5 of TMS 402/ACI 530/ASCE 5, and this section.

2109.3.1 Unstabilized adobe.

2109.3.1.1 Compressive strength. Adobe units shall have an average compressive strength of 300 psi (2068 kPa) when tested in accordance with ASTM C 67. Five samples shall be tested and no individual unit is permitted to have a compressive strength of less than 250 psi (1724 kPa).

2109.3.1.2 Modulus of rupture. Adobe units shall have an average modulus of rupture of 50 psi (345 kPa) when tested in accordance with the following procedure. Five samples shall be tested and no individual unit shall have a modulus of rupture of less than 35 psi (241 kPa).

2109.3.1.2.1 Support conditions. A cured unit shall be simply supported by 2-inch-diameter (51 mm) cylindrical supports located 2 inches (51 mm) in from each end and extending the full width of the unit.

2109.3.1.2.2 Loading conditions.A2-inch-diameter (51 mm) cylinder shall be placed at midspan parallel
to the supports.

2109.3.1.2.3 Testing procedure. A vertical load shall be applied to the cylinder at the rate of 500 pounds per
minute (37 N/s) until failure occurs.

2109.3.1.2.4 Modulus of rupture determination. The modulus of rupture shall be determined by the equation:

$$f_r = 3PL_s / 2\ S_w\ (S_t\ 2) \qquad \textbf{(Equation 21-2)}$$

where, for the purposes of this section only:

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

f_r = Modulus of rupture, psi (MPa).

L_s = Distance between supports, inches (mm).

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

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

2109.3.1.3 Moisture content requirements. Adobe units shall have a moisture content not exceeding 4 percent by weight.

2109.3.1.4 Shrinkage cracks. Adobe units shall not contain more than three shrinkage cracks and any single shrinkage crack shall not exceed 3 inches (76 mm) in length or 1/8 inch (3.2 mm) in width.

2109.3.2 Stabilized adobe.

2109.3.2.1 Material requirements. Stabilized adobe shall comply with the material requirements of unstabilized adobe in addition to Sections 2109.3.2.1.1 and 2109.3.2.1.2.

2109.3.2.1.1 Soil requirements. Soil used for stabilized adobe units shall be chemically compatible with
the stabilizing material.

2109.3.2.1.2 Absorption requirements. A 4-inch (102 mm) cube, cut from a stabilized adobe unit dried to a constant weight in a ventilated oven at 212°F to 239°F (100°C to 115°C), shall not absorb more than 21/2 percent moisture by weight when placed upon a constantly water-saturated, porous surface for seven days. A minimum of five specimens shall be tested and each specimen shall be cut from a separate unit.

2109.3.3 Allowable stress. The allowable compressive stress based on gross cross-sectional area of adobe shall not exceed 30 psi (207 kPa).

2109.3.3.1 Bolts. Bolt values shall not exceed those set forth in Table 2109.3.3.1.

2109.3.4 Construction.

2109.3.4.1 General.

2109.3.4.1.1 Height restrictions. Adobe construction shall be limited to buildings not exceeding one *story*, except that two-*story* construction is allowed when designed by a *registered design professional*.

2109.3.4.1.2 Mortar restrictions. Mortar for stabilized adobe units shall comply with Chapter 21 or adobe soil. Adobe soil used as mortar shall comply with material requirements for stabilized adobe. Mortar
for unstabilized adobe shall be portland cement mortar.

2109.3.4.1.3 Mortar joints. Adobe units shall be laid with full head and bed joints and in full running bond.

2109.3.4.1.4 Parapet walls. Parapet walls constructed of adobe units shall be waterproofed.

2109.3.4.2 Wall thickness. The minimum thickness of *exterior walls* in one-*story* buildings shall be 10 inches (254 mm). The walls shall be laterally supported at intervals not exceeding 24 feet (7315 mm). The minimum thickness of interior *load-bearing walls* shall be 8 inches (203 mm). In no case shall the unsupported height of any wall constructed of adobe units exceed 10 times the thickness of such wall.

2109.3.4.3 Foundations.

2109.3.4.3.1 Foundation support. Walls and partitions constructed of adobe units shall be supported by foundations or footings that extend not less than 6 inches (152 mm) above adjacent ground surfaces and are constructed of solid masonry (excluding adobe) or concrete. Footings and foundations shall comply with Chapter 18.

2109.3.4.3.2 Lower course requirements. Stabilized adobe units shall be used in adobe walls for the first 4 inches (102 mm) above the finished first-floor elevation.

2109.3.4.4 Isolated piers or columns. Adobe units shall not be used for isolated piers or columns in a load-bearing capacity. Walls less than 24 inches (610 mm) in length shall be considered isolated piers or columns.

2109.3.4.5 Tie beams. *Exterior walls* and interior *load-bearing walls* constructed of adobe units shall have a continuous tie beam at the level of the floor or roof bearing and meeting the following requirements.

2109.3.4.5.1 Concrete tie beams. Concrete tie beams shall be a minimum depth of 6 inches (152 mm) and a minimum width of 10 inches (254 mm). Concrete tie beams shall be continuously reinforced with a minimum of two No. 4 reinforcing bars. The specified compressive strength of concrete shall be at least 2,500 psi (17.2 MPa).

TABLE 2109.3.3.1
ALLOWABLE SHEAR ON BOLTS IN ADOBE MASONRY

(Table not shown for clarity)

2109.3.4.5.2 Wood tie beams. Wood tie beams shall be solid or built up of lumber having a minimum nominal thickness of 1 inch (25 mm), and shall have a minimum depth of 6 inches (152 mm) and a minimum width of 10 inches (254 mm). Joints in wood tie beams shall be spliced a minimum of 6 inches (152 mm). No splices shall be allowed within 12 inches (305 mm) of an opening. Wood used in tie beams shall be *approved* naturally decay-resistant or preservative-treated wood.

2109.3.4.6 Exterior finish. *Exterior walls* constructed of unstabilized adobe units shall have their exterior surface covered with a minimum of two coats of Portland cement plaster having a minimum thickness of 3/4 inch (19.1 mm) and conforming to ASTM C 926. Lathing shall comply with ASTM C 1063. Fasteners shall be spaced at 16 inches (406 mm) o.c. maximum. Exposed wood surfaces shall be treated with an *approved* wood preservative or other protective coating prior to lath application.

2109.3.4.7 Lintels. Lintels shall be considered structural members and shall be designed in accordance with the applicable provisions of Chapter 16.

SECTION ~~2110A~~ 2110
GLASS UNIT MASONRY

~~**2110A.1**~~ **2110.1** ~~***Scope***~~ **General.** Glass unit masonry construction shall comply with Chapter 7 of TMS402/ACI 530/ASCE 5 and this section.

Exception: [DSA-SS/CC] *Masonry of glass blocks* ~~*may be used*~~ *shall be permitted in non-load-bearing exterior or interior walls and shall conform to the requirements of Section* ~~*2115A*~~ *2115. Stresses in glass block shall not be utilized. Glass block may be solid or hollow and may contain inserts.*

2110.1.1 Limitations. Solid or hollow *approved* glass block shall not be used in fire walls, party walls, fire barriers, fire partitions or smoke barriers, or for load-bearing construction. Such blocks shall be erected with mortar and reinforcement in metal channel-type frames, structural frames, masonry or concrete recesses, embedded panel anchors as provided for both exterior and interior walls or other *approved* joint materials. Wood strip framing shall not be used in walls required to have a fire-resistance rating by other provisions of this code.

Exceptions:

1. Glass-block assemblies having a fire protection rating of not less than 3/4 hour shall be permitted as opening protectives in accordance with Section 715 in fire barriers, fire partitions and smoke barriers that have a required fire-resistance rating of 1 hour or less and do not enclose exit stairways, exit ramps or exit passageways.
2. Glass-block assemblies as permitted in Section 404.5, Exception 2.

SECTION ~~2111A~~ 2111
MASONRY FIREPLACES

~~**2111A.1**~~ **2111.1 Definition…**

~~**2111A.2**~~ **2111.2 Footings and foundations…**

~~**2111A.2.1**~~ **2111.2.1 Ash dump cleanout…**

~~**2111A.3**~~ **2111.3 Seismic reinforcing.** Masonry or concrete fireplaces shall be constructed, anchored, supported and reinforced as required in this chapter. In *Seismic Design Category* C or D, masonry and concrete fireplaces shall be reinforced and anchored as detailed in Sections ~~2111A.3.1~~ 2111.3.1, ~~2111A.3.2~~ 2111.3.2, ~~2111A.4~~ 2111.4 and ~~2111A.4.1~~ 2111.4.1 for chimneys serving fireplaces. In *Seismic Design Category* A or B, reinforcement and seismic anchorage is not required. In *Seismic Design Category* E or F, masonry and concrete chimneys shall be reinforced in accordance with the requirements of Sections ~~2101A~~ 2101 through ~~2108A~~ 2108.

~~**2111A.3.1**~~ **2111.3.1 Vertical reinforcing.** For fireplaces with chimneys up to 40 inches (1016 mm) wide, four No. 4 continuous vertical bars, anchored in the foundation, shall be placed in the concrete between wythes of solid

masonry or within the cells of hollow unit masonry and grouted in accordance with Section ~~2103A.12~~ 2103.12. For fireplaces with chimneys greater than 40 inches (1016 mm) wide, two additional No. 4 vertical bars shall be provided for each additional 40 inches (1016 mm) in width or fraction thereof.

~~2111A.3.2~~ 2111.3.2 Horizontal reinforcing. . . .

~~2111A.4~~ 2111.4 Seismic anchorages. . . .

~~2111A.4.1~~ 2111.4.1 Anchorage. . . .

~~2111A.5~~ 2111.5 Firebox walls. . . .

~~2111A.5.1~~ 2111.5.1 Steel fireplace units. . . .

~~2111A.6~~ 2111.6 Firebox dimensions. . . .

~~2111A.7~~ 2111.7 Lintel and throat. . . .

~~2111A.7.1~~ 2111.7.1 Damper. . . .

~~2111A.8~~ 2111.8 Smoke chamber walls. . . .

~~2111A.8.1~~ 2111.8.1 Smoke chamber dimensions. . . .

~~2111A.9~~ 2111.9 Hearth and hearth extension. . . .

~~2111A.9.1~~ 2111.9.1 Hearth thickness. . . .

~~2111A.9.2~~ 2111.9.2 Hearth extension thickness. . . .

~~2111A.10~~ 2111.10 Hearth extension dimensions. . . .

~~2111A.11~~ 2111.11 Fireplace clearance. . . .

~~2111A.12~~ 2111.12 Fireplace fireblocking. . . .

~~2111A.13~~ 2111.13 Exterior air. . . .

~~2111A.13.1~~ 2111.13.1 Factory-built fireplaces. . . .

~~2111A.13.2~~ 2111.13.2 Masonry fireplaces. . . .

~~2111A.13.3~~ 2111.13.3 Exterior air intake. . . .

~~2111A.13.4~~ 2111.13.4 Clearance. . . .

~~2111A.13.5~~ 2111.13.5 Passageway. . . .

~~2111A.13.6~~ 2111.13.6 Outlet. . . .

SECTION ~~2112A~~ 2112
MASONRY HEATERS

~~2112A.1~~ 2112.1 Definition. . . .

~~2112A.2~~ 2112.2 Installation. . . .

~~2112A.3~~ 2112.3 Footings and foundation. The firebox floor of a masonry heater shall be a minimum thickness of 4 inches (102 mm) of noncombustible material and be supported on a noncombustible footing and foundation in accordance with Section ~~2113A.2~~ 2113.2.

~~2112A.4~~ 2112.4 Seismic reinforcing. In *Seismic Design Category* D, E and F, masonry heaters shall be anchored to the masonry foundation in accordance with Section ~~2113A.3~~ 2113.3. Seismic reinforcing shall not be required within

the body of a masonry heater with a height that is equal to or less than 3.5 times its body width and where the masonry chimney serving the heater is not supported by the body of the heater. Where the masonry chimney shares a common wall with the facing of the masonry heater, the chimney portion of the structure shall be reinforced in accordance with Section ~~2113A~~ 2113.

FIGURE ~~2111A.11~~ 2111.11
ILLUSTRATION OF EXCEPTION TO FIREPLACE CLEARANCE PROVISION

(Figure not shown for Clarity)

~~2112A.~~5 2112.5 Masonry heater clearance. . . .

SECTION ~~2112A~~ 2112
MASONRY HEATERS

. . . .

SECTION ~~2113A~~ 2113
MASONRY CHIMNEYS

~~2113A.1~~ 2113.1 Definition. . . .

~~2113A.2~~ 2113.2 Footings and foundations. . . .

~~2113A.3~~ 2113.3 Seismic reinforcing. Masonry or concrete chimneys shall be constructed, anchored, supported and reinforced as required in this chapter. In *Seismic Design Category* C or D, masonry and concrete chimneys shall be reinforced and anchored as detailed in Sections ~~2113A.3.1~~ 2113.3.1, ~~2113A.3.2~~ 2113.3.2 and ~~2113A.4~~ 2113.4. In *Seismic Design Category* A or B, reinforcement and seismic anchorage is not required. In *Seismic Design Category* E or F, masonry and concrete chimneys shall be reinforced in accordance with the requirements of Sections ~~2101A~~ 2101 through ~~2108A~~ 2108.

~~2113A.3.1~~ 2113.3.1 Vertical reinforcing. . . .

~~2113A.3.2~~ 2113.3.2 Horizontal reinforcing. . . .

~~2113A.4~~ 2113.4 Seismic anchorage. . . .

~~2113A.4.1~~ 2113.4.1 Anchorage. . . .

~~2113A.5~~ 2113.5 Corbeling. ~~*Corbeling for masonry chimney shall be as required per Section 2104A.4.2.*~~ Masonry chimneys shall not be corbelled more than half of the chimney's wall thickness from a wall or foundation, nor shall a chimney be corbeled from a wall or foundation that is less than 12 inches (305 mm) in thickness unless it projects equally on each side of the wall, except that on the second *story* of a two-story *dwelling*, corbeling of chimneys on the exterior of the enclosing walls is permitted to equal the wall thickness. The projection of a single course shall not exceed one-half the unit height or one-third of the unit bed depth, whichever is less.

~~2113A.6~~ 2113.6 Changes in dimension. . . .

~~2113A.7~~ 2113.7 Offsets. Where a masonry chimney is constructed with a fireclay flue liner surrounded by one wythe of masonry, the maximum offset shall be such that the centerline of the flue above the offset does not extend beyond the center of the chimney wall below the offset. Where the chimney offset is supported by masonry below the offset in an *approved* manner, the maximum offset limitations shall not apply. Each individual corbeled masonry course of the offset shall not exceed the projection limitations specified in Section 2113.5.

~~2113A.8~~ 2113.8 Additional load. . . .

~~2113A.9~~ 2113.9 Termination. . . .

***~~2113A.9.1 Spark arrestors.~~* 2113.9.1 Spark arrestors.** *(2007 CBC, CA amendment incorporated into 2009 IBC)*

~~2113A.10~~ 2113.10 Wall thickness. . . .

~~2113A.10.1~~ 2113.10.1 Masonry veneer chimneys. . . .

~~2113A.11~~ 2113.11 Flue lining (material) . . . .

~~2113A.11.1~~ 2113.11.1 Residential-type appliances (general. . . .

~~2113A.11.1.1~~ 2113.11.1.1 Flue lin~~i~~ngs for specific appliances. Flue linings other than those covered in Section ~~2113A.11.1~~ 2113.11.1 intended for use with specific appliances shall comply with Sections ~~2113A.11.1.2~~ 2113.11.1.2 through ~~2113A.11.1.4~~ 2113.11.1.4 and Sections ~~2113A.11.2~~ 2113.11.2 and ~~2113A.11.3~~ 2113.11.3.

~~2113A.11.1.2~~ 2113.11.1.2 Gas appliances. . . .

~~2113A.11.1.3~~ 2113.11.1.3 Pellet fuel-burning appliances. Flue lining and vent systems for use in masonry chimneys with pellet fuel-burning appliances shall be limited to flue lining systems complying with Section ~~2113A.11.1~~ 2113.11.1 and pellet vents *listed* for installation within masonry chimneys (see Section ~~2113A.11.1.5~~ 2113.11.1.5 for marking).

~~2113A.11.1.4~~ 2113.11.1.4 Oil-fired appliances approved for use with L-vent. Flue lining and vent systems for use in masonry chimneys with oil-fired appliances *approved* for use with Type L vent shall be limited to flue lining systems complying with Section ~~2113A.11.1~~ 2113.11.1 and *listed* chimney liners complying with UL 641 (see Section ~~2113A.11.1.5~~ 2113.11.1.5 for marking).

~~2113A.11.1.5~~ 2113.11.1.5 Notice of usage. When a flue is relined with a material not complying with Section ~~2113A.11.1~~ 2113.11.1, the chimney shall be plainly and permanently identified by a *label* attached to a wall, ceiling or other conspicuous location adjacent to where the connector enters the chimney. The *label* shall include the following message or equivalent language: “This chimney is for use only with (type or category of appliance) that burns (type of fuel). Do not connect other types of appliances.”

~~2113A.11.2~~ 2113.11.2 Concrete and masonry chimneys for medium heat appliances. . . .

~~2113A.11.2.1~~ 2113.11.2.1 General. Concrete and masonry chimneys for medium-heat appliances shall comply with Sections ~~2113A.~~1 2113.1 through ~~2113A.5~~ 2113.5.

~~2113A.11.2.2~~ 2113.11.2.2 Construction. . . .

~~2113A.11.2.3~~ 2113.11.2.3 Lining. . . .

~~2113A.11.2.4~~ 2113.11.2.4 Multiple passageway. . . .

~~2113A.11.2.5~~ 2113.11.2.5 Termination height. . . .

~~2113A.11.2.6~~ 2113.11.2.6 Clearance. . . .

~~2113A.11.3~~ 2113.11.3 Concrete and masonry chimneys for high-heat appliances. . . .

~~2113A.11.3.1~~ 2113.11.3.1 General. Concrete and masonry chimneys for high-heat appliances shall comply with Sections ~~2113A.1~~ 2113.1 through ~~2113A.5~~ 2113.5

~~2113A.11.3.2~~ 2113.11.3.2 Construction. . . .

~~2113A.11.3.3~~ 2113.11.3.3 Lining. . . .

~~2113A.11.3.4~~ 2113.11.3.4 Termination height. . . .

~~2113A.11.3.5~~ 2113.11.3.5 Clearance. . . .

~~2113A.12~~ 2113.12 Clay flue lining (installation) . . . .

~~2113A.13~~ 2113.13 Additional requirements. . . .

~~2113A.13.1~~ 2113.13.1 **Listed materials. . . .**

~~2113A.13.2~~ 2113.13.2 **Space around lining. . . .**

~~2113A.14~~ 2113.14 **Multiple flues. . . .**

~~2113A.15~~ 2113.15 **Flue area (appliance) . . . .**

~~2113A.16~~ 2113.16 **Flue area (masonry fireplace).** Flue sizing for chimneys serving fireplaces shall be in accordance with Section ~~2113A.16.1~~ 2113.16.1 or ~~2113A.16.2~~ 2113.16.2.

~~2113A.16.1~~ 2113.16.1 **Minimum area. . . .**

~~2113A.16.2~~ 2113.16.2 **Determination of minimum area.** The minimum net cross-sectional area of the flue shall be determined in accordance with Figure ~~2113A.16~~. 2113.16. A flue size providing at least the equivalent net cross-sectional area shall be used. Cross-sectional areas of clay flue linings are as provided in Tables ~~2113A.16 (1)~~ 2113.16(1) and ~~2113A.16(2)~~ 2113.16(2) or as provided by the manufacturer or as measured in the field. The height of the chimney shall be measured from the firebox floor to the top of the chimney flue.

TABLE ~~2113A.16(1)~~ 2113.16(1)
NET CROSS-SECTIONAL AREA OF ROUND FLUE SIZES [a]

(Table not shown for Clarity)

TABLE ~~2113A.16(2)~~ 2113.16(2)
NET CROSS-SECTIONAL AREA OF SQUARE AND RECTANGULAR FLUE SIZES

(Table not shown for Clarity)

~~2113A.17~~ 2113.17 **Inlet. . . .**

~~2113A.18~~ 2113.18 **Masonry chimney cleanout openings. . . .**

~~2113A.19~~ 2113.19 **Chimney clearances.** Any portion of a masonry chimney located in the interior of the building or within the *exterior wall* of the building shall have a minimum airspace clearance to combustibles of 2 inches (51 mm). Chimneys located entirely outside the *exterior walls* of the building, including chimneys that pass through the soffit or cornice, shall have a minimum airspace clearance of 1 inch (25 mm). The airspace shall not be filled, except to provide fireblocking in accordance with Section ~~2113A.20~~ 2113.20.

Exceptions:

1. Masonry chimneys equipped with a chimney lining system *listed* and labeled for use in chimneys in contact with combustibles in accordance with UL 1777, and installed in accordance with the manufacturer's instructions, are permitted to have combustible material in contact with their exterior surfaces.
2. Where masonry chimneys are constructed as part of masonry or concrete walls, combustible materials shall not be in contact with the masonry or concrete wall less than 12 inches (305 mm) from the inside surface of the nearest flue lining.
3. Exposed combustible *trim* and the edges of sheathing materials, such as wood siding, are permitted to abut the masonry chimney sidewalls, in accordance with Figure ~~2113A.19~~ 2113.19, provided such combustible *trim* or sheathing is a minimum of 12 inches (305 mm) from the inside surface of the nearest flue lining. Combustible material and *trim* shall not overlap the corners of the chimney by more than 1 inch (25 mm).

~~2113A.20~~ 2113.20 **Chimney fireblocking. . . .**

FIGURE ~~2113A.19~~ 2113.19
ILLUSTRATION OF EXCEPTION THREE CHIMNEY CLEARANCE PROVISION

(Table not shown for Clarity)

SECTION ~~2114A~~ 2114
NONBEARING WALLS [DSA-SS/CC]

~~2114A.1~~ 2114.1 General. *All nonbearing masonry walls shall be reinforced as specified in Section ~~2106A.5.3.1.~~ 2106.1.1. Fences and interior nonbearing nonshear walls may be of hollow-unit masonry construction grouted in cells containing vertical and horizontal reinforcement. Nonbearing walls may be used to carry a superimposed load of not more than 200 pounds per linear foot (2.92 kN/m).*

1. ***Thickness.*** *Every nonbearing masonry wall shall be so constructed and have a sufficient thickness to withstand all vertical loads and horizontal loads, but in no case shall the thickness of such walls be less than the values set forth in Table ~~2107A.9~~. 2107.5.*

   Plaster shall not be considered as contributing to the thickness of a wall in computing the height-to-thickness ratio.

2. ***Anchorage.*** *All nonbearing walls shall be anchored as required by Section ~~1604A~~ 1604.8.2 and ASCE 7 Chapter 13. Suspended ceilings or other nonstructural elements shall not be used to provide anchorage for masonry walls.*

SECTION ~~2115A~~ 2115
MASONRY SCREEN WALLS [DSA-SS/CC]

~~2115A.1~~ 2115.1 General. *Masonry units may be used in nonbearing decorative screen walls. Units may be laid up in panels with units on edge with the open pattern of the unit exposed in the completed wall.*

1. ***Horizontal Forces.*** *The panels shall be capable of spanning between supports to resist the horizontal forces specified in Chapter 16A. Wind loads shall be based on gross projected area of the block.*

2. ***Mortar Joints.*** *Horizontal and vertical joints shall not be less than 1/4 inch (6 mm) thick. All joints shall be completely filled with mortar and shall be "shoved joint" work. The units of a panel shall be so arranged that either the horizontal or the vertical joint containing reinforcing is continuous without offset. This continuous joint shall be reinforced with a minimum of 0.03 square inch (19 mm^2) of reinforcing steel. Reinforcement may be embedded in mortar.*

3. ***Reinforcing.*** *Joint reinforcing may be composed of two wires made with welded ladder or trussed wire cross ties. In calculating the resisting capacity of the system, compression and tension in the spaced wires may be utilized. Ladder wire reinforcing shall not be spliced and shall be the widest that the mortar joint will accommodate, allowing 1/2 inch (13 mm) of mortar cover.*

4. ***Size of Panels.*** *The maximum size of panels shall be 144 square feet (13.4 m^2), with the maximum dimension in either direction of 15 feet (4572 mm).*

5. ***Panel Support.*** *Each panel shall be supported on all edges by a structural member of concrete, masonry or steel. Supports at the top and ends of the panel shall be by means of confinement of the masonry by at least 1/2 inch (13 mm) into and between the flanges of a steel channel. The space between the end of the panel and the web of the channel shall be filled with resilient material. The use of equivalent configuration in other steel section or in masonry or concrete is acceptable.*

Notation for [DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 21*A*
MASONRY

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter			
Adopt entire chapter as amended	**X**	**-**	
Adopt only those sections listed below			

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 2103A – MASONRY CONSTRUCTION MATERIALS – repeal amendments in following subsections:

~~***2103A.14.4 Colors.*** *Only pure mineral oxide, carbon black or synthetic colors may be used. Carbon black shall be limited to a maximum of 3 percent of the weight of the cement.*~~

2007 CBC SECTION 2105A – QUALITY ASSURANCE – repeal amendments in following subsections:

~~***2105A.2.2.3 Masonry Prism test record.*** *Compressive design strength verification by masonry prism test records shall meet the following:*~~

~~*1. A masonry prism test record approved by the enforcement agency of at least 30 masonry prisms which were built and tested in accordance with ASTM C 1314. Prisms shall have been constructed under the observation of an engineer or special inspector or an approved agency and shall have been tested by an approved agency.*~~

~~*2. Masonry prisms shall be representative of the corresponding construction.*~~

~~*3. The average compressive strength of the test record shall equal or exceed 1.33 f'_m.*~~

~~***2105A.6 Combination of Units.*** *In walls or other structural members composed of different kinds or grades of units or materials, a full-scale test panel shall be constructed before the beginning of masonry work. The test panel will be cored and tested as approved by the enforcement agency to determine the compatibility of the materials (including bond strength between the materials). If the materials are not compatible, they will be rejected. The net thickness of any facing unit which is used to resist stress shall not be less than 1-1/2 inches (38 mm).*~~

~~***2107A.1.1 Design assumptions****. The allowable stress design procedure is based on working stresses and linear stress-strain distribution assumptions with all stresses in the elastic range as follows:*~~

~~*1. Plane sections before bending remain plane after bending.*~~

~~*2. Stress is proportional to strain.*~~

~~*3. Masonry elements combine to form a homogenous member.*~~

~~*4. Tensile forces are resisted only by the tensile reinforcement.*~~

~~*5. Reinforcement is completely surrounded by and bonded to the masonry materials so that they work together as a homogeneous material within the range of working stresses.*~~

~~***2107A.10*** ***Add to ACI 530 / ASCE 5 / TMS 402 Section 2.2 as follows:***~~

~~*2.2 **Unreinforced masonry.** Not permitted by DSA-SS.*~~

~~***2107A.12*** **ACI 530/ASCE 5/TMS 402, Section 2.3.7, maximum reinforcement percentage.** Add the following text to Chapter 2:~~

~~**2.3.7 Maximum reinforcement percentage.** *All reinforced masonry components that* are subjected to in-plane forces shall have a maximum reinforcement ratio, ρ_{max}, not greater than that computed as follows:~~

$$\rho_{max} = \frac{nf'_m}{2f_y\left(n + \frac{f_y}{f'_m}\right)}$$

~~**(Equation 21A-3)**~~

~~***2108A.2 Add to ACI 530 / ASCE 5 / TMS 402 Section 3.2 as follows:***~~

~~*3.2* ***Unreinforced (plane) masonry*** *- Not permitted by OSHPD and DSA-SS.*~~

~~***2113A.9.1 Spark arrestors****. All chimneys attached to any appliance or fireplace that burns solid fuel shall be equipped with an approved spark arrester. The spark arrestor shall meet all of the following requirements:*~~

~~*1. The net free area of the spark arrestor shall not be less than four times the net free area of the outlet of the chimney.*~~

~~*2. The spark arrester screen shall have heat and corrosion resistance equivalent to 12-gage wire, 19-gage galvanized wire or 24-gage stainless steel.*~~

~~*3. Openings shall not permit the passage of spheres having a diameter larger than ½ inch (12.7 mm) and shall not block the passage of spheres having a diameter of less than 3/8 inch (9.5 mm).*~~

~~*4. The spark arrestor shall be accessible for cleaning and the screen or chimney cap shall be removable to allow for cleaning of the chimney flue.*~~

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

EXPRESS TERMS

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. *Applications listed in Section ~~109.2~~ 1.9.2.1 regulated by the Division of the State Architect—Structural Safety (DSA-SS). These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*

2. *[Reserved for OSHPD]*

2101A.1.2 Amendments in this chapter. *DSA-SS adopts 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 ~~109.2~~ 1.9.2.1.*

2. *[Reserved for OSHPD]*

2101A.1.3 Prohibition: [DSA-SS] *The following design, systems, and materials are not permitted by DSA:*

1. *Unreinforced Masonry.*
2. *Autoclaved Aerated Concrete (AAC) Masonry.*
3. *Empirical Design of Masonry.*
4. *Adobe Construction*
5. *Ordinary Reinforced Masonry Shear Walls.*
6. *Intermediate Reinforced Masonry Shear Walls.*
7. *Prestressed Masonry Shear Walls*.

2101*A*.2 Design methods. Masonry shall comply with the provisions of one of the following design methods in this chapter as well as the requirements of Sections 2101*A* through 2104*A*. Masonry designed by the allowable stress design provisions of Section 2101*A*.2.1, the strength design provisions of Section 2101*A*.2.2 or the prestressed masonry provisions of Section 2101*A*.2.3 shall comply with Section 2105*A*.

2101*A*.2.1 Allowable stress design. Masonry designed by the *allowable stress design* method shall comply with the provisions of Sections 2106*A* and 2107*A*.

2101*A*.2.2 Strength design. Masonry designed by the strength design method shall comply with the provisions of Sections 2106*A* and 2108*A*. ~~, except that autoclaved aerated concrete (AAC) masonry shall comply with the provisions of Section 2106, Section 1613.6.4 and Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.~~

2101*A*.2.3 Prestressed masonry. *Not permitted by DSA-SS.* ~~Prestressed masonry shall be designed in accordance with Chapters 1 and 4 of TMS 402/ACI 530/ASCE 5 and Section 2106. *Special inspection* during construction shall be provided as set forth in Section 1704.5.~~

2101*A*.2.4 Empirical design. *Not permitted by DSA-SS*. ~~Masonry designed by the empirical design method shall comply with the provisions of Sections 2106 and 2109 or Chapter 5 of TMS 402/ACI 530/ASCE 5.~~

2101*A*.2.5 Glass unit masonry. Glass unit masonry shall comply with the provisions of Section 2110*A*. ~~or Chapter 7 of TMS 402/ACI 530/ASCE 5.~~

. . . .

SECTION 2102*A*
DEFINITIONS AND NOTATIONS

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. . . .

SECTION 2103*A*
MASONRY CONSTRUCTION MATERIALS

2103*A*.1 Concrete masonry units. Concrete masonry units shall conform to the following standards: ASTM C 55 for concrete brick; ASTM C 73 for calcium silicate face brick; ASTM C 90 for load-bearing concrete masonry units or ASTM C 744 for prefaced concrete and calcium silicate masonry units.

. . . .

2103*A*.3 AAC masonry. *Not permitted by DSA-SS* ~~AAC masonry units shall conform to ASTM C 1386 for the strength class specified.~~

. . . .

2103*A*.8 Mortar. Mortar for use in masonry construction shall conform to ASTM C 270 *Type S or M,* ~~and Articles 2.1 and 2.6 A of TMS 602/ACI 530.1/ASCE 6,~~ except for mortars listed in Sections 2103*A*.9, *and* 2103*A*.10. ~~and 2103.11.~~ Type S ~~or N~~ mortar conforming to ASTM C 270 shall be used for glass unit masonry.

~~*Lime shall be the last material added to the mixer. Materials for mortar and grout shall be measured in suitable calibrated devices. Shovel measurements will not be accepted. Aggregates for mortar shall conform to the provisions set forth in ASTM C 144, Aggregates for Masonry Mortar.*~~

. . . .

2103*A*.11 Mortar for AAC masonry. *Not permitted by DSA-SS* ~~Thin-bed mortar for AAC masonry shall comply with Article 2.1 C.1 of TMS 602/ACI 530.1/ASCE 6. Mortar used for the leveling courses of AAC masonry shall comply with Article 2.1 C.2 of TMS 602/ACI 530.1/ASCE 6.~~

2103*A*.12 Grout. Grout shall comply with Article 2.2 of TMS 602/ACI 530.1/ASCE 6.

2103A.12.1 Water. *Water content shall be adjusted to provide proper workability and to enable proper placement under existing field conditions, without segregation.* ~~*The water content expressed on a saturated surface-dry basis shall not exceed 0.7 times the weight (mass) of cement.*~~

2103A.12.2 Selecting Proportions. *Proportions of ingredients and any additives shall be based on laboratory or field experience with the grout ingredients and the masonry units to be used. For coarse grout, the coarse and fine aggregates shall be combined such that the fine aggregate part is not greater than 80 percent of the total aggregate weight (mass)* ~~*and at least 90 percent shall pass the 1/2 inch (12.7 mm) sieve*~~*. Coarse grout proportioned by weight shall contain not less than 564 pounds of cementitious material per cubic yard (335 kg / m^3).*

2103A.12.3 Aggregate. ~~*Aggregate for grout shall conform to the requirements set forth in ASTM C 404, Aggregates for Grout.*~~ *Coarse grout shall be used in grout spaces 2 inches (51 mm) or more in width and in all filled-cell masonry construction.*

2103*A*.13 Metal reinforcement and accessories. Metal reinforcement and accessories shall conform to Article 2.4 of TMS 602/ACI 530.1/ASCE 6. Where unidentified reinforcement is *approved* for use, not less than three tension and three bending tests shall be made on representative specimens of the reinforcement from each shipment and grade of reinforcing steel proposed for use in the work.

2103A.14 Additives and Admixtures.

2103A.14.1 General. *Additives and admixtures to mortar or grout shall not be used unless approved by the enforcement agency.*

2103A.14.2 Antifreeze compounds*. Antifreeze liquids, chloride salts or other such substances shall not be used in mortar or grout.*

2103A.14.3 Air entrainment. *Air-entraining substances shall not be used in mortar or grout unless tests are conducted to determine compliance with the requirements of this code.*

SECTION 2104*A*
CONSTRUCTION

2104*A*.1 Masonry construction. Masonry construction shall comply with the requirements of Sections 2104*A*.1.1 through 2104*A*.4 and with TMS 602/ACI 530.1/ASCE 6.

2104*A*.1.1 Tolerances. Masonry, except masonry veneer, shall be constructed within the tolerances specified in TMS 602/ACI 530.1/ASCE 6.

Exception: *The maximum thickness of the initial bed joint in fully grouted masonry walls shall not exceed 1-1/4 in. (31.7 mm).*

2104*A*.1.2 Placing mortar and units. Placement of mortar, grout, and clay, concrete, *and* glass, ~~and AAC~~ masonry units shall comply with TMS 602/ACI 530.1/ASCE 6. *(Relocated from Section 2104A.1.2.4, CBC 2007)* *All mortar for glass unit masonry contact surfaces shall be treated to ensure adhesion between mortar and glass.*

2104*A*.1.3 Installation of wall ties. Wall ties shall be installed in accordance with TMS 602/ACI 530.1/ASCE 6.

2104*A*.1.4 Chases and recesses. . . .

2104*A*.1.5 Lintels. The design for lintels shall be in accordance with the masonry design provisions of either Section 2107*A* or 2108*A*.

2104*A*.1.6 Support on wood. Masonry shall not be supported on wood girders or other forms of wood construction except as permitted in Section 2304*A*.12.

~~2104A.1.2.7~~ 2104A1.7 Grouted masonry. *Grouted masonry shall be per Section ~~2104A.6~~ 2104A.5.*

~~2104A.2~~ 2104*A*.2 Corbeled Masonry Delete section and CA amendments in CBC 2007, and adopt 2104A.2 (2009 IBC) without amendment.

2104*A*.2 Corbeled masonry. Corbeled masonry shall comply with the requirements of Section 1.12 of TMS 402/ACI 530/ASCE 5.

2104*A*.2.1 Molded cornices. . . .

2104*A*.3 Cold weather construction. The cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6, Article 1.8 C, shall be implemented when the ambient temperature falls below 40°F (4°C).

2104*A*.4 Hot weather construction. The hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6, Article 1.8 D, shall be implemented when the ambient air temperature exceeds 100°F (37.8°C), or 90°F (32.2°C) with a wind velocity greater than 8 mph (12.9 km/hr).

~~2104A.6~~ 2104A.5 Grouted Masonry.

~~2104A.6.1~~ 2104A.5.1 General conditions. . . .

~~2104A.6.1.1~~ 2104A.5.1.1 Reinforced grouted masonry.

~~2104A.6.1.1.1~~ 2104A.5.1.1.1 General. *Reinforced grouted masonry is that form of construction made with clay or shale brick or made with solid concrete building brick in which interior joints of masonry are filled by pouring grout around reinforcing therein as the work progresses.*

At the time of laying, all masonry units shall be free of dust and dirt.

~~NOTES:~~

~~1. For rate of absorption, see Section 2104A.5. All units in a masonry assembly shall have a compatible absorption rate.~~

~~2. For mortar, see Section 2103A.8.~~

~~3. See Section 2105A.2 for assumed masonry strength.~~

~~2104A.6.1.1.2~~ 2104A.5.1.1.2 Low-lift grouted construction*. Requirements for construction shall be as follows:*

1. *All units in the two outer wythes shall be laid with full-shoved head joint and bed mortar joints. Masonry headers shall not project into the grout space.*

2. *The minimum grout space for low-lift grout masonry shall be 2 1/2 inches (64 mm). Floaters shall be used where the grout space exceeds 5 inches (127 mm) in width. The thickness of grout between masonry units and floaters shall be a minimum of 1 inch (25 mm). Floaters shall be*

worked into fresh puddled grout using a vibrating motion until half of the floater is embedded in the grout. All reinforcing and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and reinforcing shall be a minimum of one bar diameter.

3. *One tier of a grouted reinforced masonry wall may be carried up 12 inches (305 mm) before grouting, but the other tier shall be laid up and grouted in lifts not to exceed one masonry unit in height. All grout shall be puddled with a mechanical vibrator or wood stick immediately after placing so as to completely fill all voids and to consolidate the grout. All vertical and horizontal steel shall be held firmly in place by a frame or suitable devices.*

4. *If the work is stopped for one hour or more, the horizontal construction joints shall be formed by stopping all wythes at the same elevation, and with the grout 1/2 inch (13 mm) below the top.*

5. *Toothing of masonry walls is prohibited. Racking is to be held to a minimum.*

6. *~~The wythes shall be bonded together with wall ties in accordance with Section 2104A.6.1.1.3, Item 2.~~*

***~~2104A.6.1.1.3~~ 2104A.5.1.1.3 High-lift grouted construction**. Where high-lift grouting is used, the method shall be subject to the approval of the enforcement agency. Requirements for construction shall be as follows:*

1. *All units in the two wythes shall be laid with full head and bed mortar joints.*

2. *The two wythes shall be bonded together with wall ties. Ties shall not be less than No. 9 wire in the form of rectangles 4 inches (102 mm) wide and 2 inches (51 mm) in length less than the overall wall thickness. Kinks, water drips, or deformations shall not be permitted in the ties. One tier of the wall shall be built up not more than 16 inches (406 mm) ahead of the other tier. Ties shall be laid not to exceed 24 inches (610 mm) on center horizontally and 16 inches (406 mm) on center vertically for running bond, and not more than 24 inches (610 mm) on center horizontally and 12 inches (305 mm) on center vertically for stack bond.*

3. *Cleanouts shall be provided for each pour by leaving out every other unit in the bottom tier of the section being poured or by cleanout openings in the foundation. The foundation or other horizontal construction joints shall be cleaned of all loose material and mortar droppings before each pour. The cleanouts shall be sealed before grouting, after inspection.*

4. *The grout space in high-lift grouted masonry shall be a minimum of 3 1/2 inches (89 mm). All reinforcing and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and reinforcing shall be a minimum of one bar diameter.*

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

6. *An approved admixture of a type that reduces early water loss and produces an expansive action shall be used in high-lift grout.*

7. *Grouting shall be done in a continuous pour in lifts not exceeding 4 feet (1219 mm).Grout shall be consolidated by mechanical vibration only, and shall be reconsolidated after excess moisture has been absorbed, but before plasticity is lost. The grouting of any section of a wall between control barriers shall be completed in one day, with no interruptions greater than one hour.*

   ~~NOTE: For special inspection requirements, Chapter 17A and for testing see Section 2105A.4.~~

8. ***~~Stresses.~~** ~~All reinforced grouted masonry shall be so constructed that the unit stresses do not exceed those set forth in Sections 2107A or 2108A.~~*

~~2104A.6.1.2~~ 2104A.5.1.2 Reinforced hollow-unit masonry.

***~~2104A.6.1.2.1~~ 2104A.5.1.2.1 General.** Reinforced hollow-unit masonry is that type of construction made with hollow-masonry units in which cells are continuously filled with grout, and in which*

reinforcement is embedded. All cells shall be solidly filled with grout in reinforced hollow-unit masonry, except as provided in Section 2114A.1. Construction shall be one of the two following methods: The low-lift method where the maximum height of construction laid before grouting is 4 feet (1220 mm), or the high-lift method where the full height of construction between horizontal cold joints is grouted in one operation. General requirements for construction shall be as follows:

1. *All reinforced hollow-unit masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled. All head joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.*
2. *Mortar shall be as specified in Section 2103A.*
3. *Walls and cross webs forming such cells to be filled shall be full bedded in mortar to prevent leakage of grout.*
4. *Bond shall be provided by lapping units in successive vertical courses. Where stack bond is used in reinforced hollow-unit masonry, the open-end type of unit shall be used with vertical reinforcement spaced a maximum of 16 inches (406 mm) on center.*
5. *Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear unobstructed, continuous vertical cell measuring not less than 2 inches by 3 inches (51 mm by 76 mm), except the minimum cell dimension for high-lift grout shall be 3 inches (76 mm).*
6. *At the time of laying, all masonry units shall be free of dust and dirt.*
7. *Grout shall be a workable mix suitable for placing without segregation and shall be thoroughly mixed. Grout shall be placed by pumping or an approved alternate method and shall be placed before initial set or hardening occurs. Grout shall be consolidated by mechanical vibration during placing and reconsolidated after excess moisture has been absorbed, but before workability is lost. The grouting of any section of a wall shall be completed in one day, with no interruptions greater than one hour.*

   ~~*NOTE: For special inspection requirements, see Chapter 17A. For Testing see Section 2105A.*~~

8. *All reinforcing and wire ties shall be embedded in the grout. The space between masonry unit surfaces and reinforcing shall be a minimum of one bar diameter.*
9. *Horizontal reinforcement shall be placed in bond beam units with a minimum grout cover of 1 inch (25 mm) above steel for each grout pour. The depth of the bond beam channel below the top of the unit shall be a minimum of 1 1/2 inches (38 mm) and the width shall be 3 inches (76 mm) minimum.*

~~2104A.6.1.2.2~~ 2104A.5.1.2.2 Low-lift grouted construction. . . .

~~2104A.6.1.2.3~~ 2104A.5.1.2.3 High-lift grouted construction. . . .

~~***2104A.6.1.2.4 Stresses.*** *All reinforced hollow-unit masonry shall be so constructed that the units stressed do not exceed those set forth in 2107A or 2108A.*~~

Vertical barriers of masonry may be built across the grout space. The grouting of any section of wall between barriers shall be completed in one day with no interruption longer than one hour.

~~*NOTE: See Section 2105A.4 for assumed masonry strength.*~~

~~2104A.6.2~~ 2104A.5.2 Construction requirements. . . .

~~2104A.7~~ 2104A.6 Aluminum equipment. . . .

SECTION 2105*A*
QUALITY ASSURANCE

2105*A*.1 General. A quality assurance program shall be used to ensure that the constructed masonry is in compliance with the *construction documents*.

The quality assurance program shall comply with the inspection and testing requirements of Chapter 17*A*.

2105*A*.2 Acceptance relative to strength requirements.

2105*A*.2.1 Compliance with *f ′m*. ~~and f ′AAC.~~ Compressive strength of masonry shall be considered satisfactory if the compressive strength of each masonry wythe and grouted collar joint equals or exceeds the value of f ′m for clay and concrete masonry and *requirements of Section 2105A.2.2 is satisfied* ~~f ′AAC for AAC masonry~~. For partially grouted clay and concrete masonry, the compressive strength of both the grouted and ungrouted masonry shall equal or exceed the applicable f′m. ~~At the time of prestress, the compressive strength of the masonry shall equal or exceed f ′mi, which shall be less than or equal to f ′m.~~ *The specified compressive strength, f ′m, assumed in design shall be 1,500 psi (10.34 MPa) for all masonry construction using materials and details of construction required herein. Testing of the constructed masonry shall be provided in accordance with Section 2105A.4.*

Exception: *Subject to the approval of the enforcement agency, higher values of f′m may be used in the design of reinforced grouted masonry and reinforced hollow-unit masonry. The approval shall be based on prism test results submitted by the architect or engineer which demonstrate the ability of the proposed construction to meet prescribed performance criteria for strength and stiffness. The design shall assume that the reinforcement will be placed in a location that will produce the largest stresses within the tolerances allowed in Section 2104A.1.1 and shall take into account the mortar joint depth. In no case shall the f′m assumed in design exceed ~~2,500~~ 3,000 psi (~~17.24~~ 20.68 MPa).*

Where an f′m greater than 1,500 psi (10.34 MPa) is approved, the architect or structural engineer shall establish a method of quality control of the masonry construction acceptable to the enforcement agency which shall be described in the contract specifications. Compliance with the requirements for the specified compressive strength of masonry f′m shall be provided in accordance with Sections 2105A.2.2.2, 2105A.4 and 2105A.5. Substantiation for the specified compressive strength prior to the start of construction may be obtained in accordance with Section 2105A.2.2.3.

2105*A*.2.2 Determination of compressive strength. . . .

. . . .

2105*A*.2.2.1.3 AAC masonry. *Not permitted by DSA-SS .* ~~The compressive strength of AAC masonry shall be based on the strength of the AAC masonry unit only and the following shall be met:~~

~~1. Units conform to ASTM C 1386.~~

~~2. Thickness of bed joints does not exceed 1/8 inch (3.2 mm).~~

~~3. For grouted masonry, the grout meets one of the following requirements:~~

~~3.1. Grout conforms to Article 2.2 of TMS602/ACI 530.1/ASCE 6.~~

~~3.2. Minimum grout compressive strength equals or exceeds *f′AAC* but not less than 2,000 psi (13.79 MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.~~

~~***2105A.5***~~ ***2105A.2.2.1.4* Mortar and grout tests.** *These tests are to establish whether the masonry components meet the specified component strengths. At the beginning of all masonry work, at least one test sample of the mortar and grout shall be taken on three successive working days and at least at one-week intervals thereafter. They shall meet the minimum strength requirement given in Sections 2103A.8 and 2103A.12 for mortar and grout, respectively. Additional samples shall be taken whenever any change in materials or job conditions occur, or whenever in the judgment of the architect, structural engineer or the enforcement agency such tests are necessary to determine the quality of the material. When the prism test method of Section 2105A.2.2.2 is used, the tests in this section are not required.*

Test specimens for mortar and grout shall be made as set forth in ASTM C 1586 and ASTM C 1019

2105*A*.2.2.2 Prism test method.

2105*A*.2.2.2.1 General. The compressive strength of clay and concrete masonry shall be determined by the prism test method *prior to the start of construction and during construction*:

1. Where specified in the construction documents.

2. Where masonry does not meet the requirements for application of the unit strength method in Section 2105*A*.2.2.1.

3. Where required by Section 2105A.2.1.

2105*A*.2.2.2.2 Number of prisms per test. *Prior to the start of construction, a* prism test shall consist of *five* prisms constructed and tested in accordance with ASTM C 1314. *A set of three masonry prisms shall be built during construction in accordance with ASTM C 1314 for each 5,000 square feet (465m^2) of wall area, but not less than one set of three prisms for the project. Each set of prisms shall equal or exceed f'_m.*

2105*A*.3 Testing prisms from constructed masonry. When *approved* by the *building official*, acceptance of masonry that does not meet the requirements of Section 2105*A*.2.2.1, 2105*A*.2.2.2, *2105A.4 or ~~2105A.5~~ 2105A.2.2.1.4* shall be permitted to be based on tests of prisms cut from the masonry construction in accordance with Sections 2105*A*.3.1, 2105*A*.3.2 and 2105*A*.3.3.

2105*A*.3.1 Prism sampling and removal. . . .

2105*A*.3.2 Compressive strength calculations. . . .

2105*A*.3.3 Compliance. . . .

2105A.4 Masonry core testing*. This test is to determine the quality of the masonry constructed. Not less than two cores ~~having a diameter of 6 inches (152 mm) shall be taken from each project. Two cores~~ shall be taken from each building for each 5,000 square feet (465 m^2) of the greater of the masonry wall area or the floor area or fraction thereof. The architect or structural engineer in responsible charge of the project or his / her representative (inspector) shall select the areas for sampling. One half of the number of cores taken shall be tested in shear. Cores tested in shear shall be a minimum of 3-3/4 inches in diameter and shall be taken in such a manner as to exclude masonry unit webs. The shear ~~wall loadings~~ test shall test both joints between the grout core and the outside wythes or face shells of the masonry. Core samples shall not be soaked before testing. ~~Materials and workmanship shall be such that for all masonry when tested in compression, cores shall show an ultimate strength at least equal to the f'_m assumed in design, but not less than 1,500 psi (10.34 MPa).~~ When tested in shear, the unit shear on the cross section of the core shall not be less than 2.5 $\sqrt{f'_m}$ psi.*

Shear testing apparatus shall be of a design approved by the enforcement agency. Visual examination of all cores shall be made ~~to ascertain if the joints are filled~~ and the condition of the cores reported.

The inspector of record or testing agency shall inspect the coring of the masonry walls and shall prepare a report of coring operations for the testing laboratory files and mail one copy to the enforcement agency. Such reports shall include the total number of cores cut, the location, and the condition of all cores cut on each project, regardless of whether the core specimens failed during cutting operation. All cores shall be submitted to the laboratory for examination.

SECTION 2106*A*
SEISMIC DESIGN

2106*A*.1 Seismic design requirements for masonry. Masonry structures and components shall comply with the requirements in Section 1.17 of TMS 402/ACI 530/ASCE 5 depending on the structure's *seismic design category* as determined in Section 1613*A*.

~~2106A.5.3~~ 2106A.1.1 Modifications to TMS 402 / ACI 530 / ASCE 5. ~~/ TMS 402~~

~~2106A.5.3.1~~ 2106A.1.1.1 ~~ACI 530/ASCE 5/TMS 402Section 1.4.6.3~~ ~~Replace~~ Modify TMS 402 / ACI 530 / ASCE 5 /Section ~~1.14.6.3~~ 1.17 as follows:

~~*1.14.6.3*~~ ***1. - Minimum reinforcement requirements for Masonry Walls.*** *The total area of reinforcement in reinforced masonry walls shall not be less than 0.003 times the sectional area of the wall. Neither the horizontal nor the vertical reinforcement shall be less than one third of the total. Horizontal and vertical rebars shall be spaced at not more than 24 inches (610 mm) center to center. The minimum reinforcing shall be No. 4, except that No. 3 bars may be used for ties and stirrups. Vertical wall steel shall have dowels of equal size and equal matched spacing in all footings. Reinforcement shall be continuous around wall corners and through intersections. Only reinforcement which is continuous in the wall shall be considered in computing the minimum area of reinforcement. Reinforcement with splices conforming to TMS 402 / ACI 530 / ASCE 5 ~~/ TMS 402 Section 2.1.10.7~~ as modified by Section 2107A shall be considered as continuous reinforcement.*

Horizontal reinforcement shall be provided in the top of footings, at the top of wall openings, at roof and floor levels, and at the top of parapet walls. For walls 12 inches (nominal) (305 mm) or more in thickness, reinforcing shall be equally divided into two layers, except where designed as retaining walls. Where reinforcement is added above the minimum requirements, such additional reinforcement need not be so divided.

In bearing walls of every type of reinforced masonry, there shall not be less than one No. 5 bar or two No. 4 bars on all sides of, and adjacent to, every opening which exceeds 16 inches (406 mm) in either direction, and such bars shall extend not less than 48 diameters, but in no case less than 24 inches (610 mm) beyond the corners of the opening. The bars required by this paragraph shall be in addition to the minimum reinforcement elsewhere required.

When the reinforcement in bearing walls is designed, placed and anchored in position as for columns, the allowable stresses shall be as for columns

Joint reinforcement shall not be used as principal reinforcement in masonry designed by the strength design method.

~~***2106A.5.3.2 ACI 530 / ASCE 5 / TMS 402 Section 1.14.6.5.*** *Replace Section 1.14.6.5 as follows:*~~

~~*1.14.6.5*~~ ***2. - Minimum reinforcement for masonry columns****. The spacing of column ties shall be as follows: not greater than 8 bar diameters, 24 tie diameters, or one half the least dimension of the column for the full column height. Ties shall be at least 3/8" in diameter & shall be embedded in grout. Top tie shall be within 2 inches (51 mm) of the top of the column or of the bottom of the horizontal bar in the supported beam.*

~~***2106A.5.4***~~ ***3. Lateral support.*** *Lateral support of masonry may be provided by cross walls, columns, pilasters, counterforts or buttresses where spanning horizontally or by floors, beams, girts or roofs where spanning vertically. Where walls are supported laterally by vertical elements, the stiffness of each vertical element shall exceed that of the tributary area of the wall.*

The clear distance between lateral supports of a beam shall not exceed 32 times the least width of the compression area.

SECTION 2107*A*
ALLOWABLE STRESS DESIGN

2107*A*.1 General. The design of masonry structures using *allowable stress design* shall comply with Section 2106*A* and the requirements of Chapters 1 and 2 of TMS 402/ACI 530/ASCE 5 except as modified by Sections 2107*A*.2 through ~~2107.5~~ *2107A.8.*

. . . .

2107A.4 ~~ACI~~ TMS 402 / ACI 530/ASCE 5 ~~/ TMS 402~~ *Modify by adding Sections ~~2.1.4.2.3~~ 2.1.4.3.4 and 2.1.4.3.5 as follows: ~~last paragraph as follows:~~*

2.1.4.3.4 Edge Distance and Spacing. *Where the anchor bolt edge distance, l_{be}, in the direction of load is less than 12 bolt diameters, the value of B_v in Formula ~~(2-5)~~ (2-7) shall be reduced by linear interpolation to zero at an l_{be} distance of 1 1/2 inches (38 mm) and confining reinforcement consisting of not less than No. 3 hairpins, hooks or stirrups for end bolts and between horizontal reinforcing for other bolts shall be provided. Where adjacent anchors are spaced closer than $8d_b$, the allowable shear of the adjacent anchors determined by Formula ~~(2-5)~~*

(2-7) shall be reduced by linear interpolation to 0.75 times the allowable shear value at a center-to-center spacing of four bolt diameters.

2107A.5 Modify ACI 530/ASCE 5 / TMS 402 by adding Section 2.1.4.2.5 as follows:

2.1.4.2.5 2.1.4.3.5 - Anchor bolts size and materials. *Anchor bolts shall be hex headed bolts conforming to ASTM A 307 or F1554 with the dimensions of the hex head conforming to ANSI / ASME B18.2.1 or plain rod conforming to ASTM A 36 with threaded ends and double hex nuts at the anchored end. Bent bar anchor bolts shall not be used.*

The maximum size anchor shall be 1/2-inch (13 mm) diameter for 6-inch (152 mm) nominal masonry, 3/4-inch (19 mm) diameter for 8-inch (203 mm) nominal masonry, 7/8-inch (22 mm) diameter for 10-inch (254 mm) nominal masonry, and 1-inch (25mm) diameter for 12-inch (304.8 mm) nominal masonry.

2107A.6 2107A.5 TMS 402 / ACI 530/ASCE 5 / TMS 402 ASCE Section 2.1.9.1 2.1.8. *Modify by adding the following:*

Structural members framing into or supported by walls or columns shall be securely anchored. The end support of girders, beams or other concentrated loads on masonry shall have at least 3 inches (76 mm) in length upon solid bearing not less than 4 inches (102 mm) thick or upon metal bearing plate of adequate design and dimensions to distribute the loads safely on the wall or pier, or upon a continuous reinforced masonry member projecting not less than 3 inches (76 mm) from the face of the wall or other approved methods.

Joists shall have bearing at least 3 inches (76 mm) in length upon solid masonry at least 2 1/2 inches (64 mm) thick, or other provisions shall be made to distribute safely the loads on the wall or pier.

2107A.9 2107A.6 TMS 402 / ACI 530/ASCE 5 / TMS 402. *Modify by adding Section 2.1.11 2.1.10 as follows:*

2.1.11 2.1.10 - Walls and Piers.

Thickness of Walls. *For thickness limitations of walls as specified in this chapter, nominal thickness shall be used. Stresses shall be determined on the basis of the net thickness of the masonry, with consideration for reduction, such as raked joints.*

The thickness of masonry walls shall be designed so that allowable maximum stresses specified in this chapter are not exceeded. Also, no masonry wall shall exceed the height or length-to-thickness ratio or the minimum thickness as specified in this chapter and as set forth in Table 2107A.9 2107A.5., unless designed in accordance with ACI 530 / ASCE 5 / TMS 402 Section 3.3.5.

Piers. *Every pier or wall section which width is less than three times its thickness shall be designed and constructed as required for columns if such pier is a structural member. Every pier or wall section which width is between three and five times its thickness or less than one half the height of adjacent openings shall have all horizontal steel in the form of ties except that in walls 12 inches (305 mm) or less in thickness such steel may be in the form of hair-pins.*

TABLE 2107A.9 2107A.5 - MINIMUM THICKNESS OF MASONRY WALLS [1, 2]

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

[1] *For walls of varying thickness, use the least thickness when determining the height or length to thickness ratio.*

[2] *In determining the height or length-to-thickness ratio of a cantilevered wall, the dimension to be used shall be twice the dimension of the end of the wall from the lateral support.*

[3] *Cantilevered walls not part of a building and not carrying applied vertical loads need not meet these minimum requirements but their design must comply with stress and overturning requirements.*

~~2107A.8~~ *2107A.7* TMS 402/ACI 530/ASCE 5, Section 2.1.9.7, splices of reinforcement...

~~2107A.5~~ *2107A.8* *(Chapter 21, Section 2107.5)* **TMS402/ACI 530/ASCE 5, Section 2.3.6, maximum bar size.** Add the following to Chapter 2:

2.3.6 Maximum bar size. The bar diameter shall not exceed one-eighth of the nominal wall thickness and shall not exceed one-quarter of the least dimension of the cell, course or collar joint in which it is placed.

. . . .

SECTION 2108*A*
STRENGTH DESIGN OF MASONRY

2108*A*.1 General. The design of masonry structures using strength design shall comply with Section 2106 and the requirements of Chapters 1 and 3 of TMS 402/ACI 530/ASCE 5, except as modified by Sections 2108*A*.2 through 2108*A*.3.

~~Exception:~~ ~~AAC masonry shall comply with the requirements of Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.~~

. . . .

SECTION 2109*A*
EMPIRICAL DESIGN OF MASONRY

***Not permitted by DSA-SS*.**

. . . .

SECTION 2110*A*
GLASS UNIT MASONRY

2110*A*.1 General. ~~Glass unit masonry construction shall comply with Chapter 7 ofTMS402/ACI 530/ASCE 5 and this section.~~
Masonry of glass blocks ~~may be used~~ shall be permitted in non-load-bearing exterior or interior walls and shall conform to the requirements of Section 2115A. Stresses in glass block shall not be utilized. Glass block may be solid or hollow and may contain inserts.

~~2110.1.1 Limitations.~~ ~~Solid or hollow *approved* glass block shall not be used in fire walls, party walls, fire barriers, fire partitions or smoke barriers, or for load-bearing construction. Such blocks shall be erected with mortar and reinforcement in metal channel-type frames, structural frames, masonry or concrete recesses, embedded panel anchors as provided for both exterior and interior walls or other *approved* joint materials. Wood strip framing shall not be used in walls required to have a fire-resistance rating by other provisions of this code.~~

~~Exceptions:~~

~~1. Glass block assemblies having a fire protection rating of not less than 3/4 hour shall be permitted as opening protectives in accordance with Section 715 in fire barriers, fire partitions and smoke barriers that have a required fire-resistance rating of 1 hour or less and do not enclose exit stairways, exit ramps or exit passageways.~~

~~2. Glass block assemblies as permitted in Section 404.5, Exception 2.~~

. . . .

SECTION 2113A
MASONRY CHIMNEYS

. . . .

2113A.5 Corbeling. ~~*Corbeling for masonry chimney shall be as required per Section 2104A.4.2.*~~ Masonry chimneys shall not be corbelled more than half of the chimney's wall thickness from a wall or foundation, nor shall a chimney be corbeled from a wall or foundation that is less than 12 inches (305 mm) in thickness unless it projects equally on each side of the wall, except that on the second *story* of a two-story *dwelling*, corbeling of chimneys on the exterior of the

enclosing walls is permitted to equal the wall thickness. The projection of a single course shall not exceed one-half the unit height or one-third of the unit bed depth, whichever is less.

. . . .

2113*A*.9.1 Spark arrestors. . . . *(2007 CBC, CA amendment incorporated into 2009 IBC)*

SECTION 2114A
NONBEARING WALLS

2114A.1 General. *All nonbearing masonry walls shall be reinforced as specified in Section ~~2106A.5.3.1.~~ 2106A.1.1. Fences and interior nonbearing nonshear walls may be of hollow-unit masonry construction grouted in cells containing vertical and horizontal reinforcement. Nonbearing walls may be used to carry a superimposed load of not more than 200 pounds per linear foot (2.92 kN/m).*

1. ***Thickness.*** *Every nonbearing masonry wall shall be so constructed and have a sufficient thickness to withstand all vertical loads and horizontal loads, but in no case shall the thickness of such walls be less than the values set forth in Table ~~2107A.9.~~ 2107A.5.*

   Plaster shall not be considered as contributing to the thickness of a wall in computing the height-to-thickness ratio.

2. ***Anchorage.*** *All nonbearing walls shall be anchored as required by Section 1604A.8.2 and ASCE 7 Chapter 13. Suspended ceilings or other nonstructural elements shall not be used to provide anchorage for masonry walls.*

SECTION 2115A
MASONRY SCREEN WALLS

2115A.1 General. . . .

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

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CHAPTER 22

STEEL

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	-	X	
Adopt only those sections listed below			
2201.1.1		X	From 2201A.1.1 – CBC 2007
2201.1.2		X	From 2201A.1.2 – CBC 2007
2201.1.3		X	New amendment
2204.1.1		X	From 2204A.1.1 – CBC 2007
2204.1.2		X	New amendment
2204.1.3		X	From 2204A.1.3 – CBC 2007
2204.2.2		X	From 2204A.2.2 – CBC 2007
2206.4.1		X	From 2206A.4 – CBC 2007
2206.6		X	From 2206A.6 – CBC 2007
2209.3		X	From 2209A.3 – CBC 2007
2210.3.1.1		X	From 2210A.3 – CBC 2007
2210.4.1		X	From 2210A.4 – CBC 2007
2210.6.1		X	From 2210A.5 – CBC 2007
2212.1		X	From 2211A.1 – CBC 2007
2212.2		X	From 2211A.2 – CBC 2007

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 2205 – STRUCTURAL STEEL - repeal amendments in following subsections:

2205A.1.1 Modify AISC 360 Section J1.8 by adding the following:

~~*The welds shall be made before the bolts are tensioned.*~~

2007 CBC SECTION 2211A - LIGHT MODULAR STEEL MOMENT FRAMES FOR PUBLIC ELEMENTARY AND SECONDARY SCHOOLS, AND COMMUNITY COLLEGES - repeal amendments in following subsections:

2211A.1 General.

2211A.1.1 Configuration. *Light modular steel moment frame buildings shall be constructed of factory-assembled modules comprising a single-story moment-resisting space frame supporting a floor and roof. Individual modules shall not exceed a width of 14 feet (4.25 m) nor a length of 72 feet (22 m). All connections of beams to corner columns shall be designed as moment-resisting in accordance with the criteria of Section 2211A.2. Modules may be stacked to form multistory structures not exceeding 35 feet or two stories in height. When stacked modules are evaluated separately, seismic forces on each module shall be distributed in accordance with Section 12.8.3 of ASCE 7, considering the modules in the stacked condition. See Section 2211A.2.5 of this code.*

~~***2211A.1.2 Design, fabrication and erection.*** *The design, fabrication and erection of light modular steel moment-frame buildings shall be in accordance with the AISC Specification for Structural Steel Buildings (ANSI/AISC 360) and the AISI North American Specification for the Design of Cold Formed Structural Members (AISI/COS/NASPEC), as applicable, and the requirements of this section. The maximum dead load of the roof and elevated floor shall not exceed 25 psf and 50 psf (1197 Pa and 2394 Pa), respectively. The maximum dead load of the exterior walls shall not exceed 45 psf (2155 Pa).*~~

~~***2211A.2 Seismic requirements.*** *In addition to the other requirements of this code, the design, materials and workmanship of light modular steel moment frames shall comply with the requirements of this section. The response modification coefficient R shall be equal to 3½. C_d and Ω_0 shall be equal to 3.0.*~~

~~***2211A.2.1 Base materials.*** *Beams, columns and connection materials shall be limited to those materials permitted under the AISC Specification for Structural Members (ANSI/AISC 360) and the AISI North American Specification for the Design of Cold Formed Structural Members (AISI/COS/NASPEC).*~~

~~***2211A.2.2 Beam-to-column strength ratio.*** *At each moment-resisting connection the following shall apply:*~~

$$\frac{\sum S_{bi}F_{ybi}}{\sum S_{ci}F_{yci}} \geq 1.4 \qquad \text{(Equation 22A-1)}$$

~~*where:*~~

~~F_{ybi} = The specified yield stress of beam "i."~~

~~F_{ycj} = The specified yield stress of column "j."~~

~~S_{bi} = The flexural section modulus of each beam "i" that is moment connected to the column "j" at the connection.~~

~~S_{cj} = The flexural section modulus of each column "j" that is moment connected to the beam "i" at the connection.~~

~~***Exceptions:***~~

1. ~~*Beam-to-column connections at the floor level beams of first or second-story modules need not comply with this requirement.*~~
2. ~~*Beam-to-column strength ratios less than 1.4 are allowed if proven to be acceptable by analysis or testing.*~~

~~***2211A.2.3 Welding.*** *Weld filler metals shall be capable of producing weld metal with a minimum Charpy V-Notch toughness of 20 ft-lbs at 0°F. Where beam bottom flanges attach to columns with complete joint penetration groove welds and weld backing is used at the bottom surface of the beam flange, such backing shall be removed and the root pass back-gouged, repaired and reinforced with a minimum 3/16 inch (5 mm) fillet weld.*~~

~~***2211A.2.4 Connection design.*** *Connections of beams to columns shall have the design strength to resist the maximum seismic load effect, E_{mm}, calculated in accordance with Section 12.4.3 of ASCE 7.*~~

~~***2211A.2.5 Multistory assemblies.*** *Analysis of multistory assemblies shall be permitted to consider the stacked modules as a single assembly, with restraint conditions between the stacked units that represent the actual method of attachment. Alternatively, it shall be permitted to analyze the individual modules of stacked assemblies independently, with lateral and vertical reactions from modules above applied as concentrated loads at the top of the supporting module.*~~

~~***2212A.1 Tests of Structural Steel.*** *All steel used for structural purposes shall be identified as required by Section 2203A.1. Manufacturer's mill analyses and test reports are acceptable for properly identified steel, but the enforcement agency may require additional testing to determine the quality of the steel if there is any doubt as to its acceptability. Any steel not properly identified shall be tested to meet the minimum chemical and mechanical requirements of the ASTM standard appropriate for the steel specified for the structure.*~~

~~***EXCEPTION:*** *No mechanical tests are required for unidentified steel when the minimum yield stress required by the design is less than or equal to 25 ksi (172 MPa) and the steel is not part of the designated lateral-force-resisting system.*~~

2007 CBC SECTION 2211 - TESTING - repeal amendments in following subsections:

~~***2212A.4 Tests of Beam to Column Moment Connections.*** *When testing is required in these provisions for beam-to-column moment connections in moment frames and link-to-column connections in eccentric braced frames, it shall meet the requirements of AISC 341 Appendix S as modified in Section 2205A.*~~

(Chapter 22 Repealer and Express Terms are based on 2007 CBC Chapter 22A and 2009 IBC Chapter 22.)

(All existing CBC 2007 CA amendments that are not revised below shall continue without any change)

EXPRESS TERMS

SECTION ~~2201A~~ 2201
GENERAL

~~**2201A.1**~~ **2201.1 Scope.** The provisions of this chapter govern the quality, design, fabrication and erection of steel used structurally in buildings or structures.

~~***2201A.1.1***~~ ***2201.1.1 Application. [DSA-SS/CC]*** *The scope of application of Chapter ~~22A~~ 22 is as follows:*

1. ~~*Structures regulated by the Division of the State Architect – Structural Safety (DSA-SS/CC), which include those applications listed in Section 109.2. These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*~~ *Community college buildings regulated by the Division of the State Architect-Structural Safety/Community Colleges (DSA-SS/CC), as listed in Section 1.9.2.2.*

2. *[Reserved for OSHPD]*

~~***2201A.1.2***~~ ***2201.1.2 Identification of amendments. [DSA-SS/CC]*** ~~*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:*~~ *Division of the State Architect-Structural Safety/Community Colleges amendments appear in this chapter preceded with the appropriate acronym, as follows:*

1. ~~*Division of the State Architect – Structural Safety:*~~
   ~~***[DSA-SS]*** *For applications listed in Section 109.2.*~~
   [DSA-SS/CC] *- For community college buildings listed in Section 1.9.2.2*

2. *[Reserved for OSHPD]*

2201.1.3 Reference to other chapters. [DSA-SS/CC] *Where reference within this chapter is made to sections in Chapter 17 the provisions in Chapter 17A, shall apply instead.*

SECTION ~~2202A~~ 2202
DEFINITIONS

~~**2202A.1**~~ **2202.1 Definitions. . . .**

. . . .

SECTION ~~2203A~~ 2203
IDENTIFICATION AND PROTECTION OF STEEL FOR STRUCTURAL PURPOSES

~~**2203A.1**~~ **2203.1 Identification. . . .**

~~2203A.2~~ **2203.2 Protection. . . .**

SECTION ~~2204A~~ 2204
CONNECTIONS

~~2204A.1~~ **2204.1 Welding.** The details of design, workmanship and technique for welding, inspection of welding and qualification of welding operators shall conform to the requirements of the specifications listed in Sections ~~2205A~~ 2205, ~~2206A~~ 2206, ~~2207A~~ 2207, ~~2209A~~ 2209 and ~~2210A~~ 2210. *Special inspection* of welding shall be provided where required by Section ~~1704A~~ 1704.

~~2204A.1.1~~ 2204.1.1 Welded splice. [DSA-SS/CC] *No welded splices shall be made except those shown on approved plans. Welded butt splices subject to tension greater than 33% of the expected yield strength under the load combinations with overstrength factors, shall have tapered transitions as required per AWS D1.8 Clause 4.2.*

2204.1.2 Consumables for welding. [DSA-SS/CC]

2204.1.2.1. Seismic Force Resisting System (SFRS) welds.

All welds used in members and connections in the SFRS shall be made with filler metals meeting the requirements specified in AWS D1.8 Clause 6.3. AWS D1.8 Clauses 6.3.5, 6.3.6, 6.3.7 and 6.3.8 shall apply only to demand critical welds.

2204.1.2.2. Demand critical welds.

Where welds are designated as demand critical, they shall be made with filler metals meeting the requirements specified in AWS D1.8 Clause 6.3.

~~2204A.1.2~~ 2204.1.3 Welded shear connectors. [DSA-SS/CC] *~~When welded shear connectors are used for applications other than composite construction, such as for transfer of shear loads to ledgers, collectors and diaphragm chord members the allowable shear strength or design shear strength as appropriate, shall be one third of available strength. For installations where connectors are applied through formed steel decks and are used for transfer of shear loads other than for composite construction, the allowable shear strength or design shear strength as appropriate shall be one third the available strength multiplied by the appropriate reduction factor as required per Section 2206A.~~*

~~Exceptions:~~

~~1. Where the required shear strength is determined using load combinations with overstrength factors per ASCE 7 Section 12.4.3.2, the connector shear strength need not be reduced to one third the available strength.~~

~~2. The allowable or design shear strength of welded connectors given in code evaluation reports for concrete over formed steel decks for purposes of transferring diaphragm shear may be used without reduction subject to the acceptance of the enforcement agency.~~

Where welded shear connectors are used as part of the seismic force resisting system their shear and tensile strength shall be reduced by 25% from the specified strengths given in AISC 360 Chapter I.

Exception: *The 25% reduction is not necessary for collector components in structures designed for load combinations with overstrength factor.*

~~2204A.2~~ **2204.2 Bolting.** The design, installation and inspection of bolts shall be in accordance with the requirements of the specifications listed in Sections ~~2205A~~ 2205, ~~2206A~~ 2206, ~~2209A~~ 2209 and ~~2210A~~ 2210. *Special inspection* of the installation of high-strength bolts shall be provided where required by Section ~~1704A~~ 1704.

~~2204A.2.1~~ **2204.2.1 Anchor rods.** Anchor rods shall be set accurately to the pattern and dimensions called for on the plans. The protrusion of the threaded ends through the connected material shall be sufficient to fully engage the threads of the nuts, but shall not be greater than the length of the threads on the bolts.

~~*2204A.2.2*~~ ***2204.2.2 Column base plate. [DSA-SS/CC]*** *When shear and / or tensile forces are intended to be transferred between column base plates and anchor bolts, provision shall be made in the design to eliminate the effects of oversized holes permitted in base plates by AISC 360 by use of shear lugs and / or welded shear transfer plates or other means acceptable to the enforcement agency, when the oversized holes are larger than the anchor bolt by more than 1/8 inch (3.2 mm). When welded shear transfer plates and shear lugs or other means acceptable to the enforcement agency are not used, the anchor bolts shall be checked for the induced bending stresses in combination with the shear stresses.*

SECTION ~~2205A~~ 2205
STRUCTURAL STEEL

~~2205A.1~~ **2205.1 General.** The design, fabrication and erection of structural steel for buildings and structures shall be in accordance with AISC 360. Where required, the seismic design of steel structures shall be in accordance with the additional provisions of Section ~~2205A.2~~ 2205.2.

~~2205A.2~~ **2205.2 Seismic requirements for steel structures.** The design of structural steel structures to resist seismic forces shall be in accordance with the provisions of Section 2205.2.1 or ~~2205A.2.2~~ 2502.2.2 for the appropriate *seismic design category.*

~~2205A.2.1~~ **2205.2.1 Seismic Design Category A, B or C.** ~~*Not permitted by DSA-SS.*~~ Structural steel structures assigned to Seismic Design Category A, B or C shall be of any construction permitted in Section 2205. An *R* factor as set forth in Section 12.2.1 of ASCE 7 for the appropriate steel system is permitted where the structure is designed and detailed in accordance with the provisions of AISC 341, Part I. Systems not detailed in accordance with the above shall use the *R* factor in Section 12.2.1 of ASCE 7 designated for "structural steel systems not specifically detailed for seismic resistance."

~~2205A.2.2~~ **2205.2.1 Seismic Design Category D, E or F.** Structural steel structures assigned to *Seismic Design Category* D, E or F shall be designed and detailed in accordance with AISC 341, Part I ~~*irrespective of R values, unless approved otherwise by the enforcement agency*~~.

~~2205A.3~~ **2205.3 Seismic requirements for composite construction.** The design, construction and quality of composite steel and concrete components that resist seismic forces shall conform to the requirements of the AISC 360 and ACI 318. An *R* factor as set forth in Section 12.2.1 of ASCE 7 for the appropriate composite steel and concrete system is permitted where the structure is designed and detailed in accordance with the provisions of AISC 341, Part II. In *Seismic Design Category* B or above, the design of such systems shall conform to the requirements of AISC 341, Part II.

~~2205A.3.1~~ **2205.3.1 Seismic Design Categories D, E and F.** Composite structures are permitted in *Seismic Design Categories* D , E and F, subject to the limitations in Section 12.2.1 of ASCE 7 ~~*and shall be considered as an alternative system*~~, where substantiating evidence is provided to demonstrate that the proposed system will perform as intended by AISC 341, Part II. The substantiating evidence shall be subject to *building official* approval. Where composite elements or connections are required to sustain inelastic deformations, the substantiating evidence shall be based on cyclic testing.

SECTION ~~2206A~~ 2206
STEEL JOISTS

~~2206A.1~~ **2206.1 General.** The design, manufacture and use of open web steel joists and joist girders shall be in accordance with one of the following Steel Joist Institute (SJI) specifications:

1. SJI CJ-1.0
2. SJI K-1.1

3. SJI LH/DLH-1.1

4. SJI JG-1.1

Where required, the seismic design of buildings shall be in accordance with the additional provisions of Section ~~2205A.2~~ 2205.2 or ~~2210A.5~~ 2210.5.

~~2206A.2~~ 2206.2 Design. The *registered design professional* shall indicate on the *construction documents* the steel joist and/or steel joist girder designations from the specifications *listed* in Section ~~2206A1~~ 2206.1 and shall indicate the requirements for joist and joist girder design, layout, end supports, anchorage, non-SJI standard bridging, bridging termination connections and bearing connection design to resist uplift and lateral loads. These documents shall indicate special requirements as follows:

1. Special loads including:
    1.1. Concentrated loads;
    1.2. Nonuniform loads;
    1.3. Net uplift loads;
    1.4. Axial loads;
    1.5. End moments; and
    1.6. Connection forces.

2. Special considerations including:
    2.1. Profiles for nonstandard joist and joist girder configurations (standard joist and joist girderconfigurations are as indicated in the SJI catalog);
    2.2. Oversized or other nonstandard web openings; and
    2.3. Extended ends.

3. Deflection criteria for live and total loads for non-SJI standard joists.

~~2206A.3~~ 2206.3 Calculations. The steel joist and joist girder manufacturer shall design the steel joists and/or steel joist girders in accordance with the current SJI specifications and load tables to support the load requirements of Section ~~2206A.2~~ 2206.2. The *registered design professional* may require submission of the steel joist and joist girder calculations as prepared by a *registered design professional* responsible for the product design. If requested by the *registered design professional*, the steel joist manufacturer shall submit design calculations with a cover letter bearing the seal and signature of the joist manufacturer's *registered design professional*. In addition to standard calculations under this seal and signature, submittal of the following shall be included:

1. Non-SJI standard bridging details (e.g. for cantilevered conditions, net uplift, etc.).
2. Connection details for:
2.1. Non-SJI standard connections (e.g. flush-framed or framed connections);
2.2. Field splices; and
2.3. Joist headers.

~~2206A.4~~ 2206.4 Steel joist drawings. Steel joist placement plans shall be provided to show the steel joist products as specified on the construction documents and are to be utilized for field installation in accordance with specific project requirements as stated in Section ~~2206A.2~~ 2206.2. Steel placement plans shall include, at a minimum, the following:

1. Listing of all applicable loads as stated in Section ~~2206A.2~~ 2206.2 and used in the design of the steel joists and joist girders as specified in the construction documents.

2. Profiles for nonstandard joist and joist girder configurations (standard joist and joist girder configurations are as indicated in the SJI catalog).

3. Connection requirements for:

3.1. Joist supports;

3.2. Joist girder supports;

3.3. Field splices; and

3.4. Bridging attachments.

4. Deflection criteria for live and total loads for non-SJI standard joists.

5. Size, location and connections for all bridging.

6. Joist headers.

Steel joist placement plans do not require the seal and signature of the joist manufacturer's *registered design professional*.

~~2206A.4~~ 2206.4.1 Design Approval. [DSA-SS/CC] *Joist and joist girder design calculations and profiles with member sizes and connection details, and joist placement plans shall be provided to the enforcement agency and approved prior to joist fabrication, in accordance with Title 24, Part 1. Joist and joist girder design calculations and profiles with member sizes and connection details shall bear the signature and stamp or seal of the registered engineer or licensed architect responsible for the joist design. Alterations to the approved joist and joist girder design calculations and profiles with member sizes and connection details, or to fabricated joists are subject to the approval of the enforcement agency.*

~~2206A.5~~ 2206.5 Certification. At completion of manufacture, the steel joist manufacturer shall submit a *certificate of compliance* in accordance with Section ~~1704A.2.2~~ 1704.2.2 stating that work was performed in accordance with *approved construction documents* and with SJI standard specifications.

~~2206A.6~~ 2206.6 Joist chord bracing. [DSA-SS/CC] *The chords of all joists shall be laterally supported at all points where the chords change direction.*

SECTION ~~2207A~~ 2207
STEEL CABLE STRUCTURES

~~2207A.1~~ 2207.1 General. The design, fabrication and erection including related connections, and protective coatings of steel cables for buildings shall be in accordance with ASCE 19.

~~2207A.2~~ 2207.2 Seismic requirements for steel cable. The design strength of steel cables shall be determined by the provisions of ASCE 19 except as modified by these provisions.

1. A load factor of 1.1 shall be applied to the prestress force included in *T*3 and *T*4 as defined in Section 3.12.

2. In Section 3.2.1, Item (c) shall be replaced with "1.5 *T*3" and Item (d) shall be replaced with "1.5 *T*4."

SECTION ~~2208A~~ 2208
STEEL STORAGE RACKS

~~2208A.1~~ 2208.1 Storage racks. The design, testing and utilization of industrial steel storage racks made of cold-formed or hot-rolled steel structural members, shall be in accordance with the RMI/ANSI MH 16.1. Where required by ASCE 7, the seismic design of storage racks shall be in accordance with the provisions of Section 15.5.3 of ASCE 7, except that items (1), (2) and (3) of Section 15.5.3 of ASCE 7 do not apply when the rack design satisfies RMI/ANSI MH 16.1.

SECTION ~~2209A~~ 2209
COLD-FORMED STEEL

~~2209A.1~~ **2209.1 General.** The design of cold-formed carbon and low-alloy steel structural members shall be in accordance with AISI S100. The design of cold-formed stainless-steel structural members shall be in accordance with ASCE 8. Cold-formed steel light-frame construction shall also comply with Section ~~2210A~~ 2210.

~~2209A.2~~ **2209.2 Steel decks.** The design and construction of cold-formed steel decks shall be in accordance with this section.

~~2209A.2.1~~ **2209.2.1 Composite slabs on steel decks.** Composite slabs of concrete and steel deck shall be designed and constructed in accordance with ASCE 3.

~~2209A.2.2~~ **2209.2.2 Noncomposite steel floor decks.** Noncomposite steel floor decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-NC1.0, as modified in Section ~~2209A.2.2.1~~ 2209.2.2.1.

~~2209A.2.2.1~~ **2209.2.2.1 ANSI/SDI-NC1.0 Section 2.4B1.** Replace Section 2.4B1 of ANSI/SDI-NC1.0 with the following:

1. General: The design of the concrete slabs shall be done in accordance with the ACI *Building Code Requirements for Reinforced Concrete*. The minimum concrete thickness above the top of the deck shall be 1 1/2 inches (38 mm).

~~2209A.2.3~~ **2209.2.3 Steel roof deck.** Steel roof decks shall be permitted to be designed and constructed in accordance with ANSI/SBI-RD1.0.

~~2209A.3~~ 2209.3 Steel deck diaphragms. [DSA-SS/CC] *~~Steel deck diaphragms shall comply with the requirements of this section and Section 1604A. The design of the diaphragm as well as the construction details may be based on test information acceptable to the enforcement agency. Steel deck and concrete-filled steel deck diaphragms that is tested per ICC-ES AC 43 shall be considered to meet the requirements of this section.~~*

Diaphragm chord compression and tension forces ~~both compression and tension forces~~ resulting from in-plane shear shall be resisted by flange members and not by the steel deck diaphragm. Reinforced structural concrete on steel deck fill may be used to resist chord forces.

~~The base material thickness of steel deck for diaphragms shall not be less than 0.0359 inch (0.9 mm) (20 gage), unless tests acceptable to the enforcement agency have been performed.~~

~~Welding inspection shall conform to Section 2204A.1.~~

SECTION ~~2210A~~ 2210
COLD-FORMED STEEL
LIGHT-FRAME CONSTRUCTION

~~2210A.1~~ **2210.1 General.** The design and installation of structural members and nonstructural members utilized in cold-formed steel light-frame construction where the specified minimum base steel thickness is between 0.0179 inches (0.455 mm) and 0.1180 inches (2.997 mm) shall be in accordance with AISI S200 and Sections ~~2210A.2~~ 2210.2 through ~~2210A.7~~ 2210.7, as applicable.

~~2210A.2~~ **2210.2 Header design.** Headers, including box and back-to-back headers, and double and single L-headers shall be designed in accordance with AISI S212 or AISI S100.

~~2210A.3~~ **2210.3 Trusses.**

~~2210A.3.1~~ **2210.3.1 Design.** Cold-formed steel trusses shall be designed in accordance with AISI S214, Sections ~~2210A.3.1~~ 2210.3.1 through ~~2210A.3.5~~ 2210.3.5 and accepted engineering practice.

~~2210A.3~~ 2210.3.1.1 Analysis submittals. [DSA-SS/CC] *Complete engineering analysis and truss design drawings shall accompany the construction documents submitted to the enforcement agency for approval. When load testing is required, ~~per Section G of AISI Truss,~~ the test report shall be submitted with the truss design drawings and engineering analysis to the enforcement agency.*

~~2210A.3.2~~ **2210.3.2 Truss design drawings.** The truss design drawings shall conform to the requirements of Section B2.3 of AISI S214 and shall be provided with the shipment of trusses delivered to the job site. The truss

design drawings shall include the details of permanent individual truss member restraint/bracing in accordance with Section B6(a) or B6(c) of AISI S214 where these methods are utilized to provide restraint/bracing.

~~2210A.3.3~~ 2210.3.3 Deferred submittals. AISI Section B4.2 shall be deleted.

Exception: [DSA-SS/CC] *AISI Section B4.2 shall not be deleted.*

~~2210A.3.4~~ 2210.3.4 Trusses spanning 60 feet or greater. . . .

***~~2210A.3.5~~ 2210*.3.5 Truss quality assurance.** . . .

~~2210A.4~~ 2210.4 Wall stud design. Wall studs shall be designed in accordance with either AISI S211 or AISI S100.

2210.4.1 Anchorage for shear. [DSA-SS/CC] *(Relocated from Section 2210A.4, CBC 2007)Cold formed steel stud foundation plates or sills shall be bolted or fastened to the foundation or foundation wall. ~~in accordance with Section 2304.3.4, Item 2.~~ The design strength in shear parallel to the edge of a concrete slab or footing for sill plate anchor bolts not exceeding 5/8 inch (15.9 mm) nominal diameter, having a minimum embedment of 7 inches (178 mm), located a minimum of 2.5 diameters from a concrete edge and a minimum of 15 diameters from the end of the concrete, is permitted to be determined using the lateral design value for the bolt attaching a cold-formed sill plate to concrete, as specified in AISI S100 Section E.3.*

~~2210A.5~~ 2210.5 Floor and roof system design. . . .

~~2210A.6~~ 2210.6 Lateral design. . . .

2210.6.1 Limitations on shear wall assemblies. [DSA-SS/CC] *(Relocated from 2210A.5, CBC 2007) Shear wall assemblies per Section C2.2.3 of AISI ~~Lateral~~ S213 are not permitted within the seismic force-resisting system of buildings or structures assigned to Occupancy Category II, III, IV. , or buildings designed to be relocatable.*

~~2210A.7~~ 2210.7 Prescriptive framing. ~~*Not permitted by DSA-SS.*~~ Detached one- and two-family *dwellings* and *townhouses*, less than or equal to three stories above *grade plane*, shall be permitted to be constructed in accordance with AISI S230 subject to the limitations therein.

~~SECTION 2211A [FOR DSA-SS]~~
~~LIGHT MODULAR STEEL MOMENT FRAMES FOR PUBLIC ELEMENTARY AND SECONDARY SCHOOLS, AND COMMUNITY COLLEGES~~

(Delete entire section and renumber following accordingly)

SECTION ~~2212A~~ 2211 [DSA-SS/CC]
TESTING

~~2212A.2~~ 2211.1 Tests of High-strength Bolts, Nuts and Washers*. High-strength bolts, nuts and washers shall be sampled and tested by an approved independent testing laboratory for conformance with the requirements of Section ~~2205A~~ 2205.*

~~2212A.3~~ 2211.2 Tests of End-welded Studs. *End-welded studs shall be sampled and tested per the requirements of the AWS D1.1.*

Notation for [DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

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CHAPTER 22*A*

STEEL

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter as amended	**X**	**-**	
Adopt only those sections listed below			

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 2205A – STRUCTURAL STEEL - repeal amendments in following subsections:

~~2205A.1.1 Modify AISC 360 Section J1.8 by adding the following:~~

~~The welds shall be made before the bolts are tensioned.~~

2007 CBC SECTION 2212A – TESTING - repeal amendments in following subsections:

~~2212A.1 Tests of Structural Steel.~~ *~~All steel used for structural purposes shall be identified as required by Section 2203A.1. Manufacturer's mill analyses and test reports are acceptable for properly identified steel, but the enforcement agency may require additional testing to determine the quality of the steel if there is any doubt as to its acceptability. Any steel not properly identified shall be tested to meet the minimum chemical and mechanical requirements of the ASTM standard appropriate for the steel specified for the structure.~~*

~~EXCEPTION:~~ *~~No mechanical tests are required for unidentified steel when the minimum yield stress required by the design is less than or equal to 25 ksi (172 MPa) and the steel is not part of the designated lateral-force-resisting system.~~*

~~2212A.4~~ ~~Tests of Beam to Column Moment Connections.~~ *~~When testing is required in these provisions for beam-to-column moment connections in moment frames and link-to-column connections in eccentric braced frames, it shall meet the requirements of AISC – 341 Appendix S as modified in Section 2205A.~~*

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

EXPRESS TERMS

SECTION 2201*A*
GENERAL

2201*A*.1 Scope. The provisions of this chapter govern the quality, design, fabrication and erection of steel used structurally in buildings or structures.

2201A.1.1 Application. *The scope of application of Chapter 22A is as follows:*

1. *Structures regulated by the Division of the State Architect—Structural Safety (DSA-SS), which include those applications listed in Section ~~109.2~~ 1.9.2.1.. These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*

2. [Reserved for OSHPD]

2201A.1.2 Identification of amendments. *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 ~~109.2~~ 1.9.2.1.*

2. *[Reserved for OSHPD]*

. . . .

SECTION 2204*A*
CONNECTIONS

2204*A*.1 Welding. The details of design, workmanship and technique for welding, inspection of welding and qualification of welding operators shall conform to the requirements of the specifications listed in Sections 2205*A*, 2206*A*, 2207*A*, 2209*A* and 2210*A*. *Special inspection* of welding shall be provided where required by Section 1704*A*.

2204A.1.1 Welded Splice. *No welded splices shall be made except those shown on approved plans. Welded butt splices subject to tension greater than 33% of the expected yield strength under the load combinations with overstrength factors, shall have tapered transitions as required per AWS D1.8 Clause 4.2.*

2204A.1.2 Consumables for Welding.

2204A.1.2.1. Seismic Force Resisting System (SFRS) Welds.

All welds used in members and connections in the SFRS shall be made with filler metals meeting the requirements specified in AWS D1.8 Clause 6.3. AWS D1.8 Clauses 6.3.5, 6.3.6, 6.3.7 and 6.3.8 shall apply only to demand critical welds.

2204A.1.2.2. Demand Critical Welds.

Where welds are designated as demand critical, they shall be made with filler metals meeting the requirements specified in AWS D1.8 Clause 6.3.

~~2204A.1.2~~ 2204A.1.3 Welded Shear Connectors. *~~When welded shear connectors are used for applications other than composite construction, such as for transfer of shear loads to ledgers, collectors and diaphragm chord members the allowable shear strength or design shear strength as appropriate, shall be one third of available strength. For installations where connectors are applied through formed steel decks and are used for transfer of shear loads other than for composite construction, the allowable shear strength or design shear strength as appropriate shall be one third the available strength multiplied by the appropriate reduction factor as required per Section 2206A.~~*

~~Exceptions:~~

1. *~~Where the required shear strength is determined using load combinations with overstrength factors per ASCE 7 Section 12.4.3.2, the connector shear strength need not be reduced to one third the available strength.~~*

2. *~~The allowable or design shear strength of welded connectors given in code evaluation reports for concrete over formed steel decks for purposes of transferring diaphragm shear may be used without reduction subject to the acceptance of the enforcement agency.~~*

Where welded shear connectors in composite members are used as part of the seismic force resisting system, their shear and tensile strength shall be reduced by 25% from the specified strengths given in AISC 360 Chapter I.

Exception: *The 25% reduction is not necessary for collector components designed for load combinations that include the overstrength factor.*

2204*A*.2 Bolting. . . .

. . . .

2204A.2.2 Column base plate. . . .

SECTION 2205*A*
STRUCTURAL STEEL

2205*A*.1 General . . . .

2205*A*.2 Seismic requirements for steel structures. The design of structural steel structures to resist seismic forces shall be in accordance with the provisions of Section ~~2205.2.1 or~~ *2205A.2.2* for the appropriate *seismic design category.*

2205*A*.2.1 Seismic Design Category A, B or C. *Not permitted by DSA-SS.* ~~Structural steel structures assigned to Seismic Design Category A, B or C shall be of any construction permitted in Section 2205. An *R* factor as set forth in Section 12.2.1 of ASCE 7 for the appropriate steel system is permitted where the structure is designed and detailed in accordance with the provisions of AISC 341, Part I. Systems not detailed in accordance with the above shall use the *R* factor in Section 12.2.1 of ASCE 7 designated for "structural steel systems not specifically detailed for seismic resistance~~."

2205*A*.2.2 Seismic Design Category D, E or F. Structural steel structures assigned to *Seismic Design Category* D, E or F shall be designed and detailed in accordance with AISC 341, Part I *irrespective of R values, unless approved otherwise by the enforcement agency.*

. . . .

SECTION 2206A
STEEL JOISTS

. . . .

2206*A*.4 Steel joist drawings. Steel joist placement plans shall be provided to show the steel joist products as specified on the construction documents and are to be utilized for field installation in accordance with specific project requirements as stated in Section 2206*A*.2. Steel placement plans shall include, at a minimum, the following:

1. Listing of all applicable loads as stated in Section 2206*A*.2 and used in the design of the steel joists and joist girders as specified in the construction documents.

2. Profiles for nonstandard joist and joist girder configurations (standard joist and joist girder configurations are as indicated in the SJI catalog).

3. Connection requirements for:

    3.1. Joist supports;

    3.2. Joist girder supports;

    3.3. Field splices; and

    3.4. Bridging attachments.

4. Deflection criteria for live and total loads for non-SJI standard joists.

5. Size, location and connections for all bridging.

6. Joist headers.

Design Approval. [DSA-SS] *Joist and joist girder design calculations and profiles with member sizes and connection details, and joist placement plans shall be provided to the enforcement agency and approved prior to joist fabrication, in accordance with Title 24, Part 1. Joist and joist girder design calculations and profiles with member sizes and connection details shall bear the signature and stamp or seal of the registered engineer or licensed architect responsible for the joist design. Alterations to the approved joist and joist girder design calculations and profiles with member sizes and connection details, or to fabricated joists are subject to the approval of the enforcement agency.*

~~Steel joist placement plans do not require the seal and signature of the joist manufacturer's *registered design professional.*~~

. . . .

2206A.6 Joist Chord Bracing. . . .

. . . .

SECTION 2209*A*
COLD-FORMED STEEL

. . . .

2209A.3 Steel Deck Diaphragms. *Steel deck diaphragms shall comply with the requirements of this section. ~~and Section 1604A.~~ The design of the diaphragm as well as the construction details may be based on test information acceptable to the enforcement agency. Steel deck and concrete-filled steel deck diaphragms that is tested per ICC-ES AC 43 shall be considered to meet the requirements of this section.*

Diaphragm chord forces both compression and tension forces resulting from in-plane shear shall be resisted by flange members and not by the steel deck diaphragm.

The base material thickness of steel deck for diaphragms shall not be less than 0.0359 inch (0.9 mm) (20 gage), unless tests acceptable to the enforcement agency have been performed.

~~*Welding inspection shall conform to Section 2204A.1.*~~

SECTION 2210*A*
COLD-FORMED STEEL
LIGHT-FRAME CONSTRUCTION

2210*A*.1 General. The design and installation of structural members and nonstructural members utilized in cold-formed steel light-frame construction where the specified minimum base steel thickness is between 0.0179 inches (0.455 mm) and 0.1180 inches (2.997 mm) shall be in accordance with AISI S200 and Sections 2210*A*.2 through 2210*A*.7, as applicable.

2210*A*.2 Header design. Headers, including box and back-to-back headers, and double and single L-headers shall be designed in accordance with AISI S212 or AISI S100.

2210*A*.3 Trusses.

2210*A*.3.1 Design. Cold-formed steel trusses shall be designed in accordance with AISI S214, Sections 2210 *A*.3.1 through 2210*A*.3.5 and accepted engineering practice.

Complete engineering analysis and truss design drawings shall accompany the construction documents submitted to the enforcement agency for approval. When load testing is required, ~~per Section G of AISI Truss,~~ the test report shall be submitted with the truss design drawings and engineering analysis to the enforcement agency.

2210*A*.3.2 Truss design drawings. The truss design drawings shall conform to the requirements of Section B2.3 of AISI S214 and shall be provided with the shipment of trusses delivered to the job site. The truss design drawings shall include the details of permanent individual truss member restraint/bracing in accordance with Section B ~~6(a) or B6(c)~~ of AISI S214 where these methods are utilized to provide restraint/bracing.

2210*A*.3.3 Deferred submittals. ~~AISI Section B4.2 shall be deleted~~. *Not permitted by DSA-SS.*

. . . .

2210*A*.4 Wall stud design. Wall studs shall be designed in accordance with either AISI S211 or AISI S100. *Cold formed steel stud foundation plates or sills shall be bolted or fastened to the foundation or foundation wall in accordance with Section 2304.3.4, Item 2.*

. . . .

2210*A*.6 Lateral design. Light-frame shear walls, diagonal strap bracing that is part of a structural wall and diaphragms used to resist wind, seismic and other in-plane lateral loads shall be designed in accordance with AISI S213.

Shear wall assemblies per Section C2.2.3 of AISI ~~Lateral~~ S213 are not permitted within the seismic force-resisting system of buildings. ~~or structures assigned to Occupancy Category II, III, IV. , or buildings designed to be relocatable.~~

2210*A*.7 Prescriptive framing. *Not permitted by DSA-SS.* ~~Detached one- and two-family *dwellings* and *townhouses*, less than or equal to three stories above *grade plane*, shall be permitted to be constructed in accordance with AISI S230 subject to the limitations therein.~~

SECTION 2211A [FOR DSA-SS]
LIGHT MODULAR STEEL MOMENT FRAMES FOR PUBLIC ELEMENTARY AND SECONDARY SCHOOLS, AND COMMUNITY COLLEGES

2211A.1 General. . . .

2211A.2 Seismic requirements. . . .

SECTION 2212A
TESTING

~~2212A.2~~ 2212A.1 Tests of High-strength Bolts, Nuts and Washers*. High-strength bolts, nuts and washers shall be sampled and tested by an approved independent testing laboratory for conformance with the requirements of Section 2205A.*

~~2212A.3~~ 2212A.2 Tests of End-welded Studs. *End-welded studs shall be sampled and tested per the requirements of the AWS D1.1.*

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

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CHAPTER 23
WOOD

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	**X**	**X**	
Adopt only those sections listed below			
2301.1.1	**X**	**X**	
2301.1.2	**X**	**X**	
2301.1.3	**X**	**X**	
2301.1.3.1	**X**	**-**	
2301.1.3.2	**-**	**X**	New Amendment
2301.2, Item 4, Exception	**X**	**X**	New Amendment
2303.1.3.1	**X**	**X**	
2303.4.1.2, Exception 3	**X**	**X**	
2303.4.3.1	**X**	**X**	From 2303.4.3 – CBC 2007
2304.3.4	**X**	**X**	
2304.4.1	**X**	**X**	
2304.5	**X**	**X**	
2304.6.1, Exception	**X**	**-**	New Amendment
2304.9.1.1	**X**	**-**	
2304.11.2.2, Exception	**X**	**-**	
2304.11.2.4.1	**X**	**-**	
2305.1.2	**X**	**X**	From 2305.1.7 – CBC 2007
2305.1.3	**X**	**X**	From 2305.2.4.2 – CBC 2007
2305.1.4	**X**	**X**	New Amendment
2305.2, Exception	**X**	**X**	New Amendment
2305.3, Exception	**X**	**X**	New Amendment
Table 2306.3, Footnote m	**X**	**X**	From Table 2306.4.1– CBC 2007
2306.3.1	**X**	**X**	New Amendment
2306.4	**X**	**X**	New Amendment
2306.7, Exception	**X**	**X**	New Amendment
2308.1	**X**	**X**	
2308.2, Item 8	**X**	**X**	

(All existing amendments that are not revised below shall continue CA without any change)

EXPRESS TERMS

SECTION 2301
GENERAL

2301.1 Scope. The provisions of this chapter shall govern the materials, design, construction and quality of wood members and their fasteners.

2301.1.1 Application. [DSA-SS & DSA-SS/CC] *The scope of application of Chapter 23 is as follows:*

1. *Applications listed in Section~~s~~ ~~109.2~~ 1.9.2.1 and 1.9.2.2, regulated by the Division of the State Architect-Structural Safety (DSA-SS, and DSA-SS/CC). These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*

2. *[Reserved for OSHPD]*

2301.1.2 Identification of amendments. [DSA-SS & DSA-SS/CC] *Division of the State Architect – Structural Safety amendments appear in this chapter preceded with the appropriate acronym, as follows:*

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

   [DSA-SS] *- For applications listed in Section ~~109.2~~ 1.9.2.1.*

   [DSA-SS/CC] *- For applications listed in Section 1.9.2.2*

2. *[Reserved for OSHPD]*

2301.1.3 Reference to other chapters.

2301.1.3.1 [DSA-SS] *Where reference within this chapter is made to sections in Chapters 16, 17, 18, 19, 21, 22, and 34, the provisions in Chapters 16A, 17A, 18A, 19A, 21A, 22A, and 34A respectively shall apply instead.*

Exception*: For DSA-SS, the requirements of Chapter 34 shall apply instead of Chapter 34A*

2301.1.3.2 [DSA-SS/CC] *Where reference within this chapter is made to sections in Chapters 17 and 18, the provisions in Chapters 17A and 18A respectively shall apply instead.*

2301.2 General design requirements. The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:

1. *Allowable stress design* in accordance with Sections 2304, 2305 and 2306.
2. *Load and resistance factor design* in accordance with Sections 2304, 2305 and 2307.
3. *Conventional light-frame construction* in accordance with Sections 2304 and 2308.

   Exception: Buildings designed in accordance with the provisions of the AF&PA WFCM shall be deemed to meet the requirements of the provisions of Section 2308.

4. The design and construction of log structures shall be in accordance with the provisions of ICC 400.

   Exception: [DSA-SS & DSA-SS/CC] *Log structures are not permitted.*

SECTION 2302
DEFINITIONS

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SECTION 2303
MINIMUM STANDARDS AND QUALITY

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2303.1.3 Structural glued-laminated timber. Glued-laminated timbers shall be manufactured and identified as required in ANSI/AITC A190.1 and ASTM D 3737.

2303.1.3.1 Additional requirements. [DSA-SS <u>& DSA-SS/CC</u>] *The construction documents shall indicate the following:*

1. *Dry or wet service conditions<u>.</u> ~~(NDS 5.1.4.1)~~*
2. *Laminating combinations and stress requirements<u>.</u> ~~(NDS 5.1.4.1)~~*
3. *Species group<u>.</u> ~~(refer to Section 2304.11.3, Tables 2306.3.1 and 2306.3.2 footnote a., and AF&PA SDPWS Tables 4.2A and 4.2B, footnote 2).~~*
4. *Preservative material and retention, when preservative treatment is required<u>.</u> ~~(refer to Section 2304.11.3 and NDS Section 5.3.11).~~*
5. *Provisions for protection during shipping and field handling, such as sealing and wrapping in accordance with AITC 111.*

When mechanical reinforcement such as radial tension reinforcement is required, such reinforcement shall comply with AITC 404 and shall be detailed accordingly in the construction documents. Construction documents shall specify that the moisture content of laminations at the time of manufacture shall not exceed 12% for dry conditions of use.

The design of fasteners and connections shall comply with AITC 117, Section I, Item 6 (Connection Design), and NDS Appendix E.

Refer to Section ~~1704A.6.2~~ <u>1704A.6.3</u> for special inspection requirements during fabrication of structural glued laminated timbers.

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2303.4 Trusses.

2303.4.1 Design. Wood trusses shall be designed in accordance with the provisions of this code and accepted engineering practice. Members are permitted to be joined by nails, glue, bolts, timber connectors, metal connector plates or other *approved* framing devices.

2303.4.1.1 Truss design drawings. The written, graphic and pictorial depiction of each individual truss shall be provided to the *building official* for approval prior to installation. Truss design drawings shall also be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span and spacing;
2. Location of all joints and support locations;
3. Number of plies if greater than one;
4. Required bearing widths;
5. Design loads as applicable, including;
    5.1. Top chord live load;
    5.2. Top chord dead load;
    5.3. Bottom chord live load;
    5.4. Bottom chord dead load;

5.5. Additional loads and locations;

5.6. Environmental design criteria and loads (wind, rain, snow, seismic, etc.).

6. Other lateral loads, including drag strut loads.
7. Adjustments to wood member and metal connector plate design value for conditions of use;
8. Maximum reaction force and direction, including maximum uplift reaction forces where applicable;
9. Metal connector plate type, size and thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;
10. Size, species and grade for each wood member;
11. Truss-to-truss connections and truss field assembly requirements;
12. Calculated span-to-deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable;
13. Maximum axial tension and compression forces in the truss members; and
14. Required permanent individual truss member restraint location and the method and details of restraint/bracing to be used in accordance with Section 2303.4.1.2.

2303.4.1.2 Permanent individual truss member restraint. Where permanent restraint of truss members is required on the truss design drawings, it shall be accomplished by one of the following methods:

1. Permanent individual truss member restraint/bracing shall be installed using standard industry lateral restraint/bracing details in accordance with generally accepted engineering practice. Locations for lateral restraint shall be identified on the truss design drawing.
2. The trusses shall be designed so that the buckling of any individual truss member is resisted internally by the individual truss through suitable means (i.e., buckling reinforcement by T-reinforcement or L-reinforcement, proprietary reinforcement, etc.). The buckling reinforcement of individual members of the trusses shall be installed as shown on the truss design drawing or on supplemental truss member buckling reinforcement details provided by the truss designer.
3. A project specific permanent individual truss member restraint/bracing design shall be permitted to be specified by any *registered design professional*.

2303.4.1.3 Trusses spanning 60 feet or greater. The owner shall contract with any qualified *registered design professional* for the design of the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing for all trusses with clear spans 60 feet (18 288 mm) or greater.

2303.4.1.4 Truss designer. The individual or organization responsible for the design of trusses.

2303.4.1.4.1 Truss design drawings. Where required by the *registered design professional*, the *building official*, or the statutes of the jurisdiction in which the project is to be constructed, each individual truss design drawing shall bear the seal and signature of the truss designer.

Exceptions:

1. Where a cover sheet and truss index sheet are combined into a single sheet and attached to the set of truss design drawings, the single cover/truss index sheet is the only document required to be signed and sealed by the truss designer.
2. When a cover sheet and a truss index sheet are separately provided and attached to the set of truss design drawings, the cover sheet and the truss index sheet are the only documents required to be signed and sealed by the truss designer.
3. *(Relocated from 2303.4.1.2, CBC 2007)* ***[DSA-SS & DSA-SS/CC]*** *Exceptions 1 and 2 are not permitted by DSA-~~SS~~.*

2303.4.2 Truss placement diagram. The truss manufacturer shall provide a truss placement diagram that identifies the proposed location for each individually designated truss and references the corresponding truss design drawing. The truss placement diagram shall be provided as part of the truss submittal package, and with the shipment of trusses delivered to the job site. Truss placement diagrams that serve only as a guide for installation and do not deviate from the *permit* submittal drawings shall not be required to bear

the seal or signature of the truss designer.

2303.4.3 Truss submittal package. The truss submittal package provided by the truss manufacturer shall consist of each individual truss design drawing, the truss placement diagram, the permanent individual truss member restraint/bracing method and details and any other structural details germane to the trusses; as applicable, the cover/truss index sheet.

~~2303.4.3~~ 2303.4.3.1 Additional requirements. [DSA-SS & DSA-SS/CC] *In addition to Sections 2304.1 and 2304.2, the following requirements apply:*

1. ***Construction Documents.*** *The construction documents prepared by the registered engineer or licensed architect for the project shall indicate all requirements for the truss design, including:*

   ~~1.1 Truss profiles and layout, including girder truss locations.~~

   ~~1.2~~ 1.1 ~~Design loads, support reactions, uplift or lateral connection forces, and d~~ Deflection criteria.

   ~~1.3~~ 1. 2 Connection details to structural and non-structural elements (e.g. non-bearing partitions).

   ~~1.4 Bridging and bracing attachments to supporting structural elements.~~

   ~~1.5 Wood species and minimum grade (refer to Section 2304.11.3, Tables 2306.3.1 and 2306.3.2 footnote a., and AF&PA SDPWS Tables 4.2A and 4.2B, footnote 2).~~

   ~~1.6 For metal plate connected wood trusses, also refer to ANSI/TPI 1, Section 2.2.~~

~~2. **Truss Design Drawings.** Each truss design drawings shall bear the signature and stamp or seal of the registered engineer or licensed architect responsible for the truss design.~~

~~3~~ 2. ***Requirements for Approval.*** *The truss design drawings and engineering analysis shall be provided to the enforcement agency and approved prior to truss fabrication, in accordance with C.C.R., Title 24, Part 1. Alterations to the approved truss design drawings or manufactured trusses are subject to the approval of the enforcement agency.*

~~4~~ 3. ***Special Inspection During Truss Manufacture.*** *Refer to Section 1704A.6.2 for special inspection requirements during the manufacture of open-web trusses.*

2303.4.4 Anchorage. The design for the transfer of loads and anchorage of each truss to the supporting structure is the responsibility of the *registered design professional*.

2303.4.5 Alterations to trusses. Truss members and components shall not be cut, notched, drilled, spliced or otherwise altered in any way without written concurrence and approval of a *registered design professional*. Alterations resulting in the addition of loads to any member (e.g., HVAC equipment, piping, additional roofing or insulation, etc.) shall not be permitted without verification that the truss is capable of supporting such additional loading.

2303.4.6 TPI 1 Specifications. In addition to Sections 2303.4.1 through 2303.4.5, the design, manufacture and quality assurance of metal-plate-connected wood trusses shall be in accordance with TPI 1. Job-site inspections shall be in compliance with Section 110.4, as applicable.

2303.4.7 Truss quality assurance. Trusses not part of a manufacturing process in accordance with either Section 2303.4.6 or a standard listed in Chapter 35, which provides requirements for quality control done under the supervision of a third-party quality control agency, shall be manufactured in compliance with Sections 1704.2 and 1704.6, as applicable.

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SECTION 2304
GENERAL CONSTRUCTION REQUIREMENTS

2304.1 General. The provisions of this section apply to design methods specified in Section 2301.2.

2304.2 Size of structural members. Computations to determine the required sizes of members shall be based on the net dimensions (actual sizes) and not nominal sizes.

2304.3 Wall framing. The framing of exterior and interior walls shall be in accordance with the provisions specified in Section 2308 unless a specific design is furnished.

2304.3.1 Bottom plates. Studs shall have full bearing on a 2-inch-thick (actual $1^1/_2$-inch, 38 mm) or larger plate or sill having a width at least equal to the width of the studs.

2304.3.2 Framing over openings. Headers, double joists, trusses or other approved assemblies that are of adequate size to transfer loads to the vertical members shall be provided over window and door openings in load-bearing walls and partitions.

2304.3.3 Shrinkage. Wood walls and bearing partitions shall not support more than two floors and a roof unless an analysis satisfactory to the building official shows that shrinkage of the wood framing will not have adverse effects on the structure or any plumbing, electrical or mechanical systems, or other equipment installed therein due to excessive shrinkage or differential movements caused by shrinkage. The analysis shall also show that the roof drainage system and the foregoing systems or equipment will not be adversely affected or, as an alternate, such systems shall be designed to accommodate the differential shrinkage or movements.

2304.3.4 Additional requirements. [DSA-SS <u>& DSA-SS/CC</u>] *The following additional requirements apply:*

1. *Engineering analysis shall be furnished that demonstrates compliance of wall framing elements and connections with Section 2301.2, Item 1 or 2.*

2. *Construction documents shall include detailing of sill plate anchorage to supporting masonry or concrete for all exterior and interior bearing, non-bearing and shear walls. Unless specifically designed in accordance with item 1 above, sills under exterior walls, bearing walls and shear walls shall be bolted to masonry or concrete with 5/8" diameter by 12 inch (16 mm by 305 mm) bolts spaced not more than four (4) feet (1219 mm) on center, with a minimum of two (2) bolts for each piece of sill plate. Anchor bolts shall have a 4 inch minimum and a 12 inch maximum clearance to the end of the sill plate, and 7 inch minimum embedment into concrete or masonry.*

   Unless specifically designed in accordance with item 1 above, sill plates under non-bearing interior partitions on concrete floor slabs shall be anchored at not more than four (4) feet (1219 mm) on center to resist a minimum allowable stress shear of 100 pounds per linear foot (1.4 kN/m) acting either parallel or perpendicular to the wall.

3. *Construction documents shall include detailing and limitations for notches and bored holes in wall studs, plates and sills. ~~Refer to Sections 2308.9.10 and 2308.9.11 for code-prescribed limitations.~~*

2304.4 Floor and roof framing. The framing of wood-joisted floors and wood framed roofs shall be in accordance with the provisions specified in Section 2308 unless a specific design is furnished.

2304.4.1 Additional requirements. [DSA-SS <u>& DSA-SS/CC</u>] *The following additional requirements apply:*

1. *Engineering analysis shall be furnished that demonstrates compliance of floor, roof and ceiling framing elements and connections with Section 2301.2, Items 1 or 2.*

2. *Construction documents shall include detailing and limitations for notches and bored holes in floor and roof framing members. ~~Refer to Section 2308.10.4.2 and NDS Section 4.4.3.~~*

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TABLE 2304.6
MINIMUM THICKNESS OF WALL SHEATHING

(Table not shown for clarity)

2304.6.1 Wood structural panel sheathing. Where wood structural panel sheathing is used as the exposed finish on the exterior of outside walls, it shall have an exterior exposure durability classification. Where wood structural panel sheathing is used elsewhere, but not as the exposed finish, it shall be of a type manufactured with exterior glue (Exposure 1 or Exterior). Wood structural panel wall sheathing or siding used as structural sheathing shall be capable of resisting wind pressures in accordance with Section 1609. Maximum wind speeds for wood structural panel sheathing used to resist wind pressures shall be in accordance with Table 2304.6.1 for enclosed buildings with a mean roof height not greater than 30 feet (9144 mm), an importance factor (I) of 1.0 and a topographic factor (K_{zt}) of 1.0.

<u>Exception: [DSA-SS]</u> *<u>Wind pressure shall be calculated in accordance with Section 1609A.</u>*

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2304.9 Connections and fasteners.

2304.9.1 Fastener requirements. Connections for wood members shall be designed in accordance with the appropriate methodology in Section 2301.2. The number and size of fasteners connecting wood members shall not be less than that set forth in Table 2304.9.1.

2304.9.1.1 Additional requirements. [DSA-SS] *Fasteners used for the attachment of exterior wall coverings shall be of hot-dipped zinc-coated galvanized steel, mechanically deposited zinc-coated steel, stainless steel, silicon bronze or copper. The coating weights for hot-dipped zinc-coated fasteners shall be in accordance with ASTM A 153. The coating weights for mechanically deposited zinc coated fasteners shall be in accordance with ASTM B 695, Class 55 minimum.*

. . . .

2304.11 Protection against decay and termites.

2304.11.1 General. Where required by this section, protection from decay and termites shall be provided by the use of naturally durable or *preservative-treated wood*.

2304.11.2 Wood used above ground. Wood used above ground in the locations specified in Sections 2304.11.2.1 through 2304.11.2.7, 2304.11.3 and 2304.11.5 shall be naturally durable wood *or preservative-treated wood* using water-borne preservatives, in accordance with AWPA U1 (Commodity Specifications A or F) for above-ground use.

2304.11.2.1 Joists, girders and subfloor. Where wood joists or the bottom of a wood structural floor without joists are closer than 18 inches (457 mm), or wood girders are closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation, the floor construction (including posts, girders, joists and subfloor) shall be of naturally durable or *preservative-treated wood*.

2304.11.2.2 Wood supported by exterior foundation walls. Wood framing members, including wood sheathing, that rest on exterior foundation walls and are less than 8 inches (203 mm) from exposed earth shall be of naturally durable or *preservative-treated wood*.

Exception: [DSA-SS] *At exterior walls where the earth is paved with an asphalt or concrete slab at least 18 inches (457 mm) wide and draining away from the building, the bottom of sills are permitted to be 6 inches (152 mm) above the top of such slab. Other equivalent means of termite and decay protection may be accepted by the enforcement agency.*

2304.11.2.3 Exterior walls below grade. Wood framing members and furring strips attached directly to the interior of exterior masonry or concrete walls below grade shall be of approved naturally durable or *preservative-treated wood*.

2304.11.2.4 Sleepers and sills. Sleepers and sills on a concrete or masonry slab that is in direct contact with earth shall be of naturally durable or preservative-treated wood.

2304.11.2.4.1 Additional requirements. [DSA-SS] *Stud walls or partitions at shower or toilet rooms with more than two fixtures, and stud walls adjacent to unroofed paved areas shall rest on a concrete curb extending at least 6 inches (152 mm) above finished floor or pavement level.*

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SECTION 2305
GENERAL DESIGN REQUIREMENTS FOR LATERAL-FORCE-RESISTING SYSTEMS

2305.1 General. Structures using wood shear walls and diaphragms to resist wind, seismic and other lateral loads shall be designed and constructed in accordance with AF&PA SDPWS and the provisions of Sections 2305, 2306 and 2307.

2305.1.1 Openings in shear panels. Openings in shear panels that materially affect their strength shall be detailed on the plans, and shall have their edges adequately reinforced to transfer all shearing stresses.

~~***2305.1.7***~~ ***2305.1.2 Additional requirements. [DSA-SS & DSA-SS/CC]*** *The following limitations shall apply:*

1. *Straight-sheathed horizontal lumber diaphragms are not permitted.*
2. *Gypsum-based sheathing shear walls and portland cement plaster shear walls are not permitted.*
3. *Shear wall foundation anchor bolt washers ~~(refer to Section 4.3.6.4.3 of the SDPWS) shall conform with the requirements of Section 2305.3.11.~~ shall be provided in accordance with* AF&PA SDPWS *Section 4.3.6.4.3. The exception to* AF&PA SDPWS *Section 4.3.6.4.3 shall not apply.*
4. ~~*The engineering analysis shall include a statement indicating whether the lateral force-resisting system has been designed in accordance with Section 2305, or in accordance with the AF&PA SDPWS and the limitations of this code.*~~ *Wood structural panel shear walls and diaphragms using staples as fasteners are not permitted.*
5. *Unblocked shear walls are not permitted.*

~~***2305.2.4.2 Additional Requirements***~~ ***2305.1.3 Diaphragms and shear walls. [DSA-SS & DSA-SS/CC]*** *Any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic force-resisting system shall be applied directly to framing members.*

> ***Exception:*** *Wood structural panel sheathing in a diaphragm is permitted to be fastened over solid lumber planking or laminated decking, provided the panel joints and lumber planking or laminated decking joints do not coincide.*

2305.1.4 Sill plate anchor bolts. [DSA-SS & DSA-SS/CC] *As specified in Section 1908.1.31 modifications to ACI 318, the allowable lateral design strength for sill plate anchor bolts in shear parallel to grain is permitted to be determined using the lateral design value for a bolt attaching a wood sill plate to concrete, as specified in AF&PA NDS Table 11E, provided the anchor bolts comply with all of the following:*

1. *The maximum anchor bolt diameter is 5/8 inches (16 mm).*
2. *The anchor bolt is embedded at least 7 inches (178 mm) into concrete.*
3. *The anchor bolt is located a minimum of 2-1/2 anchor diameters from any concrete edge that is parallel to the sill plate; and*
4. *The anchor bolt is located a minimum of 15 anchor diameters from any concrete edge that is perpendicular to the sill plate.*

2305.2 Diaphragm deflection. The deflection (Δ) of a blocked wood structural panel diaphragm uniformly fastened throughout with staples is permitted to be calculated by using the following equation. If not uniformly fastened, the constant 0.188 (For SI: 1/1627) in the third term shall be modified accordingly.

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Exception: [DSA-SS & DSA-SS/CC] *Section 2305.2 is not adopted by DSA.*

2305.3 Shear wall deflection. . . .

Exception: [DSA-SS & DSA-SS/CC] *Section 2305.3 is not adopted by DSA.*

SECTION 2306
ALLOWABLE STRESS DESIGN

2306.1 Allowable stress design. The structural analysis and construction of wood elements in structures using *allowable stress design* shall be in accordance with the following applicable standards:

. . . .

2306.3 Wood structural panel shear walls. Wood structural panel shear walls, wood structural panel shear walls shall be designed and constructed in accordance with AF&PASDPWS. Wood structural panel shear walls are permitted to resist horizontal forces using the allowable capacities set forth in Table 2306.3. Allowable capacities in Table 2306.3 are permitted to be increased 40 percent for wind design.

2306.3.1 Additional requirements. [DSA-SS & DSA-SS/CC] *Any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic force-resisting system shall be applied directly to framing members, unless installed in accordance with Section 2305.1.3.*

. . . .

2306.4 Lumber sheathed shear walls. Single and double diagonally sheathed lumber shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Single and double diagonally sheathed lumber walls shall not be used to resist seismic forces in structures assigned to *Seismic Design Category* E or F.

Additional Requirements: [DSA-SS & DSA-SS/CC] *Single and double diagonally sheathed lumber walls shall not be used to resist seismic forces in structures assigned to Seismic Design Category D also*

2306.5 Particleboard shear walls. Particleboard shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Particleboard shear walls shall be permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.5. Allowable capacities in Table 2306.5 are permitted to be increased 40 percent for wind design. Particleboard shall not be used to resist seismic forces in structures assigned to *Seismic Design Category* D, E or F.

2306.6 Fiberboard shear walls. Fiberboard shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Fiberboard shear walls are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.6. Allowable capacities in Table 2306.6 are permitted to be increased 40 percent for wind design. Fiberboard shall not be used to resist seismic forces in structures assigned to *Seismic Design Category* D, E or F.

2306.7 Shear walls sheathed with other materials. Shear walls sheathed with portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall be designed and constructed in accordance with AF&PA SDPWS. Shear walls sheathed with these materials are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.7. Shear walls sheathed with portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall not be used to resist seismic forces in structures assigned to *Seismic Design Category* E or F.

Exception: [DSA-SS & DSA-SS/CC] *Shear walls sheathed with portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall not be used to resist seismic forces in structures assigned to Seismic Design Category D also.*

SECTION 2307
LOAD RESISTANCE FACTOR DESIGN

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SECTION 2308
CONVENTIONAL LIGHT-FRAME CONSTRUCTION

2308.1 General. The requirements of this section are intended for *conventional light-frame construction*. Other methods are permitted to be used, provided a satisfactory design is submitted showing compliance with other provisions of this code. Interior nonload-bearing partitions, ceilings and curtain walls of *conventional light-frame construction* are not subject to the limitations of this section. Alternatively, compliance with AF&PA WFCM shall be permitted subject to the limitations therein and the limitations of this code. Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three *stories above grade plane* in height with a separate *means of egress* and their accessory structures shall comply with the *International Residential Code*.

2308.1.1 Portions exceeding limitations of conventional construction. When portions of a building of otherwise conventional construction exceed the limits of Section 2308.2, these portions and the supporting load path shall be designed in accordance with accepted engineering practice and the provisions of this code. For the purposes of this section, the term “portions” shall mean parts of buildings containing volume and area such as a room or a series of rooms.

2308.2 Limitations. Buildings are permitted to be constructed in accordance with the provisions of *conventional light-frame construction*, subject to the following limitations, and to further limitations of Sections 2308.11 and 2308.12.

1. Buildings shall be limited to a maximum of three *stories above grade plane*. For the purposes of this section, for buildings in *Seismic Design Category* D or E as determined in Section 1613, cripple stud walls shall be considered to be a *story*.

   Exception: Solid blocked cripple walls not exceeding 14 inches (356 mm) in height need not be considered a *story*.

2. Maximum floor-to-floor height shall not exceed 11 feet 7 inches (3531 mm). Bearing wall height shall not exceed a stud height of 10 feet (3048 mm).

3. Loads as determined in Chapter 16 shall not exceed the following:

   3.1. Average dead loads shall not exceed 15 psf (718 N/m^2) for combined roof and ceiling, exterior walls, floors and partitions.

   Exceptions:

   1. Subject to the limitations of Sections 2308.11.2 and 2308.12.2, stone or masonry veneer up to the lesser of 5 inches (127 mm) thick or 50 psf (2395 N/m^2) and installed in accordance with Chapter 14 is permitted to a height of 30 feet (9144 mm) above a noncombustible foundation, with an additional 8 feet (2438 mm) permitted for gable ends.
   2. Concrete or masonry fireplaces, heaters and chimneys shall be permitted in accordance with the provisions of this code.

   3.2. Live loads shall not exceed 40 psf (1916 N/m^2) for floors.

   3.3. Ground snow loads shall not exceed 50 psf (2395 N/m^2).

4. Wind speeds shall not exceed 100 miles per hour (mph) (44 m/s) (3-second gust).

   Exception: Wind speeds shall not exceed 110 mph (48.4 m/s) (3-second gust) for buildings in Exposure Category B that are not located in a *hurricane-prone region*.

5. Roof trusses and rafters shall not span more than 40 feet (12 192 mm) between points of vertical support.

6. The use of the provisions for *conventional light-frame construction* in this section shall not be permitted for *Occupancy Category* IV buildings assigned to *Seismic Design Category* B, C, D, E or F, as determined in Section 1613.

7. *Conventional light-frame construction* is limited in irregular structures in *Seismic Design Category* D or E, as specified in Section 2308.12.6.

*8. **[DSA-SS & DSA-SS/CC]** The use of conventional light-frame construction provisions in this section is permitted, subject to the following conditions:*

   8.1. The design and construction shall also comply with Section 2304 and Section 2305.

   8.2. In conjunction with the use of provisions in Section 2308.3 (Braced Wall Lines), engineering analysis shall be furnished that demonstrates compliance of lateral-force-resisting systems with Section 2305.

   8.3. In addition to the use of provisions in Section 2308.8 (Floor Joists), engineering analysis shall be furnished that demonstrates compliance of floor framing elements and connections with Section 2301.2, Item 1 or 2.

   8.4. In addition to the use of provisions in Section 2308.9 (Wall Framing), engineering analysis shall be furnished that demonstrates compliance of wall framing elements and connections with Section 2301.2, Item 1 or 2.

8.5. In addition to the use of provisions in Section 2308.10 (Roof and Ceiling Framing), engineering analysis shall be furnished demonstrating compliance of roof and ceiling framing elements and connections with Section 2301.2, Item 1 or 2.

Notation for [DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

Notation for [DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

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CHAPTER 24
GLASS AND GLAZING

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	**X**	**X**	
Adopt only those sections listed below			
2403.2.1	X	X	
Table 2403.2.1	X	X	

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 2403 – GENERAL REQUIREMENTS FOR GLASS– repeal amendments in following subsections:

~~***2403.1.1 Additional Requirements. [DSA-SS]*** *Each light of safety glazing material installed in hazardous locations as defined in Section 2406 of this chapter shall be identified by a label which will specify the labeler, whether the manufacturer or installer, and state that safety glazing material has been utilized in such installations. The label shall be legible and visible from the inside of the building after installation and shall specify that the label shall not be removed.~~

~~***2403.6 Additional Requirements. [DSA]*** *Glazing materials shall meet the requirements of Table 2403.6.*~~

~~***TABLE 2403.6 [DSA-SS] ADDITIONAL REQUIREMENTS FOR GLAZING MATERIALS***~~

2007 CBC SECTION 2406 – SAFETY GLAZING – repeal amendments in following subsections:

~~***2406.1.5 Additional Requirements. [DSA-SS]*** *In additional to the requirements of Section 2406.1, glazing shall also comply with Tables 2403.6 and 2406.1.5.*~~

~~***TABLE 2406.1.5 [DSA-SS] IMPACT LOADS - GLAZING***~~

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

EXPRESS TERMS

SECTION 2401
GENERAL

2401.1 Scope. The provisions of this chapter shall govern the materials, design, construction and quality of glass, light- transmitting ceramic and light-transmitting plastic panels for exterior and interior use in both vertical and sloped applications in buildings and structures.

. . . .

SECTION 2403
GENERAL REQUIREMENTS FOR GLASS

2403.1 Identification. Each pane shall bear the manufacturer's mark designating the type and thickness of the glass or glazing material. The identification shall not be omitted unless approved and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with approved construction documents that comply with the provisions of this chapter. Safety glazing shall be identified in accordance with Section 2406.2.

Each pane of tempered glass, except tempered spandrel glass, shall be permanently identified by the manufacturer. The identification mark shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.

Tempered spandrel glass shall be provided with a removable paper marking by the manufacturer.

2403.2 Glass supports. Where one or more sides of any pane of glass are not firmly supported, or are subjected to unusual load conditions, detailed construction documents, detailed shop drawings and analysis or test data assuring safe performance for the specific installation shall be prepared by a registered design professional.

2403.2.1 Additional Requirements. [DSA-SS & DSA-SS/CC] *In addition to the requirements of Section 2403.2, glass supports shall comply with the following:*

1. *The construction documents and analysis or test data required per Section 2403.2 shall be submitted to the enforcement agency for approval.*

2. Glass firmly supported on all four edges shall be glazed with minimum laps and edge clearances set forth in Table 2403.2.1.

TABLE 2403.2.1 [DSA-SS & DSA-SS/CC]
MINIMUM GLAZING REQUIREMENTS

Fixed Windows and Openable Windows Other Than Horizontal Siding					
GLASS AREA	***UP TO 6 SQ. FT.***	***6 TO 14 SQ. FT.***	***14 TO 32 SQ. FT.***	***32 TO 50 SQ. FT.***	***OVER 50 SQ. FT.***
× 0.0929 for m^2, × 25.4 for mm					
1.Minimum Frame Lap	*1/4"*	*1/4"*	*5/16"*	*3/8"*	*1/2"*
2.Minimum Glass Edge Clearance	*1/8"[1,2]*	*1/8"[1,2]*	*3/16"[1]*	*1/4"*	*1/4"[1]*
3. Continuous Glazing Rabbet and Glass Retainer[3]	*Required*				
4. Resilient Setting Material[4]	*Not Required*	*Required*			
Sliding Doors and Horizontal Sliding Windows					
GLASS AREA		*UP TO 14 SQ. FT.*	*14 TO 32 SQ. FT.*	*32 TO 50 SQ. FT.*	*OVER 50 SQ. FT.*
× 0.0929 for m^2, × 25.4 for mm					
5.Minimum Glass Frame Lap		*1/4"*	*5/16"*	*3/8"*	*1/2"*
6.Minimum Glass Edge Clearance		*1/8"[2]*	*3/16"*	*1/4"*	*1/4"*
7. Continuous Glazing Rabbet and Glass Retainer[3]		*Required above third story*	*Required*		
8. Resilient Setting Material[4]		*Not Required*		*Required*	

[1] Glass edge clearance in fixed openings shall not be less than required to provide for wind and earthquake drift.

[2] Glass edge clearance at all sides of pane shall be a minimum of 3/16 inch (4.8 mm) where height of glass exceeds 3 feet (914 mm).

[3] Glass retainers such as metal, wood or vinyl face stops, glazing beads, gaskets, glazing clips and glazing channels shall be of sufficient strength and fixation to serve this purpose.

[4] Resilient setting material shall include preformed rubber or vinyl plastic gaskets or other materials which are proved to the satisfaction of the building official to remain resilient.

. . . .

~~***TABLE 2403.6 [DSA-SS]***~~
~~***ADDITIONAL REQUIREMENTS FOR GLAZING MATERIALS***~~

~~***GLAZING MATERIALS***~~	~~***SIZE OF INDIVIDUAL GLAZED AREA***~~	~~***REQUIREMENTS***~~
~~*Annealed glass (regular plate, float, sheet, rolled or obscure)*~~	~~*Over 6 square feet (0.56 m^2)*~~	~~*Not less than 3/16 inch (4.8 mm) nominal thickness. Each glazed area must be protected by protective grille or push bar[1] firmly attached to stiles on each exposed side.*~~
~~*Annealed glass (regular plate, float, sheet, rolled or obscure) face sandblasted, etched or otherwise Depreciated*~~	~~*Over 6 square feet (0.56 m^2)*~~	~~*Not less than 7/32 inch (5.6 mm) nominal thickness. Each glazed area must be protected by protective grille or push bar1 firmly attached to stiles on each exposed side.*~~
~~*Fully tempered glass*~~ ~~*Laminated glass*~~ ~~*Wire glass (obscure, patterned or transparent)*~~ ~~*Transparent rigid plastic*~~	~~*All sizes*~~	~~*Shall pass the text requirements of ANSI Z97.1.*~~

~~[1] *Shall be constructed and attached in such a manner so as to limit or prevent human impact from being delivered to glass surface.*~~

. . . .

SECTION 2406
SAFETY GLAZING

2406.1 Human impact loads. Individual glazed areas, including glass mirrors, in hazardous locations as defined in Section 2406.3 shall comply with Sections 2406.1.1 through 2406.1.5.

. . . .

~~***TABLE 2406.1.5 [DSA-SS]***~~
~~***IMPACT LOADS - GLAZING***~~

~~***SPECIFIC HAZARDOUS LOCATIONS***~~	~~***SIZE OF INDIVIDUAL GLAZED AREA***~~	~~***REQUIREMENTS [1,2]***~~
~~*Glazing in exit and entrance doors and fixed glazed panels*~~	~~*Over 6 square feet (0.56 m^2)*~~	~~*Each glazed area shall pass the test requirements of ANSI Z97.1 if not protected by a protective grille or push bar[3] firmly attached to stiles on each exposed side*~~
~~*Glazing in storm doors*~~	~~*Over 2 square feet (0.186 m^2)*~~	~~*Each glazed area shall pass the test requirements of ANSI Z97.1 if not protected by a protective grille firmly attached to stiles on each exposed side.*~~
~~*Glazing in sliding doors (both fixed and sliding panels)*~~	~~*Over 6 square feet (0.56 m^2)*~~	~~*Each glazed area shall pass the test requirements of ANSI Z97.1.*~~
~~*Glass in all unframed doors (swinging)*~~	~~*All sizes*~~	~~*Shall be fully tempered glass and pass the test requirements of ANSI Z97.1.*~~
~~*Glazing in shower doors and tub enclosures*~~	~~*All sizes*~~	~~*Shall pass the test requirements of ANSI Z97.1.*~~

~~[1] *Annealed glass less than single strength (SS) in thickness shall not be used.*~~

~~[2] *If short dimension is larger than 24 inches (610 mm), annealed glass must be doubled strength (DS) or thicker.*~~

~~[3] *Shall be constructed and attached in such a manner so as to limit or prevent human impact from being delivered to glass surface.*~~

. . . .

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 25
GYPSUM BOARD AND PLASTER

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	**X**	**X**	
Adopt only those sections listed below			
2501.2	X	X	
2503.2	X	X	
2504.2	X	X	
2504.2.1	X	X	
2505.3	X	X	
2507.3	X	X	
2508.5.6	X	X	
2510.7.1	X	X	

REPEAL OF EXISTING CALIFORNIA AMENDMENTS IN PART OR IN WHOLE THAT ARE NO LONGER NECESSARY, AS FOLLOWS:

2007 CBC SECTION 2506 – GYPSUM BOARD MATERIALS – repeal amendments in following subsections:
~~***2506.2.1.1 Additional Requirements. [DSA-SS]*** *In addition to the requirements of Section 2506.2.1 metal suspension systems shall comply with Section 13.5.6 of ASCE 7 as modified in Section 1614A.*~~

(All existing CBC 2007 CA amendments that are not revised below shall continue without any change)

EXPRESS TERMS

SECTION 2501
GENERAL

2501.1 Scope.

2501.1.1 General. Provisions of this chapter shall govern the materials, design, construction and quality of gypsum board, lath, gypsum plaster and cement plaster.

2501.1.2 Performance. Lathing, plastering and gypsum board construction shall be done in the manner and with the materials specified in this chapter, and when required for fire protection, shall also comply with the provisions of Chapter 7.

2501.1.3 Other materials. Other approved wall or ceiling coverings shall be permitted to be installed in accordance with the recommendations of the manufacturer and the conditions of approval.

2501.2 Additional Requirements. [DSA-SS & DSA-SS/CC] *Details of attachment for wall and ceiling coverings which are not provided for in these regulations shall be detailed in the approved ~~plans and specifications~~ construction documents.*

. . . .

SECTION 2503
INSPECTION

2503.1 Inspection. Lath and gypsum board shall be inspected in accordance with Section 109.3.5.

2503.2 Additional requirements for inspection and testing. [DSA-SS & DSA-SS/CC]

1. *Lath and gypsum board shall be inspected in accordance with ~~Appendix~~ Chapter 17A and Title 24, Part 1.*

2. *No lath or gypsum wallboard or their attachments shall be covered or finished until it has been inspected and approved by the inspector of record and/or special inspector.*

3. *The enforcement agency may require tests ~~to be made~~ in accordance with approved standards to determine compliance with the provisions of these regulations.*

4. *The testing of gypsum and gypsum products shall conform with standards listed in Table 2506.2.*

. . . .

SECTION 2504
VERTICAL AND HORIZONTAL ASSEMBLIES

2504.1 Scope. The following requirements shall be met where construction involves gypsum board, lath and plaster in vertical and horizontal assemblies.

2504.1.1 Wood framing. Wood supports for lath or gypsum board, as well as wood stripping or furring, shall not be less than 2 inches (51 mm) nominal thickness in the least dimension.

Exception: The minimum nominal dimension of wood furring strips installed over solid backing shall not be less than 1 inch by 2 inches (25 mm by 51 mm).

2504.1.2 Studless partitions. The minimum thickness of vertically erected studless solid plaster partitions of $^3/_8$-inch (9.5 mm) and $^3/_4$-inch (19.1 mm) rib metal lath or $^1/_2$-inch-thick (12.7 mm) long-length gypsum lath and gypsum board partitions shall be 2 inches (51 mm).

2504.2 Additional Requirements. [DSA-SS & DSA-SS/CC] *In addition to the requirements of this section, the horizontal and vertical assemblies of plaster or gypsum board shall be designed to resist the loads specified in Chapter 16A of this code. For wood framing, see Chapter 23. For metal framing, see Chapter 22A. For suspended acoustical ceiling systems, see Section 2506. For gypsum construction see Section 2508.*

2504.2.1 Wood Furring Strips. *Wood furring strips for ceilings fastened to floor or ceiling joist shall be nailed at each bearing with two common wire nails, one of which shall be a slant nail and the other a face nail, or by one nail having spirally grooved or annular grooved shanks approved by the enforcement agency for this purpose. All stripping nails shall penetrate not less than 1 3/4 inches (44.5 mm) into the member receiving the point. Holes in stripping at joints shall be subdrilled to prevent splitting.*

Where common wire nails are used to support horizontal wood stripping for plaster ceilings, such stripping shall be wire tied to the joists 4 feet (1219 mm) on center with two strands of No. 18 W&M gage galvanized annealed wire to an 8d common wire nail driven into each side of the joist 2 inches (51 mm) above the bottom of the joist or to each end of a 16d common wire nail driven horizontally through the joist 2 inches (51 mm) above the bottom of the joist, and the ends of the wire secured together with three twists of the wire.

SECTION 2505
SHEAR WALL CONSTRUCTION

2505.1 Resistance to shear (wood framing). Wood-framed shear walls sheathed with gypsum board, lath and plaster shall be designed and constructed in accordance with Section 2306.4 and are permitted to resist wind and seismic loads. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7.

2505.2 Resistance to shear (steel framing). Cold-formed steel-framed shear walls sheathed with gypsum board and constructed in accordance with the materials and provisions of Section 2210.5 are permitted to resist wind and seismic loads. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7.

2505.3 [DSA-SS & DSA-SS/CC] *Section 2505.1 and 2505.2 are not permitted by DSA.*

SECTION 2506
GYPSUM BOARD MATERIALS

2506.1 General. Gypsum board materials and accessories shall be identified by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored to protect such materials from the weather.

. . . .

2506.2.1 Other materials. Metal suspension systems for acoustical and lay-in panel ceilings shall conform with ASTM C 635 listed in Chapter 35 and Section 13.5.6 of ASCE 7 for installation in high seismic areas.

SECTION 2507
LATHING AND PLASTERING

2507.1 General. Lathing and plastering materials and accessories shall be marked by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored in such a manner to protect them from the weather.

2507.2 Standards. Lathing and plastering materials shall conform to the standards listed in Table 2507.2 and Chapter 35 and, where required for fire protection, shall also conform to the provisions of Chapter 7.

. . . .

2507.3 Lath attachment to horizontal wood supports. [DSA-SS & DSA-SS/CC] *Where interior or exterior lath is attached to horizontal wood supports, either of the following attachments shall be used in addition to the methods of attachment described in referenced standards listed in Table 2507.2.*

1. *Secure lath to alternate supports with ties consisting of a double strand of No. 18 W & M gage galvanized annealed wire at one edge of each sheet of lath. Wire ties shall be installed not less than 3 inches (76 mm) back from the edge of each sheet and shall be looped around stripping, or attached to an 8d common wire nail driven into each side of the joist 2 inches (51 mm) above the bottom of the joist or to each end of a 16d common wire nail driven horizontally through the joist 2 inches (51 mm) above the bottom of the joist and the ends of the wire secured together with three twists of the wire.*

2. *Secure lath to each support with 1/2-inch-wide (12.7 mm), 1 1/2-inch-long (38mm) No. 9 W & M gage, ring shank, hook staple placed around a 10d common nail laid flat under the surface of the lath not more than 3 inches (76 mm) from edge of each sheet. Such staples may be placed over ribs of 3/8-inch (9.5 mm) rib lath or over back wire of welded wire fabric or other approved lath, omitting the 10d nails.*

SECTION 2508
GYPSUM CONSTRUCTION

2508.1 General.

. . . .

2508.5.4 Fasteners. Fasteners used for the attachment of gypsum board to a horizontal diaphragm ceiling shall be as defined in Table 2508.5. Fasteners shall be spaced not more than 7 inches (178 mm) on center (o.c.) at all supports, including perimeter blocking, and not more than $^{3}/_{8}$ inch (9.5 mm) from the edges and ends of the gypsum board.

2508.5.5 Lateral force restrictions. Gypsum board shall not be used in diaphragm ceilings to resist lateral forces imposed by, masonry or concrete construction.

2508.5.6 Diaphragm ceiling connection to partitions. [DSA-SS & DSA-SS/CC] *Gypsum board shall not be used in diaphragm ceilings to resist lateral forces imposed by partitions. Connection of diaphragm ceiling to the vertical lateral force resisting elements shall be designed and detailed to transfer lateral forces.*

. . . .

SECTION 2510
LATHING AND FURRING FOR CEMENT PLASTER (STUCCO)

2510.1 General.

. . . .

2510.7 Preparation of masonry and concrete. Surfaces shall be clean, free from efflorescence, sufficiently damp and rough for proper bond. If the surface is insufficiently rough, approved bonding agents or a portland cement dash bond coat mixed in proportions of not more than two parts volume of sand to one part volume of portland cement or plastic cement shall be applied. The dash bond coat shall be left undisturbed and shall be moist cured not less than 24 hours.

2510.7.1 Additional Requirements. [DSA-SS & DSA-SS/CC] *Bonding agents shall conform with the provisions of United States Government Military Specifications MIL-B-19235.*

. . . .

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 27
PLASTIC

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 30
ELEVATORS AND CONVEYING SYSTEMS

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 31
SPECIAL CONSTRUCTION

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 32
ENCROACHMENT TO PUBLIC RIGHT-OF-WAY

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

DSA-SS **Authority:** Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC **Authority:** Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

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CHAPTER 33
SAFEGUARD DURING CONSTRUCTION

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt without amendments			
Adopt entire chapter with amendments listed below	**X**	**X**	
Adopt only those sections listed below			
3307.2	X	X	
3307.3	X	X	

SECTION 3301
GENERAL

3301.1 Scope. The provisions of this chapter shall govern safety during construction and the protection of adjacent public and private properties.

. . . .

SECTION 3307
PROTECTION OF ADJOINING PROPERTY

. . . .

3307.2 Protection of adjoining property. [DSA-SS & DSA-SS/CC] *The requirements for protection of adjacent property and depth to which protection is required shall be as defined in Section 832, Civil Code.*

The owner or governing board shall be responsible to retain the services of a structural engineer and a geotechnical engineer to review the design of the support system for foundations of the existing buildings, or soil supporting any portion of the building. Where the underpinning or support system provides for the stability of the foundations of an existing hospital, essential services building, or public school building, the system shall be designed and constructed to conform to all requirements of these regulations.

3307.3 Protection of existing buildings. [DSA-SS & DSA-SS/CC] *Where excavation for new construction affects the stability of the foundations or any portion of such existing building, a support system shall be provided. Such systems shall be considered a structural alteration to the existing building and shall be designed and constructed to conform to these regulations.*

. . . .

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

Notation:
Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

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CHAPTER 34
EXISTING STRUCTURES

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below	**X**	**X**	
3401.1	X	X	
3401.1.2	X	-	
3401.1.3	-	X	New Amendment
3415	X	X	
3416	X	X	
3417	X	X	
3418	X	X	
3419	X	X	
3420	X	X	
3421	X	X	

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

EXPRESS TERMS

SECTION 3401 - GENERAL

3401.1 Scope. The provisions of this Chapter shall control the *alteration*, repair, *addition* and change of occupancy of existing structures*, including state-regulated structures in accordance with Sections 3401.1.1 and 3401.1.2.*

Exception: Existing *bleachers*, grandstands and folding and telescopic seating shall comply with ICC 300-02.

3401.1.1 Existing state-owned structures. . . .

3401.1.2 Public school buildings. [DSA-SS] *The provisions of Sections 3415 through 3421 establish minimum standards for earthquake evaluation and design for the rehabilitation of existing buildings for use as public school buildings under the jurisdiction of the Division of the State Architect - Structural Safety (DSA-SS, refer to Section ~~109.2~~ 1.9.2.1) where required by Sections 4-307 and 4-309(c) of the California Administrative Code.*

The provisions of Section 3415 through 3421 also establish minimum standards for earthquake evaluation and design for rehabilitation of existing public school buildings currently under the jurisdiction of DSA-SS.

3401.1.3 Community college buildings. [DSA-SS/CC] *The provisions of Sections 3415 through 3421 establish minimum standards for earthquake evaluation and design for the rehabilitation of existing buildings for use as community college buildings under the jurisdiction of the Division of the State Architect - Structural Safety/Community Colleges(DSA-SS/CC, refer to Section 1.9.2.2) where required by Sections 4-307 and 4-309(c) of the California Administrative Code.*

The provisions of Section 3415 through 3421 also establish minimum standards for earthquake evaluation and

design for rehabilitation of existing community college buildings currently under the jurisdiction of DSA-SS/CC.

. . . .

SECTION 3415
EARTHQUAKE EVALUATION AND DESIGN FOR
RETROFIT OF EXISTING BUILDINGS

3415.1 Purpose.

3415.1.1 Existing state-owned structures. . . .

3415.1.2 Public school buildings. *The provisions of Sections 3415 through 3421 establish minimum standards for earthquake evaluation and design for the rehabilitation of existing buildings for use as public school buildings under the jurisdiction of the Division of the State Architect - Structural Safety (DSA-SS), refer to Section ~~109.2~~ 1.9.2.1.*

The provisions of Section 3415 through 3421 also establish minimum standards for earthquake evaluation and design for rehabilitation of existing public buildings currently under the jurisdiction of DSA-SS.

3415.1.2.1 Reference to other chapters: *~~Note:~~ For public schools, where reference within this chapter is made to sections in Chapters 16, 17, 18, 19, 21 or 22, the provisions in Chapters 16A, 17A, 18A, 19A, 21A, and 22A respectively shall apply instead.*

3415.1.3 Community college buildings. *The provisions of Sections 3415 through 3421 establish minimum standards for earthquake evaluation and design for the rehabilitation of existing buildings for use as community college buildings under the jurisdiction of the Division of the State Architect - Structural Safety/Community Colleges (DSA-SS/CC), refer to Section 1.9.2.2.*

The provisions of Section 3415 through 3421 also establish minimum standards for earthquake evaluation and design for rehabilitation of existing community college buildings currently under the jurisdiction of DSA-SS/CC.

3415.1.3.1 Reference to other chapters: *For community colleges, where reference within this chapter is made to sections in Chapters 17 or 18, the provisions in Chapters 17A and 18A respectively shall apply instead.*

. . . .

3415.3 Applicability.

3415.3.1 Existing state-owned buildings...

3415.3.2 Public school buildings...

3415.3.3 Community college buildings. *For community colleges, the provisions of Section 3415 apply when required in accordance with Sections 4-307 and 4-309(c), Title 24, Part 1.*

. . . .

3415.5 Minimum seismic design performance levels for structural and nonstructural components.

Following the notations of ASCE 41, the seismic requirements for design and assessment are based upon a prescribed Earthquake Hazard Level (BSE-1, BSE-2, BSE-R, or BSE-C), a specified structural performance level (S-1 through S-5) and a non-structural performance level (N-A through N-E). The minimum seismic performance criteria are given in Table 3415.5 according to the Building Regulatory Authority and the Occupancy Category as determined in Chapter 16 or by the regulatory authority. The building shall be evaluated at both the Level 1 and Level 2 performance levels, and the more restrictive requirements shall apply.

Exception: *If the floor area of an addition is greater than the larger of 50 per cent of the floor area of the original building or 1,000 square feet (93m^2), then the Table 3415.5 entries for BSE-R and BSE-C are replaced by BSE-1 and BSE-2, respectively.*

TABLE 3415.5
SEISMIC PERFORMANCE REQUIREMENTS BY BUILDING REGULATORY AUTHORITY AND OCCUPANCY CATEGORY. ALL BUILDINGS NOT REGULATED BY DSA ARE ASSIGNED AS "STATE-OWNED."

Building Regulatory Authority	*Occupancy Category*	*Performance Criteria*	
		Level 1	*Level 2*
State-Owned	*I, II, III*	*BSE-R, S-3, N-D*	*BSE-C, S-5, N-E*
State-Owned	*IV*	*BSE-R, S-2, N-B*	*BSE-C, S-4, N-C*
Division of the State Architect - Public schools	*I, ~~II, III, IV~~*	*BSE-1, ~~S-2~~ S-3, N-C*	*BSE-2, ~~S-4~~ S-5, ~~N-D~~ N-E*
Division of the State Architect - Public schools	*II, III*	*BSE-1, S-2, N-C*	*BSE-2, S-4, N-D*
Division of the State Architect - Public schools	*IV*	*BSE-1, S-2, N-C*	*BSE-2, S-4, ~~N-D~~ N-C*
Division of the State Architect - Community college	*I, II, III*	*BSE-R, S-3, N-D*	*BSE-2, S-5, N-E*
Division of the State Architect - Community college	*IV*	*BSE-R, S-2, N-B*	*BSE-2, S-4, N-C*

Footnotes:

1. *ASCE 41 provides acceptance criteria (e.g. m, rotation) for Immediate Occupancy (S1), Life Safety (S3), and Collapse Prevention (S5), and specifies that values for S-2 and S-4 are to be determined by interpolation between the adjacent performance level values.*

   The required method of interpolation is as follows:

   For level S-2, the acceptance value is 1/3 of the sum of the tabulated value for Immediate Occupancy (IO level) and twice the tabulated value for the Life Safety (LS level).

   For level S-4, the acceptance value is one-half the sum of the value for the LS level and the value for the Collapse Prevention (CP) level.

   For nonstructural components, N-A corresponds to the IO level, N-C to the LS level, and N-D to the Hazards Reduced (HR level).

   For Evaluation Procedures, N-B shall be the same as for N-A. Where numerical values are used, the values for N-B are one half the sum of the appropriate IO and LS values. Where IO or CP values are not given by ASCE 41, then the LS values are permitted to be substituted.

2. *Buildings evaluated and retrofitted to meet the requirements for a new building, Chapter 16, Part 2, Title 24, in accordance with the exception in Section 3417.1, are deemed to meet the seismic performance requirements of this section.*

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SECTION 3416
DEFINITIONS

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SECTION 3417
SEISMIC CRITERIA SELECTION FOR EXISTING BUILDINGS

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3417.1.3 *For state-owned and community college buildings, where unreinforced masonry is not bearing, it may be used only to resist applied lateral loads. Where unreinforced masonry walls are part of the structure they must be assessed for stability under the applicable non-structural evaluation procedure.*

3417.1.4 *For public schools, unreinforced masonry shall not be used to resist in-plane or out-of-plane seismic forces or superimposed gravity loads.*

3417.1.5 *For public schools of light frame construction, horizontal diaphragms and vertical shear walls shall consist of either diagonal lumber sheathing or structural panel sheathing. Braced horizontal diaphragms may be acceptable when approved by DSA. Straight lumber sheathing may be used in combination with diagonal or structural panel sheathing as diaphragms or shear walls. Let-in bracing, plaster (stucco), hollow-clay tile, gypsum wallboard and particleboard sheathing shall not be ~~allowed~~ assumed to resist seismic forces.*

3417.2 Existing conditions*. The existing condition and properties of the entire structure must be determined and documented by thorough inspection of the structure and site, review of all available related construction documents, review of geotechnical and engineering geologic reports, and performance of necessary testing and investigations. Where samples from the existing structure are taken or in situ tests are performed, they shall be selected and interpreted in a statistically appropriate manner to ensure that the properties determined and used in the evaluation or design are representative of the conditions and structural circumstances likely to be encountered in the structure as a whole. Adjacent structures or site features that may affect the retrofit design shall be identified.*

The entire load path of the seismic force resisting system shall be determined, documented and evaluated. The load path includes all the horizontal and vertical elements participating in the structural response: such as diaphragms, diaphragm chords, diaphragm collectors; vertical elements such as walls, frames, braces; foundations and the connections between the components and elements of the load path. Repaired or retrofitted elements and the standards under which the work was constructed shall be identified.

These requirements shall be met following the data collection requirements of ASCE 41 Section 2.2 and shall be implemented as follows:

1. *For state-owned buildings, the "Usual" level as defined in ASCE 41, Section 2.2.6.2.*
2. *For public schools, the "Comprehensive" level as defined in ASCE 41, Section 2.2.6.3.*
3. *For community college buildings constructed in conformance with the Field Act, the "Usual" level as defined in ASCE 41, Section 2.2.6.2.*
4. *For community college buildings not constructed in conformance with the Field Act, the "Comprehensive" level as defined in ASCE 41, Section 2.2.6.3.*

Qualified test data from the original construction may be accepted, in part or in whole, by the enforcement agency to fulfill the data collection requirements.

Exceptions:

1. *The number of samples for data collection may be adjusted with approval of the enforcement agency when it has been determined that adequate information has been obtained or additional information is required.*
2. *Welded steel moment frame connections of buildings that may have experienced potentially damaging ground motions shall be inspected in accordance with Chapters 3 and 4, FEMA 352, Recommended Post Earthquake Evaluation and Repair Criteria for Welded Moment-Frame Construction for Seismic Applications (July 2000).*

Where original building plans and specifications are not available, "as-built" plans shall be prepared that depict the existing vertical and lateral structural systems, exterior elements, foundations, and non-structural systems in sufficient detail to complete the design.

Data collection shall be directed and observed by the project structural engineer or design professional in charge of the design.

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3417.10 Structural observation, testing and inspection.

Structural, geotechnical and construction observation, testing and inspection as used in this Section shall mean meeting the requirements of Chapter 17, with a minimum allowable level of investigation corresponding to seismic design category (SDC) D. At a minimum the project site will be visited by the responsible design professional to observe existing conditions and to review the construction work for general compliance with approved plans, specifications and applicable structural regulations. Such visits shall occur at significant construction stages and at the completion of the structural retrofit. Structural observation shall be provided for all structures. The plan for testing and inspection shall be submitted to the Building Official for review and approval with the application for permit.

Additional requirements: *For public schools and community colleges, construction material testing, inspection and observation during construction shall also comply with Section 4-333, Part 1, Title 24.*

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3417.12 Voluntary modifications to the lateral-force resisting system. . . .

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3417.12.1 State-owned buildings. *Voluntary modifications to lateral-force-resisting systems conducted in accordance with Appendix A of the IEBC and the referenced standards of this code shall be permitted. When Section 3417.12 is the basis for structural modifications, the approved design documents must clearly have the phrase "The seismic requirements of Chapter 34 for existing buildings have not been met by these structural modifications; the modifications proposed are to a lesser seismic performance standard ~~that~~ than would be required in Section 3417 if they were not voluntary as allowed in Section 3417.12."*

3417.12.2 Publics schools. *When Section 3417.12 is the basis for structural modifications, the approved design documents must clearly indicate the scope of modifications and the acceptance criteria for the design.*

3417.12.3 Community colleges. *When Section 3417.12 is the basis for structural modifications, the approved design documents must clearly indicate the scope of modifications and the acceptance criteria for the design.*

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SECTION 3421
ADDITIONAL REQUIREMENTS FOR PUBLIC SCHOOLS AND COMMUNITY COLLEGES

The requirements of Section 3421 apply only to public schools under the jurisdiction of the Division of the State Architect - Structural Safety (DSA-SS, refer to Section ~~109.2~~ 1.9.2.1) and community colleges under the jurisdiction of the Division of the State Architect - Structural Safety/Community Colleges (DSA-SS/CC), refer to Section 1.9.2.2.

3421.1. Evaluation and design criteria report. *During the schematic phase of the project, the owner or the registered design professional in charge of the design shall prepare and sign an Evaluation and Design Criteria Report in accordance with Part 1, Title 24, C. C. R., Section 4-307(a). The report shall be submitted to the DSA for review and approval prior to proceeding with design development of the rehabilitation.*

The Evaluation and Design Criteria Report shall:

1. *Identify the building(s) structural and non-structural systems, potential deficiencies in the elements or systems and the proposed method for retrofit.*
2. *Identify geological and site-related hazards.*
3. *Propose the methodology for evaluation and retrofit design.*
4. *Propose the complete program for data collection (Section 3416.2).*
5. *Include existing or "as-built" building plans, reports and associated documents of the existing construction.*

3421.2. Rehabilitation involving only portions of structures. *Where only a portion(s) of a structure is to be rehabilitated, the public school or community college portion of the structure shall:*

1. *Be seismically separated from the unrehabilitated portion in accordance with Chapter 16 of Part 2, Title 24, or the entire structure shall be rehabilitated in accordance with this Section. For structures in which the*

unrehabilitated portion is above or below the school or community college portion, the entire structure shall be rehabilitated in accordance with this division.

2. *Be retrofitted as necessary to protect the occupants from falling hazards of the unrehabilitated portion of the building, and;*

3. *Be retrofitted as necessary to protect required exitways being blocked by collapse or falling hazards of the unrehabilitated portion.*

Notation for [DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

Notation for [DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

CHAPTER 35
REFERENCED STANDARDS

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below	-	**X**	
Adopt only those sections listed below			
ACI	X	**X**	
AISC	X	**X**	
AITC	X	**X**	
ASCE/SEI	X	**X**	
ASTM	X	**X**	
AWS	X	**X**	
ICC	X	**X**	
NFPA	X	**X**	
PCI	X	**X**	
PTI	X	**X**	

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

EXPRESS TERMS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.4.

[DSA-SS & DSA-SS-CC] Reference to other chapters. *In addition to the code sections referenced, the standards listed in this chapter are applicable to the respective code sections in Chapters 16A, 17A, 18A, 19A, 21A, and 22A.*

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ACI	American Concrete Institute 38800 Country Club Drive Farmington Hills, MI 48333-9094

Standard reference number	Title	Referenced in code section number
503.7-07	*Specification for Crack Repair by Epoxy Injection.*	*1917A.2*
506-05	*Guide to Shotcrete*	*1913A*
404.2R-08	*Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures*	*1917A.3*

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AISC	American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001	
Standard reference number	Title	Referenced in code section number
358-05	*Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications <u>including Supplement No. 1</u>*	*2205A,3413A*

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AITC	American Institute of Timber Construction Suite 140 7012 S. Revere Parkway Englewood, CO 80112	
Standard reference number	Title	Referenced in code section number
AITC 111-05	*Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection*	*2303.1.3.1*
AITC 404-05	*Standard for Radially Reinforcing Curved Glued Laminated Timber Members to Resist Radial Tension*	*2303.1.3.1*

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ASCE/SEI	American Society of Civil Engineers Structural Engineering Institute 1801 Alexander Bell Drive Reston, VA 20191-4400	
Standard reference number the	Title	Referenced in code section number
41-06	*Seismic Rehabilitation of Existing Buildings including Supplement No. 1*	*~~3403.2.3, 3403A.13,~~ <u>3401.5,</u>3415.5, 3415.8, <u>3416, 3417.1,</u> 3417.2, 3417.5, 3417.7, 3417.8, 3417.9, <u>3418, 3419, 3412A, 3413A</u>*

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ASTM	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428-2959	
Standard reference number	Title	Referenced in code section number
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C 144-04	*Standard specification for Aggregate for Masonry Mortar*	*~~2103A.8~~*

C 289-07	*Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates*	*1903.2, 1903A.3*
ASTM C618 - 08a	*Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete*	*1903.2, 1903A.3*
ASTM C989 - 09	*Standard Specification for Slag Cement for Use in Concrete and Mortars*	*1903.2, 1903A.3*
C 1567-04 08	*Standard Test Method for Determining the Potential Alkali-Silica Reactivity of the Cementicious Materials and aggregate (Accelerated Mortar-Bar Method)*	*1903A.3 1903A.5, 1903.3*
C 1586-05	*Standard Guide for Quality Assurance of Mortars*	*2105.2.2.1.4, 2105A.5 2105A.2.2.1.4*
E 580-08	*Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions*	*1615.1.13, 1615A.1.16*

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AWS	American Welding Society 550 N.W. LeJeune Road Miami, FL 33126	
Standard reference number	Title	Referenced in code section number
D1.1-08 *06*	Structural Welding Code-Steel	Table 1704.3, 1704.3.1.1, *1704A.3.1.4*
D1.3-*08* *98*	Structural Welding Code-Sheet Steel	1704.3.1.2, Table 1704.3
D1.4-*05*	Structural Welding Code-Reinforcing Steel	1704.3.1.3, Table 1704.3, Table 1704.4, 2107.4, *2107A.7*
D1.8-09	*Structural Welding Code – Seismic Supplement*	*1704A.3.1.4, 2204.1.1, 2204A.1.1*
QC1-06	*Standard for AWS Certification of Welding Inspectors.*	*1704A.3.1.1 1704A.3.1.4*

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ICC	International Code Council, Inc. 500 New Jersey Ave, NW 6th Floor Washington, DC 20001	
Standard reference number	Title	Referenced in code section number
*ICC-ES AC 01-09**	*Acceptance criteria for expansion anchors in Masonry elements*	*1615A.1.14*
*ICC-ES AC 43-06 09**	*Acceptance criteria for steel deck roof and floor systems*	*2209A.3*
*ICC-ES AC 58-09**	*Acceptance criteria for adhesive anchors in Masonry elements*	*1615A.1.14*
*ICC-ES AC 70-09**	*Acceptance criteria for fasteners power-driven into Concrete, Steel and Masonry elements*	*1911A.1.1*
*ICC-ES AC 106-09**	*Acceptance criteria for predrilled fasteners*	*1615A.1.14*

	(screw anchors) in Masonry	
*ICC-ES AC 125-09**	*Acceptance criteria for Concrete, and Reinforced and Unreinforced Masonry strengthening using externally bonded Fiber-Reinforced Polymer (FRP) composite systems.*	*1917A.3*
*ICC-ES AC 178-09**	*Acceptance criteria for inspection and verification of Concrete, and Reinforced and Unreinforced Masonry strengthening using Fiber-Reinforced Polymer (FRP) composite systems.*	*1917A.3*
*ICC-ES AC 193-09**	*Acceptance criteria for mechanical anchors in Concrete elements*	*1615A.1.14, 1912A.1.1*
*ICC-ES AC 308-09**	*Acceptance criteria for post-installed adhesive anchors in Concrete elements*	*1615A.1.14, 1912A.1.1*
*ICC-ES AC 358-09**	*Acceptance criteria for Helical foundation systems and devices*	*1810A.3.1.5.1*

** Refers to International Building Code, 2009 as a reference standard.*

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PCI Precast Prestressed Concrete Institute
209 W. Jackson Boulevard, Suite 500
Chicago, IL 60604-6938

Standard reference number	Title	Referenced in code section number
PCI 120-10 ~~04~~	*PCI Design Handbook, 7th ~~6~~th Edition*	*1908A.1*

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PTI Post-Tensioning Institute
8601 North Black Canyon Highway, Suite 201
Phoenix, AZ 85021

Standard reference Number	Title	Referenced in code section number
PTI-2004	*Recommendations for Prestressed Rock and Soil Anchors (4th Edition)*	*1811A.2, ~~1813A.2~~,1810A.3.10.4,*

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Notation for [DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

Notation for [DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.

APPENDIX J
GRADING

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter without amendments			
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below	**X**	**X**	
J101	X	X	
J102	X	X	
J105	X	X	
J105.1	X	X	
J106	X	X	
J107	X	X	
J107.5	X	X	
J108	X	X	
J109	X	X	
J110	X	X	
J111	X	X	

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SECTION J105
INSPECTIONS

J105.1 General. Inspections shall be governed by Section 109, ~~*Appendix*~~ Chapter 1, *Division II* of this code.

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SECTION J107
FILLS

J107.1 General. Unless otherwise recommended in the soils report, fills shall conform to provisions of this section.

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J107.5 Compaction. All fill material shall be compacted to 90 percent of maximum density as determined by ASTM D 1557, Modified Proctor, in lifts not exceeding 12 inches (305 mm) in depth.

[DSA-SS & DSA-SS/CC] *This section establishes minimum requirements only.*

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

Notation [For DSA-SS]
Authority: Education Code § 17310 and 81142, and H&S Code §16022.
Reference: Education Code §§ 17280 through 17317, and 81130 through 81147, and Health and Safety Code §§16000 through 16023.

DSA-SS/CC [For DSA-SS/CC]
Authority: Education Code § 81053.
Reference: Education Code §§ 81052, 81053, and 81130 through 81147.