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

REGARDING
THE ADOPTION BY REFERENCE OF THE
2012 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, Parts 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 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 2012 edition of the International Building Code (IBC) as the 2013 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 2012 edition of the International Building Code (IBC) as the 2013 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 2009 edition IBC adopted as the 2010 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. **IBC text not adopted**: 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.

CHAPTER 1
SCOPE AND 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**	
Division I			
1.1	X	X	
1.9.2.1	X	-	
1.9.2.1.1	X	-	Editorial change – Section references
1.9.2.1.2	X	-	
1.9.2.1.3	X	-	Editorial change – Section references
1.9.2.2	-	X	
1.9.2.2.1	-	X	Editorial change – Section references
1.9.2.2.2	-	X	
1.9.2.2.3	-	X	Editorial change – Section references
1.9.2.2.4	-	X	
Division II			
102.1	X	X	
102.2	X	X	
102.3	X	X	
102.4	X	X	Editorial change – Section references
102.4.3	X	X	Editorial change – Section numbers
102.4.4	X	X	Editorial change – Section numbers
102.5	X	X	
104.9	X	X	
104.10	X	X	
104.11	X	X	New Amendment
106.1	X	X	
106.1.1	X	X	

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

EXPRESS TERMS

CHAPTER 1
SOPE AND ADMINISTRATION

DIVISION I
CALIFORNIA ADMINISTRATION

SECTION 1.1
GENERAL

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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 1.2 through 1.14, except where modified by local ordinance pursuant to Section 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 1.9.2 for additional scope provisions.*
12. *. . .*
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SECTION 1.9
DIVISION OF THE STATE ARCHITECT

1.9.2 Division of the State Architect—Structural Safety.

1.9.2.1 DSA-SS Division of the State Architect-Structural Safety.

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

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

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 1.1 and 1.9.2.1 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, and 106.1 of Chapter 1, Division II.

1.9.2.1.2 Applicable building standards. *California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 6, 9, 11 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 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.

1.9.2.1.3 Amendments. *Division of the State Architect—Structural Safety amendments in this code appear preceded 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~~ 3417-3423—DSA-SS adopts these sections without the use of the DSA-SS acronym.*

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 1.9.2.2 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, and 106.1 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, 11 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, 22~~A~~, 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~~ 3417-3423—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.*

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CHAPTER 1 – *DIVISION II*
SCOPE AND ADMINISTRATION

SECTION 101
GENERAL

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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 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 and as further regulated in Sections 102.4.1 ~~and 102.4.2~~ *through 102.4.4*.

> **102.4.1 Conflicts.** Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.
>
> **102.4.2 Provisions in referenced codes and standards.** Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code or the International Codes listed in Section 101.4, the provisions of this code or the International Codes listed in Section 101.4, as applicable, shall take precedence over the provisions in the referenced code or standard.
>
> ~~***102.4.1***~~ ***102.4.3*** ***Code References. [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.*
>
> ~~***102.4.2***~~ ***102.4.4*** ***Reference in Standards. [DSA-SS & DSA-SS/CC]*** *All references listed in reference standards shall be replaced by referenced standards listed in Chapter 35 of this code, where applicable, and shall include all amendments to the reference standards in this code.*

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SECTION 104
DUTIES AND POWERS OF BUILDING OFFICIAL

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

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104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. ***[DSA-SS & DSA-SS/CC]*** *Alternative system shall satisfy ASCE 7 Section 1.3, unless more restrictive requirements are established by this code for an equivalent system.*

[DSA-SS & DSA-SS/CC] *Alternative systems must also satisfy the California Administrative Code, Section 4-304.*

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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/m^2), such design live loads shall be conspicuously posted by the owner in that part of each *story* in which they apply, using durable signs.

It shall be unlawful to remove or deface such notices.

106.1.1 Snow Load Posting. [DSA-SS & DSA-SS/CC] *Snow loads used in design shall be posted as for live loads.*

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

Notation [For DSA-SS]

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 2 – DEFINITIONS

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			
Active Equipment/Component	X	X	New Amendment
Diaphragm, Rigid	X	X	Revised
Enforcement Agent	X	X	From 1602.1, CBC 2010
Next Generation Attenuation (NGA)	X	X	From 1615.9.2 and 1613A.2, CBC 2010
Retrofit	X	X	From 3402.1. CBC 2010
Significant Loss of Function	X	X	New Amendment

SECTION 201
GENERAL

201.1 Scope. Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code, have the meanings shown in this chapter.

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SECTION 202
DEFINITIONS

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ACTIVE EQUIPMENT/COMPONENT. [DSA-SS & DSA-SS/CC] *Equipment/Component containing moving or rotating parts, electrical parts such as switches or relays, or other internal components that are sensitive to earthquake forces and critical to the function of the equipment.*

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DIAPHRAGM. . . .

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Diaphragm, rigid. A diaphragm is rigid for the purpose of distribution of story shear and torsional moment when the lateral deformation of the diaphragm is less than or equal to two times the average story drift.

Diaphragm, rigid. ***[DSA-SS & DSA-SS/CC]*** A diaphragm is rigid for the purpose of distribution of story shear and torsional moment *where so indicated in Section 12.3.1 of ASCE 7.* ~~*when the lateral deformation of the diaphragm is less than or equal to two times the average story drift.*~~

. . .

(Relocated from 2010 CBC, Sections 1602A and 1602.1) ***ENFORCEMENT AGENT. [DSA-SS & DSA-SS/CC]*** *That individual within the agency or organization charged with responsibility for agency or organization compliance with the requirements of this Code. Used interchangeably with Building Official and Code Official.*

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(Relocated from 2010 CBC, Section 1615.9.2 and 1613A.2) ***NEXT GENERATION ATTENUATION (NGA). [DSA-SS & 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.*

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(Relocated from 2010 CBC, Section 3402.1) ***RETROFIT. [DSA-SS & DSA-SS/CC]*** *The construction of any new element or system, or the alteration of any existing element or system required to bring an existing building, or portion thereof, conforming to earlier code requirements, into conformance with standards of the currently effective California Building Standards Code.*

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RUGGED EQUIPMENT. [DSA-SS & DSA-SS/CC] *Rugged equipment refers to an ampleness of construction that gives such equipment the ability to survive earthquake strong motions without significant loss of function.*

. . .

SIGNIFICANT LOSS OF FUNCTION. [DSA-SS & DSA-SS/CC] *Significant loss of function for equipment or components means the equipment or component cannot be restored to its original function by competent technicians after a design earthquake because the equipment or component require parts that are not normally stocked by the owner or not readily available.*

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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.

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

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.

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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~~ 1410	X	X	Section 1409 in 2010 CBC

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

EXPRESS TERMS

CHAPTER 14
EXTERIOR WALLS

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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 1405.6, 1405.7, 1405.8, 1405.9, and 1405.10, the installation of anchored or adhered veneer shall comply with applicable provisions of Section ~~1409~~ 1410.*

. . .

SECTION ~~1409~~ 1410 [DSA-SS & DSA-SS/CC]
ADDITIONAL REQUIREMENTS FOR ANCHORED AND ADHERED VENEER.

~~1409.1~~ 1410.1 General. *In no case shall veneer be considered as part of the backing in computing strength or deflection nor shall it be considered a part of the required thickness of the backing.*

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

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

~~1409.2~~ 1410.2 Adhered Veneer. *Units of tile, masonry, stone or terra cotta which exceed 5/8 inch (16 mm) in thickness shall be applied as for anchored veneer where used over exit ways or more than 20 feet (6096 mm) in height above adjacent ground elevation.*

~~1409.2.1~~ 1410.2.1 Bond Strength and Tests. *Veneer shall develop a bond to the backing in accordance with TMS 402, 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.

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.

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

CHAPTER 15
ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

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	
1509.7.1 Exception	X	X	New Amendment
~~1511~~ 1512	X	X	Section 1511 in 2010 CBC

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

EXPRESS TERMS

SECTION 1501
GENERAL

. . .

SECTION 1507
REQUIREMENTS FOR ROOF COVERINGS

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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~~ 1512.*

. . .

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

. . .

1507.7.8 Additional requirements. [DSA-SS & DSA-SS/CC] *In addition to the requirements of Sections 1507.7.5, the installation of slate shingle roof coverings shall comply with the requirements of Sections 1507.3.6 and 1507.3.7, and the seismic anchorage provisions of Section ~~1511~~ 1512.*

. . .

SECTION 1509
ROOFTOP STRUCTURES

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1509.7 Photovoltaic systems. Rooftop mounted photovoltaic systems shall be designed in accordance with this section.

1509.7.1 Wind resistance. Rooftop mounted photovoltaic systems shall be designed for wind loads for component and cladding in accordance with Chapter 16 using an effective wind area based on the dimensions of a single unit frame.

Exception: [DSA-SS, DSA-SS/CC] *The effective wind area shall be in accordance with Chapter 16 and ASCE 7 Section 26.2.*

. . .

SECTION ~~1511~~ 1512 [DSA-SS & DSA-SS/CC]
SEISMIC ANCHORAGE OF SLATE SHINGLE, CLAY AND CONCRETE TILE ROOF COVERINGS

~~1511.1~~ 1512.1 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~~ 1512.2 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~~ 1512.3 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~~ 1512.4 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 (610 mm) of the rake shall be attached at intervals of 5 feet (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~~ 1512.5 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.*

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.

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	
1601.1.2		X	
1601.1.3		X	
1601.1.4		X	
1601.2		X	
~~1615~~ 1616		X	Was Section 1615 in 2010 CBC

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

EXPRESS TERMS

SECTION 1601
GENERAL

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

1601.1.1 Application. [DSA-SS/CC] *The scope of application of Chapter 16 is as follows:*

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.

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

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

1601.1.3 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.*

1601.1.4 Amendments. [DSA-SS/CC] *See Section ~~1615~~ 1616 for additional requirements.*

1601.2 Enforcement agency approval. [DSA-SS/CC] *In addition to requirements of CCR Title 24, Parts 1 & 2, any aspect of project design, construction, quality assurance or quality control programs for which this code requires approval by the design professional, are also subject to approval by the enforcement agency.*

. . .

SECTION ~~1615~~ 1616
ADDITIONAL REQUIREMENTS [DSA-SS/CC]

~~1615.1~~ 1616.1 Construction documents.

~~1615.1.1~~ 1616.1.1 *Additional requirements for construction documents are included in Sections 4-210 and 4-317 of the ~~Building Standards~~ California Administrative Code (Part 1, Title 24, C.C.R).*

~~1615.1.2~~ 1616.1.2 Connections. *Connections that resist design seismic forces shall be designed and detailed on the design drawings.*

~~1615.1.3~~ 1616.1.3 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.*

~~1615.2~~ 1616.2 General design requirements.

~~1615.2.1~~ 1616.2.1 Lateral load deflections.

~~1615.2.1.1~~ 1616.2.1.1 Horizontal diaphragms. *The maximum span-width ratio for any roof or floor diaphragm shall not exceed those given in ~~Table 2305.2 or~~ Table 4.2.4 of AF & PA SDPWS for wood sheathed diaphragms. For other diaphragms, test data and design calculations acceptable to the enforcement agency shall be submitted and approved for span-width ratios.*

~~1615.2.1.2~~ 1616.2.1.2 Veneers. *The deflection shall not exceed ~~the limits in Section 1405.10~~ l/600 for veneered walls, anchored veneers and adhered veneers over 1 inch (25 mm) thick, including the mortar backing.*

~~1615.2.1.3~~ 1616.2.1.3 ~~Occupancy~~ Risk Category of buildings and other structures. *~~Occupancy~~ Risk Category IV includes structures as defined in ~~C.C.R. Title 24, Part 1,~~ the California Administrative Code, Section 4-207 and all structures required for their continuous operation or access/egress.*

1616.2.2 Structural Walls*. For anchorage of concrete or masonry walls to roof and floor diaphragms, the out-of-plane strength design force shall not be less than 280 lb/linear ft (4.09 kN/m) of wall.*

~~1615.3~~ 1616.3 Load combinations.

~~1615.3.1~~ 1616.3.1 Stability. *When checking stability under the provisions of Section 1605.1.1 using allowable stress design, the factor of safety for soil bearing values shall not be less than the overstrength factor of the structures supported.*

~~1615.4~~ 1616.4 Roof dead loads. *The design dead load shall provide for the weight of at least one additional roof covering in addition to other applicable loadings if the new roof covering is permitted to be applied over the original roofing without its removal, in accordance with Section 1510.*

~~1615.5~~ 1615.5 Live loads.

~~1615.5.1~~ 1616.5.1 Modifications to Table 1607.1.

~~1615.5.1.1~~ 1616.5.1.1 Item 4. Assembly areas ~~and theaters~~. *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).*

~~The minimum uniform live load for a press box floor or accessible roof with railing is 100 psf.~~

~~1615.5.1.2 Item 22. Libraries.~~ *~~The minimum vertical design live load shall be as follows:~~*

(Relocated to 1616.5.1.7) ~~*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.*~~

~~***1615.5.1.3 Item 25. Office buildings.*** *The minimum vertical design live load shall conform to Section 1615.5.1.2.*~~

~~***1615.5.1.4***~~ ***1616.5.1.2*** ***Item*** ~~***28***~~ ***24. Reviewing stands, grandstands and bleachers.*** *The minimum uniform live load for a press box floor or accessible roof with railing is 100 psf.*

~~***1615.5.1.5***~~ ***1616.5.1.3*** ***Item*** ~~***40***~~ ***35. Yards and terraces, pedestrians.*** *Item* ~~*40*~~ *35 applies to pedestrian bridges and walkways that are not subjected to uncontrolled vehicle access.*

~~***1615.5.1.6***~~ ***1616.5.1.4*** ***Item*** ~~***41***~~ ***36. Storage racks and wall-hung cabinets.*** *The minimum vertical design live load shall* ~~*conform to Section 1615.5.1.2*~~ *be as follows:*

(Relocated from 2010 CBC, Section 1615.5.1.2) 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.

~~***1615.5.2***~~ ***1616.5.2*** ***Uncovered open-frame roof structures.*** *Uncovered open-frame roof structures shall be designed for a vertical live load of not less than 10 pounds per square foot (0.48 kN/m^2) of the total area encompassed by the framework.*

~~***1615.6***~~ ***1616.6*** ***Determination of snow loads.*** *The ground snow load or the design snow load for roofs shall conform with the adopted ordinance of the city, county, or city and county in which the project site is located, and shall be approved by DSA.*

~~***1615.7***~~ ***1616.7*** ***Wind loads.***

~~***1615.7.1 Special wind regions.*** *The basic wind speed for projects located in special wind regions as defined in Figure 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/CC.*~~

~~***1615.7.2***~~ ***1616.7.1*** ***Story drift for wind loads.*** *The calculated story drift due to wind pressures with ultimate design wind speed, V_{ult}, shall not exceed* ~~*0.005*~~ *0.008 times the story height for buildings less than 65 feet (19,812 mm) in height or* ~~*0.004*~~ *0.007 times the story height for buildings 65 feet (19,812 mm) or greater in height.*

Exception: *This story drift limit need not be applied for single-story open structures.*

~~***1615.8***~~ ***1616.8*** ***Establishment of flood hazard areas.*** *Flood hazard maps shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency's Flood Insurance Study (FIS) adopted by the local authority having jurisdiction where the project is located, as amended or revised with the*

accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM) and related supporting data along with any revisions thereto.

~~1615.9~~ 1616.9 Earthquake loads.

~~1615.9.1~~ 1616.9.1 Seismic design category. *The seismic design category for a structure shall be determined in accordance with Section 1613.*

~~1615.9.2~~ 1616.9.2 Definitions. *In addition to the definitions in Section 1613.2, the following words and terms shall, for the purposes of this section, have the meanings shown herein.*

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, 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.*

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

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

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

(Relocated to Section 202) ***~~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.~~*

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

~~1615.9.3~~ 1616.9.3 Mapped acceleration parameters. *Seismic Design Category shall be determined in accordance with Section ~~1613.5.6~~ 1613.3.5.*

~~1615.9.4~~ 1616.9.4 Determination of seismic design category. *Structures not assigned to Seismic Design Category E or F in accordance with Section ~~1613.5~~ 1613.3 shall be assigned to Seismic Design Category D.*

~~1615.9.4.1~~ 1616.9.4.1 Alternative seismic design category determination. *The alternative Seismic Design Category determination procedure of Section ~~1613.5.6.1~~ 1613.3.5.1 is not permitted by DSA-SS/CC.*

~~1615.9.4.2~~ 1616.9.4.2 Simplified design procedure. *The simplified design procedure of Section ~~1613.5.6.2~~ 1613.3.5.2 is not permitted by DSA-SS/CC.*

~~1615.9.5~~ 1616.9.5 Automatic sprinkler systems. *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.*

~~1615.9.6 Anchorage of walls.~~ *~~The modification of ASCE 7, Section 11.7.5 in Section 1613.7 not adopted by DSA-SS/ CC.~~*

~~1615.10~~ 1616.10 Modifications to ASCE 7. *The text of ASCE 7 shall be modified as indicated in Sections ~~1615.10.1~~ 1616.10.1 through ~~1615.10.26~~ 1616.10.24.*

~~1615.10.1~~ 1616.10.1 ASCE 7, Section ~~11.1~~ 1.3. *Modify ASCE 7 Section ~~11.1~~ 1.3 by adding Section ~~11.1.5~~ 1.3.6 as follows:*

~~11.1.5~~ 1.3.6 Structural design criteria. *Where ~~design reviews are required in~~ design is based on ASCE 7 Chapters 16, 17, 18, or 31, the ground motion, wind tunnel design recommendations, analysis, and design*

methods, material assumptions, testing requirements, and acceptance criteria proposed by the engineer shall be submitted to the enforcement agency in the form of structural design criteria for approval.

Peer review requirements in Section 3422 of this code shall apply to design reviews required by ASCE 7 Chapters 17 and 18.

~~1615.10.2~~ 1616.10.2 ASCE 7, Section 11.4.7. *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 Chapter 21 as modified in Section 1803A.6 of this code is permitted to be used to determine ground motion for any structure.~~*

~~Unless otherwise approved, the site-specific procedure per ASCE 7 Chapter 21 as modified by Section 1803A.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 in an area identified in Section 4-317(e) of the California Administrative Code (Part 1, Title 24, C.C.R).~~

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

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

~~1615.10.3~~ 1616.10.3 ASCE 7, Table 12.2-1. *Modify ASCE 7 Table 12.2-1 as follows:*

A. BEARING WALL SYSTEMS

~~14~~ 17. Light-framed walls with shear panels of all other materials - Not permitted by DSA-SS/CC.

B. BUILDING FRAME SYSTEMS

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

C. MOMENT RESISTING FRAME SYSTEMS

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

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 ~~1613.6.2~~ 1613.4.1.

1616.10.4 ASCE 7, Section 12.2.3.1. *Replace ASCE 7 Section 12.2.3.1 Items # 1 and # 2 by the following:*

The value of the response modification coefficient, R, used for design at any story shall not exceed the lowest value of R that is used in the same direction at any story above that story. Likewise, the deflection amplification factor, C_d , and the system over strength factor, Ω_0, used for the design at any story shall not be less than the largest value of this factor that is used in the same direction at any story above that story.

~~1615.10.4~~ 1616.10.5 ASCE 7, Section ~~12.2.3.1.~~ *12.2.3.2 Modify ASCE 7 Section ~~12.2.3.1~~ 12.2.3.2 by adding the following additional requirements for a two stage equivalent lateral force procedure or modal response spectrum procedure:*

~~e~~ f. 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 portions.

1616.10.6 ASCE 7, Section 12.2.5.6.1. *The exception in Item a is not permitted by DSA-SS/CC.*

1616.10.7 ASCE 7, Section 12.2.5.7.1. *The exception in Item a is not permitted by DSA-SS/CC.*

1616.10.8 ASCE 7, Section 12.2.5.7.2. *The exception in Item a is not permitted by DSA-SS/CC.*

~~1615.10.5~~ 1616.10.9 ASCE 7, Section 12.3.3.1 *Modify ASCE 7 Section 12.3.3.1 as follows:*

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

~~1615.10.6~~ 1616.10.10 ASCE 7, Section 12.7.2. *Modify ASCE 7 Section 12.7.2 by adding Item ~~5~~ 6 to read as follows:*

~~5~~ 6. 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.

1616.10.11 ASCE 7, Section 12.8.1.3. *Replace ASCE 7 Section 12.8.1.3 by the following:*

12.8.1.3 Maximum S_s Value in Determination of C_s. *For regular structures five stories or less above the base as defined in Section 11.2 and with a period, T, of 0.5 s or less, C_S is permitted to be calculated using the larger of either S_S =1.5 or 75% of the value of S_S determined per Sections 11.4.1 or 11.4.7.*

~~1615.10.7 ASCE 7, Section 12.8.7.~~ *~~Modify ASCE 7 Section 12.8.7 by replacing Equation 12.8-16 as follows:~~*

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

~~1615.10.8~~ 1616.10.12 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 for both forces and drifts shall not be less than the base shear calculated using the equivalent lateral force procedure of Section 12.8.*

1616.10.13 ASCE 7, Section 12.10.2.1 *Replace ASCE 7 Exception 1. of Section 12.10.2.1 by the following:*

Exceptions:

1. *The forces calculated above need not exceed those calculated using the load combinations of Section 12.4.3.2 with seismic forces determined by Equation 12.10-3 and transfer forces, where applicable.*

~~1615.10.9~~ 1616.10.14 ***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 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 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, unless the reference standard specifies the use of higher design loads..*

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

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

~~1615.10.10~~ 1616.10.15 ***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 (mobile) 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 at seismic separation joints and 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 Seismic Certification ~~for Designated Seismic Systems in accordance with Section 13.2.2 shall apply.~~ requirements of this code in accordance with Section 1705A.12.3 shall be applicable.*

      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.*

~~***1615.10.11 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.*~~

~~***1615.10.12 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.*~~

~~***1615.10.13***~~ ***<u>1616.10.16</u>*** ***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 C 635, ASTM C 636, 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:*

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. ***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.* <u>*Restraint wires shall be secured with four tight twists in 1 1/2 inches, or an approved alternate connection.*</u>

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.

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. 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.*

~~1615.10.14~~ 1616.10.17 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, Exceptions 1 and 2 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, Dp, 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.*

~~1615.10.15~~ 1616.10.18 ASCE 7, Section 13.6.7. *Replace ASCE 7, Section 13.6.7, Exceptions 1 and 2 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:

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, 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.~~

~~1615.10.16~~ 1616.10.19 ASCE 7, Section 13.6.8. *~~Replace~~ Modify ASCE 7, Section 13.6.8.2 by ~~the following~~ adding Exception as follows:*

~~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 B 31 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 B 31, the force and displacement requirements of Section 13.3 shall be used.~~*

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

Exception: *~~Pipe hangers, bracing, and anchor~~ Anchor capacities shall be determined in accordance with material chapters of ~~the California Building Code, 2010~~ this code in lieu of using those in NFPA 13 and demand shall be based on ASCE 7. ~~The force and displacement requirements of Section 13.3 or those in the NFPA 13 may be used for design.~~*

~~1615.10.16~~ 1616.10.20 ASCE 7, Section 13.6.8.3. *Replace ASCE 7, Section 13.6.8.3 with the following:*

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 B-31 or NFPA 13 shall comply with the requirements of Section 13.6.11.*~~

~~***1615.10.17***~~ ***1616.10.21*** ***ASCE 7, Section 13.6.10.1.*** *Modify ASCE 7 Section 13.6.10.1 by adding Section 13.6.10.1.1 as follows:*

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

~~***1615.10.18***~~ ***1616.10.22*** ***ASCE 7, Section 13.6.10.4.*** *Replace ASCE 7 Section 13.6.10.4 as follows:*

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

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

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

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

RAIL SIZE (weight per foot of length, pounds)	***WIDTH OF MACHINED SURFACE (inches)***	***ALLOWABLE RAIL DEFLECTION (inches)***
8	*$1^1/_4$*	*0.20*
11	*$1^1/_2$*	*0.30*
12	*$1^3/_4$*	*0.40*
15	*$1^{31}/_{32}$*	*0.50*
$18^1/_2$	*$1^{31}/_{32}$*	*0.50*
$22^1/_2$	*2*	*0.50*
30	*$2^1/_4$*	*0.50*

For SI: 1 inch = 25 mm, 1 foot = 305 mm, 1 pound = 0.454 kg.
Note: Deflection limitations are given to maintain a consistent factor of safety against disengagement of retainer plates from the guide rails during an earthquake.

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

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

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

~~1615.10.19~~ 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.~~

~~1615.10.20~~ 1616.10.23 ASCE 7, Section 16.1.4. *~~Modify~~ Remove ASCE 7 Sections 16.1.4.1 and 16.1.4.2 and modify 16.1.4 by the following:*

Maximum scaled base shear for both forces and drifts shall not be less than the base shear calculated using the equivalent lateral force procedure of Section 12.8.

~~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 with Section 12.8.4.~~

~~1615.10.21~~ 1616.10.24 ASCE 7, Section 16.2.4. *Modify ASCE 7 Section 16.2.4 by the following:*

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

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

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

b) *Where site is located more than 3.1 miles (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.*

~~1615.10.22~~ 1616.10.25 ASCE 7, Section 17.2.1. *Modify ASCE 7 Section 17.2.1 by adding the following:*

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

~~1615.10.23~~ 1616.10.26 ASCE 7 Section 17.2.4.7. *Modify ASCE 7 Section 17.2.4.7 by adding the following to the end of the section:*

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

~~1615.10.24~~ 1616.10.27 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 deformation resulting from the 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.*

~~1615.10.25 ASCE 7, Section 17.3.2.~~ *~~Modify ASCE 7, Section 17.3.2 by adding the following:~~*

~~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 $1.25T_M$.~~

~~1615.10.26 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, 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}.~~

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

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

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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			

(All existing California 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 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 1.9.2.1.*

2. *(Reserved for OSHPD)*

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

SECTION 1602A
DEFINITIONS AND NOTATIONS

1602*A*.1 Definitions. The following terms are defined in Chapter 2 *except those defined below which shall, for the purposes of this section, have the meanings shown herein.*

. . .

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

. . .

SECTION 1603*A*
CONSTRUCTION DOCUMENTS

1603*A*.1 General. Construction documents shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information

pertinent to the structural design required by Sections 1603*A*.1.1 through ~~1603*A*.1.9~~ *1603A.1.10* shall be indicated on the construction documents.

Exception: Construction documents for buildings constructed in accordance with the conventional light-frame construction provisions of Section 2308 shall indicate the following structural design information:

1. Floor and roof live loads.
2. Ground snow load, P_g.
3. Ultimate design wind speed, V_{ult}, (3-second gust), miles per hour (mph) (km/hr) and nominal design wind speed, V_{asd}, as determined in accordance with Section 1609.3.1 and wind exposure.
4. Seismic design category and site class.
5. Flood design data, if located in *flood hazard areas* established in Section 1612*A*.3.
6. Design load-bearing values of soils.

[DSA-SS] *Additional requirements are included in Section 4-210 and 4-317 of the California 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 structure:

1. Risk Category.
2. Seismic importance factor, I_e
3. Mapped spectral response accelerations, S_S and S_1.
4. Site class.
5. Design spectral response acceleration parameters, S_{DS} and S_{D1}.
6. Seismic design category.
7. Basic seismic-force-resisting system(s).
8. Design base shear(s).
9. Seismic response coefficient(s), C_S.
10. Response modification coefficient(s), *R*.
11. Analysis procedure used.

~~*11*~~ *12. Applicable horizontal structural irregularities.*

~~*12*~~ *13. Applicable vertical structural irregularities.*

~~*13*~~ *14. Location of base as defined in Section 1613A.2.*

~~*14. Analysis procedure used.*~~

. . .

1603A.1.10 Construction Procedures. *Where unusual erection or construction procedures are considered essential by the ~~project structural engineer or architect~~ Registered Design Professional (RDP) in order to accomplish the intent of the design or influence the design, such procedure shall be indicated on the construction documents.*

1603A.2 Site Data Reports. *Geotechnical and Geohazard reports for review by the enforcement agency shall be accompanied by a description of the project prepared by the Registered Design Professional (RDP) in responsible charge, which shall include the following:*

1. *Type of service such as general acute care facility, skilled nursing facility, intermediate care facility, acute psychiatric facility, central utility plants, K-12 school, community college, essential services, etc.*
2. *Construction materials used for the project such as steel, concrete. masonry, wood, etc.*

3. *Type of construction such as new, addition, alteration, repair, etc.*

4. *For existing buildings, extent of construction such as incidental, minor, major, and/or voluntary seismic improvements as defined in Section 3418* ***[DSA-SS]*** *Section 3402A.2* ***[OSHPD 1 & 4]****.*

5. *Seismic force resisting system used for each structure in the project.*

6. *Foundation system that will be used for each structure in the project such as spread footing, drilled piers, etc.*

7. *Analysis procedure used and basis of design such as ASCE 7 Equivalent Lateral Force Procedure, ASCE 41 Nonlinear Dynamic Procedure, etc.*

8. *Building characteristics such as number of stories above and below grade, foot print area at grade, grade slope on site, etc.*

9. *Special features such as requirement for shoring, underpinning, retaining walls, etc.*

1603A.3 Structural Calculations. *The application for the approval of construction documents that involves structural elements or components shall be accompanied by complete and accurate structural design computations, which shall comply with requirements prescribed by the enforcement agency:*

1. *The computations shall be preceded by a detailed index.*
2. *The computations including each major subsection shall be prefaced by a statement clearly and concisely outlining the basis for the structural design and indicating the manner in which the structure will resist the vertical loads and lateral forces.*
3. *The computations shall be sufficiently complete to the extent that calculations for the individual structural members and connections can be readily interpreted.*

SECTION 1604*A*
GENERAL DESIGN REQUIREMENTS

. . .

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

1604*A*.3.1 Deflections. The deflections of structural members shall not exceed the more restrictive of the limitations of Sections 1604*A*.3.2 through *1604A.3.6* 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 or stucco ceiling Supporting nonplaster ceiling Not supporting ceiling	 *l*/360 *l*/240 *l*/180	 *l*/360 *l*/240 *l*/180	 *l*/240 *l*/180 *l*/120
Floor members	*l*/360	—	*l*/240
Exterior walls and interior partitions: With plaster and stucco finishes With other brittle finishes With flexible finishes *Veneered walls, anchored veneers and adhered veneers over 1 inch (25 mm) thick, including the mortar backing*	 — — —	 *l*/360 l/240 l/180 ~~*Section 1405.10*~~ *l/600*	 — — —
Farm buildings	—	—	*l*/180
Greenhouses	—	—	*l*/120

. . .

1604A.3.7 Horizontal diaphragms. *The maximum span-width ratio for any roof or floor diaphragm shall not exceed those given in Table 4.2.4 of AF & PA SDPWS for wood or ~~ICC-ES AC 43~~ maximum span-depth ratio given in Table 1604A.4 for steel and composite steel-slab decking, unless test data and design calculations acceptable to the enforcement agency are submitted and approved for the use of other span-width or span-depth ratios. Concrete diaphragms shall not exceed the span-~~width~~ depth ratios for the equivalent composite ~~floor~~ steel-slab diaphragm in ~~ICC-ES AC 43~~ Table 1604A.4*

TABLE 1604A.4 – MAXIMUM HORIZONTAL DIAPHRAGM SPAN AND SPAN-DEPTH RATIOS[1,3,4]

FLEXIBILITY FACTOR(F)[2]	***MAXIMUM DIAPHRAGM SPAN FOR MASONRY OR CONCRETE WALLS (feet)***	***DIAPHRAGM SPAN-DEPTH LIMITATION***			
		Rotation (torsion) Not Considered in Diaphragm		***Rotation (torsion) Considered in Diaphragm***	
		Masonry or Concrete Walls	***Flexible Walls***	***Masonry or Concrete Walls***	***Flexible Walls***
More than 150	*Not to be used*	*Not to be used*	*2:1*	*Not to be used*	*1-1/2:1*
70-150	*200*	*2:1 or as required for deflection*	*3:1*	*Not to be used*	*2:1*
10-70	*400*	*2-1/2:1 or as required for deflection*	*4:1*	*As required for deflection*	*2-1/2:1*
1-10	*No limitation*	*3:1 or as required for deflection*	*5:1*	*As required for deflection*	*3:1*
Less than 1	*No limitation*	*As required for deflection*	*No limitation*	*As required for deflection*	*3-1/2:1*

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 plf = 14.594 N/m, 1 psi = 6894 Pa

[1] *Diaphragms shall satisfy span-depth limitations based on flexibility.*

[2] *Flexibility Factor (F) is the average deflection in micro inches (10^{-6}) or µm of the diaphragm web per foot (m) of span stressed with a shear of 1 pound per foot (N/m).*

[3] *The total deflection Δ of the diaphragm may be computed from the equation: $\Delta = \Delta_f + \Delta_w$.*

Where:

Δ_f = Flexural deflection of the diaphragm determined in the same manner as the deflection of beams. The flexural stiffness of the web of diaphragms consisting of bare steel decking shall be neglected.

Δ_w = Web deflection of the diaphragm may be determined solving the following equation:

$$F = \frac{\Delta_w x 10^6}{q_{ave} L}$$

Where:

L = Distance in feet (m) between the vertical resisting element (such as a shear wall) and the point to which the deflection is to be determined.

q_{ave} = Average shear in the diaphragm in pounds per foot (N/m) over length L.

[4] *When applying these limitations to cantilevered diaphragms, the allowable span-depth ratio will be half of that shown.*

1604*A*.5 Risk category. Each building and structure shall be assigned a risk category in accordance with Table 1604*A*.5. Where a referenced standard specifies an occupancy category, the risk category shall not be taken as lower than the occupancy category specified therein.

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

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

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than 250. • Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500. • ~~Group I-2 occupancies with an occupant load of 50 or more resident care recipients 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, communications and operations centers and other facilities required for emergency response~~.~~ ***[DSA-SS]*** *as defined in the California Administrative Code (~~CCR~~ Title 24, Part 1, CCR), Section 4-207 and all structures required for their continuous operation or access/egress.* . . .

. . .

1604*A*.8.2 Structural walls. Walls that provide vertical load-bearing resistance or lateral shear resistance for a portion of the structure shall be anchored to the roof and to all floors and members that provide lateral support for the wall or that are supported by the wall. The connections shall be capable of resisting the horizontal forces specified in Section 1.4.4 of ASCE 7 for walls of structures assigned to Seismic Design Category A and to Section 12.11 of ASCE 7 for walls of structures assigned to all other seismic design categories. *For anchorage of concrete or masonry walls to roof and floor diaphragms, the out-of-plane strength design force shall not be less than 280 lb/linear ft (4.09 kN/m) of wall.* Required anchors in masonry walls of hollow units or cavity walls shall be embedded in a reinforced grouted structural element of the wall. See Sections 1609*A* for wind design requirements and 1613*A* for earthquake design requirements.

. . .

SECTION 1605*A*
LOAD COMBINATIONS

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

. . .

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.*

. . .

SECTION 1606*A*
DEAD LOADS

. . .

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

. . .

SECTION 1607*A*
LIVE LOADS

. . .

1607*A*.4 Concentrated live loads. Floors and other similar surfaces shall be designed to support the uniformly distributed live loads prescribed in Section 1607*A*.3 or the concentrated live loads, in pounds (kilonewtons), given in Table 1607*A*.1, whichever produces the greater load effects. Unless otherwise specified, the indicated concentration shall be assumed to be uniformly distributed over an area 2-1/2 feet by 2-1/2 feet (762 mm by 762 mm) and shall be located so as to produce the maximum load effects in the structural members.

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

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (lbs.)
. . .	. . .	. . .
3. Armories and drill rooms	150 [m]	—
4. Assembly areas [~~n,p~~ o,q]		
Fixed seats (fastened to floor)	60 [m]	
Follow spot, projections and control rooms	50	
Lobbies	100 [m]	—
Movable seats	100 [m]	
Stage floors	150 [m]	
Platforms (assembly)	100 [m]	
Other assembly areas	100 [m]	
. . .	. . .	. . .
17. Hospitals		
Corridors above first floor	100	1,000
Operating rooms, laboratories	60	1,000
Patient rooms	40	1,000
Mechanical and electrical equipment areas including open areas around equipment	*50*	—
Storage:		
Light	*125*	—
Heavy	*250*	—
Dining Area (not used for assembly)	*100*	*1,000*
Kitchen and serving areas	*50*	*1,000*

. . .	. . .	. . .
19. Libraries ~~m~~ n Corridors above first floor Reading rooms Stack rooms	 80 60 m 150 b,m	 1,000 1,000 1,000
. . .	. . .	. . .
22. Office buildings ~~m,~~ n Corridors above first floor File and computer rooms shall be designed for heavier loads based on anticipated occupancy Lobbies and first-floor corridors Offices	 80 — 100 50	 2,000 — 2,000 2,000
. . .	. . .	. . .
27. Schools ~~m~~ n Classrooms Corridors above first floor First-floor corridors	 40 ~~o~~ p 80 100	 1,000 1,000 1,000
. . .	. . .	. . .
35. Yards and terraces, pedestrians ~~q~~ r	100m	—
~~41~~ 36. Storage racks and wall-hung cabinets.	*Total Loads ~~m~~ n*	—

. . .

~~m~~ n. 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~~ o. [DSA-SS] 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.

~~o~~ p. [DSA-SS] The minimum uniform live load for classroom occupancies is 50 psf. Live load reduction is not permitted for classrooms classified as Group A occupancies unless specific exception of Section 1607A.10 apply.

~~p~~ q. [DSA-SS] The minimum uniform live load for a press box floor or accessible roof with railing is 100 psf.

~~q~~ r. [DSA-SS] Item ~~40~~ 35 applies to pedestrian bridges and walkways that are not subjected to uncontrolled vehicle access.

. . .

***~~1607A.11.5~~ 1607A.12.5* Uncovered open-frame roof structures.** *Uncovered open-frame roof structures shall be designed for a vertical live load of not less than 10 pounds per square foot (0.48 kN/m^2) of the total area encompassed by the framework.*

. . .

~~1607A.13~~ 1607A.14 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) working 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 the limits in Table 1604A.3.*

. . .

SECTION 1608*A*
SNOW LOADS

1608.1 General. Design snow loads shall be determined in accordance with Chapter 7 of ASCE 7, but the design roof load shall not be less than that determined by Section 1607*A*.

1608*A*.2 Ground snow loads. The ground snow loads to be used in determining the design snow loads for roofs shall be determined in accordance with ASCE 7 or Figure 1608*A*.2 for the contiguous United States ~~and Table 1608.2 for Alaska~~ Site-specific case studies shall be made in areas designated "CS" in Figure 1608*A*.2. Ground snow loads for sites at elevations above the limits indicated in Figure 1608*A*.2 and for all sites within the CS areas shall be approved. Ground snow load determination for such sites shall be based on an extreme value statistical analysis of data available in the vicinity of the site using a value with a 2-percent annual probability of being exceeded (50-year mean recurrence interval). ~~Snow loads are zero for Hawaii, except in mountainous regions as *approved* by the *building official*.~~

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

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

~~For SI: 1 pound per square foot = 0.0479 kN/m^2.~~

1608.3 Ponding instability. Susceptible bays of roofs shall be evaluated for ponding instability in accordance with Section 7.11 of ASCE 7.

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

(Figure not shown for clarity)

. . .

~~1608A.3~~ 1608A.4 Determination of snow loads. [DSA-SS] *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 1609*A*
WIND LOADS

. . .

~~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-SS.~~*

. . .

1609A.1.3 Story Drift for Wind Loads*. The calculated story drift due to wind pressures with ultimate design wind speed, V_{ult}, shall not exceed ~~0.005~~ 0.008 times the story height for buildings less than 65 feet (19,812 mm) in height or ~~0.004~~ 0.007 times the story height for buildings 65 feet (19,812 mm) or greater in height.*

Exception: *This story drift limit need not be applied for single-story open structures.*

. . .

SECTION 1612*A*
FLOOD LOADS

. . .

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

. . .

SECTION 1613*A*
EARTHQUAKE LOADS

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

Exceptions~~s~~:

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

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

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

~~4.~~ Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.

1613*A*.2 Definitions. The following terms are defined in Chapter 2*, except those defined below which 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, 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 ~~another~~ any authoritative source, federal, state or local governmental agency.*

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

. . .

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

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

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

. . .

(Relocated to Chapter 2) ~~***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.*~~

. . .

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

1613*A*.3 Seismic ground motion values. Seismic ground motion values shall be determined in accordance with this section.

1613*A*.3.1 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 1613.3.1(1) through 1613.3.1(6). ~~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. The parameters S_S and S_1 shall be, respectively,1.5 and 0.6 for Guam and 1.0 and 0.4 for American Samoa.~~

. . .

(Figures 1613.3.1(1) through 1613.3.1(6) were stricken in the CBC 2010 and will not be shown in Chapter 16A. These figures are shown in Chapter 16)

1613*A*.3.4 Design spectral response acceleration parameters. . . .

1613*A*.3.5 Determination of seismic design category. Structures classified as Risk 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 Risk 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.~~

~~**TABLE 1613.3.5(1) - SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATIONS**~~

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

~~**TABLE 1613.3.5(2) - SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION**~~

~~**VALUE OFS_{D1}**~~	~~**RISK CATEGORY**~~		
	~~**I or II**~~	~~**III**~~	~~**IV**~~
~~$S_{D1} < 0.067g$~~	~~A~~	~~A~~	~~A~~
~~$0.067g \le S_{D1} < 0.133g$~~	~~B~~	~~B~~	~~C~~
~~$0.133g \le S_{D1} < 0.20g$~~	~~C~~	~~C~~	~~D~~
~~$0.20g \le S_{D1}$~~	~~D~~	~~D~~	~~D~~

1613*A*.3.5.1 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 T_s.~~

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

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

~~**1613*A*.5.6.2**~~ **1613*A*.3.5.2 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.~~

1613*A*.4 Alternatives to ASCE 7. The provisions of Section 1613*A*.4 shall be permitted as alternatives to the relevant provisions of ASCE 7.

1613*A*.4.1 Additional seismic-force-resisting systems for seismically isolated structures. Add the following exception to the end of Section 17.5.4.2 of ASCE 7:

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

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

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

3. *For IMFs, design is in accordance with AISC 341. In addition, requirements of Section ~~9.3~~ E3.6e of AISC 341 shall be satisfied.*

. . .

(Existing DSA amendments in Section 1613A.6.3, and 1613A.6.7 are deleted, since those sections are deleted in IBC 2012)

. . .

SECTION 1615*A*
STRUCTURAL INTEGRITY

1615*A*.1 General. High-rise buildings that are assigned to Risk Category III or IV shall comply with the requirements of this section. Frame structures shall comply with the requirements of Section 1615*A*.3. Bearing wall structures shall comply with the requirements of Section 1615*A*.4.

1615*A*.2 Definitions. The following terms are defined in Chapter 2*, except those defined below which shall, for the purposes of this section, have the meanings shown herein.*

. . .

HIGH-RISE BUILDING. *A building with an occupied floor located more than 75 feet (22 860 mm) above the base.*

. . .

SECTION ~~1615A~~ 1616A
MODIFICATIONS TO ASCE 7

~~1615A.1~~ 1616A.1 General. *The text of ASCE 7 shall be modified as indicated in Sections ~~1615A.1.1~~ 1616A.1.1 through ~~1615A.1.41~~ 1616A.1.42.*

~~1615A.1.1~~ 1616A.1.1 ASCE 7, Section ~~11.1~~ 1.3. *Modify ASCE 7 Section ~~11.1~~ 1.3 by adding Section ~~11.1.5~~ 1.3.6 as follows:*

~~11.1.5~~ 1.3.6 Structural design criteria. *Where ~~design reviews are required in~~ design is based on ASCE 7, Chapters 16, 17, 18, and 31, the ground motion, wind tunnel design recommendations, analysis, and design methods, material assumptions, testing requirements, and acceptance criteria proposed by the engineer shall be submitted to the enforcement agency in the form of structural design criteria for approval.*

[DSA-SS] *Peer review requirements in Section 3422 of this code shall apply to design reviews required by ASCE 7 Chapters 17 and 18.*

1616A.1.2 ASCE 7, Section 11.1.3. *Replace last paragraph of ASCE 7 Section 11.1.3 by the following:*

Buildings shall be designed and detailed in accordance with Chapter 12.

~~1615A.1.2A [DSA-SS] ASCE 7, Section 11.4.7.~~ *~~Modify ASCE 7 Section 11.4.7 as follows:~~*

~~***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 1803A.6 of this code is 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 1803A.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.*~~

~~***Exceptions:***~~

~~*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 in an area identified in Section 4-317(e) of the California Administrative Code (Part 1, Title 24, C.C.R).*~~

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

~~***1615A.1.2B***~~ ***<u>1616A.1.3</u>*** ***ASCE 7, Section 11.4.7.*** *Modify ASCE 7 Section 11.4.7 by adding the following:*

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

~~***1615A.1.3***~~ ***<u>1616A.1.4</u>*** ***ASCE 7, Table 12.2 -1.*** *Modify ASCE 7 Table 12.2-1 as follows:*

A. BEARING WALL SYSTEMS

. . .

~~14.~~<u>17.</u> Light-framed walls with shear panels of all other materials – Not permitted by DSA-SS.

B. BUILDING FRAME SYSTEMS

. . .

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

. . .

C. MOMENT RESISTING FRAME SYSTEMS

. . .

<u>5. Cold-formed steel –special bolted moment frame - Not permitted by DSA-SS</u>.

Exceptions:

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

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

3) Systems listed in this section can be used for seismically isolated buildings when permitted by Section ~~1613A.6.2~~ 1613A.4.1.

1616A.1.5 ASCE 7, Section 12.2.3.1. *Replace ASCE 7 Section 12.2.3.1 Items # 1 and # 2 by the following:*

The value of the response modification coefficient, R, used for design at any story shall not exceed the lowest value of R that is used in the same direction at any story above that story. Likewise, the deflection amplification factor, C_d , and the system over strength factor, Ω_0, used for the design at any story shall not be less than the largest value of this factor that is used in the same direction at any story above that story.

~~1615A.1.4~~ 1616A.1.6 ASCE 7, Section ~~12.2.3.1~~ 12.2.3.2. *Modify ASCE 7 Section ~~12.2.3.1~~ 12.2.3.2 by adding the following additional requirement~~s for a two stage equivalent lateral force procedure or modal response spectrum procedure~~:*

~~e.~~ f. 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~~.

1616A.1.7 ASCE 7, Section 12.2.5.6.1 [DSA-SS] *The Exception after the first paragraph is not permitted by DSA-SS.*

1616A.1.8 ASCE 7, Section 12.2.5.7.1 [DSA-SS] *The Exception after the first paragraph is not permitted by DSA-SS.*

1616A.1.9 ASCE 7, Section 12.2.5.7.2 [DSA-SS] *The Exception after the first paragraph is not permitted by DSA-SS.*

~~1615A.1.5~~ 1616A.1.10 ASCE 7, Section 12.3.3. *Modify first sentence of ASCE 7 Section 12.3.3.1 as follows:*

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

~~1615A.1.6~~ 1616A.1.11 ASCE 7, Section 12.7.2. *Modify ASCE 7 Section 12.7.2 by adding item ~~5~~ 6 to read as follows:*

~~5.~~ 6. 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.

1616A.1.12 ASCE 7, Section 12.8.1.3. *Replace ASCE 7 Section 12.8.1.3 by the following:*

12.8.1.3 Maximum S_s Value in Determination of C_s. *For regular structures five stories or less above the base as defined in Section 11.2 and with a period, T, of 0.5 s or less, C_S is permitted to be calculated using the larger of either S_S =1.5 or 75% of the value of S_S determined per Sections 11.4.1 or 11.4.7.*

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

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

~~1615A.1.8~~ 1616A.1.13 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 for both forces and drifts shall not be less than the base shear calculated using the equivalent lateral force procedure of section 12.8.*

~~1615A.1.9~~ 1616A.1.14 ASCE 7, Section 12.10.2.1 *~~Modify~~ Replace ASCE 7 Exception 1. of Section 12.10.2.1 by the following:*

Exception:

1. *The forces calculated above need not exceed those calculated using the load combinations of Section 12.4.3.2 with seismic forces determined by Equation 12.10-3 and transfer forces, where applicable.*

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

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

1616A.1.15 *(Reserved for OSHPD)*

~~1615A.1.10~~ 1616A.1.16 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 reference standards specify the use of higher design loads.*
2. *When it can be demonstrated that inelastic deformation of the foundation and superstructure-to-foundation connection will not result in a weak story or cause collapse of the structure.*
3. *Where basic structural system consists of light framed walls with shear panels, unless the reference standard specifies the use of higher design loads.*

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

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

~~1615A.1.11~~ 1616A.1.17 ASCE 7, Section 13.1.3. *(Reserved for OSHPD)*

~~**1615A.1.12**~~ **1616A.1.18 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 (mobile) 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 at seismic separation joints and 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 Seismic Certification ~~for Designated Seismic Systems in accordance with Section 13.2.2 shall apply.~~ requirements of this code in accordance with Section 1705A.12.3 shall be applicable.*

or

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

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

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

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

~~**1615A.1.14**~~ **1616A.1.19 ASCE 7, Section 13.4.** *Replace ASCE 7 Sections ~~13.4.1 and 13.4.2~~ 13.4.2.3 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.

Use of screw anchors shall be limited to dry interior conditions. Re-use of screw anchors or screw anchor holes shall not be permitted.

~~***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***~~ ***1616A.1.20 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~~(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:*

1. ***Exitways****. Lay-in ceiling assemblies in exitways of hospitals shall be installed with a main runner or cross runner surrounding all sides of each piece of tile, board or panel and each light fixture or grille. A cross runner that supports another cross runner shall be considered as a main runner for the purpose of structural classification. Splices or*

intersections of such runners shall be attached with through connectors such as pop rivets, screws, pins, plates with end tabs or other approved connectors.

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

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

4. ***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. Restraint wires shall be secured with four tight twists in 1 1/2 inches, or an approved alternate connection.*

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.

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. 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.*

~~1615A.1.17~~ 1616A.1.21 ASCE 7, Section 13.5.7. [OSHPD 1 & 4] *Modify ASCE 7 Section 13.5.7 by the following:*

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

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

~~1615A.1.19~~ 1616A.1.22 *Reserved.*

~~1615A.1.20~~ 1616A.1.23 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, Exceptions 1 and 2 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~~ 1616A.1.24 ASCE 7, Section 13.6.7. *Replace ASCE 7, Section 13.6.7 Exceptions 1 and 2 with the following:*

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

Exceptions:

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

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

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

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

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

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

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

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

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

   ~~a. For piping constructed with ductile materials (e.g., steel, aluminum, or copper), 90 percent of the minimum specified yield strength.~~
   ~~b. For threaded connections in piping constructed with ductile materials, 70 percent of the minimum specified yield strength.~~

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

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

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

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

~~***1615A.1.22***~~ ***1616A.1.25 ASCE 7, Section 13.6.8.2.*** *Modify ASCE 7, Section 13.6.8.2 by adding Exception as follows:*

~~***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 a*~~ *Anchor capacities shall be determined in accordance with material chapters of* ~~*the California Building Code, 2010*~~ *this code in lieu of using those in NFPA 13 and demand shall be based on ASCE 7.* ~~*The force and displacement requirements of Section 13.3 or those in the NFPA 13 may be used for design.*~~

~~***1615A.1.22***~~ ***1616A.1.26 ASCE 7, Section 13.6.8.3.*** *Replace ASCE 7, Section 13.6.8.3 with the following:*

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

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

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

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

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

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

The exceptions above shall not apply to elevator piping.

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

~~***1615A.1.23***~~ ***1616A.1.27 ASCE 7, Section 13.6.10.1.*** *Modify ASCE 7 Section 13.6.10.1 by adding Section 13.6.10.1.1 as follows:*

13.6.10.1.1 Elevators guide rail support. *The design of guide rail support-bracket fastenings and the supporting structural framing shall use the weight of the counterweight or maximum weight of the car plus not less than 40 percent of its rated load. The seismic forces shall be assumed to be distributed one third to the top guiding members and two thirds to the bottom guiding members of cars and*

counterweights, unless other substantiating data are provided. In addition to the requirements of ASCE 7 Section 13.6.10.1, the minimum seismic forces shall be 0.5g acting in any horizontal direction.

***~~1615A.1.24~~ 1616A.1.28* ASCE 7, Section 13.6.10.4.** *Replace ASCE 7, Section 13.6.10.4 as follows:*

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

1. *The seismic force shall be computed per the requirements of ASCE 7 13.6.10.1. The minimum horizontal acceleration shall be 0.5g for all buildings.*
2. *W_p shall equal the weight of the counterweight or the maximum weight of the car plus not less than 40 percent of its rated load.*
3. *With the car or counterweight located in the most adverse position, the stress in the rail shall not exceed the limitations specified in these regulations, nor shall the deflection of the rail relative to its supports exceed the deflection listed below:*

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

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

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

4. *Where guide rails are continuous over supports and rail joints are within 2 feet (610 mm) of their supporting brackets, a simple span may be assumed.*
5. *The use of spreader brackets is allowed.*
6. *Cab stabilizers and counterweight frames shall be designed to withstand computed lateral load with a minimum horizontal acceleration of 0.5g.*

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

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

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

***~~1615A.1.26~~ 1616A.1.29* ASCE 7, Section 16.1.4.** *~~Modify~~ Remove ASCE 7 Sections 16.1.4.1 and 16.1.4.2 and modify Section 16.1.4 by the following:*

Maximum scaled base shear for both forces and drifts shall not be less than the base shear calculated using the equivalent lateral force procedure of Section 12.8.

~~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~~ 1616A.1.30* ASCE 7, Section 16.2.2.** *Modify ASCE 7 Section 16.2.2 by adding the following:*

Requirements of this section shall be deemed to be satisfied for new buildings, using acceptance criteria in Section 16.2.4.2, by the nonlinear modeling parameters in ASCE 41.

***~~1615A.2.18~~ 1616A.1.31* ASCE 7, Section 16.2.3.** *Modify ASCE 7 Section 16.2.3 by adding the following:*

Requirements of this section shall be deemed to be satisfied by using load combinations in Sections 12.4.2.3 and 12.4.3.2 with 25 percent of the required live loads.

***~~1615A.1.29~~ 1616A.1.32* ASCE 7, Section 16.2.4.** *Modify ASCE 7 Section 16.2.4 by the following:*

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

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

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

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

~~1615A.1.30~~ 1616A.1.33 *(Reserved for OSHPD)*

~~1615A.1.31~~ 1616A.1.34 *(Reserved for OSHPD)*

***~~1615A.1.32~~ 1616A.1.35* ASCE 7, Section 17.2.1.** *Modify ASCE 7, Section 17.2.1 by adding the following:*

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

***~~1615A.1.33~~ 1616A.1.36* ASCE 7 Section 17.2.4.7.** *Modify ASCE 7, Section 17.2.4.7 by adding the following:*

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

***~~1615A.1.34~~ 1616A.1.37* 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.*

~~***1615A.1.35 ASCE 7, Section 17.3.2.*** *Replace ASCE 7, Section 17.3.2 with the following:*~~

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

~~***1615A.1.36***~~ ***1616A.1.38 ASCE 7, Section 17.4.*** *Modify ASCE 7, Section 17.4.2 by adding the following:*

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

~~***1615A.1.37***~~ ***1616A.1.39 ASCE 7, Section 17.6.*** *Modify ASCE 7, Section 17.6 by adding the following:*

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

~~***1615A.1.38***~~ ***1616A.1.40 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 Risk-Targeted Maximum Considered Earthquake (MCE_R) nor its nominal strength for the Design Earthquake (DE), the element is permitted to be modeled as linear. For this section, the MCE_R and DE response shall be based on largest response due to a single ground motion and not the average response of suite of ground motions.

~~***1615A.1.39 ASCE 7, Section 21.4.*** *Replace ASCE 7, Section 21.4 with the following:*~~

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

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

~~***1615A.1.40***~~ ***1616A.1.41*** *(Reserved for OSHPD)*

~~***1615A.1.41***~~ ***1616A.1.42*** *(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.

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

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

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CHAPTER 17*A*
SPECIAL INSPECTIONS AND TESTS

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			

(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, which include those applications listed in Sections 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 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.4 *(Reserved for OSHPD)*

1701A.5 Special inspectors. [DSA-SS & DSA-SS/CC] *In addition to the project inspector required by California Administrative Code (CCR, Title 24, Part 1), Section 4-333 of the, 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 of the California Building Code and noted in the special test, inspection and observation plan required by Section 4-335 of ~~Title 24, Part 1, of the California Administrative Code~~ the California Administrative Code.

SECTION 1702*A*
DEFINITIONS

1702*A*.1 Definitions. The following terms are defined in Chapter 2, *except those defined below which shall, for the purposes of this section, have the meanings shown herein.*

APPROVED AGENCY.

APPROVED FABRICATOR.

CERTIFICATE OF COMPLIANCE.

DESIGNATED SEISMIC SYSTEM.

FABRICATED ITEM.

INSPECTION CERTIFICATE.

INTUMESCENT FIRE-RESISTANT COATINGS.

MAIN WINDFORCE-RESISTING SYSTEM.

MASTIC FIRE-RESISTANT COATINGS.

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

SPECIAL INSPECTION.

Continuous special inspection. *The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.*

Periodic special inspection. *The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.*

SPECIAL INSPECTOR.

SPRAYED FIRE-RESISTANT MATERIALS.

STRUCTURAL OBSERVATION.

. . .

SECTION 1704*A*
SPECIAL INSPECTIONS, CONTRACTOR RESPONSIBILITY AND STRUCTURAL OBSERVATIONS

1704*A*.1 General. This section provides minimum requirements for special inspections, the statement of special inspections, contractor responsibility and structural observations.

1704*A*.2 Special inspections. 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 1705*A*. These inspections are in addition to the inspections identified in Section 110.

Exceptions:

~~1.~~ Special inspections are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as approved by the building official.

~~2. Unless otherwise required by the building official, special inspections are not required for Group U occupancies that are accessory to a residential occupancy including, but not limited to, those listed in Section 312.1.~~

~~3. Special inspections are not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of Section 2211.7 or the conventional light-frame construction provisions of Section 2308.~~

. . .

1704*A*.2.3 Statement of special inspections. The applicant shall submit a statement of special inspections *prepared by the registered design professional in general responsible change* in accordance with Section 107.1 as a condition for ~~permit issuance~~ *construction documents review*. This statement shall be in accordance with Section 1704*A*.3.

~~**Exception:** A statement of *special inspections* is not required for portions of structures designed and constructed in accordance with the cold-formed steel light frame construction provisions of Section 2211.7 or the conventional light-frame construction provisions of Section 2308.~~

1704*A*.2.4 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, the California Administrative Code*. Reports shall indicate that work inspected was or was not completed in conformance to approved construction documents *as required by Title 24 Parts 1 and 2*. Discrepancies shall be brought to the immediate attention of the contractor for correction. If they are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon prior to the start of work by the applicant and the building official.

1704*A*.2.5 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*.2.5.1 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 1704.2.5 shall not be required where the fabricator is *approved* in accordance with Section 1704.2.5.2.~~

~~**1704.2.5.2 Fabricator approval.** *Special inspections* required by Section 1705 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*.3.2 Seismic requirements in the statement of special inspections. Where Section 1705*A*.11 or 1705*A*.12 specifies special inspection, testing or ~~qualification~~ *certification* for seismic resistance, the statement of special inspections shall identify the ~~designated seismic systems~~ *equipment/components that require special seismic certification* and seismic force resisting systems that are subject to special inspections.

. . .

1704*A*.4 Contractor responsibility. Each contractor responsible for the construction of a main wind- or seismic force resisting system, ~~designated seismic system~~ *installation of equipment/components requiring special seismic certification* or a wind- or seismic-resisting component listed in the statement of special inspections shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the

system or component. The contractor's statement of responsibility shall contain acknowledgement of awareness of the special requirements contained in the statement of special inspection.

1704*A*.5 Structural observations. ~~Where required by the provisions of Section 1704.5.1 or 1704.5.2, t~~ The owner shall employ a registered design professional to perform structural observations as defined in Section 1702*A*.

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

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

~~**1704.5.1 Structural observations for seismic resistance.** Structural observations shall be provided for those structures assigned to *Seismic Design Category* D, E or F where one or more of the following conditions exist:~~

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

~~2. The height of the structure is greater than 75 feet (22 860 mm) above the base.~~

~~3. The structure is assigned to *Seismic Design Category* E, is classified as *Risk Category* I or II in accordance with Table 1604.5, and is greater than two *stories 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*.*2* Structural observations for seismic resistance.** *Observation of the construction shall be provided by the architect or engineer in responsible charge as set forth in Title 24, Part 1.*~~

~~**1704.5.2 Structural observations for wind requirements.** Structural observations shall be provided for those structures sited where V_{asd} as determined in accordance with Section 1609.3.1 exceeds 110 mph (49 m/sec), where one or more of the following conditions exist:~~

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

~~2. The *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.~~

~~4. When such observation is specifically required by the *building official*.~~

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

SECTION 1705*A*
REQUIRED VERIFICATION AND INSPECTION

1705*A*.1 General. Verification and inspection of elements of buildings and structures shall be as required by this section.

. . .

1705A.2.1 Structural steel. Special inspections *and tests* of structural steel shall be in accordance with the quality assurance ~~inspection~~ requirements ~~of AISC 360~~ *of this section and Chapter 22A.*

AISC 360, Chapter N and AISC 341, Chapter J are adopted, except as noted below:

The following provisions of AISC 360, Chapter N are not adopted:

N4., Item 2. (Quality Assurance Inspector Qualifications)
N5., Item 2. (Quality Assurance)

N5., Item 3. (Coordinated Inspection)
N5., Item 4. (Inspection of Welding)
N7 (Approved Fabricators and Erectors)
N8 (Nonconforming Material and Workmanship)

In addition to the quality assurance inspection requirements contained in AISC 360, Section N5, Item 6 (Inspection of High Strength Bolting), the requirements of Table 1705A.2.1 of the California Building Code shall apply.

In addition to the quality assurance requirements contained in AISC 360, Section N6 (Minimum Requirements for Inspection of Composite Construction), the requirements of Table 1705A.2.1 of the California Building Code shall apply.

In addition to the quality assurance requirements contained in AISC 341, Chapter J, Section J5 (Inspection Tasks), the requirements of Section 1704A.3 and Table 1705A.2.1 of the California Building Code shall apply.

~~**TABLE 1705.2.2**~~
~~**REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION OTHER THAN STRUCTURAL STEEL**~~
(Deleted table not shown for clarity)

(Relocated from 2010 CBC, Section 1704A.3) ***TABLE ~~1705.2.2~~ 1705A.2.1 REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION***

VERIFICATION AND INSPECTION	***CONTINUOUS***	***PERIODIC***	***REFERENCED STANDARD[a]***	***CBC REFERENCE***
1. Material verification of high-strength bolts, nuts and washers:				
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	-	X	*AISC 360, Section A3.3 and applicable ASTM material standards*	-
b. Manufacturer's certificate of compliance required.	-	X	-	-
2. Inspection of high-strength bolting:				
a. Snug-tight joints.	-	X	*AISC 360, Section M2.5*	~~*1704A.3.3*~~
b. Pretensioned and slip-critical joints using turn-of-nut with matchmarking, twist-off bolt or direct tension indicator methods of installation.	-	X		
c. Pretensioned and slip-critical joints using turn-of-nut without matchmarking or calibrated wrench methods of installation.	X	-		
3. Material verification of structural steel and cold-formed steel deck:				
a. For structural steel, identification markings to conform to AISC 360.	-	X	*AISC 360, Section A3.1*	*2203A.1*
b. For other steel, identification markings to conform to ASTM standards specified in the approved construction documents.	-	X	*Applicable ASTM material standards*	
c. Manufacturer's certified test reports.	-	X		
4. Material verification of weld filler materials:				
a. Identification markings to conform to AWS specification in the approved construction documents.	-	X	*AISC 360, Section A3.5 and applicable AWS A5 documents*	-
b. Manufacturer's certificate of compliance required.	-	X	-	-

(continued)

TABLE ~~1705.2.2~~ 1704A.2.1- continued
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD[a]	CBC REFERENCE
5. Inspection of welding:				
a. Structural steel and cold-formed steel deck:				
1) Complete and partial joint penetration groove welds.	*X*	*-*	*AWS D1.1*	*~~1704A.3.1~~ 1705A.2.2*
2) Multipass fillet welds.	*X*	*-*		
3) Single-pass fillet welds > $^5/_{16}$"	*X*	*-*		
4) Plug and slot welds.	*X*	*-*		
5) Single-pass fillet welds ≤ $^5/_{16}$"	*-*	*X*		
6) Floor and roof deck welds.	*-*	*X*	*AWS D1.3*	
b. Reinforcing steel:				
1) Verification of weldability of reinforcing steel other than ASTM A 706.	*-*	*X*	*AWS D1.4 ACI 318: Section 3.5.2*	*-*
2) Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special structural walls of concrete and shear reinforcement.	*X*	*-*		
3) Shear reinforcement.	*X*	*-*		
4) Other reinforcing steel.	*-*	*X*		
6. Inspection of steel frame joint details for compliance:				
a. Details such as bracing and stiffening.	*-*	*X*	*-*	*~~1704A.3.2~~ 1705A.2.2*
b. Member locations.	*-*	*X*		
c. Application of joint details at each connection.	*-*	*X*		

1705*A*.2.2 Steel construction ~~other than structural steel~~. Special inspection for steel construction ~~other than structural steel~~ shall be in accordance with Table ~~1705*A*.2.2~~ *1705A.2.1* and this section.

1705*A*.2.2.1 Welding. Welding inspection and welding inspector qualification shall be in accordance with this section.

1705*A*.2.2.1.1 Cold-formed steel. Welding inspection and welding inspector qualification for coldformed steel floor and roof decks shall be in accordance with AWS D1.3.

1705*A*.2.2.1.2 Reinforcing steel. Welding inspection and welding inspector qualification for reinforcing steel shall be in accordance with AWS D1.4 and ACI 318.

1705*A*.2.2.2 Cold-formed steel trusses spanning 60 feet or greater. Where a cold-formed steel truss clear span is 60 feet (18 288 mm) or greater, the special inspector shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

~~1704A.3.2.1~~ 1705A.2.2.3 Steel joist and joist girder inspection. *Special inspection is required during the manufacture and welding of steel joists or joist girders. The special inspector shall verify that proper quality control procedures and tests have been employed for all materials and the manufacturing process, and shall perform visual inspection of the finished product. The special inspector shall place a distinguishing mark, and/or tag with this distinguishing mark, on each inspected joist or joist girder. This mark or tag shall remain on the joist or joist girder throughout the job site receiving and erection process.*

~~1704A.3.2.2~~ 1705A.2.2.4 Light-framed steel truss inspection. *The manufacture of cold-formed light framed steel trusses shall be continuously inspected by a qualified special inspector approved by the enforcement agency. The special inspector shall verify conformance of materials and manufacture with approved plans and specifications. The special inspector shall place a distinguishing mark, and/or tag with this distinguishing mark, on each inspected truss. This mark or tag shall remain on the truss throughout the job site receiving and erection process.*

~~1704A.3.1.4~~ ***1705A.2.2.5*** ***Inspection of structural welding.*** *Inspection of all shop and field welding operations shall be made by a qualified welding inspector approved by the enforcement agency. The minimum requirements for a qualified welding inspector shall be as those for an AWS certified welding inspector (CWI), as defined in the provisions of the AWS QC1. All welding inspectors shall be as approved by the enforcement agency.*

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, details of construction and procedure, as well as workmanship of the welds. The inspector shall verify that the installation 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 construction documents.

1705*A*.3 Concrete construction. The special inspections and verifications for concrete construction shall be as required by this section and Table 1705*A*.3.

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

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

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

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

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

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

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

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

~~5. C~~concrete patios, driveways and sidewalks, on grade.

. . .

~~1704A.4.2~~ ***1705A.3.2*** ***Batch plant inspection.*** *Except as provided under Section ~~1704A.4.~~3 1705A.4.3, the quality and quantity of materials used in transit-mixed concrete and in batched aggregates shall be continuously inspected at the location where materials are measured by an approved special inspector.*

~~1704A.4.3~~ ***1705A.3.3*** ***Waiver of continuous batch plant inspection.*** *Continuous B batch plant inspection may be waived by the registered design professional, subject to approval by the enforcement agency under either of the following conditions:*

1. *The concrete plant complies fully with the requirements of ASTM C 94, Sections 8 and 9, and has a current certificate from the National Ready Mixed Concrete Association or another agency acceptable to the enforcement agency. The certification shall indicate that the plant has automatic batching and recording capabilities.*
2. *For single -story light-framed - buildings and isolated foundations supporting equipment only, where the specified compressive strength fc 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 3,000 psi (20.68 MPa).*

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

1. *Qualified technician of the testing laboratory shall check the first batch at the start of the day.*

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

3. *Batch tickets, including material quantities and weights shall accompany the load, shall be transmitted to the inspector of record by a truck driver with load identified thereon. The load shall not be placed without a batch ticket identifying the mix. 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.*

~~1704A.4.4~~ 1705A.3.4 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. The prestressed concrete plant fabrication inspector shall check the materials, equipment, tensioning procedure and construction of the prestressed members and prepare daily written reports. The inspector shall make a verified report identifying the members by mark and shall include such pertinent data as lot numbers of tendons used, tendon jacking forces, age and strength of concrete at time of tendon release and such other information that may be required.

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

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

~~1704A.4.5~~ 1705A.3.5 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.*

~~1704A.4.6~~ 1705A.3.6 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 1705A.3
REQUIRED VERIFICATION AND INSPECTION OF CONCRETECONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD[a]	~~CBC~~ *IBC* REFERENCE
…		…	…	…
13. Inspection of adhesive anchors in horizontal and upwardly inclined positions.[c]		X	ACI 318: D.9.2.2	___

. . .

c. Installation of all adhesive anchors in horizontal and upwardly inclined positions shall be performed by an ACI/CRSI Certified Adhesive Anchor Installer.

1705*A*.4 Masonry construction. Masonry construction shall be inspected and verified in accordance with TMS 402/ACI 530/ASCE 5 and TMS 602/ACI 530.1/ASCE 6 quality assurance program *as set forth in Table 1.19.3, Level C* requirements. *Inspection and testing of post-installed anchors in masonry shall be required in accordance with requirements for concrete in Chapters 17A and 19A*

~~**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, where they are part of structures classified as *Risk 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.~~

1705*A*.4.1 ~~Empirically designed masonry, g~~ *G*lass unit masonry and masonry veneer in Risk ~~Category~~ *Categories II, III, or* IV. The minimum special inspection program for ~~empirically designed masonry,~~ glass unit masonry or masonry veneer designed by Section ~~2109,~~ 2110*A* or Chapter 14, respectively, in structures classified as Risk ~~Category~~ *Categories II, III, or* IV, in accordance with Section 1604*A*.5, shall comply with TMS 402/ACI 530/ASCE 5 Level B Quality Assurance.

1705*A*.4.2 Vertical masonry foundation elements. Special inspection shall be performed in accordance with Section 1705*A*.4 for vertical masonry foundation elements.

1705*A*.5 Wood construction. Special inspections of the fabrication process of prefabricated wood structural elements and assemblies shall be in accordance with Section 1704*A*.2.5 *except as modified in this section*. Special inspections of site-built assemblies shall be in accordance with this section.

. . .

***~~1704A.6.3~~ 1705A.5.3* Wood structural elements and assemblies.** *Special inspection of wood structural elements and assemblies is required, as specified in this section, to ensure conformance with approved drawings and specifications, and applicable standards.*

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

***~~1704A.6.3.1~~ 1705A.5.4* Structural glued - laminated timber.** *Manufacture of all structural glued laminated timber shall be continuously inspected by a qualified special inspector approved by the enforcement agency.*

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

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

***~~1704A.6.3.2~~ 1705A.5.5* Manufactured open web trusses.** *The manufacture of open web trusses shall be continuously inspected by a qualified special inspector approved by the enforcement agency.*

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

***~~1704A.6.4~~ 1705A.5.6* 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.*

1705*A*.6 Soils. Special inspections for existing site soil conditions, fill placement and load-bearing requirements shall be as required by this section and Table 1705*A*.6. The approved geotechnical report, and the construction documents prepared by the registered design professionals shall be used to determine compliance. During fill placement, the special inspector shall determine that proper materials and procedures are used in accordance with the provisions of the approved geotechnical report.

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

***1705A.6.1 ~~1704A.7.1~~* Soil fill.** *All fills used to support the foundations of any building or structure shall be continuously inspected by the geotechnical engineer or his or her qualified representative. It shall be the responsibility of the geotechnical engineer to verify that fills meet the requirements of the ~~specifications~~ approved construction documents 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~~ inspection of cleared areas and benches prepared to receive fill; ~~observation~~ inspection 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 in accordance with the approved construction documents.

A verified report shall be submitted ~~to the enforcement agency~~ by the geotechnical engineer as required by the California Administrative Code. The report shall indicate that all ~~the~~ tests and inspection required by the approved construction documents were completed and that the tested materials ~~were in compliance with~~ and/or inspected work meet the requirements of the approved construction documents.

1705*A*.7 Driven deep foundations. Special inspections shall be performed during installation and testing of driven deep foundation elements as required by Table 1705.7. The approved instruction documents prepared by the registered design professionals, shall be used to determine compliance.

***~~1704A.8.1~~* 1705*A*.7.1 Driven deep foundations observation.** *The installation of driven deep foundations shall be continuously observed by a qualified representative of the geotechnical engineer responsible for that portion of the project.*

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

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1705*A*.10.1 Structural wood. Continuous special inspection is required during field gluing operations of elements of the main windforce-resisting system. Periodic special inspection is required for nailing, bolting, anchoring and other fastening of components within the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs.

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

1705*A*.10.2 Cold-formed steel light-frame construction. Periodic special inspection is required during welding operations of elements of the main windforce-resisting system. Periodic special inspection is required for screw

attachment, bolting, anchoring and other fastening of components within the main windforce-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.).~~

1705*A*.10.3 Wind-resisting components. Periodic special inspection is required for the following systems and components:

1. Roof cladding.
2. Wall cladding.

1705*A*.11 Special inspections for seismic resistance. Special inspections itemized in Sections 1705*A*.11.1 through 1705*A*.11.8, unless exempted by the exceptions of Section 1704*A*.2, are required for the following:

1. The seismic force-resisting systems in structures assigned to Seismic Design Category ~~C,~~ D, E or F in accordance with Sections 1705*A*.11.1 through 1705*A*.11.3, as applicable.
2. ~~Designated seismic systems in structures~~ *Equipment/components requiring special seismic certification* assigned to Seismic Design Category ~~C,~~ D, E or F in accordance with Section 1705*A*.11.4.
3. Architectural, mechanical and electrical components in accordance with Sections 1705*A*.11.5 and 1705*A*.11.6.
4. Storage racks in structures assigned to *Seismic Design Category* D, E or F in accordance with Section 1705*A*.11.7.
5. Seismic isolation *and damping* systems in accordance with Section 1705*A*.11.8.

~~**Exception:** Special inspections itemized in Sections 1705.11.1 through 1705.11.8 are not required for structures designed and constructed in accordance with one of the following:~~

~~1. The structure consists of light-frame construction; the design spectral response acceleration at short periods, S_{DS}, as determined in Section 1613.3.4, does not exceed 0.5; and the building height of the structure does not exceed 35 feet (10 668 mm).~~

~~2. The seismic force-resisting system of the structure consists of reinforced masonry or reinforced concrete; the design spectral response acceleration at short periods, S_{DS}, as determined in Section 1613.3.4, does not exceed 0.5; and the building height of the structure does not exceed 25 feet (7620 mm).~~

~~3. The structure is a detached one- or two-family dwelling not exceeding two *stories above grade plane* and does not have any of the following horizontal or vertical irregularities in accordance with Section 12.3 of ASCE 7:~~

~~3.1. Torsional or extreme torsional irregularity.~~

~~3.2. Nonparallel systems irregularity.~~

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

~~3.4. Discontinuity in lateral strength-weak story irregularity.~~

1705*A*.11.1 Structural steel. Special inspection for structural steel shall be in accordance with the quality assurance requirements of AISC 341 *as modified by Section 1705A.2.1 of this code*.

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

1705*A*.11.2 Structural wood. Continuous special inspection is required during field gluing operations of elements of the seismic force-resisting system. Periodic special inspection is required for nailing, bolting, anchoring and other fastening of components within the seismic force resisting system, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.

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

1705*A*.11.3 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) o.c.~~

1705*A*.11.4 ~~Designated seismic systems.~~ *Special inspection for special seismic certification*. The special inspector shall examine ~~designated seismic systems~~ *equipment and components* requiring *special* seismic ~~qualification~~ *certification* in accordance with Section ~~1705.12.3~~ 1705*A*.12.4 and verify that the label, anchorage or mounting conforms to the certificate of compliance.

1705*A*.11.5 Architectural components. Periodic special inspection is required during the erection and fastening of exterior cladding, interior and exterior nonbearing walls, *ceilings,* and interior and exterior veneer in structures assigned to Seismic Design Category D, E or F.

~~**Exceptions:**~~

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

~~2. *Special inspection* is not required for exterior cladding and interior and exterior veneer weighing 5 psf (24.5 N/m^2) 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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1705*A*.11.6 Mechanical and electrical components. Special inspection for mechanical and electrical components shall be as follows:

1. Periodic special inspection is required during the anchorage of electrical equipment for emergency or standby power systems in structures assigned to Seismic Design Category ~~C,~~ D, E or F;
2. Periodic special inspection is required during the anchorage of other electrical equipment in structures assigned to Seismic Design Category *D,* E or F;
3. Periodic special inspection is required during the installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units in structures assigned to Seismic Design Category ~~C,~~ D, E or F;
4. Periodic special inspection is required during the installation and anchorage of ductwork designed to carry hazardous materials in structures assigned to Seismic Design Category ~~C,~~ D, E or F; and
5. Periodic special inspection is required during the installation and anchorage of vibration isolation systems in structures assigned to Seismic Design Category ~~C,~~ D, E or F where the construction documents require a nominal clearance of 1/4 inch (6.4 mm) or less between the equipment support frame and restraint.

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***~~1707A.9~~* 1705A.11.8 Seismic isolation *and damping* systems.** Periodic special inspection shall be provided for seismic isolation *and damping* systems during the fabrication and installation of isolator units and energy dissipation devices*. Continuous special inspection is required for prototype and production testing of isolator units and damping devices.*

1705*A*.12 Testing and ~~qualification~~ *certification* for seismic resistance. The testing and ~~*qualification*~~ *certification* specified in Sections 1705*A*.12.1 through 1705*A*.12.4, unless exempted from special inspections by the exceptions of Section 1704*A*.2, are required as follows:

1. The seismic force-resisting systems in structures assigned to Seismic Design Category ~~C,~~ D, E or F shall meet the requirements of Sections 1705*A*.12.1 and 1705*A*.12.2, as applicable.

2. ~~Designated seismic systems~~ *Equipment and components* in structures assigned to Seismic Design Category ~~C,~~ D, E or F ~~and subject to~~ shall comply with the *special seismic* certification requirements ~~of ASCE 7 Section 13.2.2~~ *of Section 1705A.12.4* ~~shall comply with Section 1705.12.3~~.

3. Architectural, mechanical and electrical components in structures assigned to Seismic Design Category ~~C,~~ D, E or F and where the requirements of ASCE 7 Section 13.2.1 *Item 2* are met by submittal of manufacturer's certification, ~~in accordance with Item 2 therein,~~ shall comply with Section 1705*A*.12.3.

4. The seismic isolation system in seismically isolated structures *and damping devices* shall meet the testing requirements of Section ~~1705.12.4~~ *1705A.12.5*.

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1705*A*.12.3 ~~Seismic~~ *Manufacturer's* certification of nonstructural components. The registered design professional shall specify on the construction documents the requirements for *manufacturer's* certification by analysis, testing or experience data for nonstructural components ~~and designated seismic systems~~ in accordance with Section ~~13.2~~ *13.2.1, Item 2* of ASCE 7, where such certification is required by Section 1705*A*.12.

Seismic sway braces satisfying requirements of FM 1950 shall be deemed to satisfy the requirements of this Section.

1705A.12.4 *(Reserved for OSHPD)*

***1705A.12.5* Seismic isolation *and damping* systems.** Seismic isolation *and damping* systems shall be tested in accordance with Section 17.8 *and 18.9* of ASCE 7.

~~1708A.5~~ *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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***~~1704A.17~~ 1705A.18* Shotcrete.** *All shotcrete work shall be continuously inspected during placing by an inspector specially approved for that purpose by the enforcement agency. The special shotcrete inspector shall check the materials, placing equipment, details of construction and construction procedure. The inspector shall furnish a verified report that of his or her own personal knowledge the work covered by the report has been performed and materials used and installed in every material respect in compliance with the duly approved plans and specifications.*

***~~1704A.17.1~~ 1705A.18.1* Visual examination for structural soundness of in-place shotcrete.** *Completed shotcrete work shall be checked visually for reinforcing bar embedment, voids, rock pockets, sand streaks and similar deficiencies by examining a minimum of three 3-inch (76 mm) cores taken from three areas chosen by the design engineer which represent the worst congestion of reinforcing bars occurring in the project. Extra reinforcing bars may be added to noncongested areas and cores may be taken from these areas. The cores shall be examined by the special inspector and a report submitted to the enforcement agency prior to final approval of the shotcrete.*

Exception: *Shotcrete work fully supported on earth, minor repairs, and when, in the opinion of the enforcement agency, no special hazard exists.*

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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.

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

CHAPTER 18A
SOILS AND FOUNDATIONS

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			

(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. *Structures regulated by the Division of the State Architect-Structural Safety, which include those applications listed in Section 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 & 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 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.*

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

SECTION 1803*A*
GEOTECHNICAL INVESTIGATIONS

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

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

Exceptions: ~~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.~~

1. *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) or in seismic hazard zones as defined in the Safety Element of the local General Plan. Allowable foundation and lateral soil pressure values may be determined from Table 1806A.2.*
2. *A previous report for a specific site may be resubmitted, provided that a reevaluation is made and the report is found to be currently appropriate.*

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

1803*A*.3.1 Scope of investigation. The scope of the geotechnical investigation including the number and types of borings or soundings, the equipment used to drill or sample, the in-situ testing equipment and the laboratory testing program shall be determined by a registered design professional.

There shall not be less than one boring or exploration shaft for each 5,000 square feet (465 m^2) of building area at the foundation level with a minimum of two provided for any one building. A boring may be considered to reflect subsurface conditions relevant to more than one building, subject to the approval of the enforcement agency.

Borings shall be of sufficient size to permit visual examination of the soil in place or, in lieu thereof, cores shall be taken.

Borings shall be of sufficient depth and size to adequately characterize sub-surface conditions.

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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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1803A.6 ~~Site data~~. Geohazard reports

~~1803A.6.1 Engineering geological reports~~.

~~1803A.6.1.1~~ *~~Geologic and earthquake engineering~~ Geohazard 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) or in seismic hazard zones as defined in the Safety Element of the local General Plan; nonstructural, associated structural or voluntary structural alterations, and incidental structural additions or alterations, and structural repairs for other than earthquake damage.*
2. *A previous report for a specific site may be resubmitted, provided that a reevaluation is made and the report is found to be currently appropriate.*

~~1803A.6.1.2~~ *The purpose of the ~~engineering geologic~~ geohazard 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~~ geohazard 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 report shall include, but shall not be limited to, the following:

1. *~~Geologic investigation~~ Site geology.*
2. *Evaluation of the known active and potentially active faults, both regional and local.*
3. *Ground-motion parameters, as required by Section 1613A, 1615A, & ASCE 7.*

~~1803A.6.2 Supplemental ground-response report.~~ *~~If site-specific ground-motion procedures, as set forth in ASCE 7 Chapter 21, or ground-motion response history analysis, as set forth in ASCE 7 Chapter 16, Sections 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 supported by 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 structures 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.*~~

~~***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.*~~

~~***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, may require additional information, analysis or clarification of potential ground-response issues reported in the supplemental ground-response report for the proposed building site.*~~

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

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

11. *The report shall consider the effects of stepped footings addressed in Section 1809A.3.*

12. *The report shall consider the effects of seismic hazards in accordance with Section 1803A.6 and shall incorporate the associated geohazard report.*

1803A.8 Geotechnical Peer Review. [DSA-SS and DSA-SS/CC] *When alternate foundations designs or ground improvements are employed or where slope stabilization is required, a qualified peer review by a California-licensed geotechnical engineer in accordance with Section 3422 may be required by the enforcement agency. In Section 3422, where reference is made to structural or seismic-resisting system, it shall be replaced with geotechnical, foundation, or ground improvement, as appropriate.*

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SECTION 1805*A*
DAMPPROOFING AND WATERPROOFING

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

Ventilation for crawl spaces shall comply with Section 1203.4.

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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 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.

1807*A*.1.1 Design lateral soil loads. Foundation walls shall be designed for the lateral soil loads ~~set forth in Section 1610*A*.~~ *determined by a geotechnical investigation in accordance with Section 1803A.*

1807*A*.1.2 Unbalanced backfill height. Unbalanced backfill height is the difference in height between the exterior finish ground level and the lower of the top of the concrete footing that supports the foundation wall or the interior finish ground level. Where an interior concrete slab on grade is provided and is in contact with the interior surface of the foundation wall, the unbalanced backfill height shall be permitted to be measured from the exterior finish ground level to the top of the interior concrete slab.

1807*A*.1.3 Rubble stone foundation walls. *Not permitted by 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 2303*A*.1.8.1.~~

1807*A*.1.5 Concrete and masonry foundation walls. Concrete and masonry foundation walls shall be designed in accordance with Chapter 19*A* or 21*A*, as applicable.

~~**Exception:** Concrete and masonry foundation walls shall be permitted to be designed and constructed in accordance with Section 1807.1.6.~~

~~**1807.1.6 Prescriptive design of concrete and masonry foundation walls.** Concrete and masonry foundation walls that are laterally supported at the top and bottom shall be permitted to be designed and constructed in accordance with this section.~~

~~**1807.1.6.1 Foundation wall thickness.** The thickness of prescriptively designed foundation walls shall not be less than the thickness of the wall supported, except that foundation walls of at least 8-inch (203 mm) nominal width shall be permitted to support brick-veneered frame walls and 10-inch-wide (254 mm) cavity walls provided the requirements of Section 1807.1.6.2 or 1807.1.6.3 are met.~~

~~**TABLE 1807.1.6.2**~~
~~**CONCRETE FOUNDATION WALLS**[b, c]~~
(Table not shown for clarity)

~~**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.~~

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 forplain concrete members in Section 1908.1.8.

TABLE 1807.1.6.3(1)
PLAIN MASONRY FOUNDATION WALLS[a,b,c]
(Table not shown for clarity)

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.

4. Grout shall comply with Section 2103.12.

5. Concrete masonry units shall comply with ASTM C 90.

6. Clay masonry units shall comply with ASTM C 652 for hollow brick, except compliance with ASTM C 62 or ASTM C 216 shall be permitted where solid masonry units are installed in accordance with Table 1807.1.6.3(1) for plain masonry.

7. Masonry units shall be laid in running bond and installed with Type Mor S mortar in accordance with Section 2103.8.

8. The unfactored axial load per linear foot of wall shall not exceed 1.2 *t f'm* where *t* is the specified wall thickness in inches and *f'm* is the specified compressive strength of masonry in pounds per square inch.

9. At least 4 inches (102 mm) of solid masonry shall be provided at girder supports at the top of hollow masonry unit foundation walls.

10. Corbeling of masonry shall be in accordance with Section 2104.2. Where an 8-inch (203 mm) wall is corbeled, the top corbel shall not extend 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 not shown for clarity)

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.

~~**TABLE 1807.1.6.3(3)**~~
~~**10-INCH MASONRY FOUNDATION WALLS**~~
~~**WITH REINFORCEMENT WHERE d ≥ 6.75 INCHES**~~ ~~[a, b, c]~~
(Table not shown for clarity)

~~**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.~~

~~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 not shown for clarity)

1807*A*.2 Retaining walls. Retaining walls shall be designed in accordance with Sections 1807*A*.2.1 through 1807*A*.2.3. *Freestanding cantilever walls shall be design in accordance with Section 1807A.2.4.*

1807*A*.2.1 General. Retaining walls shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, lateral soil pressures on both sides of the keyway shall be considered in the sliding analysis.

1807*A*.2.2 Design lateral soil loads. Retaining walls shall be designed for the lateral soil loads ~~set forth in Section 1610.~~ *determined by a geotechnical investigation in accordance with Section 1803A and shall not be less than eighty percent of the lateral soil loads determined in accordance with Section 1610A*.

. . .

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 1808.9. Shallow foundations shall also satisfy the requirements of Section 1809. Deep foundations shall also satisfy the requirements of Section 1810*A*.

1808*A*.2 Design for capacity and settlement. Foundations shall be so designed that the allowable bearing capacity of the soil is not exceeded, and that differential settlement is minimized. Foundations in areas with expansive soils shall be designed in accordance with the provisions of Section 1808*A*.6.

The enforcing agency may require an analysis of foundation elements to determine subgrade deformations in order to evaluate their effect on the superstructure, including story drift.

. . .

1808*A*.8 Concrete foundations. The design, materials and construction of concrete foundations shall comply with Sections1808*A*.8.1 through 1808*A*.8.6 and the provisions of Chapter 19*A*.

~~**Exception:** Where concrete footings supporting walls of light-frame construction are designed in accordance with Table 1809.7, a specific design in accordance with Chapter 19 is not required.~~

1808*A*.8.1 Concrete or grout strength and mix proportioning. Concrete or grout in foundations shall have a specified compressive strength (*f ′*c) not less than the largest applicable value indicated in Table 1808*A*.8.1.

Where concrete is placed through a funnel hopper at the top of a deep foundation element, the concrete mix shall be designed and proportioned so as to produce a cohesive workable mix having a slump of not less than 4 inches (102 mm) and not more than 8 inches (204 mm). Where concrete or grout is to be pumped, the mix design including slump shall be adjusted to produce a pumpable mixture.

TABLE 1808*A*.8.1
MINIMUM SPECIFIED COMPRESSIVE STRENGTH f'_c OF CONCRETE OR GROUT

FOUNDATION ELEMENT OR CONDITION	SPECIFIED COMPRESSIVE STRENGTH, f'_c
~~1. Foundations for structures assigned to Seismic Design Category A, B or C~~	~~2,500 psi~~
~~2a. Foundations for Group R or U occupancies of light-frame construction, two stories or less in height, assigned to Seismic Design Category D, E or F~~	~~2,500 psi~~
~~2b~~ *1*.Foundations for other structures assigned to Seismic Design Category D, E or F	3,000 psi
~~3~~ *2*. Precast nonprestressed driven piles	4,000 psi
~~4~~ *3*. Socketed drilled shafts	4,000 psi
~~5~~ *4*. Micropiles	4,000 psi
~~6~~ *5.* Precast prestressed driven piles	5,000 psi

For SI: 1 pound per square inch = 0.00689MPa.

. . .

1808*A*.8.6 Seismic requirements. See Section 1908*A* for additional requirements for foundations of structures assigned to Seismic Design Category ~~C,~~ D, E or F.

For structures assigned to Seismic Design Category D, E or F, provisions of ACI 318, Sections 21.12.1 through 21.12.4, shall apply where not in conflict with the provisions of Sections 1808*A* through 1810*A*.

~~**Exceptions:**~~

1. ~~Detached one- and two-family dwellings of light-frame construction and two stories or less above *grade plane* are not required to comply with the provisions of ACI 318, Sections 21.12.1 through 21.12.4.~~

2. ~~Section 21.12.4.4(a) of ACI 318 shall not apply.~~

1808.9*A* Vertical masonry foundation elements. Vertical masonry foundation elements that are not foundation piers as defined in Section 202 shall be designed as piers, walls or columns, as applicable, in accordance with TMS 402/ACI 530/ASCE 5.

SECTION 1809*A*
SHALLOW FOUNDATIONS

1809*A*.1 General. Shallow foundations shall be designed and constructed in accordance with Sections 1809*A*.2 through 1809*A*.13.

1809*A*.2 Supporting soils. Shallow foundations shall be built on undisturbed soil, compacted fill material or controlled low-strength material (CLSM). Compacted fill material shall be placed in accordance with Section 1804*A*.5. CLSM shall be placed in accordance with Section 1804*A*.6.

1809*A*.3 Stepped footings. The top surface of footings shall be level. The bottom surface of footings shall be permitted to have a slope not exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footing or where the surface of the ground slopes more than one unit vertical in 10 units horizontal (10-percent slope).

Individual steps in continuous footings shall not exceed 18 inches (457 mm) in height and the slope of a series of such steps shall not exceed 1 unit vertical to 2 units horizontal (50% slope) unless otherwise recommended by a geotechnical 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*.6 Location of footings. Footings on granular soil shall be so located that the line drawn between the lower edges of adjoining footings shall not have a slope steeper than 30 degrees (0.52 rad) with the horizontal, unless the material supporting the higher footing is braced or retained or otherwise laterally supported in an approved manner or a greater slope has been properly established by engineering analysis.

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

(Table not shown for clarity)

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.~~

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. Grillage footings of structural steel shapes shall be separated with *approved* steel spacers and be entirely encased in concrete with at least 6 inches (152 mm) on the bottom and at least 4 inches (102 mm) at all other points. The spaces between the shapes shall be completely filled with concrete or cement grout.

1809*A*.12 Timber footings. *Not permitted by 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.~~

. . .

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 shall be permitted when approved by registered design professional in responsible charge and the enforcement agent.*

1809A.15 Grade beams: [DSA-SS, DSA-SS/CC] *For structures assigned to Seismic Design Category D, E or F, grade beams in shallow foundations shall comply with 1810A.3.12.*

SECTION 1810*A*
DEEP FOUNDATIONS

1810*A*.1 General. Deep foundations shall be analyzed, designed, detailed and installed in accordance with Sections 1810*A*.1 through 1810*A*.4.

. . .

1810*A*.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*.3.1.6 Casings. Temporary and permanent casings shall be of steel and shall be sufficiently strong to resist collapse and sufficiently water tight to exclude any foreign materials during the placing of concrete. Where a permanent casing is considered reinforcing steel, the steel shall be protected under the conditions specified in Section 1810*A*.3.2.5. Horizontal joints in the casing shall be spliced in accordance with Section 1810*A*.3.6.

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*A*.3.2.1 Concrete. Where concrete is cast in a steel pipe or where an enlarged base is formed by compacting concrete, the maximum size for coarse aggregate shall be 3/4 inch (19.1 mm). Concrete to be compacted shall have a zero slump.

1810*A*.3.2.1.1 Seismic hooks. For structures assigned to Seismic Design Category C, D, E or F, the ends of hoops, spirals and ties used in concrete deep foundation elements shall be terminated with seismic hooks, as defined in ACI 318, and shall be turned into the confined concrete core.

~~**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.~~

. . .

1810A.3.3.1.2 Load tests. Where design compressive loads are greater than those determined using the allowable stresses specified in Section 1810*A*.3.2.6, where the design load for any deep foundation element is in doubt, or where cast-in-place deep foundation elements have an enlarged base formed either by compacting concrete or by driving a precast base, control test elements shall be tested in accordance with ASTM D 1143 *including Procedure G: Cyclic Loading Test* or ASTM D 4945. At least one element shall be load tested in each area of uniform subsoil conditions. Where required by the building official, additional elements shall be load tested where necessary to establish the safe design capacity. The resulting allowable loads shall not be more than one-half of the ultimate axial load capacity of the test element as assessed by one of the published methods listed in Section 1810*A*.3.3.1.3 with consideration for the test type, duration and subsoil. The ultimate axial load capacity shall be determined by a registered design professional with consideration given to tolerable total and differential settlements at design load in accordance with Section 1810*A*.2.3. In subsequent installation of the balance of deep foundation elements, all elements shall be deemed to have a supporting capacity equal to that of the control element where such elements are of the same type, size and relative length as the test element; are installed using the same or comparable methods and equipment as the test element; are installed in similar subsoil conditions as the test element; and, for driven elements, where the rate of penetration (e.g., net displacement per blow) of such elements is equal to or less than that of the test element driven with the same hammer through a comparable driving distance.

. . .

1810*A*.3.3.1.5 Uplift capacity of a single deep foundation element. Where required by the design, the uplift capacity of a single deep foundation element shall be determined by an approved method of analysis based on a minimum factor of safety of three or by load tests conducted in accordance with ASTM D 3689. The maximum allowable uplift load shall not exceed the ultimate load capacity as determined in Section 1810A.3.3.1.2, using the results of load tests conducted in accordance with ASTM D 3689 *including the Cyclic Loading Procedure*, divided by a factor of safety of two.

> **Exception:** Where uplift is due to wind or seismic loading, the minimum factor of safety shall be two where capacity is determined by an analysis and one and a half where capacity is determined by load tests.

1810*A*.3.3.1.6 Uplift capacity of grouped deep foundation elements. For grouped deep foundation elements subjected to uplift, the allowable working uplift load for the group shall be calculated by an *approved* method of analysis. ~~where~~ *Where* the deep foundation elements in the group are placed at a center to- center spacing of at least 2.5 times the least horizontal dimension of the largest single element, the allowable working uplift load for the group is permitted to be calculated as the lesser of:

1. The proposed individual uplift working load times the number of elements in the group.
2. Two-thirds of the effective weight of the group and the soil contained within a block defined by the perimeter of the group and the length of the element, plus two-thirds of the ultimate shear resistance along the soil block.

. . .

1810*A*.3.3.2 Allowable lateral load. Where required by the design, the lateral load capacity of a single deep foundation element or a group thereof shall be determined by an approved method of analysis or by lateral load tests *in accordance with ASTM D3966, including the Cyclic Loading Procedure,* to at least twice the proposed design working load. The resulting allowable load shall not be more than one-half of the load that produces a gross lateral movement of 1 inch (25 mm) at the lower of the top of foundation element and the ground surface, unless it can be shown that the predicted lateral movement shall cause neither harmful distortion of, nor instability in, the structure, nor cause any element to be loaded beyond its capacity.

. . .

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 1613A*, 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.~~

6. Where transverse reinforcement consists of rectangular hoops and cross ties, the total cross-sectional area of lateral transverse reinforcement in the ductile region with spacing, *s*, and perpendicular dimension, *hc*, shall conform to:

. . .

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 *at* ~~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*.3.9.4.2.2 Site Classes E and F. For Site Class E or F 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 seven times the least element dimension *at* ~~of~~ the *bottom of the* pile cap and within seven times the least element dimension *at* ~~of~~ the interfaces of strata that are hard or stiff and strata that are liquefiable or are composed of soft- to medium-stiff clay.

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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.

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~~**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.

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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.~~

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SECTION 1811A
PRESTRESSED ROCK AND SOIL FOUNDATION ANCHORS

1811A.1 General. *The requirements of this section address the use of vertical rock and soil anchors in resisting seismic or wind overturning forces resulting in tension on shallow foundations.*

1813A.2 Adoption. *Except for the modifications as set forth in Sections 1811A.3 and 1811A.4, all Prestressed Rock and Soil Foundation Anchors shall be designed in accordance with PTI Recommendations for Prestressed Rock and Soil Anchors.*

1811A.3 Geotechnical Requirements*. Geotechnical report for the Prestressed Rock & Soil Foundation Anchors shall address the following:*

1. *Minimum diameter and minimum spacing for the anchors including consideration of group effects.*

2. *Maximum unbonded length and minimum bonded length of the tendon.*

3. *Maximum recommended anchor tension capacity based upon the soil or rock strength / grout bond and anchor depth / spacing.*

4. *Allowable bond stress at the ground / grout interface and applicable factor of safety for ultimate bond stress.*

5. *Anchor axial tension stiffness recommendations at the anticipated anchor axial tension displacements, when required for structural analysis.*

6. *Minimum grout pressure for installation and post-grout pressure.*

7. *Class I Corrosion Protection is required for all permanent anchors. Geotechnical report shall specify the corrosion protection recommendations for temporary anchors.*

8. *Performance test shall be at a minimum of 1.6 times the design loads. There shall be a minimum of two preproduction test anchors. Preproduction test anchors shall be tested to ultimate load or 0.80 times the specified minimum tensile strength of the tendon. A Creep test is required for all prestressed anchors with greater than 10 kips of lock-off prestressing load.*

9. *Lock-off prestressing load requirements.*

10. *Acceptable Drilling methods.*

11. *Geotechnical observation and monitoring requirements.*

1811A.4 Structural Requirements*.*

1. *Tendons shall be thread-bar anchors conforming to ASTM A 722.*

2. *The anchors shall be placed vertical.*

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

4. *Ultimate Load shall be based upon Section 1615A.1.10 and shall not exceed 80 percent of the specified minimum tensile strength of the tendons.*

5. *The anchor shall be designed to fail in grout bond to the soil or rock before pullout of the soil wedge by group effect.*

6. *Foundation design shall incorporate the ~~affect~~ effect of lock-off loads.*

7. *Design shall account for as-built locations of soil anchors considering all the acceptable construction tolerances.*

8. *Design shall account for both short and long term deformation.*

9. *Enforcement agency may require consideration of anchor deformation in evaluating deformation compatibility or building drift where it may be significant.*

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.

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

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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	
1901.1.2		X	
1901.1.3		X	
1901.1.4		X	
~~1916~~ 1913		X	Was 1916 in 2010 CBC
1913.1.1		X	From 1916.3.2.1 – CBC 2010
1913.2		X	From 1916.1 – CBC 2010
1913.2.1		X	From 1916.1.1 – CBC 2010
1913.2.2		X	From 1916.1.2 – CBC 2010
1913.2.3		X	From 1916.1.3 – CBC 2010
1913.2.4		X	From 1916.1.4 – CBC 2010
1913.2.5		X	From 1916.1.5 – CBC 2010
1913.2.6		X	From 1916.1.6 – CBC 2010
1913.2.7		X	From 1916.1.7 – CBC 2010
1913.2.8		X	From 1916.1.8 – CBC 2010
1913.2.9		X	From 1916.1.9 – CBC 2010
1913.2.10		X	From 1916.1.10 – CBC 2010
1913.2.11		X	From 1916.1.11 – CBC 2010
1913.2.11.1		X	From 19161.11.1 – CBC 2010
1913.2.11.2		X	From 1916.1.11.2 – CBC 2010
1913.2.11.3		X	From 1916.1.11.3 – CBC 2010
1913.2.11.4		X	From 1916.1.11.4 – CBC 2010
1913.2.11.5		X	From 1916.1.11.5 – CBC 2010
1913.3.1		X	New Amendment
1913.3.2		X	From 1916.4.1 – CBC 2010
1913.3.3		X	From 1916.4.5 – CBC 2010
1913.3.4		X	From 1916.4.6 – CBC 2010
1913.3.5		X	From 1916.4.7 – CBC 2010
1913.3.6		X	From 1916.4.8 – CBC 2010
1913.3.7		X	From 1916.4.9 – CBC 2010
1913.3.8		X	New Amendment

1913.4.1		**X**	From 1916.5.1– CBC 2010
1913.4.2		**X**	From 1916.5.2 – CBC 2010
1913.4.3		**X**	From 1916.5.3 – CBC 2010
1913.4.4		**X**	From 1916.5.4 – CBC 2010
1913.4.5		**X**	From 1916.5.5 – CBC 2010
1913.5		**X**	From 1916.6 – CBC 2010

(All amendments not revised below shall continue without any change.)

EXPRESS TERMS

Italics are used for text within Sections 1903 through 1905 of this code to indicate provisions that differ from ACI 318.

SECTION 1901
GENERAL

1901.1 Scope. The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

1901.1.1 Application. *The scope of application of Chapter 19 is as follows:*

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.

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:*

Division of the State Architect—Structural Safety/Community Colleges:

[DSA-SS/CC] *For applications listed in Section 1.9.2.2.*

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.*

1901.1.4 Amendments. [DSA-SS/CC] *See Section ~~1916~~ 1913 for additional requirements applicable to community colleges.*

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SECTION ~~1916~~ 1913
ADDITIONAL REQUIREMENTS [DSA-SS/CC]

1913.1 General.

(Relocated from 2010 CBC, Section 1916.3.2.1) ***1913.1.1 Construction documents.*** *Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural ~~plans~~ drawings.*

~~1916.1~~ 1913.2 Tests and materials. *Where required, special inspections and tests shall be in accordance with Chapter 17A and this section.*

~~1916.1.1~~ 1913.2.1 Glass fiber reinforced concrete. *Glass fiber reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCI MNL128 standard.*

~~1916.1.2~~ 1913.2.2 Fly ash. *Replace ACI 318 Section 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 1905.3~~ ACI 318 Section 5.3. See Section 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 1905.3~~ ACI 318 Section 5.3. See Section 1904 for durability requirements.*

~~1916.1.3~~ 1913.2.3 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 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.*

~~1916.1.4~~ 1913.2.4 Discontinuous steel fibers - *Modify ACI 318 Section 3.5.1 by adding the following:*

Discontinuous steel fibers shall not be permitted

~~1916.1.5~~ 1913.2.5 Cementitious material. *The concrete supplier shall furnish to the enforcement agency certification that the cement proposed for use on the project has been manufactured and tested in compliance with the requirements of ASTM C 150 for portland cement and ASTM C 595 or ASTM C 1157 for blended hydraulic cement, whichever is applicable. When a mineral admixture or ground granulated blast-furnace slag is proposed for use, the concrete supplier shall furnish to the enforcement agency certification that they have been manufactured and tested in compliance with ASTM C 618 or ASTM C 989, whichever is applicable. The concrete producer shall provide copies of the cementitious material supplier's certificate of compliance that represents the materials used by date of shipment for concrete. Cementitious materials without certification of compliance shall not be used.*

~~1916.1.6~~ 1913.2.6 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.

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.

~~1916.1.7~~ 1913.2.7 Tests for prestressing steel and anchorage. *All wires or bars of each size from each mill heat and all strands from each manufactured reel to be shipped to the site shall be assigned an individual lot number and shall be tagged in such a manner that each lot can be accurately identified at the job site. Each lot of tendon and anchorage assemblies and bar couplers to be installed shall be likewise identified.*

The following samples of materials and tendons selected by the engineer or the designated testing laboratory from the prestressing steel at the plant or job site shall be furnished by the contractor and tested by an approved independent testing agency:

1. *For wire, strand or bars, 7-foot-long (2134 mm) samples shall be taken of the coil of wire or strand reel or rods. A minimum of one random sample per 5,000 pounds (2270 kg) of each heat or lot used on the job shall be selected.*
2. *For prefabricated prestressing tendons other than bars, one completely fabricated tendon 10 feet (3048 mm) in length between grips with anchorage assembly at one end shall be furnished for each size and type of tendon and anchorage assembly.*

   Variations of the bearing plate size need not be considered.

   The anchorages of unbonded tendons shall develop at least 95 percent of the minimum specified ultimate strength of the prestressing steel. The total elongation of the tendon under ultimate load shall not be less than 2 percent measured in a minimum gage length of 10 feet (3048 mm).

   Anchorages of bonded tendons shall develop at least 90 percent of the minimum specified strength of the prestressing steel tested in an unbonded state. All couplings shall develop at least 95 percent of the minimum specified strength of the prestressing steel and shall not reduce the elongation at rupture below the requirements of the tendon itself.
3. *If the prestressing tendon is a bar, one 7-foot (2134 mm) length complete with one end anchorage shall be furnished and, in addition, if couplers are to be used with the bar, two 4-foot (1219 mm) lengths of bar fabricated to fit and equipped with one coupler shall be furnished.*
4. *Mill tests of materials used for end anchorages shall be furnished. In addition, at least one Brinnell hardness test shall be made of each thickness of bearing plate.*

***~~1916.1.8~~ 1913.2.8* Composite construction cores.** *Cores of the completed composite concrete construction shall be taken to demonstrate the shear strength along the contact surfaces. The cores shall be tested when the cast-in-place concrete is approximately 28 days old and shall be tested by a shear loading parallel to the joint between the precast concrete and the cast-in-place concrete. The minimum unit shear strength of the contact surface area of the core shall not be less than 100 psi (689 kPa).*

At least one core shall be taken from each building for each 5,000 square feet (465 m^2) of area of composite concrete construction and not less than three cores shall be taken from each project. The architect or structural engineer in responsible charge of the project or his or her representative shall designate the location for sampling.

***~~1916.1.9~~ 1913.2.9* Tests of shotcrete.** *Testing of shotcrete shall follow the provisions of Section 1913A and the general requirements of ACI 318 Section 5.6.*

***~~1916.1.10~~ 1913.2.10* Gypsum field tests.** *Field tests shall be made during construction to verify gypsum strength. One sample consisting of three specimens shall be made for each 5,000 square feet (465 m^2) or fraction thereof of all gypsum poured, but not less than one sample shall be taken from each half-day's pour.*

***~~1916.1.11~~ 1913.2.11* Tests for post-installed anchors in concrete.** *When post-installed anchors are used in lieu of cast-in- place bolts, the installation verification test loads frequency and acceptance criteria shall be in accordance with this section.*

***~~1916.1.11.1~~ 1913.2.11.1* 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.

***~~1916.1.11.2~~ 1913.2.11.2* 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)~~ an approved test report using criteria adopted in this code or determined in accordance with Appendix D of ACI 318.*

   Tension test load need not exceed 80 percent 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~~ based on approved test report using criteria adopted in this code.*

~~1916.1.11.3~~ 1913.2.11.3 Test frequency. *When post-installed anchors are used for sill plate bolting applications, 10 percent of the anchors shall be tested.*

When post-installed anchors are used for other structural applications, all such anchors shall be tested.

When 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 tested.

The testing of the 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.

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 lb 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 percent 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 be required.*
5. *Testing is not required for power actuated fasteners used to attach tracks of interior nonshear wall partitions for shear only, where there are at least three fasteners per segment of track.*

~~1916.1.11.4~~ 1913.2.11.4 Test acceptance criteria. *Acceptance criteria for post-installed anchors shall be based on ~~ICC-ESR)~~ an approved test report using criteria adopted in this code 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 discernible movement during the tension test, e.g., as evidenced by loosening of the washer under the nut.

   For adhesive anchors, where other than bond is being tested, 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 $^{1}/_{2}$ 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.*

~~1916.1.11.5~~ 1913.2.11.5 Testing procedure. *Test procedure shall be as permitted ~~required by the ICC-ESR~~ by approved test report using criteria adopted in this code. Torque controlled post installed anchors shall be permitted to be tested using torque based on approved test report using criteria adopted in this code. All other post-installed anchors shall be tension tested. Manufacturer's recommendation for testing may be approved by the enforcement agency~~, when ICC-ESR~~ based on approved test report using criteria adopted in this code. ~~does not provide a testing procedure.~~.*

~~1916.2 Concrete quality, mixing and testing.~~

~~***1916.2.1 Selection of concrete proportions.*** *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 ACI 318, Section 5.2.*~~

~~***1916.2.2 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 (345 m^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.*~~

~~***1916.3 Formwork, embedded pipes and construction joints.***~~

~~***1916.3.1 Removal of forms, shores and reshores.*** *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.*~~

~~***1916.3.2 Conduits and pipes embedded in concrete.***~~

~~***1916.3.2.1 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.*~~

~~***1916.3.2.2 Adequate support.*** *Pipes and conduits shall be adequately supported and secured against displacement before concrete is placed.*~~

~~***1916.3.3 Construction joints.***~~

~~***1916.3.3.1 Joint details.*** *Typical details and proposed locations of construction joints shall be indicated on the plans.*~~

~~***1916.3.3.2 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.*~~

~~1916.4~~ 1913.3 Modifications to ACI 318

1913.3.1 ACI 318, Section 5.6.2.1. *Replace ACI 318 Section 5.6.2.1 by the following:*

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.*

~~***1916.4.1***~~ ***1913.3.2 ACI 318, Section 14.9.*** *Modify ACI 318 by adding Section 14.9 as follows:*

14.9-Foundation walls. Horizontal reinforcing of concrete foundation walls for wood-frame or light-steel buildings shall consist of the equivalent of not less than one No. 5 bar located at the top and bottom of the wall. Where such walls exceed 3 feet (914 mm) in height, intermediate horizontal reinforcing shall be provided at spacing not to exceed 2 feet (610 mm) on center. Minimum vertical reinforcing shall consist of No. 3 bars at 24 inches (610 mm) on center.

Where concrete foundation walls or curbs extend above the floor line and support wood-frame or light-steel exterior, bearing or shear walls, they shall be doweled to the foundation wall below with a minimum of No. 3 bars at 24 inches (610 mm) on center. Where the height of the wall above the floor line exceeds 18 inches (457 mm), the wall above and below the floor line shall meet the requirements of ACI 318 Section 14.3.

~~***1916.4.2 ACI 318, Section 18.21.*** *Add Section 18.21.5 to ACI 318 as follows:*~~

~~*18.21.5-Prequalification of anchorages and coupler. Post-tensioned anchorages and couplers for unbonded tendons shall be prequalified for use in prestressed concrete. Data shall be submitted by the post-tensioning 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 post-tensioning systems to be used. General approval will be based on satisfactory performance. Tests shall be required for prestressing 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*~~

$$\cancel{f_{cp} = 0.6 f'_c \sqrt{A'_b / A_b}}$$

~~*but not greater than f'_c*~~

~~*At transfer load*~~

$$\cancel{f_{cp} = 0.8 f'_{ci} \sqrt{A'_b / A_b - 0.2}}$$

~~*but not greater than 1.25 f'_{ci} where:*~~

~~*f_{cp} = Permissible compressive concrete stress.*~~

~~*f'_c = Compressive strength of concrete.*~~

~~*f'_{ci} = Compressive strength of concrete at time of initial prestress.*~~

~~*A'_b = Maximum area of the portion of the concrete anchorage surface that is geometrically similar to and concentric with the area of the anchorage.*~~

~~*A_b = Bearing area of the anchorage.*~~

~~*P = Prestress force in tendon.*~~

~~***1916.4.3 ACI 318, Section 18.*** *Add Section 18.23 to ACI 318 as follows:*~~

~~*18.23 - Post-tensioned 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).*~~

~~***1916.4.4 ACI 318, Section 21.4.*** *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.*~~

~~***1916.4.5*** **1913.3.3** **ACI 318, Section 21.9.2.2.*** *Modify ACI 318, Section 21.9.2.2 by adding the following:*~~

Where boundary members are not required by ACI 318 Section 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 21.9.6.4 (a) and (b).

~~1916.4.6~~ 1913.3.4 ACI 318, Section 21.9.4. Modify ACI 318 by adding Section *21.9.4.6* as follows:

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 21.13.

~~1916.4.7~~ 1913.3.5 ACI 318, Section 21.11.4. *Modify ACI 318 Section 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 db is the diameter of the largest reinforcement in the topping slab.

~~1916.4.8~~ 1913.3.6 ACI 318, Section 21.11.7. *Modify ACI 318 Section 21.11.7 by adding Section 21.11.7.7 as follows:*

21.11.7.7 - Where boundary members are not required by ACI 318 Section 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.

~~1916.4.9~~ 1913.3.7 ACI 318, Chapter 22. *Plain concrete is not permitted.*

~~1916.4.10 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 $1^1/_2$ 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 $2^1/_2$ anchor diameters from the edges of the concrete parallel to the grain of the wood sill plate; and~~*
4. *~~They are located a minimum of 15 anchor diameters from the end of the concrete perpendicular to the grain of the wood sill plate.~~*

1913.3.8 ACI 318, Section D.3.3. *Replace the requirements of Section 1905.1.9 and 1905.1.10 with the following. Modify ACI 318 Sections D.3.3.4.2, D.3.3.4.3(d) and D.3.3.5.2 to read as follows:*

D.3.3.4.2 - Where the tensile component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with D.3.3.4.3. The anchor design tensile strength shall be determined in accordance with D.3.3.4.4.

Exception:

Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 and Section 1604.8.2 of this code shall be deemed to satisfy Section D.3.3.4.3(d).

*D.3.3.4.3(d) - The anchor or group of anchors shall be designed for the maximum tension obtained from design load combinations that include **E**, with **E** increased by Ω_0. The anchor design tensile strength shall be calculated from D.3.3.4.4.*

D.3.3.5.2 – Where the shear component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their attachments shall be designed in accordance with D.3.3.5.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with D.6.

Exceptions:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or non-bearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane design shear strength in accordance with D.6.2 and D.6.3 need not be computed and D.3.3.5.3 shall be deemed to be satisfied provided all of the following are met:

1.1. The allowable in-plane shear strength of the anchor is determined in accordance with AF&PA NDS Table 11E for lateral design values parallel to grain.

1.2. The maximum anchor nominal diameter is $^{5}/_{8}$ inches (16 mm).

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

1.4. Anchor bolts are located a minimum of $1^{3}/_{4}$ inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.

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

1.6. The sill plate is 2-inch or 3-inch nominal thickness.

2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or non-bearing walls of anchor bolts attaching cold-formed steel track of bearing or non-bearing walls of light-frame construction to foundations or foundation stem walls the in-plane design shear strength in accordance with Section D.6.2 and D.6.3 need not be computed and D.3.3.5.3 shall be deemed to be satisfied provided all of the following are met:

2.1. The maximum anchor nominal diameter is $^{5}/_{8}$ inches (16 mm).

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

2.3. Anchors are located a minimum of $1^{3}/_{4}$ inches (45 mm) from the edge of the concrete parallel to the length of the track.

2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.

2.5. The track is 33 to 68 mil designation thickness.

Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete shall be permitted to be determined in accordance with AISI S100 Section E3.3.1.

3. In light-frame construction, bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 5/8 inch [16mm] in diameter of sill plate or track to foundation or foundation stem wall need not satisfy D.3.3.5.3 (a) through (c) when the design strength of the anchors is determined in accordance with D.6.2.1(c).

~~1916.5~~ 1913.4 Shotcrete.

~~1916.5.1~~ 1913.4.1 Preconstruction tests. *A test panel prepared in accordance with Section 1913.5 is required. Approval from the enforcement agency must be obtained prior to performing test panels.*

~~1916.5.2~~ 1913.4.2 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.*

~~1916.5.3~~ 1913.4.3 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.*

~~1916.5.4~~ 1913.4.4 *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.

***~~1916.5.5~~ 1913.4.5* Placing.** *Shotcrete shall be placed in accordance with ACI 506.*

***~~1916.6~~ 1913.5* 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.

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

CHAPTER 19*A*
CONCRETE

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter			
Adopt entire chapter as amended (amended sections listed below)	**X**	**-**	
Adopt only those sections listed below			

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

EXPRESS TERMS

Italics are used for text within Sections 1903A through ~~1908A~~ 1905A 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. *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 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 1.9.2.1*

2. *(Reserved for OSHPD).*

. . .

1901*A*.3 Construction documents. The construction documents for structural concrete construction shall include:

1. The specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.
2. The specified strength or grade of reinforcement.
3. The size and location of structural elements, reinforcement and anchors.
4. Provision for dimensional changes resulting from creep, shrinkage and temperature.

5. The magnitude and location of prestressing forces.
6. Anchorage length of reinforcement and location and length of lap splices.
7. Type and location of mechanical and welded splices of reinforcement.
8. Details and location of contraction or isolation joints specified for plain concrete.
9. Minimum concrete compressive strength at time of posttensioning.
10. Stressing sequence for post-tensioning tendons.
11. For structures assigned to Seismic Design Category D, E or F, a statement if slab on grade is designed as a structural diaphragm.
12. *(Relocated from 2010 CBC, Section 1906A.3.1) Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural drawings.*

1901*A*.4 Special inspection. The special inspection of concrete elements of buildings and structures and concreting operations shall be as required by Chapter 17*A*.

SECTION 1902*A*
DEFINITIONS

1902*A*.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 *1905A.1.1*.

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~~ 1913A.*

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 PCI MNL128 standard.*

1903*A*.3 Flat wall insulating concrete form (ICF) systems. *Insulating concrete form material used for forming flat concrete walls shall conform to ASTM E 2634*.

~~1903A.3~~ 1903A.4 Reporting Requirements – Modify ACI 318 Section 3.2.1 by adding the following:

Each component (a) through (g), when present, as a percentage of total cementitiious materials shall be reported for each mix design.

~~1903A.4~~ 1903A.5 Fly Ash –*Add ACI 318 Section ~~3.6.6~~ 3.2.3 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~~ ACI 318 Section 5.3 . See Section 1904A for durability requirements.*
3. *More than 40 percent by weight of ground-granulated blast-furnace slag conforming to ASTM C 989 shall be permitted to be substituted for ASTM C 150 portland cement if the mix design is proportioned per ~~Section 1905A.3~~ ACI 318 Section 5.3. See Section 1904A for durability requirements.*

~~1903A.5~~ 1903A.6 Aggregates - 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 alkali-silica reactivity ~~according~~ in accordance with ~~to~~ ASTM C ~~289~~ 1260 or ASTM C 1293 to determine the potential alkali-silica reactivity of the aggregate ~~in the presence of cement~~. If the results ~~of the test are other than innocuous, selected concrete proportions using the aggregate (see Section 1905A.2) shall be tested in accordance with ASTM C 1567. If the results of this test~~ indicate an expansion greater than 0.10 percent at 16-days age with ASTM C 1260, or an expansion greater than 0.04 percent at 12 months age with ASTM C 1293, 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 with ASTM C 1567:

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 cement ~~constituent~~.*
3. *Replacement of not less than 15 percent by weight of the portland cement ~~used by~~ with a ~~mineral admixture~~ pozzolan 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~~ with slag cement conforming to ASTM C 989.*
5. *Replacement of not less than 5 percent nor more than 10 percent by weight of portland cement with silica fume conforming to ASTM C 1240.*
6. *Replacement of portland cement with a ternary blend of portland cement, slag cement and pozzolan such that the resulting blend contains not more than 70 percent portland cement*

ASTM C 1567 shall be performed separately on the fine and coarse aggregate with one requiring the higher percentage of supplementary cementitious materials dictating the required replacement.

ASTM C 1260, ASTM C 1293 and ASTM C 1567 tests must have been performed within the past three years.

~~1903A.6~~ 1903A.7 Discontinuous Steel Fibers - *Modify ACI 318 Section 3.5.1 by adding the following:*

Discontinuous steel fibers are not permitted.

~~1903A.7~~ 1903A.8 Welding of reinforcing bars - *Modify ACI 318 Section 3.5.2 by adding the following:*

If mill test reports are not available, chemical analysis shall be made of bars representative of the bars to be welded. Bars with a carbon equivalent (C.E.) above 0.75 shall not be welded. Welding shall not be done on or within two bar diameters of any bent portion of a bar that has been bent cold. Welding of crossing bars shall not be permitted for assembly of reinforcement unless authorized by the structural engineer and approved by the enforcement agency per approved procedures.

. . .

~~SECTION 1905A~~
~~CONCRETE QUALITY, MIXIBG AND PLACING~~

~~1905A.1 General . . .~~

~~1905A.1.1 Strength.~~ ~~Concrete shall be proportioned to provide an average compressive strength as prescribed in Section 1905A.3 and shall satisfy the durability criteria of Section 1904A. Concrete shall be produced to minimize the frequency of strengths below f'_c, as prescribed in Section 1905A.6.3. *For concrete designed and constructed in accordance with this chapter, f'_c, shall not be less than 3,000 psi (20.7 MPa).* No maximum specified compressive strength shall apply unless restricted by a specific provision of this code or ACI 318. *Reinforced concrete with specified compressive strength higher than*~~

8,000 psi (55 Mpa) shall require prior approval of structural design method and acceptance criteria by the enforcement agency.

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.

1905*A*.3 Proportioning on the basis of filed experience and/or trial mixture. . . .

1905*A*.4 Proportioning without filed experience or trial mixtures. . . .

1905*A*.5 Average strength reduction. . . .

1905*A*.6 Evaluation and acceptance of concrete. . . .

1905*A*.6.1 Qualified Technician. . . .

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.*

1905A.6.2.1 Sample Frequency. *Replace ACI 318 Section 5.6.2.1 as follows:*

5.6.2.1 *Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards (345m^3) of concrete, or not less than once for each 2,000 square feet (186 m^2) of surface area for slabs or walls. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.*

1905*A*.6.3 Strength of test specimens. . . .

1905*A*.6.4 Field cured specimens. . . .

1905*A*.6.5 Low-strength test results. . . .

1905*A*.7 Preparation of equipment and place of deposit. . . .

1905*A*.8 Mixing. . . .

1905*A*.9 Conveying. . . .

1905*A*.10 Depositing. The depositing of concrete shall comply with the provisions of ACI 318, Section 5.10.

1905A.10.1 Consolidation in congested areas. *Where conditions make consolidation difficult, or where reinforcement is congested, a mix design with smaller size aggregates, shall be used as approved by the architect, structural engineer and the enforcement agency.*

1904*A*.11 Curing. . . .

1905*A*.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).

1904A.13 Hot weather requirements. . . .

SECTION 1906
FORMWORK, EMBEDDED PIPES AND CONSTRUCTION JOINTS

. . .

~~**1906A.2 Removal of forms, shores and reshores.** The removal of forms and shores, including from slabs and beams (except where cast on the ground), and the installation of reshores shall comply with ACI 318, Section 6.2.~~

~~*No portion of the forming and shoring system may be removed less than 12 hours after placing. When stripping time is less than the specified curing time, measures shall be taken to provide adequate curing and thermal protection of the stripped concrete.*~~

~~**1906A.3 Conduits and pipes embedded in concrete.** Conduits, pipes and sleeves of any material not harmful to concrete and within the limitations of ACI 318, Section 6.3, are permitted to be embedded in concrete with approval of the registered design professional.~~

(Relocated to 1901A.3, Item 12) ~~***1906A.3.1 Large Openings.*** *Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural drawings. Nothing in this section shall be construed to permit work in violation of fire and panic or other safety standards*~~

~~***1906A.3.2 Adequate Support.*** *Pipes and conduits shall be adequately supported and secured against displacement before concrete is placed.*~~

~~**1906A.4 Construction joints.** Construction joints, including their location, shall comply with the provisions of ACI 318, Section 6.4.~~

~~*Typical details and proposed locations of construction joints shall be indicated on the plans.*~~

~~***1906A.4.1 Surface Preparation.*** *The surface of all horizontal construction joints shall be cleaned and roughened by exposing clean aggregate solidly embedded in mortar matrix.*~~

~~*In the event that the contact surface becomes coated with earth, sawdust, etc., after being cleaned, the entire surface so coated shall be recleaned.*~~

~~**SECTION 1907**~~
~~**DETAILS OF REINFORCEMENT**~~

. . .

~~***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).*~~

. . .

SECTION ~~1908*A*~~ 1905*A*
MODIFICATIONS TO ACI 318

~~**1908*A*.1**~~ **1905*A*.1 General.** The text of ACI 318 shall be modified as indicated in Sections ~~1908*A*.1.1~~ 1905*A*.1.1 through ~~1905.1.10~~ 1905*A*.1.*21*.

~~**1908*A*.1.1 ACI 318, Section 2.2.** Modify existing definitions and add the following definitions to ACI 318, Section 2.2.~~

~~**DESIGN DISPLACEMENT.** Total lateral displacement expected for the design-basis earthquake, *as specified by Section 12.8.6 of ASCE 7.*~~

~~***DETAILED PLAIN CONCRETE STRUCTURAL WALL.*** *A wall complying with the requirements of Chapter 22, including 22.6.7.*~~

~~***ORDINARY PRECAST STRUCTURAL WALL.*** *A precast wall complying with the requirements of Chapters 1 through 18.*~~

~~**ORDINARY REINFORCED CONCRETE STRUCTURAL WALL.** A *cast-in-place* wall complying with the requirements of Chapters 1 through 18.~~

~~**ORDINARY STRUCTURAL PLAIN CONCRETE WALL.** A wall complying with the requirements of Chapter 22, *excluding 22.6.7*.~~

~~**SPECIAL STRUCTURAL WALL**. A cast-in-place or precast wall complying with the requirements of 21.1.3 through 21.1.7, 21.9 and 21.10, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls *or ordinary precast structural walls, as applicable*. *Where ASCE 7 refers to a "special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."*~~

~~***WALL PIER.** A wall segment with a horizontal length-to-thickness ratio of at least 2.5, but not exceeding 6, whose clear height is at least two times its horizontal length.*~~

1905A.1.1 ACI 318, Section 5.1.1. *Modify ACI 318 Section 5.1.1 as follows.*

For concrete designed and constructed in accordance with this chapter, f'_c, shall not be less than 3,000 psi (20.7 MPa). Reinforced concrete with specified compressive strength higher than 8,000 psi (55 MPa) shall require prior approval of structural design method and acceptance criteria by the enforcement agency.

(Relocated from 2010 CBC, Section 1905A.6.2.1) ***1905A.1.2 ACI 318, Section 5.6.2.1.*** *Replace ACI 318 Section 5.6.2.1 by the following:*

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.

~~***1908A.1.2***~~ ***1905A.1.3 ACI 318, Section 8.13.5.*** *Replace ACI 318 Section 8.13.5 as follows:*

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 8.13.6 as modified in Section ~~1908A.1.3.~~1905A.1.4.

~~***1908A.1.3***~~ ***1905A.1.4 ACI 318, Section 8.13.6.*** *Replace ACI 318 Section 8.13.6 as follows:*

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.1.4***~~ ***1905A.1.5 ACI 318, Section 8.13.*** *Add Section 8.13.9 to ACI 318 as follows:*

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.1.5~~ 1905A.1.6 ACI 318, Section 10.5.3. *Modify ACI 318 Section 10.5.3 by adding the following:*

This section shall not be used for members that resist seismic loads, except that reinforcement provided for foundation elements for one-story wood-frame or one-story light steel buildings need not be more than one-third greater than that required by analysis for all loading conditions.

~~1908A.1.6~~ 1905A.1.7 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 318 Sections 7.6 and 7.7.

~~1908A.1.7~~ 1905A.1.8 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, of intersecting walls and footings with reinforcement at least equivalent to No. 4 bars at 12 inches (305 mm) on center for each layer of reinforcement.

~~1908A.1.8~~ *~~Reserved.~~*

~~1908A.1.9~~ *~~Reserved~~*

~~1908A.1.10~~ 1905A.1.9 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.1.12~~ 1905A.1.10 ACI 318, Section 14.9. *Modify ACI 318 by adding Section 14.9 as follows:*

14.9 - Foundation Walls. Horizontal reinforcing of concrete foundation walls for wood-frame or light-steel buildings shall consist of the equivalent of not less than one No. 5 bar located at the top and bottom of the wall. Where such walls exceed 3 feet (914 mm) in height, intermediate horizontal reinforcing shall be provided at spacing not to exceed 2 feet (610 mm) on center. Minimum vertical reinforcing shall consist of No. 3 bars at 24 inches (610 mm) on center.

Where concrete foundation walls or curbs extend above the floor line and support wood-frame or light-steel exterior, bearing or shear walls, they shall be doweled to the foundation wall below with a minimum of No. 3 bars at 24 inches (610 mm) on center. Where the height of the wall above the floor line exceeds 18 inches (457 mm), the wall above and below the floor line shall meet the requirements of ACI 318 Section 14.3.

~~1908A.1.13~~ *~~Reserved.~~*

~~1908A.1.14~~ 1905A.1.11 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: *Nonbearing, nonshear panels such as nonstructural architectural cladding panels or column covers are not required to meet the provisions of this section.*

~~1908A.1.15~~ 1905A.1.12 ACI 318, Section 17.5.1*. Modify ACI 318 Section 17.5.1 by adding Sections 17.5.1.1 and 17.5.1.2 as follows:*

17.5.1.1 - Full transfer of horizontal shear forces may be assumed when all of the following are satisfied:

1. Contact surfaces are clean, free of laitance, and intentionally roughened to full amplitude of approximately 1/4 inch (6.4 mm),

2. Minimum ties are provided in accordance with ACI 318 Section 17.6,

3. Web members are designed to resist total vertical shear, and

4. All shear reinforcement is fully anchored into all interconnected elements.

17.5.1.2 - If any of the requirements of ACI 318 Section 17.5.1.1 is not satisfied, horizontal shear shall be investigated in accordance with ACI 318 Section 17.5.3 or 17.5.4.

~~1908A.1.16~~ 1905A.1.13 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 PCI Design Handbook, 7TH Edition.

~~1908A.1.17~~ 1905A.1.14 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 PCI Design Handbook, 7TH Edition.

~~1908A.1.18~~ 1905A.1.15 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 continuous 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.1.21~~

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.1.20 ACI 318, Section 18.21.~~ *~~Add Section 18.21.5 to ACI 318 as follows:~~*

~~18.21.5 - Prequalification of anchorages and coupler. Posttensioned anchorages and couplers for unbonded tendons shall be prequalified for use in prestressed concrete. Data shall be submitted by the posttensioning materials fabricator from an approved independent testing agency to show compliance with the following dynamic test requirements:~~

~~A dynamic test shall be performed on a representative specimen and the tendon shall withstand, without failure, 500,000 cycles from 60 percent to 66 percent of its minimum specified ultimate strength and 50 cycles from 40 percent to 80 percent of its minimum specified ultimate strength. The period of each cycle involves the change from the lower stress level to the upper stress level and back to the lower. The specimen used for the second dynamic test need not be the same used for the first dynamic test. Systems utilizing multiple strands, wires or bars may be tested utilizing a test tendon of smaller capacity than the full-size tendon. The test tendon shall duplicate the behavior of the full-size tendon and generally shall not have less than 10 percent of the capacity of the full-size tendon.~~

~~The above test data must be on file at the enforcement agency for posttensioning systems to be used. General approval will be based on satisfactory performance. Tests shall be required for pre-stressing steel and anchorages.~~

~~The average bearing stress, P/A_b, on the concrete created by the anchorage plates shall not exceed the following:~~

~~At service load~~

$f_{cp} = 0.6\, f'_c \sqrt{(A'_b/A_b)}$

~~but not greater than f'_c~~

~~At transfer load~~

$f_{cp} = 0.8\, f'_{ci} \sqrt{(A'_b/A_b - 02)}$

~~but not greater than $1.25\, f'_{ci}$ where:~~

~~f_{cp} = permissible compressive concrete stress.~~

~~f'_c = compressive strength of concrete.~~

~~f'_{ci} = compressive strength of concrete at time of initial prestress.~~

~~A'_b = maximum area of the portion of the concrete anchorage surface that is geometrically similar to and concentric with the area of the anchorage.~~

~~A_b = bearing area of the anchorage.~~

~~P = prestress force in tendon.~~

1908A.1.21 ACI 318, Section 18. *Add Section 18.23 to ACI 318 as follows:*

18.23 - Prestressed Flat Slab.

18.23.1 - Span depth ratio. The ratio of the span to depth of the slab continuous over at least three supports with cantilevers at the ends shall not be greater than 40 for floor slabs or 44 for roof slabs.

18.23.2 - Distribution of tendons. The use of banded tendons is acceptable. Maximum tendon spacing shall be six times the slab thickness, not to exceed 42 inches (1067 mm). A minimum prestress level of 125 psi (861 kPa) on the local slab section tributary to the tendon or tendon group is required. A minimum of two tendons in flat slabs shall be placed over columns in each direction. Tendons at slab edges shall be placed 6 inches (152 mm) clear of the slab edge. Tendons shall be firmly supported at intervals not exceeding 42 inches (1067 mm) to prevent displacement during concrete placement. Tendons shall not be bundled in groups greater than five monostrand tendons. At horizontal plane deviations grouped tendons at curved portions must be separated with 1-inch minimum (25 mm) clear between each tendon.

18.23.3 - Slab edge reinforcement. The slab edges, including interior openings with anchorages, shall be reinforced with two No. 5 bars, one top and one bottom, minimum, with a No. 3 hairpin placed each side of each anchorage or tendon carrying an effective prestressing force of 50,000 pounds (223 kN) or less. These hairpins shall be increased to No. 4 hairpins if the effective force per anchorage or tendon is greater than 50,000 pounds (223 kN).

1908A.1.22 *(Chapter 19, Section 1905.1.2)* **1905.1.2 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, 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.

1908A.1.23 1905A.1.16 . *(Chapter 19, Section 1908A.1.3 1905.1.3)***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, 21.4.6, and 21.4.7 to read as follows modifying 21.4.2 and adding 21.4.2.1 as follows:

21.4.2 In connections between wall panels, or between wall panels and the foundation, yielding shall be restricted to steel elements or reinforcement. In connections between wall panels and the foundation, they shall be designed per 1616A.1.16.

~~21.4.3~~ 21.4.2.1 - 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 S_y.~~

~~21.4.5 - Wall piers in Seismic Design Category D, E or F shall comply with Section 1908.1.26 of this code.~~

~~21.4.6 - Wall piers not designed as part of a moment frame in buildings assigned to Seismic Design Category C 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.~~

~~21.4.7 - Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as columns.~~

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~~1908A.1.24~~ 1905A.1.17 ACI 318, Section 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 21.9.6, 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 21.9.6.4 (a) & (b).

~~1908A.1.25~~ 1905A.1.18 ACI 318, Section 21.9.4. *Modify ACI 318 by adding Section 21.9.4.6 as follows:*

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 21.13.

~~1908A.1.26~~ *~~(Chapter 19, Section 1905.1.4)~~* **1905.1.4 ACI 318, Section 21.9.** ~~Modify ACI 318, Section 21.9, by adding new Section 21.9.10 to read as follows:~~

~~21.9.10 – Wall piers and wall segments.~~

~~21.9.10.1 – Wall piers not designed as a part of a special moment frame shall have transverse reinforcement designed to satisfy the requirements in 21.9.10.2.~~

~~Exceptions:~~

~~1. Wall piers that satisfy 21.13.~~

~~2. Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.~~

~~21.9.10.2 – Transverse reinforcement with seismic hooks at both ends shall be designed to resist the shear forces determined from 21.6.5.1. Spacing of transverse reinforcement shall not exceed 6 inches (152 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).~~

~~21.9.10.3 – Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as column.~~

~~***1908A.1.27*** *(Chapter 19, Section 1905.1.5)* **1905.1.5 1908.1.5 ACI 318, Section 21.10.** Modify ACI 318, Section 21.10.2, to read as follows:~~

~~21.10.2 – Special structural walls constructed using precast concrete shall satisfy all the requirements of 21.9 for cast-in-place special structural walls in *addition* to Sections 21.4.2 *through 21.4.4.*~~

~~***1908A.1.28*** **1905A.1.19 ACI 318, Section 21.9.4.** *Modify ACI 318 Section 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.1.29*** **1905A.1.20 ACI 318, Section 21.11.7.** *Modify ACI 318 Section 21.11.7 by adding Section 21.11.7.7 as follows:*~~

21.11.7.7 - Where boundary members are not required by ACI 318 Section 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.

~~***1908A.1.30*** *(Chapter 19, Section 1905.1.6)* **1905.1.6 ACI 318, Section 21.12.1.1.** Modify ACI 318, Section 21.12.1.1, to read as follows:~~

~~21.12.1.1 – Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and ground shall comply with the requirements of Section 21.12 and other applicable provisions of ACI 318 *unless modified by Chapter 18A of the California Building Code.*~~

~~**1905.1.7 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 maximumspacing specified in Item 3 above, shall be continuous in the wall.*~~

~~**1905.1.8 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 Seismic Design Category A, B, and C, detached one- and two-family dwellings three stories or less in height and constructed with stud-bearing walls, plain concrete footings without longitudinal reinforcement supporting walls are permitted.*~~

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

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

~~***1908A.1.31*** *(Chapter 19, Section 1908.1.9)* **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.~~

~~***Exception:*** *Anchors designed to resist wall out-of- plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 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.~~

~~***Exception:*** *Anchors designed to resist wall out-of- plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 need not satisfy Section D.3.3.5.*~~

~~*D.3.3.7 - For wood sill plates a minimum of $1^1/_2$ 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-$^1/_2$ anchor diameters from the edges of the concrete parallel to the grain of the wood sill plate; and*~~

~~*4. They are located a minimum of 15 anchor diameters from the end of the concrete perpendicular to the grain of the wood sill plate.*~~

1905A.1.21 *(Chapter 19, Section 1905.1.9)* ***ACI 318, Section D.3.3.*** Modify ACI 318 Sections D.3.3.4.2, D.3.3.4.3(d) and D.3.3.5.2 to read as follows:

D.3.3.4.2 - Where the tensile component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with D.3.3.4.3. The anchor design tensile strength shall be determined in accordance with D.3.3.4.4.

Exception:

Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 and Section 1604A.8.2 of this code shall be deemed to satisfy Section D.3.3.4.3(d).

*D.3.3.4.3(d) - The anchor or group of anchors shall be designed for the maximum tension obtained from design load combinations that include **E**, with **E** increased by Ω_0. The anchor design tensile strength shall be calculated from D.3.3.4.4.*

D.3.3.5.2 – Where the shear component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their attachments shall be designed in accordance with

D.3.3.5.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with D.6.

Exceptions:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or non-bearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane design shear strength in accordance with D.6.2 and D.6.3 need not be computed and D.3.3.5.3 shall be deemed to be satisfied provided all of the following are met:

1.1. The allowable in-plane shear strength of the anchor is determined in accordance with AF&PA NDS Table 11E for lateral design values parallel to grain.

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

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

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

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

1.6. The sill plate is 2-inch or 3-inch nominal thickness.

2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or non-bearing walls of anchor bolts attaching cold-formed steel track of bearing or non-bearing walls of light-frame construction to foundations or foundation stem walls the in-plane design shear strength in accordance with Section D.6.2 and D.6.3 need not be computed and D.3.3.5.3 shall be deemed to be satisfied provided all of the following are met:

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

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

2.3. Anchors are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the track.

2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.

2.5. The track is 33 to 68 mil designation thickness.

Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete shall be permitted to be determined in accordance with AISI S100 Section E3.3.1.

3. In light-frame construction, bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 5/8 inch [16mm] in diameter of sill plate or track to foundation or foundation stem wall need not satisfy D.3.3.5.3 (a) through (c) when the design strength of the anchors is determined in accordance with D.6.2.1(c).

~~***1908A.1.32*** *(Chapter 19, Section 1905.1.10)* **1905.1.10 ACI 318, Section D.4.2.2.** Delete ACI 318, Section D.4.2.2, and replace with the following:~~

~~*D.4.2.2 – The concrete breakout strength requirements for anchors in tension shall be considered satisfied by the design procedure of D.5.2 provided Equation D-8 is not used for anchor embedments exceeding 25 inches. The concrete breakout strength requirements for anchors in shear with diameters not exceeding 2 inches shall be considered satisfied by the design procedure of D.6.2. For anchors in shear with diameters exceeding 2 inches, shear anchor reinforcement shall be provided in accordance with the procedures of D.6.2.9.*~~

SECTION ~~-~~1906*A*
STRUCTURAL PLAIN CONCRETE

NOT PERMITTED BY DSA-SS

~~**1906.1 Scope.** The design and construction of structural plain concrete, both cast-in-place and precast, shall comply with the minimum requirements of ACI 318, as modified in Section 1905.~~

~~**Exception:** For Group R-3 occupancies and buildings of other occupancies less than two stories above grade plane of light-frame construction, the required footing 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.~~

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SECTION 1908*A*
ANCHORAGE TO CONCRETE—
ALLOWABLE STRESS DESIGN

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~~***1911A.1.1***~~ ***1908A.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~~ in seismic shear ~~when they are specifically listed in ICC-ES Report (ICC-ESR) for such service~~ for components exempt from permit requirements by Section 1616A.1.18 of this code and for interior non-bearing non-shear wall partitions. Power actuated fastener shall not be used to anchor exterior cladding or curtain wall systems.

. . .

SECTION 1909*A*
ANCHORAGE TO CONCRETE - STRENGTH DESIGN

1909*A*.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 Section~~s~~ ~~1905.1.9~~ *1905A.1.21* ~~and 1905.1.10~~, 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 Section~~s~~ ~~1905.1.9 and 1905.1.10~~ *1905A.1.21*, shall be in accordance with an approved procedure.

> ~~***1912A.1.1***~~ ***1909A.1.1* Specialty Inserts:** *Specialty inserts, including cast-in-place specialty inserts, tested in accordance with ICC-ES AC 193 shall be deemed to satisfy the requirements of this section.*

SECTION 1910*A*
SHOTCRETE

1910*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.

. . .

1910*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.

. . .

1910*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.

. . .

1910*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.

. . .

1910*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.

1910*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.

1910*A*.10.2 Panel criteria. When the maximum-size aggregate is larger than $^3/_8$ inch (9.5 mm), the test panels shall have minimum dimensions of 18 inches by 18 inches (457 mm by 457 mm). When the maximum size aggregate is $^3/_8$ inch (9.5 mm) or smaller, the test panels shall have minimum dimensions of 12 inches by 12 inches (305 mm by 305 mm). Panels shall be shot in the same position as the work, during the course of the work and by the nozzlemen doing the work. The conditions under which the panels are cured shall be the same as the work. *Approval from the enforcement agency shall be obtained prior to performing the test panel method.*

. . .

***~~1913A.11~~ 1910A.11* Forms and Ground Wires for Shotcrete.** *Forms for shotcrete shall be substantial and rigid. Forms shall be built and placed so as to permit the escape of air and rebound.*

Adequate ground wires, which are to be used as screeds, shall be placed to establish the thickness, surface planes and form of the shotcrete work. All surfaces shall be rodded to these wires.

***~~1913A.12~~ 1910A.12* Placing.** *Shotcrete shall be placed in accordance with ACI 506.*

SECTION 1911*A*
REINFORCED GYPSUM CONCRETE

1911*A*.1 General. Reinforced gypsum concrete shall comply with the requirements of ASTM C 317 and ASTM C 956. *Reinforced gypsum concrete shall be considered as an alternative system.*

. . .

SECTION ~~1916A~~ 1913A
CONCRETE, REINFORCEMENT AND ANCHOR TESTING

***~~1916A.1~~ 1913A.1* Cementitious material.** *The concrete supplier shall furnish to the enforcement agency certification that the cement proposed for use on the project has been manufactured and tested in compliance with the requirements of ASTM C 150 for portland cement and ASTM C 595 or ASTM C 1157 for blended hydraulic cement, whichever is applicable. When a mineral admixture or ground granulated blast-furnace slag is proposed for use, the concrete supplier shall furnish to the enforcement agency certification that they have been manufactured and tested in compliance with ASTM C 618 or ASTM C 989, whichever is applicable.~~. The concrete producer shall provide copies of the cementitious material supplier's Certificate of Compliance that represents the materials used by date of shipment for concrete. Cementitious materials without Certification of Compliance shall not be used.*

***~~1916A.2~~ 1913A.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.

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~~ 1913A.3* Tests for prestressing steel and anchorage. All wires or bars of each size from each mill heat and all strands from each manufactured reel to be shipped to the site shall be assigned an individual lot number and shall be tagged in such a manner that each lot can be accurately identified at the jobsite. Each lot of tendon and anchorage assemblies and bar couplers to be installed shall be likewise identified.*

The following samples of materials and tendons selected by the engineer or the designated testing laboratory from the prestressing steel at the plant or jobsite shall be furnished by the contractor and tested by an approved independent testing agency:

1. *For wire, strand or bars, 7-foot-long (2134 mm) samples shall be taken of the coil of wire or strand reel or rods. A minimum of one random sample per 5,000 pounds (2270 kg) of each heat or lot used on the job shall be selected.*

2. *For prefabricated prestressing tendons other than bars, one completely fabricated tendon 10 feet (3048 mm) in length between grips with anchorage assembly at one end shall be furnished for each size and type of tendon and anchorage assembly.*

   Variations of the bearing plate size need not be considered.

   The anchorages of unbonded tendons shall develop at least 95 percent of the minimum specified ultimate strength of the pre-stressing steel. The total elongation of the tendon under ultimate load shall not be less than 2 percent measured in a minimum gage length of 10 feet (3048 mm).

   Anchorages of bonded tendons shall develop at least 90 percent of the minimum specified strength of the prestressing steel tested in an unbonded state. All couplings shall develop at least 95 percent of the minimum specified strength of the prestressing steel and shall not reduce the elongation at rupture below the requirements of the tendon itself.

3. *If the prestressing tendon is a bar, one 7-foot (2134 mm) length complete with one end anchorage shall be furnished and, in addition, if couplers are to be used with the bar, two 4-foot (1219 mm) lengths of bar fabricated to fit and equipped with one coupler shall be furnished.*

4. *Mill tests of materials used for end anchorages shall be furnished. In addition, at least one Brinnell hardness test shall be made of each thickness of bearing plate.*

~~1916A.4~~ 1913A.4* Composite construction cores. Cores of the completed composite concrete construction shall be taken to demonstrate the shear strength along the contact surfaces. The cores shall be tested when the cast-in-place concrete is approximately 28 days old and shall be tested by a shear loading parallel to the joint between the precast concrete and the cast-in-place concrete. The minimum unit shear strength of the contact surface area of the core shall not be less than 100 psi (689 kPa).*

At least one core shall be taken from each building for each 5,000 square feet (465m^2) of area of composite concrete construction and not less than three cores shall be taken from each project. The architect or structural engineer in responsible charge of the project or his or her representative shall designate the location for sampling.

***~~1916A.5~~ 1913A.5* Tests of shotcrete.** *Testing of shotcrete shall follow the provisions of Section ~~1913A~~ 1910A and the general requirements of ACI 318 Section 5.6.*

***~~1916.6~~ 1913A.6* Gypsum field tests.** *Field tests shall be made during construction to verify gypsum strength. One sample consisting of three specimens shall be made for each 5,000 square feet (465 m^2) or fraction thereof of all gypsum poured, but not less than one sample shall be taken from each half day's pour.*

***~~1916A.7~~ 1913A.7* Tests for Post-Installed Anchors in Concrete.** *When post-installed anchors are used in lieu of cast-in place bolts, the installation verification test loads, frequency, and acceptance criteria shall be in accordance with this section.*

~~1916A.7.1~~ ***1913A.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~~ ***1913A.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)~~ an approved test report using criteria adopted in this code 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~~ based on approved test report using criteria adopted in this code.*

~~1916A.7.3~~ ***1913A.7.3*** **Test Frequency.** *When post-installed anchors are used for sill plate bolting applications, 10 percent of the anchors shall be tested.*

When post-installed anchors are used for other structural applications, all such anchors shall be tested.

When 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 tested.

The testing of the 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.

Exceptions:

1. *Undercut anchors that allow visual confirmation of full set shall not require testing.*
2. *Where the factored design tension on anchors is less than 100 lbs. and those anchors are clearly noted on the approved construction documents, only 10 percent of those anchors shall be tested.*
3. *Where adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, only 25% of the dowels shall be tested if all of the following conditions are met:*
   a. *The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.*
   b. *The number of dowels in any one member equals or exceeds 12.*
   c. *The dowels are uniformly distributed across seismic force resisting members (such as shear walls, collectors and diaphragms).*

   Anchors to be tested shall be selected at random by the special inspector/Inspector Of Record (IOR).
4. *Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting system shall not be required.*

5. *Testing is not required for power actuated fasteners used to attach tracks of interior non-shear wall partitions for shear only, where there are at least three fasteners per segment of track.*

~~1916A.7.4~~ 1913A.7.4 Test Acceptance Criteria. *Acceptance criteria for post-installed anchors shall be based on ~~ICC-ESR, or manufacturers written instruction,~~ approved test report using criteria adopted in this code. ~~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 discernible movement during the tension test, e.g., as evidenced by loosening of the washer under the nut.

   For adhesive anchors, where other than bond is being tested, the testing device shall not restrict the concrete shear cone type failure mechanism from occurring.

2. *Torque Wrench Method:*

   Anchors tested with a calibrated torque wrench must attain the specified torque within ½ turn of the nut.

   Exceptions:

   a. *Wedge or Sleeve type:*
      One-quarter (1/4) turn of the nut for a 3/8 in. sleeve anchor only.

   b. *Threaded Type:*
      One-quarter (1/4) turn of the screw after initial seating of the screw head.

~~1916A.7.5~~ 1913A.7.5 Testing Procedure. *Test procedure shall be as ~~required by the ICC-ESR~~ permitted by an approved test report using criteria adopted in this code. Torque controlled post installed anchors shall be permitted to be tested using torque based on approved test report using criteria adopted in this code. All other post-installed anchors shall be tension tested. Manufacturer's recommendation for testing may be approved by the enforcement agency~~, when ICC-ESR~~ based on an approved test report using criteria adopted in this code. ~~does not provide a testing procedure.~~*

SECTION ~~1917A~~ 1914A
EXISTING CONCRETE STRUCTURES

~~1917A.1~~ 1914A.1 Existing concrete structures.

The structural use of existing concrete with a core strength less than 1,500 psi (10.3MPa) is not permitted in rehabilitation work.

For existing concrete structures, sufficient cores shall be taken at representative locations throughout the structure, as designated by the architect or structural engineer, so that knowledge will be had of the in-place strength of the concrete. At least three cores shall be taken from each building for each 4,000 square feet (372 m2) of floor area, or fraction thereof. Cores shall be at least 4 inches (102 mm) in diameter. Cores as small as 2.75 inches (70 mm) in diameter may be allowed by the enforcement agency when reinforcement is closely spaced and the coarse aggregate does not exceed 3/4 inch (19 mm).

~~1917A.2~~ 1914A.2 Crack repair by epoxy injection. *Crack repair by epoxy injection of concrete and masonry member shall conform to all requirements of ACI 503.7.*

~~1917A.3~~ 1914A.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 and DSA-SS/CC]

Authority: Education Code §17310 and 81142
Health and Safety Code §16022

Reference: Education Code §§ 17280 through 17317, and 81130 through 81147
Health and Safety Code §§16000 through 16023

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

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CHAPTER 19*A*
CONCRETE

PROPOSED ADOPTION	DSA-SS	DSA-SS/CC	Comments
Adopt entire chapter			
Adopt entire chapter as amended (amended sections listed below)	**X**	**-**	
Adopt only those sections listed below			

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

EXPRESS TERMS

Italics are used for text within Sections 1903A through ~~1908A~~ 1905A 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. *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 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 1.9.2.1*

2. *(Reserved for OSHPD).*

. . .

1901*A*.3 Construction documents. The construction documents for structural concrete construction shall include:

1. The specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.
2. The specified strength or grade of reinforcement.
3. The size and location of structural elements, reinforcement and anchors.
4. Provision for dimensional changes resulting from creep, shrinkage and temperature.

5. The magnitude and location of prestressing forces.
6. Anchorage length of reinforcement and location and length of lap splices.
7. Type and location of mechanical and welded splices of reinforcement.
8. Details and location of contraction or isolation joints specified for plain concrete.
9. Minimum concrete compressive strength at time of posttensioning.
10. Stressing sequence for post-tensioning tendons.
11. For structures assigned to Seismic Design Category D, E or F, a statement if slab on grade is designed as a structural diaphragm.
12. *(Relocated from 2010 CBC, Section 1906A.3.1) Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural drawings.*

1901*A*.4 Special inspection. The special inspection of concrete elements of buildings and structures and concreting operations shall be as required by Chapter 17*A*.

SECTION 1902*A*
DEFINITIONS

1902*A*.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 *1905A.1.1*.

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~~ 1913A.*

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 PCI MNL128 standard.*

1903*A*.3 Flat wall insulating concrete form (ICF) systems. *Insulating concrete form material used for forming flat concrete walls shall conform to ASTM E 2634*.

~~1903A.3~~ 1903A.4 Reporting Requirements – Modify ACI 318 Section 3.2.1 by adding the following:

Each component (a) through (g), when present, as a percentage of total cementitiious materials shall be reported for each mix design.

~~1903A.4~~ 1903A.5 Fly Ash –*Add ACI 318 Section ~~3.6.6~~ 3.2.3 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~~ ACI 318 Section 5.3 . See Section 1904A for durability requirements.*
3. *More than 40 percent by weight of ground-granulated blast-furnace slag conforming to ASTM C 989 shall be permitted to be substituted for ASTM C 150 portland cement if the mix design is proportioned per ~~Section 1905A.3~~ ACI 318 Section 5.3. See Section 1904A for durability requirements.*

~~1903A.5~~ 1903A.6 Aggregates - 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 alkali-silica reactivity ~~according~~ in accordance with ~~to~~ ASTM C ~~289~~ 1260 or ASTM C 1293 to determine the potential alkali-silica reactivity of the aggregate ~~in the presence of cement~~. If the results ~~of the test are other than innocuous, selected concrete proportions using the aggregate (see Section 1905A.2) shall be tested in accordance with ASTM C 1567. If the results of this test~~ indicate an expansion greater than 0.10 percent at 16-days age with ASTM C 1260, or an expansion greater than 0.04 percent at 12 months age with ASTM C 1293, 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 with ASTM C 1567:

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 cement ~~constituent~~.*
3. *Replacement of not less than 15 percent by weight of the portland cement ~~used by~~ with a ~~mineral admixture~~ pozzolan 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~~ with slag cement conforming to ASTM C 989.*
5. *Replacement of not less than 5 percent nor more than 10 percent by weight of portland cement with silica fume conforming to ASTM C 1240.*
6. *Replacement of portland cement with a ternary blend of portland cement, slag cement and pozzolan such that the resulting blend contains not more than 70 percent portland cement*

ASTM C 1567 shall be performed separately on the fine and coarse aggregate with one requiring the higher percentage of supplementary cementitious materials dictating the required replacement.

ASTM C 1260, ASTM C 1293 and ASTM C 1567 tests must have been performed within the past three years.

~~1903A.6~~ 1903A.7 Discontinuous Steel Fibers - *Modify ACI 318 Section 3.5.1 by adding the following:*

Discontinuous steel fibers are not permitted.

~~1903A.7~~ 1903A.8 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.

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~~SECTION 1905A~~
~~CONCRETE QUALITY, MIXIBG AND PLACING~~

~~1905A.1 General . . .~~

~~1905A.1.1 Strength.~~ ~~Concrete shall be proportioned to provide an average compressive strength as prescribed in Section 1905A.3 and shall satisfy the durability criteria of Section 1904A. Concrete shall be produced to minimize the frequency of strengths below f'_c, as prescribed in Section 1905A.6.3. *For concrete designed and constructed in accordance with this chapter, f'_c, shall not be less than 3,000 psi (20.7 MPa).* No maximum specified compressive strength shall apply unless restricted by a specific provision of this code or ACI 318. *Reinforced concrete with specified compressive strength higher than*~~

8,000 psi (55 Mpa) shall require prior approval of structural design method and acceptance criteria by the enforcement agency.

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.

1905*A*.3 Proportioning on the basis of filed experience and/or trial mixture. . . .

1905*A*.4 Proportioning without filed experience or trial mixtures. . . .

1905*A*.5 Average strength reduction. . . .

1905*A*.6 Evaluation and acceptance of concrete. . . .

1905*A*.6.1 Qualified Technician. . . .

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.*

1905A.6.2.1 Sample Frequency. *Replace ACI 318 Section 5.6.2.1 as follows:*

5.6.2.1 *Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards (345m^3) of concrete, or not less than once for each 2,000 square feet (186 m^2) of surface area for slabs or walls. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.*

1905*A*.6.3 Strength of test specimens. . . .

1905*A*.6.4 Field cured specimens. . . .

1905*A*.6.5 Low-strength test results. . . .

1905*A*.7 Preparation of equipment and place of deposit. . . .

1905*A*.8 Mixing. . . .

1905*A*.9 Conveying. . . .

1905*A*.10 Depositing. The depositing of concrete shall comply with the provisions of ACI 318, Section 5.10.

1905A.10.1 Consolidation in congested areas. *Where conditions make consolidation difficult, or where reinforcement is congested, a mix design with smaller size aggregates, shall be used as approved by the architect, structural engineer and the enforcement agency.*

1905*A*.11 Curing. . . .

1905*A*.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).

1904A.13 Hot weather requirements. . . .

SECTION 1906*A*
FORMWORK, EMBEDDED PIPES AND CONSTRUCTION JOINTS

. . .

1906A.2 Removal of forms, shores and reshores. The removal of forms and shores, including from slabs and beams (except where cast on the ground), and the installation of reshores shall comply with ACI 318, Section 6.2.

No portion of the forming and shoring system may be removed less than 12 hours after placing. When stripping time is less than the specified curing time, measures shall be taken to provide adequate curing and thermal protection of the stripped concrete.

1906A.3 Conduits and pipes embedded in concrete. Conduits, pipes and sleeves of any material not harmful to concrete and within the limitations of ACI 318, Section 6.3, are permitted to be embedded in concrete with approval of the registered design professional.

(Relocated to 1901A.3, Item 12) ***1906A.3.1 Large Openings.*** *Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural drawings. Nothing in this section shall be construed to permit work in violation of fire and panic or other safety standards*

1906A.3.2 Adequate Support. *Pipes and conduits shall be adequately supported and secured against displacement before concrete is placed.*

1906A.4 Construction joints. Construction joints, including their location, shall comply with the provisions of ACI 318, Section 6.4.

Typical details and proposed locations of construction joints shall be indicated on the plans.

1906A.4.1 Surface Preparation. *The surface of all horizontal construction joints shall be cleaned and roughened by exposing clean aggregate solidly embedded in mortar matrix.*

In the event that the contact surface becomes coated with earth, sawdust, etc., after being cleaned, the entire surface so coated shall be recleaned.

SECTION 1907*A*
DETAILS OF REINFORCEMENT

. . .

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).*

. . .

SECTION 1908*A* 1905*A*
MODIFICATIONS TO ACI 318

1908*A*.1 1905*A*.1 General. The text of ACI 318 shall be modified as indicated in Sections 1908*A*.1.1 1905*A*.1.1 through 1905.1.10 1905*A*.1.*21*.

1908*A*.1.1 ACI 318, Section 2.2. Modify existing definitions and add the following definitions to ACI 318, Section 2.2.

DESIGN DISPLACEMENT. Total lateral displacement expected for the design-basis earthquake, *as specified by Section 12.8.6 of ASCE 7.*

DETAILED PLAIN CONCRETE STRUCTURAL WALL. *A wall complying with the requirements of Chapter 22, including 22.6.7.*

ORDINARY PRECAST STRUCTURAL WALL. *A precast wall complying with the requirements of Chapters 1 through 18.*

~~**ORDINARY REINFORCED CONCRETE STRUCTURAL WALL.** A *cast-in-place* wall complying with the requirements of Chapters 1 through 18.~~

~~**ORDINARY STRUCTURAL PLAIN CONCRETE WALL.** A wall complying with the requirements of Chapter 22, *excluding 22.6.7*.~~

~~**SPECIAL STRUCTURAL WALL**. A cast-in-place or precast wall complying with the requirements of 21.1.3 through 21.1.7, 21.9 and 21.10, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls *or ordinary precast structural walls, as applicable*. *Where ASCE 7 refers to a "special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."*~~

~~***WALL PIER.** A wall segment with a horizontal length-to-thickness ratio of at least 2.5, but not exceeding 6, whose clear height is at least two times its horizontal length.*~~

1905A.1.1 ACI 318, Section 5.1.1. *Modify ACI 318 Section 5.1.1 as follows.*

For concrete designed and constructed in accordance with this chapter, f'_c, shall not be less than 3,000 psi (20.7 MPa). Reinforced concrete with specified compressive strength higher than 8,000 psi (55 MPa) shall require prior approval of structural design method and acceptance criteria by the enforcement agency.

(Relocated from 2010 CBC, Section 1905A.6.2.1) ***1905A.1.2 ACI 318, Section 5.6.2.1.*** *Replace ACI 318 Section 5.6.2.1 by the following:*

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.

~~***1908A.1.2***~~ ***1905A.1.3 ACI 318, Section 8.13.5.*** *Replace ACI 318 Section 8.13.5 as follows:*

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 8.13.6 as modified in Section ~~1908A.1.3.~~1905A.1.4.

~~***1908A.1.3***~~ ***1905A.1.4 ACI 318, Section 8.13.6.*** *Replace ACI 318 Section 8.13.6 as follows:*

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.1.4***~~ ***1905A.1.5 ACI 318, Section 8.13.*** *Add Section 8.13.9 to ACI 318 as follows:*

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.1.5~~ 1905A.1.6 ACI 318, Section 10.5.3. *Modify ACI 318 Section 10.5.3 by adding the following:*

This section shall not be used for members that resist seismic loads, except that reinforcement provided for foundation elements for one-story wood-frame or one-story light steel buildings need not be more than one-third greater than that required by analysis for all loading conditions.

~~1908A.1.6~~ 1905A.1.7 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 318 Sections 7.6 and 7.7.

~~1908A.1.7~~ 1905A.1.8 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, of intersecting walls and footings with reinforcement at least equivalent to No. 4 bars at 12 inches (305 mm) on center for each layer of reinforcement.

~~1908A.1.8~~ *~~Reserved.~~*

~~1908A.1.9~~ *~~Reserved~~*

~~1908A.1.10~~ 1905A.1.9 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.1.12~~ 1905A.1.10 ACI 318, Section 14.9. *Modify ACI 318 by adding Section 14.9 as follows:*

14.9 - Foundation Walls. Horizontal reinforcing of concrete foundation walls for wood-frame or light-steel buildings shall consist of the equivalent of not less than one No. 5 bar located at the top and bottom of the wall. Where such walls exceed 3 feet (914 mm) in height, intermediate horizontal reinforcing shall be provided at spacing not to exceed 2 feet (610 mm) on center. Minimum vertical reinforcing shall consist of No. 3 bars at 24 inches (610 mm) on center.

Where concrete foundation walls or curbs extend above the floor line and support wood-frame or light-steel exterior, bearing or shear walls, they shall be doweled to the foundation wall below with a minimum of No. 3 bars at 24 inches (610 mm) on center. Where the height of the wall above the floor line exceeds 18 inches (457 mm), the wall above and below the floor line shall meet the requirements of ACI 318 Section 14.3.

~~1908A.1.13~~ *~~Reserved.~~*

~~1908A.1.14~~ 1905A.1.11 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: *Nonbearing, nonshear panels such as nonstructural architectural cladding panels or column covers are not required to meet the provisions of this section.*

~~1908A.1.15~~ 1905A.1.12 ACI 318, Section 17.5.1*. Modify ACI 318 Section 17.5.1 by adding Sections 17.5.1.1 and 17.5.1.2 as follows:*

17.5.1.1 - Full transfer of horizontal shear forces may be assumed when all of the following are satisfied:

1. Contact surfaces are clean, free of laitance, and intentionally roughened to full amplitude of approximately 1/4 inch (6.4 mm),

2. Minimum ties are provided in accordance with ACI 318 Section 17.6,

3. Web members are designed to resist total vertical shear, and

4. All shear reinforcement is fully anchored into all interconnected elements.

17.5.1.2 - If any of the requirements of ACI 318 Section 17.5.1.1 is not satisfied, horizontal shear shall be investigated in accordance with ACI 318 Section 17.5.3 or 17.5.4.

~~1908A.1.16~~ 1905A.1.13 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 PCI Design Handbook, 7TH Edition.

~~1908A.1.17~~ 1905A.1.14 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 PCI Design Handbook, 7TH Edition.

~~1908A.1.18~~ 1905A.1.15 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 continuous 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.1.21~~

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.1.20 ACI 318, Section 18.21.~~ *~~Add Section 18.21.5 to ACI 318 as follows:~~*

~~18.21.5 - Prequalification of anchorages and coupler. Posttensioned anchorages and couplers for unbonded tendons shall be prequalified for use in prestressed concrete. Data shall be submitted by the posttensioning materials fabricator from an approved independent testing agency to show compliance with the following dynamic test requirements:~~

~~A dynamic test shall be performed on a representative specimen and the tendon shall withstand, without failure, 500,000 cycles from 60 percent to 66 percent of its minimum specified ultimate strength and 50 cycles from 40 percent to 80 percent of its minimum specified ultimate strength. The period of each cycle involves the change from the lower stress level to the upper stress level and back to the lower. The specimen used for the second dynamic test need not be the same used for the first dynamic test. Systems utilizing multiple strands, wires or bars may be tested utilizing a test tendon of smaller capacity than the full-size tendon. The test tendon shall duplicate the behavior of the full-size tendon and generally shall not have less than 10 percent of the capacity of the full-size tendon.~~

~~The above test data must be on file at the enforcement agency for posttensioning systems to be used. General approval will be based on satisfactory performance. Tests shall be required for pre-stressing steel and anchorages.~~

~~The average bearing stress, P/A_b, on the concrete created by the anchorage plates shall not exceed the following:~~

~~At service load~~

$f_{cp} = 0.6\, f'_c \sqrt{(A'_b/A_b)}$

~~but not greater than f'_c~~

~~At transfer load~~

$f_{cp} = 0.8\, f'_{ci} \sqrt{(A'_b/A_b - 02)}$

~~but not greater than $1.25\, f'_{ci}$ where:~~

~~f_{cp} = permissible compressive concrete stress.~~

~~f'_c = compressive strength of concrete.~~

~~f'_{ci} = compressive strength of concrete at time of initial prestress.~~

~~A'_b = maximum area of the portion of the concrete anchorage surface that is geometrically similar to and concentric with the area of the anchorage.~~

~~A_b = bearing area of the anchorage.~~

~~P = prestress force in tendon.~~

1908A.1.21 ACI 318, Section 18. *Add Section 18.23 to ACI 318 as follows:*

18.23 - Prestressed Flat Slab.

18.23.1 - Span depth ratio. The ratio of the span to depth of the slab continuous over at least three supports with cantilevers at the ends shall not be greater than 40 for floor slabs or 44 for roof slabs.

18.23.2 - Distribution of tendons. The use of banded tendons is acceptable. Maximum tendon spacing shall be six times the slab thickness, not to exceed 42 inches (1067 mm). A minimum prestress level of 125 psi (861 kPa) on the local slab section tributary to the tendon or tendon group is required. A minimum of two tendons in flat slabs shall be placed over columns in each direction. Tendons at slab edges shall be placed 6 inches (152 mm) clear of the slab edge. Tendons shall be firmly supported at intervals not exceeding 42 inches (1067 mm) to prevent displacement during concrete placement. Tendons shall not be bundled in groups greater than five monostrand tendons. At horizontal plane deviations grouped tendons at curved portions must be separated with 1-inch minimum (25 mm) clear between each tendon.

18.23.3 - Slab edge reinforcement. The slab edges, including interior openings with anchorages, shall be reinforced with two No. 5 bars, one top and one bottom, minimum, with a No. 3 hairpin placed each side of each anchorage or tendon carrying an effective prestressing force of 50,000 pounds (223 kN) or less. These hairpins shall be increased to No. 4 hairpins if the effective force per anchorage or tendon is greater than 50,000 pounds (223 kN).

1908A.1.22 *(Chapter 19, Section 1908.1.2)* **1905.1.2 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, 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.

1908A.1.23 1905A.1.16 . *(Chapter 19, Section 1908A.1.3 1905.1.3)***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, 21.4.6, and 21.4.7 to read as follows modifying 21.4.2 and adding 21.4.2.1 as follows:

21.4.2 In connections between wall panels, or between wall panels and the foundation, yielding shall be restricted to steel elements or reinforcement. In connections between wall panels and the foundation, they shall be designed per 1616A.1.16.

~~21.4.3~~ 21.4.2.1 - 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 S_y.~~

~~21.4.5 - Wall piers in Seismic Design Category D, E or F shall comply with Section 1908.1.26 of this code.~~

~~21.4.6 - Wall piers not designed as part of a moment frame in buildings assigned to Seismic Design Category C 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.~~

~~21.4.7 - Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as columns.~~

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~~1908A.1.24~~ 1905A.1.17 ACI 318, Section 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 21.9.6, 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 21.9.6.4 (a) & (b).

~~1908A.1.25~~ 1905A.1.18 ACI 318, Section 21.9.4. *Modify ACI 318 by adding Section 21.9.4.6 as follows:*

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 21.13.

~~1908A.1.26~~ *~~(Chapter 19, Section 1908.1.4)~~* **1905.1.4 ACI 318, Section 21.9.** ~~Modify ACI 318, Section 21.9, by adding new Section 21.9.10 to read as follows:~~

~~21.9.10 – Wall piers and wall segments.~~

~~21.9.10.1 – Wall piers not designed as a part of a special moment frame shall have transverse reinforcement designed to satisfy the requirements in 21.9.10.2.~~

~~Exceptions:~~

~~1. Wall piers that satisfy 21.13.~~

~~2. Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.~~

~~21.9.10.2 – Transverse reinforcement with seismic hooks at both ends shall be designed to resist the shear forces determined from 21.6.5.1. Spacing of transverse reinforcement shall not exceed 6 inches (152 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).~~

~~21.9.10.3 – Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as column.~~

~~***1908A.1.27*** *(Chapter 19, Section 1908.1.5)* **1905.1.5 1908.1.5 ACI 318, Section 21.10.** Modify ACI 318, Section 21.10.2, to read as follows:~~

> ~~21.10.2 – Special structural walls constructed using precast concrete shall satisfy all the requirements of 21.9 for cast-in-place special structural walls in *addition* to Sections 21.4.2 *through 21.4.4.*~~

~~***1908A.1.28*** **1905A.1.19 ACI 318, Section 21.9.4.*** Modify ACI 318 Section 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.1.29*** **1905A.1.20 ACI 318, Section 21.11.7.*** Modify ACI 318 Section 21.11.7 by adding Section 21.11.7.7 as follows:*~~

> *21.11.7.7 - Where boundary members are not required by ACI 318 Section 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.*

~~***1908A.1.30*** *(Chapter 19, Section 1908.1.6)* **1905.1.6 ACI 318, Section 21.12.1.1.** Modify ACI 318, Section 21.12.1.1, to read as follows:~~

> ~~21.12.1.1 – Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and ground shall comply with the requirements of Section 21.12 and other applicable provisions of ACI 318 *unless modified by Chapter 18A of the California Building Code.*~~

~~**1905.1.7 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 maximumspacing specified in Item 3 above, shall be continuous in the wall.*~~

~~**1905.1.8 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 Seismic Design Category A, B, and C, detached one- and two-family dwellings three stories or less in height and constructed with stud-bearing walls, plain concrete footings without longitudinal reinforcement supporting walls are permitted.*~~

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

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

~~***1908A.1.31*** *(Chapter 19, Section 1908.1.9)* **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.~~

~~***Exception:*** *Anchors designed to resist wall out-of- plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 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.~~

~~***Exception:*** *Anchors designed to resist wall out-of- plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 need not satisfy Section D.3.3.5.*~~

~~*D.3.3.7 - For wood sill plates a minimum of $1^1/_2$ 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-$^1/_2$ anchor diameters from the edges of the concrete parallel to the grain of the wood sill plate; and*~~

~~*4. They are located a minimum of 15 anchor diameters from the end of the concrete perpendicular to the grain of the wood sill plate.*~~

1905A.1.21 *(Chapter 19, Section 1905.1.9)* ***ACI 318, Section D.3.3.*** Modify ACI 318 Sections D.3.3.4.2, D.3.3.4.3(d) and D.3.3.5.2 to read as follows:

D.3.3.4.2 - Where the tensile component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with D.3.3.4.3. The anchor design tensile strength shall be determined in accordance with D.3.3.4.4.

Exception:

Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 and Section 1604A.8.2 of this code shall be deemed to satisfy Section D.3.3.4.3(d).

D.3.3.4.3(d) - The anchor or group of anchors shall be designed for the maximum tension obtained from design load combinations that include ***E****, with* ***E*** *increased by Ω_0. The anchor design tensile strength shall be calculated from D.3.3.4.4.*

D.3.3.5.2 – Where the shear component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their attachments shall be designed in accordance with

D.3.3.5.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with D.6.

Exceptions:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or non-bearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane design shear strength in accordance with D.6.2 and D.6.3 need not be computed and D.3.3.5.3 shall be deemed to be satisfied provided all of the following are met:

1.1. The allowable in-plane shear strength of the anchor is determined in accordance with AF&PA NDS Table 11E for lateral design values parallel to grain.

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

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

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

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

1.6. The sill plate is 2-inch or 3-inch nominal thickness.

2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or non-bearing walls of anchor bolts attaching cold-formed steel track of bearing or non-bearing walls of light-frame construction to foundations or foundation stem walls the in-plane design shear strength in accordance with Section D.6.2 and D.6.3 need not be computed and D.3.3.5.3 shall be deemed to be satisfied provided all of the following are met:

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

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

2.3. Anchors are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the track.

2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.

2.5. The track is 33 to 68 mil designation thickness.

Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete shall be permitted to be determined in accordance with AISI S100 Section E3.3.1.

3. In light-frame construction, bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 5/8 inch [16mm] in diameter of sill plate or track to foundation or foundation stem wall need not satisfy D.3.3.5.3 (a) through (c) when the design strength of the anchors is determined in accordance with D.6.2.1(c).

~~1908A.1.32~~ *~~(Chapter 19, Section 1908.1.10)~~* **1905.1.10 ACI 318, Section D.4.2.2.** ~~Delete ACI 318, Section D.4.2.2, and replace with the following:~~

~~D.4.2.2 – The concrete breakout strength requirements for anchors in tension shall be considered satisfied by the design procedure of D.5.2 provided Equation D-8 is not used for anchor embedments exceeding 25 inches. The concrete breakout strength requirements for anchors in shear with diameters not exceeding 2 inches shall be considered satisfied by the design procedure of D.6.2. For anchors in shear with diameters exceeding 2 inches, shear anchor reinforcement shall be provided in accordance with the procedures of D.6.2.9.~~

SECTION ~~-~~1906*A*
STRUCTURAL PLAIN CONCRETE

NOT PERMITTED BY DSA-SS

~~**1906.1 Scope.** The design and construction of structural plain concrete, both cast-in-place and precast, shall comply with the minimum requirements of ACI 318, as modified in Section 1905.~~

~~**Exception:** For Group R-3 occupancies and buildings of other occupancies less than two stories above grade plane of light-frame construction, the required footing 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.~~

. . .

SECTION 1908*A*
ANCHORAGE TO CONCRETE—
ALLOWABLE STRESS DESIGN

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~~1911A.1.1~~ ***1908A.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~~ in seismic shear ~~when they are specifically listed in ICC-ES Report (ICC-ESR) for such service~~ for components exempt from permit requirements by Section 1616A.1.18 of this code and for interior non-bearing non-shear wall partitions. Power actuated fastener shall not be used to anchor exterior cladding or curtain wall systems.

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SECTION 1909*A*
ANCHORAGE TO CONCRETE - STRENGTH DESIGN

1909*A*.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 Section~~s~~ ~~1905.1.9~~ *1905A.1.21* ~~and 1905.1.10~~, 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 Section~~s~~ ~~1905.1.9 and 1905.1.10~~ *1905A.1.21*, shall be in accordance with an approved procedure.

> ~~***1912A.1.1***~~ ***1909A.1.1* Specialty Inserts:** *Specialty inserts, including cast-in-place specialty inserts, tested in accordance with ICC-ES AC 193 shall be deemed to satisfy the requirements of this section.*

SECTION 1910*A*
SHOTCRETE

1910*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.

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1910*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.

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1910*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.

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1910*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.

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1910*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.

1910*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.

1910*A*.10.2 Panel criteria. When the maximum-size aggregate is larger than $^3/_8$ inch (9.5 mm), the test panels shall have minimum dimensions of 18 inches by 18 inches (457 mm by 457 mm). When the maximum size aggregate is $^3/_8$ inch (9.5 mm) or smaller, the test panels shall have minimum dimensions of 12 inches by 12 inches (305 mm by 305 mm). Panels shall be shot in the same position as the work, during the course of the work and by the nozzlemen doing the work. The conditions under which the panels are cured shall be the same as the work. *Approval from the enforcement agency shall be obtained prior to performing the test panel method.*

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***~~1913A.11~~ 1910A.11* Forms and Ground Wires for Shotcrete.** *Forms for shotcrete shall be substantial and rigid. Forms shall be built and placed so as to permit the escape of air and rebound.*

Adequate ground wires, which are to be used as screeds, shall be placed to establish the thickness, surface planes and form of the shotcrete work. All surfaces shall be rodded to these wires.

***~~1913A.12~~ 1910A.12* Placing.** *Shotcrete shall be placed in accordance with ACI 506.*

SECTION 1911*A*
REINFORCED GYPSUM CONCRETE

1911*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.*

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SECTION ~~1916A~~ 1913A
CONCRETE, REINFORCEMENT AND ANCHOR TESTING

***~~1916A.1~~ 1913A.1* Cementitious material.** *The concrete supplier shall furnish to the enforcement agency certification that the cement proposed for use on the project has been manufactured and tested in compliance with the requirements of ASTM C 150 for portland cement and ASTM C 595 or ASTM C 1157 for blended hydraulic cement, whichever is applicable. When a mineral admixture or ground granulated blast-furnace slag is proposed for use, the concrete supplier shall furnish to the enforcement agency certification that they have been manufactured and tested in compliance with ASTM C 618 or ASTM C 989, whichever is applicable.~~. The concrete producer shall provide copies of the cementitious material supplier's Certificate of Compliance that represents the materials used by date of shipment for concrete. Cementitious materials without Certification of Compliance shall not be used.*

***~~1916A.2~~ 1913A.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.

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~~ 1913A.3* Tests for prestressing steel and anchorage. All wires or bars of each size from each mill heat and all strands from each manufactured reel to be shipped to the site shall be assigned an individual lot number and shall be tagged in such a manner that each lot can be accurately identified at the jobsite. Each lot of tendon and anchorage assemblies and bar couplers to be installed shall be likewise identified.*

The following samples of materials and tendons selected by the engineer or the designated testing laboratory from the prestressing steel at the plant or jobsite shall be furnished by the contractor and tested by an approved independent testing agency:

1. *For wire, strand or bars, 7-foot-long (2134 mm) samples shall be taken of the coil of wire or strand reel or rods. A minimum of one random sample per 5,000 pounds (2270 kg) of each heat or lot used on the job shall be selected.*

2. *For prefabricated prestressing tendons other than bars, one completely fabricated tendon 10 feet (3048 mm) in length between grips with anchorage assembly at one end shall be furnished for each size and type of tendon and anchorage assembly.*

   Variations of the bearing plate size need not be considered.

   The anchorages of unbonded tendons shall develop at least 95 percent of the minimum specified ultimate strength of the pre-stressing steel. The total elongation of the tendon under ultimate load shall not be less than 2 percent measured in a minimum gage length of 10 feet (3048 mm).

   Anchorages of bonded tendons shall develop at least 90 percent of the minimum specified strength of the prestressing steel tested in an unbonded state. All couplings shall develop at least 95 percent of the minimum specified strength of the prestressing steel and shall not reduce the elongation at rupture below the requirements of the tendon itself.

3. *If the prestressing tendon is a bar, one 7-foot (2134 mm) length complete with one end anchorage shall be furnished and, in addition, if couplers are to be used with the bar, two 4-foot (1219 mm) lengths of bar fabricated to fit and equipped with one coupler shall be furnished.*

4. *Mill tests of materials used for end anchorages shall be furnished. In addition, at least one Brinnell hardness test shall be made of each thickness of bearing plate.*

~~1916A.4~~ 1913A.4* Composite construction cores. Cores of the completed composite concrete construction shall be taken to demonstrate the shear strength along the contact surfaces. The cores shall be tested when the cast-in-place concrete is approximately 28 days old and shall be tested by a shear loading parallel to the joint between the precast concrete and the cast-in-place concrete. The minimum unit shear strength of the contact surface area of the core shall not be less than 100 psi (689 kPa).*

At least one core shall be taken from each building for each 5,000 square feet (465m^2) of area of composite concrete construction and not less than three cores shall be taken from each project. The architect or structural engineer in responsible charge of the project or his or her representative shall designate the location for sampling.

***~~1916A.5~~ 1913A.5* Tests of shotcrete.** *Testing of shotcrete shall follow the provisions of Section ~~1913A~~ 1910A and the general requirements of ACI 318 Section 5.6.*

***~~1916.6~~ 1913A.6* Gypsum field tests.** *Field tests shall be made during construction to verify gypsum strength. One sample consisting of three specimens shall be made for each 5,000 square feet (465 m^2) or fraction thereof of all gypsum poured, but not less than one sample shall be taken from each half day's pour.*

***~~1916A.7~~ 1913A.7* Tests for Post-Installed Anchors in Concrete.** *When post-installed anchors are used in lieu of cast-in place bolts, the installation verification test loads, frequency, and acceptance criteria shall be in accordance with this section.*

~~1916A.7.1~~ ***1913A.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~~ ***1913A.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)~~ an approved test report using criteria adopted in this code 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~~ based on approved test report using criteria adopted in this code.*

~~1916A.7.3~~ ***1913A.7.3*** **Test Frequency.** *When post-installed anchors are used for sill plate bolting applications, 10 percent of the anchors shall be tested.*

When post-installed anchors are used for other structural applications, all such anchors shall be tested.

When 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 tested.

The testing of the 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.

Exceptions:

1. *Undercut anchors that allow visual confirmation of full set shall not require testing.*
2. *Where the factored design tension on anchors is less than 100 lbs. and those anchors are clearly noted on the approved construction documents, only 10 percent of those anchors shall be tested.*
3. *Where adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, only 25% of the dowels shall be tested if all of the following conditions are met:*
   a. *The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.*
   b. *The number of dowels in any one member equals or exceeds 12.*
   c. *The dowels are uniformly distributed across seismic force resisting members (such as shear walls, collectors and diaphragms).*

   Anchors to be tested shall be selected at random by the special inspector/Inspector Of Record (IOR).
4. *Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting system shall not be required.*

5. *Testing is not required for power actuated fasteners used to attach tracks of interior non-shear wall partitions for shear only, where there are at least three fasteners per segment of track.*

~~1916A.7.4~~ 1913A.7.4 Test Acceptance Criteria. *Acceptance criteria for post-installed anchors shall be based on ~~ICC-ESR, or manufacturers written instruction,~~ approved test report using criteria adopted in this code. ~~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 discernible movement during the tension test, e.g., as evidenced by loosening of the washer under the nut.

   For adhesive anchors, where other than bond is being tested, the testing device shall not restrict the concrete shear cone type failure mechanism from occurring.

2. *Torque Wrench Method:*

   Anchors tested with a calibrated torque wrench must attain the specified torque within ½ turn of the nut.

   Exceptions:

   a. *Wedge or Sleeve type:*
      One-quarter (1/4) turn of the nut for a 3/8 in. sleeve anchor only.

   b. *Threaded Type:*
      One-quarter (1/4) turn of the screw after initial seating of the screw head.

~~1916A.7.5~~ 1913A.7.5 Testing Procedure. *Test procedure shall be as ~~required by the ICC-ESR~~ permitted by an approved test report using criteria adopted in this code. Torque controlled post installed anchors shall be permitted to be tested using torque based on approved test report using criteria adopted in this code. All other post-installed anchors shall be tension tested. Manufacturer's recommendation for testing may be approved by the enforcement agency~~, when ICC-ESR~~ based on an approved test report using criteria adopted in this code. ~~does not provide a testing procedure.~~*

SECTION ~~1917A~~ 1914A
EXISTING CONCRETE STRUCTURES

~~1917A.1~~ 1914A.1 Existing concrete structures.

The structural use of existing concrete with a core strength less than 1,500 psi (10.3MPa) is not permitted in rehabilitation work.

For existing concrete structures, sufficient cores shall be taken at representative locations throughout the structure, as designated by the architect or structural engineer, so that knowledge will be had of the in-place strength of the concrete. At least three cores shall be taken from each building for each 4,000 square feet (372 m2) of floor area, or fraction thereof. Cores shall be at least 4 inches (102 mm) in diameter. Cores as small as 2.75 inches (70 mm) in diameter may be allowed by the enforcement agency when reinforcement is closely spaced and the coarse aggregate does not exceed 3/4 inch (19 mm).

~~1917A.2~~ 1914A.2 Crack repair by epoxy injection. *Crack repair by epoxy injection of concrete and masonry member shall conform to all requirements of ACI 503.7.*

~~1917A.3~~ 1914A.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 and DSA-SS/CC]

Authority: Education Code §17310 and 81142
Health and Safety Code §16022

Reference: Education Code §§ 17280 through 17317, and 81130 through 81147
Health and Safety Code §§16000 through 16023

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

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CHAPTER 20
ALUMINUM

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

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.

(All existing amendments are continued without any change)

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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	
2101.1.2		X	
2101.1.3		X	
2101.1.4		X	
2114.1		X	
2114.1.1		X	Revised
2114.2		X	Revised
2114.3		X	
2114.4		X	
2114.5		X	
2114.6.1		X	Revised
2114.7		X	
2114.8		X	
2114.9.1		X	
2114.9.2.1		X	
2114.9.3		X	Revised
2114.10		X	Revised
2114.11.1		X	Revised
~~2114.11.3~~ 2114.11.1		X	Was section 2114.11.3 in 2010 CBC
Table 2114.11.1		X	Was Table 2114.11.3 – CBC 2010
2114.12		X	
2114.13		X	
2114.14		X	Revised

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

EXPRESS TERMS

SECTION 2101
GENERAL

2101.1 Scope. This chapter shall govern the materials, design, construction and quality of masonry.

2101.1.1 Division of the State Architect-Structural Safety/Community Colleges (DSA-SS/CC)

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.

2101.1.2 Amendments in this chapter. *DSA-SS/CC adopts this chapter and all amendments.*

Exception: *Division of the State Architect-Structural Safety/Community Colleges (DSA-SS/CC) amendments appear in this chapter preceded with the appropriate acronym, as follows:*

~~(Division of the State Architect—Structural Safety/Community Colleges:~~
[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 Amendments. [DSA-SS/CC] *See Section 2114 for additional requirements.*

. . .

SECTION 2114
ADDITIONAL REQUIREMENTS [DSA-SS/CC]

2114.1 General. *In addition to the provisions of this chapter, the following requirements shall apply to community college buildings regulated by the Division of the State Architect-Structural Safety/Community Colleges (DSA-SS/CC).*

2114.1.1 Prohibitions. *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

7. Direct design of masonry

2114.2 Mortar. *~~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.*

2114.3 Additives and Admixtures.

2114.3.1 General. *Additives and admixtures to mortar or grout shall not be used unless approved by the enforcement agency.*

2114.3.2 Antifreeze compounds. *Antifreeze liquids, chloride salts or other such substances shall not be used in mortar or grout.*

2114.3.3 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.*

2114.4 Tolerances. *The maximum thickness of the initial bed joint in fully grouted masonry walls shall not exceed $1^1/_4$ in. (31.7 mm).*

2114.5 Glass unit masonry. *All mortar for glass unit masonry contact surfaces shall be treated to ensure adhesion between mortar and glass.*

2114.6 Grouted masonry.

2114.6.1 General conditions. *Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections greater than $^1/_4$ inch (6.4 mm), mortar droppings and other foreign material.*

All cells shall be solidly filled with grout, except as provided in Section 2114.14.

~~Reinforcement shall be clean, properly positioned, and solidly embedded in the grout~~. Reinforcement and embedded items shall be clean, properly positioned 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. Reinforcement, embedded items and bolts shall be solidly embedded in grout. Anchor bolts in the face shells of hollow masonry units shall be positioned to maintain a minimum of ½ in. of grout between the bolt and the face shell.

The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour. At the time of laying, all masonry units shall be free of dust and dirt.

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

Between grout pours or where grouting has been stopped more than an hour, a horizontal construction joint shall be formed by stopping all wythes at the same elevation and with the grout stopping a minimum of $1^1/_2$ inches (38 mm) below a mortar joint, except at the top of the wall. Where bond beams occur, the grout pour shall be stopped a minimum of $^1/_2$ inch (12.7 mm) below the top of the masonry.

The construction documents shall completely describe grouting procedures, subject to approval of DSA.

~~2114.6.2 Construction requirements.~~ *~~Reinforcement and embedded items shall be placed and securely anchored against moving prior to grouting. Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.~~*

~~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.~~

2114.7 Aluminum equipment. *Grout shall not be handled nor pumped utilizing aluminum equipment unless it can be demonstrated with the materials and equipment to be used that there will be no deleterious effect on the strength of the grout.*

2114.8 Specified compressive strength. *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 2114.9.3 ~~2105.4~~.*

In no case shall the f'_m assumed in design exceed 3,000 psi (20.68 MPa).

2114.9 Additional testing requirements.

2114.9.1 Mortar and grout tests. *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 2103.9 ~~2103.8~~ and 2103.13 ~~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 during construction, 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

2114.9.2 Prism test method.

2114.9.2.1 Number of prisms per test. *Prior to the start of construction, 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 (465 m^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.*

~~***2114.9.2.2 Testing prisms from constructed masonry.*** *Acceptance of masonry that does not meet the requirements of Sections 2105.2.2.1 or 2105.2.2.2 may be based on prism tests conducted in accordance with Section 2105.3.*~~

2114.9.3 Masonry core testing*. Not less than 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)~~ or the inspector of record shall select the areas for sampling. Cores shall be a minimum of 3-3/4" inches (76 mm) in diameter and shall be taken in such a manner as to exclude masonry unit webs and reinforcing steel. If vertical reinforcing steel is placed such that cores will include reinforcing steel, core testing may be waived by the design professional in responsible charge, as approved by the enforcement agency. The inspector of record shall observe the coring of the masonry walls.*

Visual examination of all cores shall be made by a laboratory acceptable to the building official and the condition of the cores reported as required by the California Administrative Code. ~~One half of the number of~~ All cores taken shall be tested in shear. The shear test shall test both joints between the grout core and the outside wythes or face shell of the masonry. Shear testing apparatus shall be of a design approved by the enforcement agency. Core samples shall not be soaked before testing. The average unit shear on the cross section of all the cores shall not be less than 2.5 $\sqrt{f'_m}$ psi.

All cores shall be submitted to the laboratory, acceptable to the building official, for examination, regardless of whether the ~~core specimens failed~~ the outside wythe or face shells separated during the 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.

2114.10 Modifications to TMS 402/ACI 530/ASCE 5.

2114.10.1 *Modify TMS 402/ACI 530/ASCE 5, Section ~~1.17~~ 1.18 as follows:*

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~~ reinforcement 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~~ reinforcement shall have dowels of equal size and equal matched spacing in all footings. Reinforcement shall be continuous around wall corners and through intersections. Only reinforcement which is continuous in the wall shall be considered in computing the minimum area of reinforcement. Reinforcement with splices conforming to TMS 402/ACI 530/ASCE 5 as modified by Section 2107 and 2108 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, horizontal and vertical reinforcement ~~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 be trim reinforcement of 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.

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 $^3/_8$ inch (10 mm) in diameter and*

shall be embedded in grout. Top tie shall be within 2 inches (51 mm) of the top of the column or of the bottom of the horizontal bar in the supported beam.

3. Anchor Bolts. *(Relocated from 2010 CBC, Section 2114.11.1) Bent bar anchor bolts shall not be ~~used~~ allowed. The maximum size anchor shall be 1/2-inch (13 mm) diameter for 6-inch (152 mm) nominal masonry, 3/4-inch (19 mm) diameter for 8-inch (203 mm) nominal masonry, 7/8-inch (22 mm) diameter for 10-inch (254 mm) nominal masonry, and 1-inch (25mm) diameter for 12-inch (304.8 mm) nominal masonry.*

2114.11 Additional requirements for Allowable Stress Design.

~~2114.11.1 TMS 402/ACI 530/ASCE 5.~~ *~~Modify by adding Sections 2.1.4.3.4 and 2.1.4.3.5 as follows:~~*

~~2.1.4.3.4 - Edge distance and spacing. Where the anchor bolt edge distance, lbe, in the direction of load is less than 12 bolt diameters, the value of B_v in Formula (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 (2-7) shall be reduced by linear interpolation to 0.75 times the allowable shear value at a center-to-center spacing of four bolt diameters.~~

~~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.~~

(Relocated to 2114.10.1, Item 3) ~~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 (25 mm) diameter for 12-inch (304.8 mm) nominal masonry.~~

~~2114.11.2 TMS 402/ACI 530/ASCE 5, Section 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.~~

~~2114.11.3~~ 2114.11.1 TMS 402/ACI 530/ASCE 5 [DSA-SS/CC] *Modify by adding Section ~~2.1.10~~ 2.1.8 as follows:*

~~2.1.10~~ 2.1.8 - 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 ~~2114.11.3~~ 2114.11.1.

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 ~~2114.11.3~~ 2114.11.1
MINIMUM THICKNESS OF MASONRY WALLS[1, 2] [DSA-SS/CC]

(Table not shown for clarity)

. . .

2114.12 Glass unit masonry construction. *Masonry of glass blocks shall be permitted in nonload-bearing exterior or interior walls and shall conform to the requirements of Section 2114.14. Stresses in glass block shall not be utilized. Glass block may be solid or hollow and may contain inserts.*

2114.13 Nonbearing walls. *All nonbearing masonry walls shall be reinforced as specified in Section ~~2114.11.1.1~~ 2114.10.1.1. 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 ~~2114.11.3~~ 2114.11.1.*

   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 1604.8.2 and ASCE 7 Chapter 13. Suspended ceilings or other nonstructural elements shall not be used to provide anchorage for masonry walls.*

2114.14 Masonry screen walls. *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 16. 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 and maximum spacing of 16 in. on center. Reinforcement may be embedded in mortar.*

3. ***~~Reinforcing~~ Reinforcement.*** *Joint ~~reinforcing~~ reinforcement 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~~ reinforcement 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). The specified thickness of the units for exterior applications shall not be less than 3 7/8 in.*

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)~~ 1 inch (25 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

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

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			

(All existing amendments that are not revised below 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 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 adopt this chapter and all amendments.*

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

1. *Division of the State Architect—Structural Safety:*
[DSA-SS] *For applications listed in Section 1.9.2.1.*

2*. (Reserved for OSHPD).*

2101A.1.3 Prohibition: *The following design methods, systems, and materials are not permitted by DSA-SS:*

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.*
8. *Direct design of masonry*

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 2101A.2.1, *or* the strength design provisions of Section 2101*A*.2.2~~, the prestressed masonry provisions of Section 2101*A*.2.3, or the direct design requirements of Section 2101*A*.2.7~~ 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.* ~~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.* ~~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.~~

2101*A*.2.6 Masonry veneer. Masonry veneer shall comply with the provisions of Chapter 14 ~~or Chapter 6 of TMS 402/ACI 530/ASCE 5~~.

2101*A*.2.7 Direct design. *Not permitted by DSA.* ~~Masonry designed by the direct design method shall comply with the provisions of TMS 403.~~

. . .

SECTION 2102*A*
DEFINITIONS AND NOTATIONS

2102*A*.1 General. The following terms are defined in Chapter 2*, except those defined below which shall, for the purposes of this chapter, have the meanings shown herein*:

. . .

WALL. . . .

. . .

Hollow-unit masonry wall*. Type of construction made with hollow masonry units in which the units are laid and set in mortar, reinforced and grouted solid except as provided in Section 2114A.*

. . .

SECTION 2103*A*
MASONRY CONSTRUCTION MATERIALS

2103*A*.1 Concrete masonry units. Concrete masonry units shall conform to the following standards: ASTM C 55 for concrete brick; ASTM C 73 for calcium silicate face brick; ASTM C 90 for load-bearing concrete masonry units or ASTM C 744 for prefaced concrete and calcium silicate masonry units.

. . .

2103*A*.3 AAC masonry. ~~AAC masonry units shall conform to ASTM C 1386 for the strength class specified.~~ *Not permitted by DSA.*

. . .

2103*A*.9 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 Section~~s~~ 2103*A*.10. ~~and 2103.11.~~ Type S ~~or N~~ mortar conforming to ASTM C 270 shall be used for glass unit masonry.

. . .

2103*A*.12 Mortar for AAC masonry. ~~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.~~ *Not permitted by DSA.*

2103A.13 Grout. Grout shall comply with Article 2.2 of TMS 602/ACI 530.1/ASCE 6.

***~~2103A.12.1~~ 2103A.13.1* 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~~ 2103A.13.2* 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).~~ 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~~ 2103A.13.3* Aggregate.** *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~~ 2103A.15* Additives and Admixtures.**

***~~2103A.14.1~~ 2103A.15.1* General.** *Additives and admixtures to mortar or grout shall not be used unless approved by the enforcement agency.*

***~~2103A.14.2~~ 2103A.15.2* Antifreeze compounds**. *Antifreeze liquids, chloride salts or other such substances shall not be used in mortar or grout.*

***~~2103A.14.3~~ 2103A.15.3* 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~~ 2104*A*.5 and with TMS 602/ACI 530.1/ASCE 6.

2104*A*.1.1 Tolerances. Masonry, except masonry veneer, shall be constructed within the tolerances specified in TMS 602/ACI 530.1/ASCE 6.

Exception: *The maximum thickness of the initial bed joint in fully grouted masonry walls shall not exceed 1-1/4 in. (31.7 mm).*

2104*A*.1.2 Placing mortar and units. Placement of mortar, grout, and clay, concrete, *and* glass~~,~~ ~~and AAC~~ masonry units shall comply with TMS 602/ACI 530.1/ASCE 6. *All mortar for glass unit masonry contact surfaces shall be treated to ensure adhesion between mortar and glass.*

. . .

~~2104A.1.7 Grouted masonry.~~ *~~Grouted masonry shall be in accordance with Section 2104A.5.~~*

. . .

2104A.5 Grouted masonry.

2104A.5.1 General conditions. *Grouted masonry shall be constructed in such a manner that all elements of the masonry act together as a structural element. At the time of laying, all masonry units shall be free of dust and dirt. Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections 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. Segregation of the grout materials and damage to the masonry shall be avoided during the grouting process. ~~Reinforcement shall be clean, properly positioned, and solidly embedded in the grout~~.

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

The grouting of any section of wall shall be completed in one day with no interruptions greater than ~~1~~ one hour.

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

Between grout pours or where grouting has been stopped more than an hour, a horizontal construction joint shall be formed by stopping all wythes at the same elevation and with the grout stopping a minimum of 1 1/2 inches (38 mm) below a mortar joint, except at the top of the wall. Where bond beams occur, the grout pour shall be stopped a minimum of 1/2 inch (12.7 mm) below the top of the masonry.

Grout shall not be handled nor pumped utilizing aluminum equipment unless it can be demonstrated with the materials and equipment to be used that there will be no deleterious effect on the strength of the grout.

2104A.5.1.1 Reinforced grouted masonry.

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~~ reinforcement therein as the work progresses.*

~~At the time of laying, all masonry units shall be free of dust and dirt.~~

~~2104A.5.1.1.2~~ 2104A.5.1.1.1.1 Low-lift grouted construction*. Requirements for construction shall be as follows:*

1. *All units in the two outer wythes shall be laid with full-shoved head joint and bed mortar joints. 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~~ reinforcement and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and ~~reinforcing~~ reinforcement shall be a minimum of one bar diameter.*

3. *One tier of a grouted reinforced masonry wall may be carried up 12 inches (305 mm) before grouting, but the other tier shall be laid up and grouted in lifts not to exceed one masonry unit in height. All grout shall be puddled with a mechanical vibrator or wood stick immediately after placing so as to completely fill all voids and to consolidate the grout. All vertical and horizontal steel shall be held firmly in place by a frame or suitable devices.*

~~4. 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~~ 4 . Toothing of masonry walls is prohibited. Racking is to be held to a minimum.

~~2104A.5.1.1.3~~ 2104A.5.1.1.1.2 High-lift grouted construction*. Where high-lift grouting is used, the method shall be subject to the approval of the enforcement agency. Requirements for construction shall be as follows:*

1. *All units in the two wythes shall be laid with full head and bed mortar joints.*

2. *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 after inspection and 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~~ reinforcement and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and ~~reinforcing~~ reinforcement shall be a minimum of one bar diameter.*

5. *Vertical grout barriers or dams of solid masonry 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 be spaced 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.*

2104A.5.1.2 Reinforced hollow-unit masonry.

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.*~~ *1. 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.*~~ *2.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~~ 3. 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.~~

~~8~~ 4. All ~~reinforcing~~ reinforcement and wire ties shall be embedded in the grout. The space between masonry unit surfaces and ~~reinforcing~~ reinforcement shall be a minimum of one bar diameter.

~~9~~ 5. Horizontal reinforcement shall be placed in bond beam units with a minimum grout cover of 1 inch (25 mm) above steel for each grout pour. The depth of the bond beam channel below the top of the unit shall be a minimum of 1 1/2 inches (38 mm) and the width shall be 3 inches (76 mm) minimum.

***2104A.5.1.2.1.1 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~~ reinforcement shall be fully embedded in grout in an uninterrupted pour.*

***2104A.5.1.2.1.2 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 for access to ~~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.*

~~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.~~

***~~2104A.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.5.3~~ ~~Aluminum Equipment.~~** ~~Grout shall not be handled nor pumped utilizing aluminum equipment unless it can be demonstrated with the materials and equipment to be used that there will be no deleterious effect on the strength of the grout.~~*

SECTION 2105*A*
QUALITY ASSURANCE

. . .

2105*A*.2 Acceptance relative to strength requirements. Where required by Chapter 17*A*, verification of the strength of masonry shall be in accordance with Sections 2105*A*.2.1 and 2105*A*.2.2.

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 or 2105A.5.*

Exception: [DSA-SS] *Subject to the approval of the enforcement agency, higher values of f'$_m$ may be used in the design of reinforced grouted masonry and reinforced hollow-unit masonry. The approval shall be based on prism test results submitted by the architect or engineer which demonstrate the ability of the proposed construction to meet prescribed performance criteria for strength and stiffness. The design shall ~~assume that the reinforcement will be placed in a location that will produce the largest stresses within the tolerances allowed in Section 2104A.1.1 and shall~~ take into account the mortar joint depth. In no case shall the f'$_m$ assumed in design exceed 3,000 psi (20.7MPa).*

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.2.2.1 or 2105A.2.2.2, ~~2105A.4, and 2105A.2.2.1.4~~. Substantiation for the specified compressive strength prior to the start of construction shall ~~may~~ be obtained in accordance with Section 2105A.2.2.2.2. Testing of the constructed masonry shall be provided in accordance with Section 2105A.5.

Exception: *(Reserved for OSHPD)*

. . .

2105*A*.2.2.1 Unit strength method. The determination of compressive strength by the unit strength method shall be in accordance with Section 2105*A*.2.2.1.1 for clay masonry~~,~~ *and* Section 2105*A*.2.2.1.2 for concrete masonry. ~~and Section 2105.2.2.1.3 for AAC masonry.~~

. . .

2105*A*.2.2.1.3 AAC masonry. *Not permitted by DSA .* ~~The compressive strength of AAC masonry shall be based on the strength of the AAC masonry unit only and the following shall be met:~~

~~1. Units conform to ASTM C 1386.~~

~~2. Thickness of bed joints does not exceed 1/8 inch (3.2 mm).~~

~~3. For grouted masonry, the grout meets one of the following requirements:~~

~~3.1. Grout conforms to Article 2.2 of TMS602/ACI 530.1/ASCE 6.~~

~~3.2. Minimum grout compressive strength equals or exceeds *f_AAC* but not less than 2,000 psi (13.79 MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.~~

2105A.2.2.1.4 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~~ 2103A.9 and ~~2103A.12~~ 2103A.13 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 during construction, 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*.2.2.2.2 Number of prisms per test. *Prior to the start of construction,* ~~A~~ *a* prism test shall consist of ~~three~~ *five* prisms constructed and tested in accordance with ASTM C 1314. *A set of three masonry prisms shall be built during construction in accordance with ASTM C 1314 for each 5,000 square feet (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, ~~or~~ 2105*A*.2.2.2, *2105A.4, 2105A.5, or 2105A.2.2.1.4* shall be permitted to be based on tests of prisms cut from the masonry construction in accordance with Sections 2105*A*.3.1, 2105*A*.3.2 and 2105*A*.3.3.

2105*A*.3.1 Prism sampling and removal. A set of three masonry prisms that are at least 28 days old shall be saw cut from the masonry for each 5,000 square feet (465 m^2) of the wall area that is in question but not less than one set of three masonry prisms for the project. The length, width and height dimensions of the prisms shall comply with the requirements of ASTM C 1314. Transporting, preparation and testing of prisms shall be in accordance with ASTM C 1314.

2105A.3.2 Compressive strength calculations. The compressive strength of prisms shall be the value calculated in accordance ASTM C 1314, except that the net cross-sectional area of the prism shall be based on the net mortar bedded area.

2105*A*.3.3 Compliance. Compliance with the requirement for the specified compressive strength of masonry, f'_m, shall be considered satisfied provided the modified compressive strength equals or exceeds the specified f'_m. Additional testing of specimens cut from locations in question shall be permitted.

2105A.4 *(Reserved for OSHPD)*

2105A.5* [DSA-SS]** *(Relocated from 2105A.4, 2010 CBC) (Chapter 21, Section 2114.9.3)* ***Masonry core testing*. Not less than 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)~~ or the inspector of record shall select the areas for sampling. Cores shall be a minimum of 3-3/4" inches (76 mm) in diameter and shall be taken in such a manner as to exclude masonry unit webs and reinforcing steel. If vertical reinforcing steel is placed such that cores will include reinforcing steel, core testing may be waived by the design professional in responsible charge, as approved by the enforcement agency. The inspector of record shall observe the coring of the masonry walls.*

Visual examination of all cores shall be made by a laboratory acceptable to the building official and the condition of the cores reported as required by the California Administrative Code. ~~One half of the number of~~ All cores taken shall be tested in shear. The shear test shall test both joints between the grout core and the outside wythes or face shell of the masonry. Shear testing apparatus shall be of a design approved by the enforcement agency. Core samples shall not be soaked before testing. The average unit shear on the cross section of all the cores shall not be less than 2.5 $\sqrt{f'_m}$ *psi.*

All cores shall be submitted to the laboratory, acceptable to the building official, for examination, regardless of whether the ~~core specimens failed~~ the outside wythe or face shells separated during the 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 2106*A*
SEISMIC DESIGN

2106*A*.1 Seismic design requirements for masonry. Masonry structures and components shall comply with the requirements in Section 1.18 of TMS 402/ACI 530/ASCE 5 depending on the structure's seismic design category.

2106A.1.1 Modifications to TMS 402 / ACI 530 / ASCE 5.

~~2106A.1.1.1~~ *Modify TMS 402 / ACI 530 / ASCE 5 Section ~~1.17~~ 1.18 as follows:*

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~~ reinforcement 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~~ reinforcement shall have dowels of equal size and equal matched spacing in all footings. Reinforcement shall be continuous around wall corners and through intersections. Only reinforcement which is continuous in the wall shall be considered in computing the minimum area of reinforcement. Reinforcement with splices conforming to TMS 402 / ACI 530 / ASCE 5 as modified by Section 2107A and 2108A 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, horizontal and vertical reinforcement ~~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 be trim reinforcement of 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.

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.*

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.~~

4. ***Anchor Bolts.*** *(Relocated from 2010 CBC, Section 2107A.6) Bent bar anchor bolts shall not be ~~used~~ allowed. The maximum size anchor shall be 1/2-inch (13 mm) diameter for 6-inch (152 mm) nominal masonry, 3/4-inch (19 mm) diameter for 8-inch (203 mm) nominal masonry, 7/8-inch (22 mm) diameter for 10-inch (254 mm) nominal masonry, and 1-inch (25mm) diameter for 12-inch (304.8 mm) nominal masonry.*

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 ~~2107A.4~~ *2107A.6*.

2107*A*.2 TMS 402/ACI 530/ASCE 5, Section ~~2.1.8.7.1.1~~ *2.1.7.7.1.1*, lap splices. In lieu of Section ~~2.1.8.7.1.1~~ *2.1.7.7.1.1*, it shall be permitted to design lap splices in accordance with Section 2107*A*.2.1.

2107*A*.2.1 Lap splices. The minimum length of lap splices for reinforcing bars in tension or compression, l_d, shall be……

2107A.3 TMS 402/ACI 530/ASCE 5, Section ~~2.1.8.7~~ *2.1.7.7*, splices of reinforcement. Modify Section ~~2.1.8.7~~ *2.1.7.7* as follows:

~~2.1.8.7~~ *2.1.7.7* Splices of reinforcement. Lap splices, welded splices or mechanical splices are permitted in accordance with the provisions of this section. All welding shall conform to AWS D1.4. Welded splices shall be of ASTM A 706 steel reinforcement. Reinforcement larger than No. 9 (M #29) shall be spliced using mechanical connections in accordance with Section ~~2.1.8.7.3~~ *2.1.7.7.3*.

. . .

~~***2107A.6 Modify TMS 402 / ACI 530 / ASCE 5 by adding Sections 2.1.4.3.4 and 2.1.4.3.5 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 (2-7) 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 (2-7) shall be reduced by linear interpolation to 0.75 times the allowable shear value at a center-to-center spacing of four bolt diameters.*~~

~~***2.1.4.3.5 - Anchor bolts size and materials.*** *Anchor bolts shall be hex headed bolts conforming to ASTM A 307 or F1554 with the dimensions of the hex head conforming to ANSI / ASME B18.2.1 or plain rod conforming to ASTM A 36 with threaded ends and double hex nuts at the anchored end. Bent bar anchor bolts shall not be used.*~~

~~*The maximum size anchor shall be 1/2-inch (13 mm) diameter for 6-inch (152 mm) nominal masonry, 3/4-inch (19 mm) diameter for 8-inch (203 mm) nominal masonry, 7/8-inch (22 mm) diameter for 10-inch (254 mm) nominal masonry, and 1-inch (25mm) diameter for 12-inch (304.8 mm) nominal masonry.*~~

~~***2107A.7 Modify TMS 402 / ACI 530/ASCE 5 Section 2.1.6 2.1.8 by adding the following:***~~

~~*Structural members framing into or supported by walls or columns shall be securely anchored. The end support of girders, beams or other concentrated loads on masonry shall have at least 3 inches (76 mm) in length upon solid bearing not less than 4 inches (102 mm) thick or upon metal bearing plate of adequate design and dimensions to distribute the loads safely on the wall or pier, or upon a continuous reinforced masonry member projecting not less than 3 inches (76 mm) from the face of the wall or other approved methods.*~~

~~*Joists shall have bearing at least 3 inches (76 mm) in length upon solid masonry at least 2 1/2 inches (64 mm) thick, or other provisions shall be made to distribute safely the loads on the wall or pier.*~~

~~2107A.8~~ 2107A.5 Modify TMS 402 / ACI 530/ASCE 5 by adding Section ~~2.1.10~~ 2.1.8 as follows:

~~2.1.10~~ 2.1.8 - Walls and piers.

Thickness of walls. *For thickness limitations of walls as specified in this chapter, nominal thickness shall be used. Stresses shall be determined on the basis of the net thickness of the masonry, with consideration for reduction, such as raked joints.*

The thickness of masonry walls shall be designed so that allowable maximum stresses specified in this chapter are not exceeded. Also, no masonry wall shall exceed the height or length-to-thickness ratio or the minimum thickness as specified in this chapter and as set forth in Table ~~2107A.8~~ 2107A.5, below.

Piers. *Every pier or wall section which width is less than three times its thickness shall be designed and constructed as required for columns if such pier is a structural member. Every pier or wall section which width is between three and five times its thickness or less than one half the height of adjacent openings*

shall have all horizontal steel in the form of ties except that in walls 12 inches (305 mm) or less in thickness such steel may be in the form of hair-pins.

TABLE ~~2107A.8~~ 2107A.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.6 *(Reserved for OSHPD)*

SECTION 2108A
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 2108.2 through 2108.3.

~~**Exception:** AAC masonry shall comply with the requirements of Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.~~

. . .

SECTION 2109A
EMPIRICAL DESIGN OF MASONRY

Not permitted by DSA.

~~**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:~~
~~$f_r = 3PL_s / 2S_w (S_t^2)$~~ **~~(Equation 21-2)~~**

~~where, for the purposes of this section only:~~

~~S_w = Width of the test specimen measured parallel to the loading cylinder, inches (mm).~~
~~f_r = Modulus of rupture, psi (MPa).~~
~~L_s = Distance between supports, inches (mm).~~
~~S_t = Thickness of the test specimen measured parallel to the direction of load, inches (mm).~~
~~P = The applied load at failure, pounds (N).~~

~~2109.3.1.3 Moisture content requirements.~~ ~~Adobe units shall have a moisture content not exceeding 4 percent by weight.~~

~~2109.3.1.4 Shrinkage cracks.~~ ~~Adobe units shall not contain more than three shrinkage cracks and any single shrinkage crack shall not exceed 3 inches (76 mm) in length or 1/8 inch (3.2 mm) in width.~~

~~2109.3.2 Stabilized adobe.~~

~~2109.3.2.1 Material requirements.~~ ~~Stabilized adobe shall comply with the material requirements of unstabilized adobe in addition to Sections 2109.3.2.1.1 and 2109.3.2.1.2.~~

~~2109.3.2.1.1 Soil requirements.~~ ~~Soil used for stabilized adobe units shall be chemically compatible with the stabilizing material.~~

~~2109.3.2.1.2 Absorption requirements.~~ ~~A 4-inch (102 mm) cube, cut from a stabilized adobe unit dried to a constant weight in a ventilated oven at 212°F to 239°F (100°C to 115°C), shall not absorb more than 21/2 percent moisture by weight when placed upon a constantly water-saturated, porous surface for seven days. A minimum of five specimens shall be tested and each specimen shall be cut from a separate unit.~~

~~**2109.3.3 Allowable stress.** The allowable compressive stress based on gross cross-sectional area of adobe shall not exceed 30 psi (207 kPa).~~

~~**2109.3.3.1 Bolts.** Bolt values shall not exceed those set forth in Table 2109.3.3.1.~~

~~**2109.3.4 Construction.**~~

~~**2109.3.4.1 General.**~~

~~**2109.3.4.1.1 Height restrictions.** Adobe construction shall be limited to buildings not exceeding one *story*, except that two-*story* construction is allowed when designed by a *registered design professional*.~~

~~**2109.3.4.1.2 Mortar restrictions.** Mortar for stabilized adobe units shall comply with Chapter 21 or adobe soil. Adobe soil used as mortar shall comply with material requirements for stabilized adobe. Mortar for unstabilized adobe shall be portland cement mortar.~~

~~**2109.3.4.1.3 Mortar joints.** Adobe units shall be laid with full head and bed joints and in full running bond.~~

~~**2109.3.4.1.4 Parapet walls.** Parapet walls constructed of adobe units shall be waterproofed.~~

~~**2109.3.4.2 Wall thickness.** The minimum thickness of *exterior walls* in one-*story* buildings shall be 10 inches (254 mm). The walls shall be laterally supported at intervals not exceeding 24 feet (7315 mm). The minimum thickness of interior *load-bearing walls* shall be 8 inches (203 mm). In no case shall the unsupported height of any wall constructed of adobe units exceed 10 times the thickness of such wall.~~

~~**2109.3.4.3 Foundations.**~~

~~**2109.3.4.3.1 Foundation support.** Walls and partitions constructed of adobe units shall be supported by foundations or footings that extend not less than 6 inches (152 mm) above adjacent ground surfaces and are constructed of solid masonry (excluding adobe) or concrete. Footings and foundations shall comply with Chapter 18.~~

~~**2109.3.4.3.2 Lower course requirements.** Stabilized adobe units shall be used in adobe walls for the first 4 inches (102 mm) above the finished first-floor elevation.~~

~~**2109.3.4.4 Isolated piers or columns.** Adobe units shall not be used for isolated piers or columns in a load-bearing capacity. Walls less than 24 inches (610 mm) in length shall be considered isolated piers or columns.~~

~~**2109.3.4.5 Tie beams.** *Exterior walls* and interior *load-bearing walls* constructed of adobe units shall have a continuous tie beam at the level of the floor or roof bearing and meeting the following requirements.~~

~~**2109.3.4.5.1 Concrete tie beams.** Concrete tie beams shall be a minimum depth of 6 inches (152 mm) and a minimum width of 10 inches (254 mm). Concrete tie beams shall be continuously reinforced with a minimum of two No. 4 reinforcing bars. The 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)~~

~~**2109.3.4.5.2Wood tie beams.** Wood tie beams shall be solid or built up of lumber having a minimum nominal thickness of 1 inch (25 mm), and shall have a minimum depth of 6 inches (152 mm) and a minimum width of 10 inches (254 mm). Joints in wood tie beams shall be spliced a minimum of 6 inches (152 mm). No splices shall be allowed within 12 inches (305 mm) of an opening. Wood used in tie beams shall be *approved* naturally decay-resistant or preservative-treated wood.~~

~~**2109.3.4.6 Exterior finish.** *Exterior walls* constructed of unstabilized adobe units shall have their exterior surface covered with a minimum of two coats of Portland cement plaster having a minimum thickness of 3/4 inch (19.1 mm) and conforming to ASTM C 926. Lathing shall comply with ASTM C 1063. Fasteners shall be spaced at 16 inches (406 mm) o.c. maximum. Exposed wood surfaces shall be treated with an *approved* wood preservative or other protective coating prior to lath application.~~

~~**2109.3.4.7 Lintels.** Lintels shall be considered structural members and shall be designed in accordance with the applicable provisions of Chapter 16.~~

SECTION 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 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.~~

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SECTION 2114A
NONBEARING WALLS

2114A.1 General. *All nonbearing masonry walls shall be reinforced as specified in Section 2106A.1.1.1 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.8~~ 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 Sections 1604A.8.2 and ASCE 7 Chapter 13. Suspended ceilings or other nonstructural elements shall not be used to provide anchorage for masonry walls.*

SECTION 2115A
MASONRY SCREEN WALLS

2115A.1 General. *Masonry units may be used in nonbearing decorative screen walls. Units may be laid up in panels with units on edge with the open pattern of the unit exposed in the completed wall.*

1. ***Horizontal Forces.*** *The panels shall be capable of spanning between supports to resist the horizontal forces specified in Chapter 16A. Wind loads shall be based on gross projected area of the block.*

2. ***Mortar Joints.*** *Horizontal and vertical joints shall not be less than 1/4 inch (6 mm) thick. All joints shall be completely filled with mortar and shall be "shoved joint" work. The units of a panel shall be so arranged that either the horizontal or the vertical joint containing reinforcing is continuous without offset. This continuous joint shall be reinforced with a minimum of 0.03 square inch (19 mm^2) of*

reinforcing steel and maximum spacing of 16 in. on center. Reinforcement may be embedded in mortar.

3. ***~~Reinforcing~~ Reinforcement.*** *Joint ~~reinforcing~~ reinforcement 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~~ reinforcement 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). The specified thickness of the units for exterior applications shall not be less than 3 7/8 in.*

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)~~ 1 inch (25 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]

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.

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

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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	
2201.1.2		X	
2201.1.3		X	
2201.1.4		X	
2212		X	Was Section 2211 in 2010 CBC
2212.1		X	Revised
~~*2211.1.4*~~ *2212.1.1*		X	From Section 2211.1.4, CBC 2010
2212.2		X	New Amendment
2212.3		X	New Amendment
~~*2211.2*~~ *2212.4*		X	From Section 2211.2, CBC 2010
~~*2211.4*~~ *2212.5*		X	From Section 2211.4, CBC 2010
~~*2211.5*~~ *2212.6*		X	From Section 2211.5, CBC 2010

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

EXPRESS TERMS

SECTION 2201
GENERAL

2201.1 Scope. The provisions of this chapter govern the quality, design, fabrication and erection of steel used structurally in buildings or structures.

2201.1.1 Application. [DSA-SS/CC] *The scope of application of Chapter 22 is as follows:*

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.

2201.1.2 Identification of amendments. [DSA-SS/CC]

Division of the State Architect-Structural Safety/Community Colleges amendments appear in this chapter preceded with the appropriate acronym, as follows:
[DSA-SS/CC] *- For community college buildings listed in Section 1.9.2.2*

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.*

2201.1.4 Amendments. [DSA-SS/CC] *See Section ~~2211~~ 2212 for additional requirements.*

. . .

SECTION ~~2211~~ 2212
ADDITIONAL REQUIREMENTS [DSA-SS/CC]

~~2211.1~~ 2212.1 Connections.

~~2211.1.1 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.~~*

~~2211.1.2 Consumables for welding.~~

~~2211.1.2.1 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.~~*

~~2211.1.2.2 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.~~*

~~2211.1.3 Welded shear connectors.~~ *~~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.~~*

~~2211.1.4~~ 2212.1.1 Column base plate. *When shear and / or tensile forces are intended to be transferred between column base plates and anchor bolts, provision shall be made in the design to eliminate the effects of oversized holes permitted in base plates by AISC 360 by use of shear lugs and / or welded shear transfer plates or other means acceptable to the enforcement agency, when the oversized holes are larger than the anchor bolt by more than 1/8 inch (3.2 mm). When welded shear transfer plates and shear lugs or other means acceptable to the enforcement agency are not used, the anchor bolts shall be checked for the induced bending stresses in combination with the shear stresses.*

2212.2 Modifications to AISC 341.

2212.2.1 Section D1. *Add Section D1.6 as follows:*

6. Diaphragm bracing systems*. The required strength of diagonal bracing members used as the diaphragm shall be determined from either of the following:*

(1) The load effect resulting from the diaphragm analysis per the applicable building code provided the members satisfy all of the following requirements:

1. *Diagonal bracing members comply with Section D1.1 for moderately ductile members.*
2. *Each diagonal bracing member resists no more than 30% of the diaphragm shear at each line of resistance.*
3. *Diagonal bracing members shall not support gravity loads other than self-weight.*

(2) The load effect required for collectors using the load combinations stipulated in the applicable building code.

2212.2.2 Section D2. *Modify Section D2.6c(b)(ii) as follows:*

(ii) the moment calculated using the load combinations of the applicable building code, including the amplified seismic load*, provided the connection or other mechanism within the column base is designed to have the ductility necessary to accommodate the column base rotation resulting from the design story drift.*

2212.2.3 Section D2. *Add Section D2.9 as follows:*

9. Diaphragm bracing systems*. The required strength of the connections of diagonal bracing members used as the diaphragm shall be the load effect required for collectors using the load combinations stipulated in the applicable building code.*

2212.2.4 Section F2. *Modify Section F2.3 Exception (2)(a) as follows:*

(a) The *maximum of the* forces determined using load combination stipulated by the applicable building code including the amplified seismic load, applied to the building frame model in which all compression braces have been removed *and those determined with no compression braces removed per D1.4a(2).*

2212.2.5 Section F2. *Modify Section F2.4a by adding the following:*

Where each framing bay on a line of resistance does not have opposing diagonal braces within the same column bay, then the collector forces along that line shall be designed considering the redistribution of seismic forces to other bays as a result of the post buckled redistribution of loads using the analysis requirements of Section F2.3. The collector shall not be designed for a load less than that stipulated by the applicable building code:

2212.3 Seismic requirements for composite structural steel and concrete construction. *In addition to the requirements of Section 2206.2, steel and concrete composite special moment frame with the ConXtech ConXL moment connections in accordance with AISC 358 Chapter 10 shall be permitted provided:*

1. *Beams are provided with Reduced Beam Sections (RBS),*
2. *Columns shall be Hollow Structural Sections (HSS) and completely filled with structural concrete having unit weight not less than 110 pounds per cubic foot (17 kN/m^3). Concrete shall have 28-day compressive strength not less than 4,000 psi (28 MPa).*
3. *Collar Web Extension (CWX) to beam web two sided fillet weld welds are sized to develop expected strength of the beam web and shall not be less than a ¼ inch fillet weld,*
4. *The high strength bolt design shall consider interaction between shear and tension as required by AISC 360, and*
5. *The HSS shall not be less than ½ inch.*

~~2211.2~~ 2212.4 Steel joists.

~~2211.2.1~~ 2212.4.1 Design Approval. *Joist and joist girder design calculations and profiles with member sizes and connection details, and joist placement plans shall be provided to the enforcement agency and approved prior to joist fabrication, in accordance with Title 24, Part 1. Joist and joist girder design calculations and profiles with member sizes and connection details shall bear the signature and stamp or seal of the registered engineer or licensed architect responsible for the joist design. Alterations to the approved joist and joist girder design calculations and profiles with member sizes and connection details, or to fabricated joists are subject to the approval of the enforcement agency.*

~~2211.2.2~~ 2212.4.2 Joist chord bracing. *The chords of all joists shall be laterally supported at all points where the chords change direction.*

~~2211.3 Cold-formed steel.~~

~~2211.3.1 Steel deck diaphragms.~~ *~~Diaphragm chord 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.~~*

~~2211.4~~ 2212.5 Cold-formed steel light-frame construction.

~~2211.4.1~~ 2212.5.1 Trusses.

~~2211.4.1.1~~ 2212.5.1.1 Analysis submittals. *Complete engineering analysis and truss design drawings shall accompany the construction documents submitted to the enforcement agency for approval. When load testing is required the test report shall be submitted with the truss design drawings and engineering analysis to the enforcement agency.*

~~2211.4.1.2~~ 2212.5.1.2 ***Deferred submittals.*** *AISI S214 Section B4.2 shall not be deleted.*

~~2211.4.2~~ 2212.5.2 ***Anchorage for shear.*** *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.*

~~2211.4.3~~ 2212.5.3 ***Limitations on shear wall assemblies.*** *Shear wall assemblies per Section C2.2.3 of AISI- 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.*

~~2211.5~~ 2212.6 ***Testing.***

~~2211.5.1~~ 2212.6.1 ***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 2205.*

~~2211.5.2~~ 2212.6.2 ***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.

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

CHAPTER 22A
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			

(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 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 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 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*, 2208*A*, 2210*A* and 2211*A*. Special inspection of welding shall be provided where required by Section 1705*A*.

~~***2204A.1.1 Welded Splice.*** *No welded splices shall be made except those shown on approved plans. Welded butt splices subject to tension greater than 33% of the expected yield strength under the load combinations with overstrength factor, shall have tapered transitions as required per AWS D1.8 Clause 4.2.*~~

~~***2204A.1.2 Consumables for Welding.***~~

~~***2204A.1.2.1. Seismic Force Resisting System (SFRS) Welds.***~~

~~*All welds used in members and connections in the SFRS shall be made with filler metals meeting the requirements specified in AWS D1.8 Clause 6.3. AWS D1.8 Clauses 6.3.5, 6.3.6, 6.3.7 and 6.3.8 shall apply only to demand critical welds.*~~

~~***2204A.1.2.2 Demand Critical Welds.***~~

~~*Where welds are designated as demand critical, they shall be made with filler metals meeting the requirements specified in AWS D1.8 Clause 6.3.*~~

~~***2204A.1.3 Welded Shear Connectors.***~~

~~*Where welded shear connectors in composite members are used as part of the seismic force resisting system, their shear and tensile strength shall be reduced by 25% from the specified strengths given in AISC 360 Chapter I.*~~

~~***Exception:*** *The 25% reduction is not necessary for collector components in structure designed for the load combinations with overstrength factor.*~~

. . .

2204A.2.2 Column base plate. *When shear and / or tensile forces are intended to be transferred between column base plates and anchor bolts, provision shall be made in the design to eliminate the effects of oversized holes permitted in base plates by AISC 360 by use of shear lugs and / or welded shear transfer plates or other means acceptable to the enforcement agency, when the oversized holes are larger than the anchor bolt by more than 1/8 inch (3.2 mm). When welded shear transfer plates and shear lugs or other means acceptable to the enforcement agency are not used, the anchor bolts shall be checked for the induced bending stresses in combination with the shear stresses.*

SECTION 2205A
STRUCTURAL STEEL

2205*A*.1 General. The design, fabrication and erection of structural steel for buildings and structures shall be in accordance with AISC 360. Where required, the seismic design of structural steel structures shall be in accordance with the additional provisions of Section 2205*A*.2.

2205.2 Seismic requirements for structural steel structures. The design of structural steel structures to resist seismic forces shall be in accordance with the provisions of Section ~~2205.2.1 or~~ 2205.2.2, as applicable.

2205*A*.2.1 Seismic Design Category B or C.. *Not permitted by DSA-SS.* ~~Structural steel structures assigned to Seismic Design Category B or C shall be of any construction permitted in Section 2205. Where a response modification coefficient, R, in accordance with ASCE 7, Table 12.2-1 is used for the design of structural steel structures assigned to Seismic Design Category B or C, the structures shall be designed and detailed in accordance with the requirements of AISC 341.~~

~~**Exception:** The response modification coefficient, R, designated for "Steel systems not specifically detailed for seismic resistance, excluding cantilever column systems" in ASCE 7, Table 12.2-1 shall be permitted for systems designed and detailed in accordance with AISC 360, and need not be designed and detailed in accordance with AISC 341.~~

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. ~~, except as permitted in ASCE 7, Table 15.4-*1 irrespective of the R values, unless approved otherwise by the enforcement agency*.~~

2205A.3 Modifications to AISC 341. [DSA-SS]

2205A.3.1 Section D1. *Add Section D1.6 as follows:*

***6. Diaphragm bracing systems**. The required strength of diagonal bracing members used as the diaphragm shall be determined from either of the following:*

(1) The load effect resulting from the diaphragm analysis per the applicable building code provided the members satisfy all of the following requirements:

1. *Diagonal bracing members comply with Section D1.1 for moderately ductile members.*
2. *Each diagonal bracing member resists no more than 30% of the diaphragm shear at each line of resistance.*
3. *Diagonal bracing members shall not support gravity loads other than self-weight.*

(2) The load effect required for collectors using the load combinations stipulated in the applicable building code.

***2205A.3.2 Section D2.** Modify Section D2.6c(b)(ii) as follows:*

(ii) the moment calculated using the load combinations of the applicable building code, including the amplified seismic load*, provided the connection or other mechanism within the column base is designed to have the ductility necessary to accommodate the column base rotation resulting from the design story drift.*

***2205A.3.3 Section D2.** Add Section D2.9 as follows:*

***9. Diaphragm bracing systems**. The required strength of the connections of diagonal bracing members used as the diaphragm shall be the load effect required for collectors using the load combinations stipulated in the applicable building code.*

***2205A.3.4 Section F2.** Modify Section F2.3 Exception (2)(a) as follows:*

(a) The *maximum of the* forces determined using load combination stipulated by the applicable building code including the amplified seismic load, applied to the building frame model in which all compression braces have been removed *and those determined with no compression braces removed per D1.4a(2).*

***2205A.3.5 Section F2.** Modify Section F2.4a by adding the following:*

Where each framing bay on a line of resistance does not have opposing diagonal braces within the same column bay, then the collector forces along that line shall be designed considering the redistribution of seismic forces to other bays as a result of the post buckled redistribution of loads using the analysis requirements of Section F2.3. The collector shall not be designed for a load less than that stipulated by the applicable building code.

***2205A.4** (Reserved for OSHPD)*

***2205A.5** (Reserved for OSHPD)*

SECTION 2206*A*
COMPOSITE STRUCTURAL STEEL AND CONCRETE STRUCTURES

2206*A*.1 General. Systems of structural steel acting compositely with reinforced concrete shall be designed in accordance with AISC 360 and ACI 318, excluding ACI 318 Chapter 22. Where required, the seismic design of composite steel and concrete systems shall be in accordance with the additional provisions of Section 2206*A*.2.

2206*A*.2 Seismic requirements for composite structural steel and concrete construction. Where a response modification coefficient, *R*, in accordance with ASCE 7, Table 12.2-1 is used for the design of systems of structural steel acting compositely with reinforced concrete, the structures shall be designed and detailed in accordance with the requirements of AISC 341 *and shall be considered as an alternative system*.

Exception: *Steel and concrete composite special moment frame with the ConXtech ConXL moment connections in accordance with AISC 358 Chapter 10 shall be permitted provided:*

1. *Beams are provided with Reduced Beam Sections (RBS),*
2. *Columns shall be Hollow Structural Sections (HSS) and completely filled with structural concrete having unit weight not less than 110 pounds per cubic foot (17 kN/m^3). Concrete shall have 28-day compressive strength not less than 4,000 psi (28 MPa).*
3. *Collar Web Extension (CWX) to beam web two sided fillet weld welds are sized to develop expected strength of the beam web and shall not be less than a ¼ inch fillet weld,*
4. *The high strength bolt design shall consider interaction between shear and tension as required by AISC 360, and*
5. *The HSS shall not be less than ½ inch.*

SECTION 2207*A*
STEEL JOISTS

. . .

2207*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.

~~Steel joist placement plans do not require the seal and signature of the joist manufacturer's *registered design professional*.~~

. . .

***~~2206A.4.1~~ 2207A.4.1* 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 the California Administrative Code (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.6~~ 2207A.6* Joist Chord Bracing.** *The chords of all joists shall be laterally supported at all points where the chords change direction.*

SECTION 2208*A*
STEEL CABLE STRUCTURES

2208*A*.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.

~~**2208.2 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 2210*A*
COLD-FORMED STEEL

2210*A*.1 General. The design of cold-formed carbon and low alloy steel structural members shall be in accordance with AISI S100. The design of cold-formed stainless-steel structural members shall be in accordance with ASCE 8. Cold formed steel light-frame construction shall also comply Section 2211*A*. Where required, the seismic design of cold-formed steel structures shall be in accordance with the additional provisions of Section 2210*A*.2.

2210*A*.1.1 Steel decks. The design and construction of cold formed steel decks shall be in accordance with this section.

2210*A*.1.1.1 Noncomposite steel floor decks. Noncomposite steel floor decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-NC1.0.

2210*A*.1.1.2 Steel roof deck. Steel roof decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-RD1.0. *(Relocated from the CBC 2010 Section 2209A.3) The base material thickness of steel deck ~~for diaphragms~~ shall not be less than 0.0359 inch (0.9 mm) (20 gage).*

Exception: [DSA-SS] *For single-story open structures, the minimum deck thickness may be waived if the steel roof deck need not be used as the diaphragm and there are no suspended hangers or bracing for non-structural components attached to the deck.*

2210A.1.1.3 Composite slabs on steel decks. *Composite slabs of concrete and steel deck shall be permitted to be designed and constructed in accordance with ANSI/SDI-C.*

2210*A*.2 Seismic requirements for cold-formed steel structures. Where a response modification coefficient, *R*, in accordance with ASCE 7, Table 12.2-1 is used for the design of cold-formed steel structures, the structures shall be designed and detailed in accordance with the requirements of AISI S100~~,~~ *and* ASCE 8. ~~, and, for cold-formed steel special bolted moment frames, AISI S110.~~

~~***2209A.3 Steel deck diaphragms.*** *Steel deck diaphragms shall comply with the requirements of this section. 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.*~~

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

2211*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 2211*A*.2 through 2211*A*.7, as applicable.

. . .

2211*A*.3 Truss design. Cold-formed steel trusses shall be designed in accordance with AISI S214, Sections 2211*A*.3.1 through 2211*A*.3.4 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, the test report shall be submitted with the truss design drawings and engineering analysis to the enforcement agency.

2211*A*.3.1 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 B-6(c)~~ of AISI S214 where these methods are utilized to provide restraint/bracing.

2211*A*.3.2 Deferred submittals. ~~AISI S214 Section B4.2 shall be deleted.~~ *Not permitted by DSA-SS.*

. . .

2211*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.

2211*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 S213 are not permitted within the seismic force-resisting system of buildings.

2211*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~~ 2212A [DSA-SS]
LIGHT MODULAR STEEL MOMENT FRAMES FOR PUBLIC ELEMENTARY AND SECONDARY SCHOOLS, AND COMMUNITY COLLEGES

~~2211A.1~~ 2212A.1 General.

~~2211A.1.1~~ 2212A.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~~ 2212A.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~~ 2212A.2.5 of this code.*

~~2211A.1.2~~ 2212A.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~~ 2212A.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 $3^1/_2$. Cd and Ω_0 shall be equal to 3.0.*

***~~2211A.2.1~~ 2212A.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~~ 2212A.2.2* Beam-to-column strength ratio.** *At each moment-resisting connection the following shall apply:*

$$\frac{\sum S_{bi}F_{ybi}}{\sum S_{cj}F_{ycj}} \geq 1.4$$ **(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~~ 2212A.2.3* Welding.** *Weld filler metals shall be capable of producing weld metal with a minimum Charpy V-Notch toughness of 20 ft-lb 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~~ 2212A.2.4* Connection design.** *Connections of beams to columns shall have the design strength to resist the maximum seismic load effect, E_m , calculated in accordance with Section 12.4.3 of ASCE 7.*

***~~2211A.2.5~~ 2212A.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.*

SECTION ~~2212A~~ 2213A
TESTING AND FIELD VERIFICATION

***2213A.1 ~~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~~ applicable ASTM standards.*

2213A.2 ***~~2212A.2~~*** ***Tests of End-welded Studs.*** *End-welded studs shall be ~~sampled and~~ tested per the requirements of the AWS D1.1, Sections 7.7 and 7.8.*

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.

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

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	
2301.2, Item 4, Exception	X	X	
2303.1.3.1	X	X	
2303.4.1.2, Exception 3	X	X	
2303.4.3.1	X	X	
2304.3.4	X	X	
2304.4.1	X	X	
2304.6.1, Exception	X	-	
2304.9.1.1	X	-	
2304.11.2.2, Exception	X	-	
2304.11.2.4.1	X	-	
2305.1.2	X	X	Revised
2305.2, Exception	X	X	
2305.3, Exception	X	X	
2306.2, Exception	X	X	New Amendment
2306.3, Exception	X	X	New Amendment
2308.2, Item 8	X	X	

(All existing California amendments that are not revised below shall continue without 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 Sections 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 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 <u>by DSA</u>.*

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SECTION 2302
DEFINITIONS

2302.1 Definitions. The following terms are defined in Chapter 2:

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NATURALLY DURABLE WOOD.

Decay resistant.

Termite resistant.

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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 A 190.1 and ASTM D 3737.

2303.1.3.1 Additional requirements. [DSA-SS & DSA-SS/CC] *The construction documents shall indicate the following:*

1. *Dry or wet service conditions.*
2. *Laminating combinations and stress requirements.*
3. *Species group.*
4. *Preservative material and retention, when preservative treatment is required.*
5. *Provisions for protection during shipping and field handling, such as sealing and wrapping in accordance with AITC 111.*

When mechanical reinforcement such as radial tension reinforcement is required, such reinforcement shall comply with AITC 404 and shall be detailed accordingly in the construction documents. Construction documents shall specify that the moisture content of laminations at the time of manufacture shall not exceed 12% for dry conditions of use.

The design of fasteners and connections shall comply with AITC 117, Section I, Item 6 (Connection Design), and NDS Appendix E.

Refer to Section ~~1704A.6.3~~ 1705A.5.4 for special inspection requirements during fabrication of structural glued laminated timbers.

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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. ***[DSA-SS & DSA-SS/CC]*** *Exceptions 1 and 2 are not permitted by DSA.*

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; and, as applicable, the cover/truss index sheet.

2303.4.3.1 Additional requirements. [DSA-SS & DSA-SS/CC] *In addition to Sections ~~2304.1~~ 2303.4.1 and ~~2304.2~~ 2303.4.2, 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 Deflection criteria.

   1.2 Connection details to structural and non-structural elements (e.g. non-bearing partitions).

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 the California Administrative Code ~~C.C.R.,~~ (Title 24, Part 1). Alterations to the approved truss design drawings or manufactured trusses are subject to the approval of the enforcement agency.*

3. ***Special inspection during truss manufacture.*** *Refer to Section ~~1704A.6.2~~ 1705A.5.5 for special inspection requirements during the manufacture of open-web trusses.*

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SECTION 2304
GENERAL CONSTRUCTION REQUIREMENTS

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2304.3.4 Additional requirements. [DSA-SS & DSA-SS/CC] *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.*

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 & DSA-SS/CC] *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.*

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2304.6.1 Wood structural panel sheathing. Where wood structural panel sheathing is used as the exposed finish on the outside of exterior 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), and a topographic factor (*Kz t*) of 1.0.

Exception: [DSA-SS] *Wind pressure shall be calculated in accordance with Section 1609A.*

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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.*

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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 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-frame shear walls or wood-frame diaphragms to resist wind, seismic or other lateral loads shall be designed and constructed in accordance with AF&PA SDPWS and the applicable provisions of Sections 2305, 2306 and 2307.

2305.1.1 Openings in shear panels. Openings in shear panels that materially affect their strength shall be detailed on the plans, and shall have their edges adequately reinforced to transfer all shearing stresses.

2305.1.2 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 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. *Wood structural panel shear walls and diaphragms using staples as fasteners are not permitted.*
5. *Unblocked shear walls are not permitted.*
6. *(Relocated from 2010 CBC Section 2305.1.3) Any wood structural panel sheathing used for ~~diaphragms and~~ shear walls that are part of the seismic force-resisting system shall be applied directly to framing members.*
7. *(Relocated from 2010 CBC, Section 2306.4) Single and double diagonally sheathed lumber walls shall not be used to resist seismic forces. ~~in structures assigned to Seismic Design Category D~~.*

~~2305.1.3~~ *(Relocated to 2305.1.2, Item 6)* ***~~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~~*

~~The anchor bolt is located a minimum of 15 anchor diameters from any concrete end that is perpendicular to the sill plate.~~

2305.2 Diaphragm deflection. The deflection of wood-frame diaphragms shall be determined in accordance with AF&PA SDPWS. The deflection (Δ) of a blocked wood structural panel diaphragm uniformly fastened throughout with staples is permitted to be calculated in accordance with Equation 23-1. If not uniformly fastened, the constant 0.188 (For SI: 1/1627) in the third term shall be modified by an approved method.

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Exception: [DSA-SS & DSA-SS/CC] *Section 2305.2 is not permitted by DSA.*

2305.3 Shear wall deflection. The deflection of wood-frame shear walls shall be determined in accordance with AF&PA SDPWS. The deflection (Δ) of a blocked wood structural panel shear wall uniformly fastened throughout with staples is permitted to be calculated in accordance with Equation 23- 2.

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Exception: [DSA-SS & DSA-SS/CC] *Section 2305.3 is not permitted by DSA.*

SECTION 2306
ALLOWABLE STRESS DESIGN

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2306.2 Wood-frame diaphragms. Wood-frame diaphragms shall be designed and constructed in accordance with AF&PA SDPWS. Where panels are fastened to framing members with staples, requirements and limitations of

AF&PA SDPWS shall be met and the allowable shear values set forth in Table 2306.2(1) or 2306.2(2) shall be permitted. The allowable shear values in Tables 2306.2(1) and 2306.2(2) are permitted to be increased 40 percent for wind design.

Exception: [DSA-SS & DSA-SS/CC] *Wood structural panel diaphragms using staples as fasteners are not permitted by DSA.*

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2306.3 Wood-frame shear walls. Wood-frame shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Where panels are fastened to framing members with staples, requirements and limitations of AF&PA SDPWS shall be met and the allowable shear values set forth in Table 2306.3(1), 2306.3(2) or 2306.3(3) shall be permitted. The allowable shear values in Tables 2306.3(1) and 2306.3(2) are permitted to be increased 40 percent for wind design. Panels complying with ANSI/APA PRP-210 shall be permitted to use design values for Plywood Siding in the AF&PA SDPWS.

Exception: [DSA-SS & DSA-SS/CC] *Wood structural panel shear walls using staples as fasteners are not permitted by DSA.*

~~***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.*~~

TABLE 2306.3(1) ALLOWABLE SHEAR VALUES (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS UTILIZING STAPLES WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE[a] FOR WIND OR SEISMIC LOADING[b, f, g, i]

(Table not shown for clarity)

~~*m.* ***[DSA/SS & DSA/SS-CC]*** *Refer to Section 2305.1.3, which requires any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic force-resisting system to be applied directly to framing members.*~~

~~**2306.4 Lumber sheathed shear walls.** Single and double diagonally sheathed lumber shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Single and double diagonally sheathed lumber walls shall not be used to resist seismic forces in structures assigned to *Seismic Design Category* E or F.~~

(Relocated to 2305.1.2, Item 7) ~~***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.*~~

~~**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.*~~

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SECTION 2308
CONVENTIONAL LIGHT-FRAME CONSTRUCTION

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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.

. . .

7. Conventional light-frame construction is limited in irregular structures assigned to 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.

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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.

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

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	
2410	X	X	New Amendment

(All existing amendments that are not revised below 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.

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SECTION 2403
GENERAL REQUIREMENTS FOR GLASS

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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.

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SECTION 2410 [DSA-SS & DSA-SS/CC]
STRUCTURAL SEALANT GLAZING (SSG)

2410.1 General. *The requirements of this section address the use of Structural Sealant Glazing (SSG). These requirements shall not be used for butt joint glazing, point supported glass, and glass fins.*

Design, construction, testing, and inspection shall satisfy the requirements of this code except as modified in Sections 2410.1.1 through 2410.1.4.

2410.1.1 Design. *Design of Structural Sealant Glazing (SSG) shall satisfy the following requirements:*

1. *SSG shall be waterproof and serviceable under design story drifts associated with the Design Earthquake and no glass fallout shall occur at the drifts determined by ASCE 7 Section 13.5.9.1 and AAMA 501.4 Section 11.3.*

2. *The sealant utilized in the insulated glass units used in SSG shall be designed in accordance with ASTM C 1249. The insulated glass unit design shall include compliance with ASTM C 1249 Section 6.7.2.*

3. *Allowable stress for SSG shall not exceed 20 psi and shall have a minimum factor of safety of 5 as required by ASTM C 1401.*

4. *Design methodology shall address seismic movement as required by ASTM C 1401 Section 30.3.4.*

5. *SSG systems shall be supported for self-weight and lateral loading at each floor level of the building.*

6. *Unitized SSG framing shall be anchored to the building floor bearing plate by screws or bolts and shall not rely upon gravity or frictional forces for attachment.*

7. *Framing shall satisfy the out-of-plane deflection requirements of this code.*

2410.1.2 Testing and Inspection. *Testing and inspection of Structural Sealant Glazing (SSG) shall satisfy the following requirements:*

a. *The seismic drift limits of structural sealant glazing shall be determined by tests in accordance with AAMA 501.6, AAMA 501.4 and ASCE 7 Section 13.5.9.2.*

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

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

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

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

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

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

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

i. *Quality assurance and inspection requirements shall include formalized post-installation tests using the Point Load Testing procedure in accordance with ASTM C 1392. The Point Load Tests shall be done after the initial installation, then once every year for 3 years, not less than one test per elevation each time.*

   Exception: *[DSA-SS, DSA-SS/CC] For 2-sided SSG systems where the horizontal edges are mechanically attached to mullions, the yearly point load test for 3 years is not required.*

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

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

2410.1.3 Monitoring. *Short and Long term periodic performance monitoring shall be provided in accordance with ASTM C 1401, C 1392, and C 1394. Inspection frequencies recommended in ASTM C 1392 Section 5.1 shall be followed.*

After every significant seismic event, where the ground shaking acceleration at the site exceeds 0.3g, or the acceleration at any monitored building level (if any) exceeds 0.8g, as measured by the seismic monitoring system in the building, the owner shall retain a structural engineer to make an inspection of the SSG system. The inspection shall include viewing the performance of the panel, structural sealant, glass, reviewing the strong motion records, and a visual examination of the overall performance for

deterioration, offset or physical damage. A report for each inspection, including conclusions on the continuing adequacy of the SSG system, shall be submitted to the enforcement agency.

Exception: [DSA-SS, DSA-SS/CC] *The inspection requirements triggered by specific ground shaking acceleration or measured building acceleration is not required.*

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

1. *A design narrative explaining how the SSG is supported by the building and the mechanism used to accommodate seismic racking.*
2. *Type of SSG and whether field or shop built.*
3. *The means of supporting the glass during structural sealant curing time shall be shown in the construction documents.*
4. *Typical curtain wall panel elevation, plan view, and sections.*
5. *Details of building corner joint to verify how the corner vertical mullion will move to accommodate the seismic drift.*
6. *Joints between panel and floors at top and bottom.*
7. *Joint between panels – including vertical & horizontal stack joints at intermediate and edge mullion.*
8. *Member sizes for curtain wall panels.*
9. *Glass pane sizes, thickness and type of glass.*
10. *Contact width of structural sealant and sealant materials for shop and field installation/re-glazing.*
11. *Glass to aluminum joints (including primers, if any).*
12. *Maximum roof/floor dead and live load deflection of the roof/floor framing members supporting the exterior curtain wall system.*
13. *Required seismic separation or gap distance between the structural sealant glazing curtain wall and other adjacent cladding units.*
14. *Mitigation of galvanic reactions between the roof/floor slab anchors, steel screw connections of aluminum sections and the aluminum anchorage components, if any.*

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.

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

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	Revised
2504.2.1	X	X	
2505.3	X	X	
2507.3	X	X	
2508.5.6	X	X	

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

EXPESS 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 construction documents.*

. . .

SECTION 2503
INSPECTION

2503.1 Inspection. Lath and gypsum board shall be inspected in accordance with Section 110.3.5, *Chapter 1, Division II*.

2503.2 Additional requirements for inspection and testing. [DSA-SS & DSA-SS/CC]

1. Lath and gypsum board shall be inspected in accordance with Chapter 17A and the California Administrative Code (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 in accordance with Table 2506.2 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

. . .

2504.2 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 (**[DSA-SS/CC]** Chapter 22) .~~ 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 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. Gypsum board and gypsum plaster construction shall be of the materials listed in Tables 2506.2 and 2507.2. These materials shall be assembled and installed in compliance with the appropriate standards listed in Tables 2508.1 and 2511.1.1, and Chapter 35.

. . .

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)

. . .

2510.7 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

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.

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

CHAPTER 26
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

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 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			

Notation

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 PUBIC 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 entire chapter	**X**	**X**	
Adopt entire chapter with amendments listed below			
Adopt only those sections listed below			

EXPRESS TERMS

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, or essential services building, the system shall be designed and constructed to conform to all requirements of these regulations.*~~

~~***3307.3 Protection of Existing Buildings. [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.*~~

. . .

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.

(All existing DSA-SS & DSA-SS/CC amendments are stricken)

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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	
3402	X	X	Revised
3417	X	X	
3417.1.2	X	-	
3417.1.3	-	X	
3417.3.2	X	-	
3417.3.3	-	X	
3418	X	X	Revised
3419	X	X	Revised
3420	X	X	Revised
3421	X	X	Revised
3422	X	X	
3423	X	X	

(All existing amendments that are not revised below shall continue without 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 buildings and structures.

Exceptions:

1. Existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300.

. . .

3401.1.1 Existing state-owned structures. *The provisions of Sections 3417 through 3422 establish minimum standards for earthquake evaluation and design for retrofit of existing state-owned structures, including buildings owned by the University of California and the California State University.*

The provisions of Sections 3417 through 3422 may be adopted by a local jurisdiction for earthquake evaluation and design for retrofit of existing buildings.

3401.1.2 Public school buildings. [DSA-SS] *The provisions of Sections 3417 through 3423 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 1.9.2.1) where required by Sections 4-307 and 4-309(c) of the California Administrative Code.*

The provisions of Section 3417 through 3423 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 3417 through 3423 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 *3417 through 3423 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 3402
DEFINITIONS

3402.1 Definitions. The following terms are defined in Chapter 2:

DANGEROUS.

EXISTING STRUCTURE.

PRIMARY FUNCTION.

(Relocated to Chapter 2) ~~***RETROFIT*** *is the construction of any new element or system, or the alteration of any existing element or system required to bring an existing building, or portion thereof, conforming to earlier code requirements, into conformance with standards of the currently effective California Building Standards Code.*~~

SUBSTANTIAL STRUCTURAL DAMAGE.

TECHNICALLY INFEASIBLE.

. . .

SECTION 3417
EARTHQUAKE EVALUATION AND DESIGN FOR
RETROFIT OF EXISTING BUILDINGS

3417.1 Purpose.

3417.1.1 Existing state-owned structures. *The provisions of Sections 3417 through 3423 establish minimum standards for earthquake evaluation and design for retrofit of existing state-owned structures, including buildings owned by the University of California and the California State University.*

The provisions of Sections 3417 through 3423 may be adopted by a local jurisdiction for earthquake evaluation and design for retrofit of existing buildings.

3417.1.2 Public school buildings. *The provisions of Sections 3417 through 3423 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 1.9.2.1.*

The provisions of Section 3417 through 3423 also establish minimum standards for earthquake evaluation and design for rehabilitation of existing public buildings currently under the jurisdiction of DSA-SS.

3417.1.2.1 Reference to other chapters. *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.*

3417.1.3 Community college buildings. *The provisions of Sections 3417 through 3423 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 3417 through 3423 also establish minimum standards for earthquake evaluation and design for rehabilitation of existing community college buildings currently under the jurisdiction of DSA-SS/CC.

3417.1.3.1 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.*

3417.2 Scope. *All modifications, structurally connected additions and/or repairs to existing structures or portions thereof shall, at a minimum, be designed and constructed to resist the effects of seismic ground motions as provided in this section. The structural system shall be evaluated by a registered design professional and, if not meeting or exceeding the minimum seismic design performance requirements of this section, shall be retrofitted in compliance with these requirements.*

Exception: *Those structures for which Section 3417.3 determines that assessment is not required, or for which Section 3417.4 determines that retrofit is not needed, then only the requirements of Section 3417.11 apply.*

3417.3 Applicability.

. . .

3417.3.2 Public school buildings. *For public schools, the provisions of Section 3417 apply when required in accordance with Sections 4-307 and 4-309(c), Title 24, Part 1.*

3417.3.3 Community college buildings. *For community colleges, the provisions of Section 3417 apply when required in accordance with Sections 4-307 and 4-309(c), Title 24, Part 1.*

. . .

SECTION 3419
SEISMIC CRITERIA SELECTION FOR EXISTING BUILDINGS

3419.1 Basis for evaluation and design. *This section determines what technical approach is to be used for the seismic evaluation and design for existing buildings. For those buildings or portions of buildings for which Section 3417 requires action, the procedures and limitations for the evaluation of existing buildings and design of retrofit systems and/or repair thereof shall be implemented in accordance with this section.*

One of the following approaches must be used:

1. *Method A of Section 3420;*
2. *Method B of Section 3421, with independent review of a peer reviewer as required in Section ~~3420~~ 3422; or*
3. *For state-owned buildings only, the use of one of the specific procedures listed in Section 3419.1.1.*

When Method B is chosen it must be approved by the building official, and, where applicable, by the peer reviewer. All referenced standards in ASCE 41 shall be replaced by referenced standards listed in Chapter 35 of this code.

Exceptions:

1. *For buildings constructed to the requirements of California Building Code, 1998 or later edition as adopted by the governing jurisdiction, that code is permitted to be used in place of those*

specified in Section 3419.1 provided the building complies with Seismic Design Category D or higher.

2. ***[DSA-SS & DSA-SS/CC]*** *For public schools and community colleges constructed to the requirements of California Building Code, 2007 or later edition, that code is permitted to be used in place of those specified in Section 3419.1 provided the building complies with Seismic Design Category D or higher.*

. . .

3419.1.3 *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 nonstructural evaluation procedure.*

3419.1.4 Public schools. *For public schools, unreinforced masonry shall not be used to resist in-plane or out-of-plane seismic forces or superimposed gravity loads.*

3419.1.5 Public schools. *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 assumed to resist seismic forces.*

3419.2 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 investigation. 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.

Data collection in accordance with ASCE 41 Section 2.2 shall meet the following minimum levels:

1. *For state-owned buildings, the requirements shall be met following the data collection requirements of ASCE 41, Section 2.2.*

~~*2. For public schools, the "Comprehensive" level as defined in ASCE 41, Section 2.2.6.3.*~~

~~*3*~~ *2. For public schools and community college buildings constructed in conformance with the Field Act, the "Usual" level as defined in ASCE 41, Section 2.2.6.2.*

~~*4*~~ *3. For public schools and community college buildings not constructed in conformance with the Field Act, the "Comprehensive" level as defined in ASCE 41, Section 2.2.6.3.*

Concrete material requirements and testing for public school and community college buildings shall also comply with Sections 1914A and 1913.5, respectively.

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 nonstructural 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.

. . .

3419.10 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.*

. . .

3419.12.2 Public schools and community colleges. *When Section 3419.12 is the basis for structural modifications, the approved design documents must clearly indicate the scope of modifications and the acceptance criteria for the design.*

. . .

SECTION 3423
ADDITIONAL REQUIREMENTS FOR PUBLIC SCHOOLS AND COMMUNITY COLLEGES

The requirements of Section 3423 apply only to public schools under the jurisdiction of the Division of the State Architect-Structural Safety (DSA-SS, refer to Section 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.

3423.1 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 4-306 or 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 nonstructural 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 ~~3418.2~~ 3419.2).*
5. *Include existing or "as-built" building plans, reports and associated documents of the existing construction.*

3423.2 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.

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

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			
AAMA	X	X	
ACI	X	X	
AF & PA	X	X	
AISC	X	X	
AISI			
AITC	X	X	
ANSI	X	X	
ASCE/SEI	X	X	
ASTM	X	X	
AWPA	X	X	
AWS	X	X	
FEMA	X	X	
ICC	X	X	
ISO	X	X	
NFPA	X	X	
PCI	X	X	
PTI	X	X	
TMS	X	X	

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, 22A, and 34A.*

. . .

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

ACI	American Concrete Institute 38800 Country Club Drive Farmington Hills, MI 48333-9094	
Standard reference number	Title	Referenced in code section number
. . .		
318-11	Building Code Requirements for Structural Concrete	*Table 1705A.2.1, 1705A.2.2.1.2, 1810A.3.10.4, 1903A, 1905A, 1913A.5, 1913A.7.2, ~~1916.1~~ 1913.2, 1913.3*
355.2-07	*Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary*	*1616A.1.19*
440.2R-08	*Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures*	*~~1917A.3~~ 1914A.3*
. . .		
503.7-07	*Specification for Crack Repair by Epoxy Injection.*	*~~1917A.2~~ 1914A.2*
506-05	*Guide to Shotcrete*	*1913.4.5, ~~1913A~~ , 1910A.1, 1910A.3, 1910A.12, 1914A.2*
530-11	Building Code Requirements for Masonry Structures	*2114.10, 2114.11*
. . .		

AF&PA	American Forest Products & Paper Association 1119th St., NW Suite 800 Washington, DC 20036	
Standard reference number	Title	Referenced in code section number
. . .		
NDS-2012	National Design Specifications (NDS) for Wood Construction with 2012 Supplement	*1905A.1.21*
. . .		
ANSI/AF&PA SDPWS-2008	Special Design Provisions for Wind and Seismic	*1616.2.1*

AISC	American Institute of Steel Construction Construction One East Wacker Drive, Suite 700 Chicago, IL 60601-2001	
Standard reference number	Title	Referenced in code section number
341-10	Seismic Provisions for Structural Steel Buildings	*1705A.2.1, 2212.2, 2205A*
358-~~05~~ 10	*Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications including Supplement No. 1*	*2212.3, 2205A, 2206A.2*
360-10	Specifications for Structural Steel Buildings	*1705A.2.1, Table 1705A.2.1, 2206A.2, 2212.1.1, 2212.3, 2204A.2.2, 2212A.1.2. 2212A.2.1*

AISI	American Iron and Steel Institute 1140 Connecticut Avenue, 705 Suite 705 Washington. DC 20036	
Standard reference number	Title	Referenced in code section number
AISI S100-07/S~~1~~2-10	North American Specification for the Design of Cold-formed Steel Structural Members, with Supplement 1, dated 2010	*1905A.1, 1913.3.8, 2210A.2, 2211A.1, 2212A.1.2*
S213-07/SI-10	North American Standard for Cold-formed Steel Framing Lateral Design, with Supplement 1, dated 2010	*2212A.2.1, 2212.5.3*
S214-07	North American Standard for Cold-formed Steel Framing-Truss Design, with Supplement 2, dated 2008	*2211A.3, 2212.5.1.2*

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 117-10	Standard Specifications for Structural Glued Laminated Timber of Softwood Species	*2303.1.3.1*
. . .		
A 190.1-07	Structural Glued Laminated Timber	*1705A.5.4*
AITC 404-05	*Standard for Radially Reinforcing Curved Glued Laminated Timber Members to Resist Radial Tension*	*2303.1.3.1*

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ANSI	American National Standards Institute 25 West 43rd Street, Fourth Floor New York, NY 10036	
Standard reference number	Title	Referenced in code section number
. . .		
ANSI/SDI-C-2012	*Standard for Composite Steel Floor Deck Slabs*	*2210A.1.1.3*

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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	Title	Referenced in code section number
5-11	Building Code Requirements for Masonry Structures	*2114.10, 2114.11*
. . .		
7-10	*Minimum Design Loads for Buildings and Other Structures including Supplement No. 1*	*104.11, 202, 1509.7.1, 1616.9, 1616.10,1603A.2 1613A, 1616A, 1803A.6, 1905A.1.21, 1913.3.8, 2114A.1, 2114.13, 2210A.2, 2212A.2.4, 2410.1.1, 2410.1.2, 3419.7.2*
. . .		
19-~~09~~ 10	*Structural Application of Steel Cables for Buildings*	*2207.1, 2207.2*
. . .		
41-06	*Seismic Rehabilitation of Existing Buildings including Supplement No. 1*	*1603A.2, 1616A.1.30, 3417.5, 3417.8, 3418.1, 3419.1, 3419.2, 3419.5, 3419.7.2, 3419.8, 3419.9, 3420.1, 3421.2.2,*

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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
. . .		
A 153/A 153M-05	Specification for Zinc Coating (Hot-dip) on Iron and Steel Hardware	*2304.9.1.1*
. . .		
A 722/A722M-07	Specifications for Uncoated High-strength Steel Bar for Prestressing Concrete	*J106.2.4.2, 1811A.4*
. . .		
B 695-04	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel Strip for Building Construction	*2304.9.1.1*
. . .		
C 94/C94M-09	Specifications for Ready Mix Concrete	*1705A.3.3*
C 114-10	*Standard Test Methods for Chemical Analysis of Hydraulic Cement*	*1903A.6, 1913.2.3*
. . .		
C 150-07	Specification for Portland Cement	*1903A, 1913A, ~~1916.1.2~~ 1913.2*
. . .		

C 289-07	*Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates*	*~~1916.1.3~~ 1913.2.3, 1903A.3*
. . .		
C 270-08a	Specifications for Mortar for Unit Masonry	*2114.2*
. . .		
C 595-08a	Specification for Blended Hydraulic Cement	*1903A.6, 1913A.1, 1913.2*
. . .		
C 618 - 08a	*Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete*	*1903A.3, 1913A.1, ~~1916.1.3~~ 1913.2*
. . .		
C 635/C 635M-07	Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel ceilings	*1616.10.16, 1616A.1.20*
C 636/C 636M -08	Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels	*1616.10.16, 1616A.1.20*
. . .		
C 989-09	*Standard Specification for Slag Cement for Use in Concrete and Mortars*	*~~1903A.3~~ 1903A.5, 1903A.6, 1913A.1, ~~1916.1.3~~ 1913.2*
. . .		
C 1019	Test Method of Sampling and Testing Grout	*2105A.2.2.1.4, 2114.9.1*
. . .		
C 1157/C 1157M-11	*ASTM Standard Performance Specification for Hydraulic Cement*	*1913A.1, 1913.2.5*
. . .		
C 1240-11	*Standard Specification for Silica Fume Used in Cementitious Mixtures*	*1903A.6*
C 1249-06a(2011)	*Standard Guide for Secondary Seal for Sealed Insulated Glass Units for Structural Sealant Glazing Applications*	*1903A.6, 2410.1.1*
. . .		
C 1260-07	*Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)*	*1903A.6, 2410.1.1*
. . .		
C 1293-08b	*Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction*	*1903A.6, 1913.2.3*
. . .		
C 1314-07	Test Method for Compressive Strength of Masonry Prisms	*2114.9.1*
. . .		
C 1392-00 (2009)	*Standard Guide for Evaluating Failure of Structural Sealant Glazing*	*2410.1.3*
C 1394-03 (2008)	*Standard Guide for In-Situ Structural Silicone Glazing Evaluation*	*2410.1.3*
. . .		
C 1401-09a	*Standard Guide for Structural Sealant Glazing*	*2410.1*
. . .		
C1567-~~04~~ 08	*Standard Test Method for Determining the Potential Alkali-Silica Reactivity of the Combinations of Cementicious Materials and Aggregate (Accelerated Mortar-Bar Method)*	*~~1903A.3~~ 1903A.6, ~~1916.1.3~~ 1913.2.3,*
C1586-05	*Standard Guide for Quality Assurance of Mortars*	*2114.9.1, 2105A.2.2.1.4*

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D 1586 – ~~05~~ 11	*Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*	*J112.2*
. . .		
D 3441-05	*Standard Test Method for Mechanical Cone Penetration Tests of Soil*	*J112.2*
. . .		
D 3966-07	*Standard Test Method for Piles Under Lateral Loads*	*1810A.3.3.2*
. . .		
E 580-08	*Standard Practice for Installation of Ceiling Suspension Systems of Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions*	*1616.1.16, 1616A.1.20*

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AWPA	American Wood Products Association P.O. Box 361784 Birmingham. AL 35236-1784	
. . .		
U1-11	USE CATEGORY SYSTEM: User Specification for Treated Wood Except Section 6, Commodity Specification H	*J106.2.2*

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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~~ 10	*Structural Welding Code-Steel*	*Table 1705A.2.1, ~~1704A.3.1.4~~, 1705A.2.2.5, 2212.6.2, 2213A.2*
D1.3-08	Structural Welding Code-Sheet Steel	*Table 1705A.2.1, 1705A.2.2.1.1*
D1.4-05	Structural Welding Code – Reinforcing Steel	*Table 1705A.2.1, 1705.2.2.1.2, 2107A.3,* 2107A.4, *~~2107A.7~~*
D1.8-09	*Structural Welding Code – Seismic Supplement*	*1705A.2.2.5*
QC1-06	*Standard for AWS Certification of Welding Inspectors*	*1705A.2.2.5*

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FEMA	Federal Emergency Management Agency Federal Center Plaza 500 C Street S.W. Washington, DC 20472	
Standard reference number	Title	Referenced in code section number
352-00	*Recommended Postearthquake Evaluation and Repair Criteria for Welded Steel Moment-Frame Buildings*	*3419.2*
FM 1950-10	*Approval Standard for Seismic Sway Braces for Automatic Sprinkler Systems*	*1705A.12.3*
. . .		

FM	Factory Mutual Global Research Standards Laboratories Department 1301 Atwood Avenue, P.O. Box 7500 Johnston, RI 02919	
Standard reference number	Title	Referenced in code section number
FM 1950-10	*Approval Standard for Seismic Sway Braces for Automatic Sprinkler Systems*	*1705A.12.3*
. . .		

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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~~-12**	*Acceptance criteria for expansion anchors in Masonry elements*	*~~1615A.1.14~~ 1616A.1.19*
~~ICC-ES AC 43-09~~*	*~~Acceptance Criteria for Steel Deck Roof and Floor Systems~~*	*~~2209A.3~~*
*ICC-ES AC 70-~~09~~ 12**	*Acceptance criteria for fasteners power-driven into Concrete, Steel and Masonry elements*	*~~1911A.1.1~~ 1908A.1.1*
*ICC-ES AC 106-~~09~~ 12**	*Acceptance criteria for predrilled fasteners (screw anchors) in Masonry*	*~~1615A.1.14~~ 1616A.1.19*
*ICC-ES AC 125-~~09~~ 12**	*Acceptance criteria for Concrete, and Reinforced and Unreinforced Masonry strengthening using externally bonded Fiber-Reinforced Polymer (FRP) composite systems.*	*~~1917A.3~~ 1914.3*
*ICC-ES AC 178-~~09~~ 12**	*Acceptance criteria for inspection and verification of Concrete, and Reinforced and Unreinforced Masonry strengthening using Fiber-Reinforced Polymer (FRP) composite systems.*	*~~1917A.3~~ 1914A.3*
*ICC-ES AC 193-~~09~~ 12**	*Acceptance criteria for mechanical anchors in Concrete elements*	*~~1615A.1.14~~ 1616A.1.19, ~~1912A.1.1~~ 1909A.11*
*ICC-ES AC 308-~~09~~ 12**	*Acceptance criteria for post-installed adhesive anchors in Concrete elements*	*~~1615A.1.14~~ 1616A.1.19, ~~1912A.1.1~~*
*ICC-ES AC 358-~~09~~ 12**	*Acceptance criteria for Helical foundation systems and devices*	*1810A.3.1.5.1*

** Refers to International Building Code, 2012 ~~2009~~ as a reference standard.*

ISO	International Organization for Standardization ISO Central Secretariat 1 ch, de la Voie-Creuse, Case Postale 56 CH-1211 Geneva 20, Switzerland	
Standard reference number	Title	Referenced in code section number
. . .		
ISO 9001-08	*Quality management systems - Requirements*	*1705A.12.4*
ISO 17025-05	*General requirement for competence of testing and calibration laboratories.*	*1705A.12.4*

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NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471	
Standard reference number	Title	Referenced in code section number
. . .		
13-10	Installation of Sprinkler Systems	*1616.9.5, 1616.10.17*

. . .

PCI	Precast Prestressed Concrete Institute 200 West Adams Street, Suite 2100 Chicago, IL 60606-5230	
Standard reference number	Title	Referenced in code section number
. . .		
MLN 128-01	Recommended Practice for Glass Fiber Reinforcement	*1913.2.1*
. . .		
PCI 120-10	*PCI Design Handbook, 7th Edition*	~~*1908A.1*~~ *1905A.1*

PTI	Post-Tensioning Institute 8601 North Black Canyon Highway, Suite 103 Phoenix, AZ 85021	
Standard reference number	Title	Referenced in code section number
. . .		
PTI-2004	*Recommendations for Prestressed Rock and Soil Anchors (4th Edition)*	*1810A.3.10.4, 1811A.2, 1813A.2 J106.2.4, J106.2.5*
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TMS	The Masonry Society 3970 Broadway, Unit 201-D Boulder, CO 80304-1135	
Standard reference number	Title	Referenced in code section number
. . .		
402—11	Building Code Requirements for Masonry Structures	*1410.2.1, 2114.10, 2114.11*
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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.

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

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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~~	
J106.2	X	X	
J107	X	X	
J107.5	X	X	
J108	X	X	
J109	X	X	
J110	X	X	
J111	X	X	
J112	X	X	New amendment

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

(Blue highlighted text below is language that appears in OSHPD Express Terms. This is for clarity in identifying DSA text, since J106.2 will be treated as a continuing amendment by OSHPD)

EXPRESS TERMS

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SECTION J106
EXCAVATIONS

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J106.2 Earth retaining shoring. [DSA-SS & DSA-SS/CC]

J106.2.1 General. *The requirements of this section shall apply to temporary and permanent earth retaining shoring using soldier piles and lagging with or without tie-back anchors in soil or rock, only when existing or new DSA-SS, DSA-SS/CC, or OSHPD 1 or 4 facilities are affected. Shoring used as construction means and methods only, which does not affect existing or new DSA-SS, DSA-SS/CC, or OSHPD 1 or 4 facilities, are not regulated by DSA or OSHPD and shall satisfy the requirements of the authorities having jurisdiction.*

Design, construction, testing, and inspection shall satisfy the requirements of this code except as modified in Sections J106.2.2 through J106.2.8.

J106.2.2 Duration. *Shoring shall be considered temporary when elements of the shoring will be exposed to site conditions for a period of less than one (1) year, and shall be considered permanent otherwise. Permanent shoring shall account for the increase in lateral soil pressure due to earthquake. At the end of the construction period, the existing and new structures shall not rely on the temporary shoring for support in anyway. Wood components shall not be used for permanent shoring lasting more than two (2) years. Wood components of the temporary shoring that may affect the performance of permanent structure shall be removed after the shoring is no longer required.*

All components of the shoring shall have corrosion protection or preservative treatment for their expected duration. Wood components of the temporary shoring that will not be removed shall be treated in accordance with AWPA U1 (Commodity Specification A, Use Category 4B and Section 5.2), and shall be identified in accordance with Section 2303.1.8.1.

J106.2.3 Surcharge: *Surcharge pressure due to footings, traffic, or other sources shall be considered in design. If the footing surcharge is located within the semi-circular distribution or bulb of earth pressure (when shoring is located close to a footings), lagging shall be designed for lateral earth pressure due to footing surcharge. Soil arching effects may be considered in the design of lagging. Underpinning of the footing may be used in lieu of designing the shoring and lagging for surcharge pressure. Alternatively, continuously contacting drilled pier shafts near the footings shall be permitted. The lateral surcharge design pressure shall be derived using Boussinesq equations modified for the distribution of stresses in an elastic medium due to a uniform, concentrated or line surface load as appropriate and soil arching effects.*

J106.2.4 Design and testing: *Except for the modifications as set forth in Sections J106.2.4.1 and J106.2.4.2 below, all Prestressed Rock and Soil Tie-back Anchors shall be designed and tested in accordance with PTI Recommendations for Prestressed Rock and Soil Anchors (PTI-2004).*

J106.2.4.1 Geotechnical requirements*: The geotechnical report for the earth retaining shoring shall address the following:*

1. *Minimum diameter and minimum spacing for the anchors including consideration of group effects.*

2. *Maximum unbonded length and minimum bonded length of the tie-back anchors.*

3. *Maximum recommended anchor tension capacity based upon the soil or rock strength / grout bond and anchor depth / spacing.*

4. *Allowable bond stress at the ground / grout interface and applicable factor of safety for ultimate bond stress for the anchor. For permanent anchors, a minimum factor of safety of 2.0 shall be applied to ground soil interface as required by PTI-2004 Section 6.6.*

5. *Minimum grout pressure for installation and post-grout pressure for the anchor. The presumptive post grout pressure of 300 psi may be used for all soil type.*

6. *Class I Corrosion Protection is required for all permanent anchors. The geotechnical report shall specify the corrosion protection recommendations for temporary anchors.*

7. *Performance test for the anchors shall be at a minimum of two (2) times the design loads and shall not exceed 80% of the specified minimum tensile strength of the anchor rod. A creep test is required for all prestressed anchors that are performance tested. All production anchors shall be tested at 150% of design loads and shall not be greater than 70% of the specified minimum tensile strength of the anchor rod.*

8. *Earth pressure, surcharge pressure, and the seismic increment of earth pressure loading, when applicable.*

9. *Maximum recommended lateral deformation at the top of the soldier pile, at the tie-back anchor locations, and the drilled pier concrete shafts at the lowest grade level.*

10. *Allowable vertical soil bearing pressure, friction resistance, and lateral passive soil resistance for the drilled pier concrete shafts and associated factors of safety for these allowable capacities.*

11. *Soil-pier shaft / pile interaction assumptions and lateral soil stiffness to be used in design for drilled pier concrete shaft or pile lateral loads.*

12. *Acceptable drilling methods.*

13. *Geotechnical observation and monitoring recommendations.*

***J106.2.4.2 Structural requirements**:*

1. *Tendons shall be thread-bar anchors conforming to ASTM A 722.*

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

3. *The anchor shall be designed to fail in grout bond to the soil or rock before pullout of the soil wedge.*

4. *Design of shoring system shall account for as-built locations of soil anchors considering all specified construction tolerances in Section J106.2.8.*

5. *Design of shoring system shall account for both short and long term deformation.*

***J106.2.4.3 Testing of tie-back anchors**:*

1. *The geotechnical engineer shall keep a record at job site of all test loads, total anchor movement, and report their accuracy.*

2. *If a tie-back anchor initially fails the testing requirements, the anchor shall be permitted to be re-grouted and retested. If anchor continues to fail, the followings steps shall be taken:*

    a. *The contractor shall determine the cause of failure – variations of the soil conditions, installation methods, materials, etc.*
    b. *Contractor shall propose a solution to remedy the problem. The proposed solution will need to be reviewed and approved by geotechnical engineer, shoring design engineer, and the building official.*

3. *After a satisfactory test, each anchor shall be locked-off in accordance with Section 8.4 of PTI 2004.*

4. *The shoring design engineer shall specify design loads for each anchor.*

***J106.2.5 Construction:** The construction procedure shall address the following:*

1. *Holes drilled for piles / tie-back anchors shall be done without detrimental loss of ground, sloughing or caving of materials and without endangering previously installed shoring members or existing foundations.*
2. *Drilling of earth anchor shafts for tie-backs shall occur when the drill bench reaches two to three feet below the level of the tie-back pockets.*
3. *Casing or other methods shall be used where necessary to prevent loss of ground and collapse of the hole.*
4. *The drill cuttings from earth anchor shaft shall be removed prior to anchor installation.*
5. *Unless tremie methods are used, all water and loose materials shall be removed from the holes prior to installing piles / tie-backs.*
6. *Tie-back anchor rods with attached centralizing devices shall be installed into the shaft or through the drill*

casing. Centralizing device shall not restrict movement of the grout.

7. *After lagging installation, voids between lagging and soil shall be backfilled immediately to the full height of lagging.*

8. *The soldier piles shall be placed within specified tolerances in the drilled hole and braced against displacement during grouting. Fill shafts with concrete up to top of footing elevation, rest of the shaft can generally be filled with lean concrete. Excavation for lagging shall not be started until concrete has achieved sufficient strength for all anticipated loads as determined by the shoring design engineer.*

9. *Where boulders and / or cobbles have been identified in the geotechnical reports, contractor shall be prepared to address boulders and / or cobbles that may be encountered during the drilling of soldier piles and Tie-back anchors.*

10. *The grouting equipment shall produce grout free of lumps and indispensed cement. The grouting equipment shall be sized to enable the grout to be pumped in continuous operation. The mixer shall be capable of continuously agitating the grout.*

11. *The quantity of grout and grout pressure shall be recorded. The grout pressure shall be controlled to prevent excessive heave in soils or fracturing rock formations.*

12. *If post-grouting is required, post grouting operation shall be performed after initial grout has set for 24-hours in the bond length only. Tie-backs shall be grouted over a sufficient length (anchor bond length) to transfer the maximum anchor force to the anchor grout.*

13. *Testing of anchors may be performed after post-grouting operations provided grout has reached strength of 3,000 psi as required by PTI-2004 Section 6.11.*

14. *Anchor rods shall be tensioned straight and true. Excavation directly below the anchors shall not continue before those anchors are tested.*

J106.2.6 Inspection, survey monitoring, and observation

1. *The shoring design engineer or his designee shall make periodic inspections of the job site for the purpose of observing the installation of shoring system, testing of tie-back anchors, and monitoring of survey.*

2. *Testing, inspection, and observation shall be in accordance with testing, inspection and observation requirements approved by the building official. The following activities and materials shall be tested, inspected, or observed by the special inspector and geotechnical engineer:*

    a. *Sampling and testing of concrete in soldier pile and tie-back anchor shafts.*

    b. *Fabrication of tie-back anchor pockets on soldier beams*

    c. *Installation and testing of tie-back anchors.*

    d. *Survey monitoring of soldier pile and tie-back load cells.*

    e. *Survey Monitoring of existing buildings.*

3. *A complete and accurate record of all soldier pile locations, depths, concrete strengths, tie-back locations and lengths, tie-back grout strength, quantity of concrete per pile, quantity of grout per tie-back and applied tie-back loads shall be maintained by the special inspector and geotechnical engineer. The shoring design engineer shall be notified of any unusual conditions encountered during installation.*

4. *Calibration data for each test jack, pressure gauge, and master pressure gauge shall be verified by the special inspector and geotechnical engineer. The calibration tests shall be performed by an independent testing laboratory and within 120 calender days of the data submitted.*

5. *Monitoring points shall be established at the top and at the anchor heads of selected soldier piles and at intermediate intervals as considered appropriate by the geotechnical engineer.*

6. *Control points shall be established outside the area of influence of the shoring system to ensure the accuracy of the monitoring readings.*

7. *The periodic basis of shoring monitoring, as a minumum, shall be as follows:*

a. *Intitial monitoring shall be performed prior to any excavation.*

b. *Once excavation has begun, the periodic readings shall be taken weekly until excavation reaches the estimated subgrade elevation and the permanent foundation is complete.*

c. *If performance of the shoring is within established guidelines, shoring design engineer may permit the periodic readings to be bi-weekly. Once initiated, bi-weekly readings shall continue until the building slab at ground floor level is completed and capable of transmitting lateral loads to the permanent structure. Thereafter, readings can be monthly.*

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

e. *Additional readings shall be taken when requested by special inspector, shoring design engineer, geotechnical engineer, or the building official.*

8. *Monitoring reading shall be submitted to shoring design engineer, engineer in responsible charge, and the building official within 3 working days after they are conducted. Monitoring readings shall be accurate to within 0.01 feet. Results are to be submitted in tabular form showing at least the intial date of monitoring and reading, current monitoring date and reading and difference between the two readings.*

9. *If the total cummulative horizontal or vertical movement (from start of construction) of the existing buildings reaches ½" or soldier piles reaches 1" all excavation activities shall be suspended. The geotechnical and shoring design engineer shall determine the cause of movement, if any, and recommend corrective measures, if necessary, before excavation continues.*

10. *If the total cummulative horizontal or vertical movement (from start of construction) of the existing buildings reaches 3/4" or soldier piles reaches 1 ½" all excavation activities shall be suspended until the causes, if any, can be determined. Supplemental shoring shall be devised to eliminate further movement and the building official shall review and approve the supplemental shoring before excavation continues.*

11. *Monitoring of Tie-back Anchor Loads:*

    a. *Load cells shall be installed at the tie-back heads adjacent to buildings at maximum interval of 50', with a minimum of one load cells per wall.*

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

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

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

J106.2.7 Monitoring of existing DSA-SS, DSA-SS/CC, and OSHPD 1 and 4 structures

1. *The contractor shall complete a written and photographic log of all existing DSA-SS, DSA-SS/CC, and OSHPD 1 & 4 structures within 100 ft or three times depth of shoring, prior to construction. A licensed surveyor shall document all existing substantial cracks in adjacent existing structures.*

2. *Contractor shall document existing condition of wall cracks adjacent to shoring walls prior to start of construction.*

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

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

5. *Monitoring of the existing structure shall be at reasonable intervals as required by the registered design professional subject to approval of the building official. Monitoring shall be performed by a licensed surveyor and shall consist of vertical and lateral movement of the existing structures. Prior to starting shoring installation a pre-construction meeting shall take place between the contractor, shoring design*

engineer, surveyor, geotechnical engineer, and the building official to identify monitoring locations on existing buildings.

6. *If in the opinion of the building official or shoring design engineer, monitoring data indicate excessive movement or other distress, all excavation shall cease until the geotechnical engineer and shoring design engineer investigates the situation and makes recommendations for remediation or continuing.*
7. *All reading and measurements shall be submitted to the building official and shoring design engineer.*

J106.2.8 Tolerances. *Following tolerances shall be specified on the construction documents.*

1. *Soldier Piles:*
   i. *Horizontal and vertical construction tolerances for the soldier pile locations.*
   ii. *Soldier pile plumbness requirements (angle with vertical line).*
2. *Tie-back Anchors:*
   i. *Allowable deviation of anchor projected angle from specified vertical and horizontal design projected angle.*
   ii. *Anchor clearance to the existing/new utilities and structures.*

SECTION J107
FILLS

J107.1 General. Unless otherwise recommended in the soils report, fills shall conform to provisions of this section.

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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.*

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SECTION J112
VIBRO STONE COLUMNS FOR GROUND IMPROVEMENT
[DSA-SS & DSA-SS/CC]

J112.1 General. *This section shall apply to Vibro Stone Columns (VSCs) for ground improvement using unbounded aggregate materials. Vibro stone column provisions in this section are intended to increase bearing capacity, reduce settlements, and mitigate liquefaction for shallow foundations. These requirements shall not be used for grouted or bonded stone columns, ground improvement for deep foundation elements, or changing site class. VSCs shall not be considered as a deep foundation element. Ground improvement shall be installed under the entire building/structure footprint and not under isolated foundation elements only. Design, construction, testing, and inspection shall satisfy the requirements of this code except as modified in Sections J112.2 through J112.5.*

J112.2 Geotechnical report. *Geotechnical report shall specify vibro stone column requirements to ensure uniformity in total and differential immediate settlement, long term settlement, and earthquake inducedsettlement.*

1. *Soil compaction shall be in accordance with California Geological Survey (CGS) Special Publication 117A (SP-117A): Guidelines for Evaluating and Mitigating Seismic Hazard in California.*
2. *Area replacement ratio for the compaction elements and the basis of its determination shall be explained. Minimum factor of safety for soil compaction shall be in accordance with SP-117A.*
3. *Depth of soil compaction elements and extent beyond the footprint of structures/foundation shall be defined. Extent beyond the foundation shall be half the depth of the VSCs with a minimum of 10' or an approved alternative.*
4. *Minimum diameter and maximum spacing of soil compaction elements shall be specified. VSC's shall not be less than 2 feet in diameter and center to center spacing shall not exceed 8 feet.*
5. *The modulus of subgrade reactions for shallow foundations shall account for the presence of compaction elements.*
6. *The modulus of subgrade reactions, long-term settlement, and post-earthquake settlement shall be specified along with expected total and differential settlements for design.*

7. *The acceptance criteria for Cone Penetration Test (CPT) in accordance with ASTM D 3441 complemented by Standard Penetration Test (SPT) in accordance with ASTM D 1586, if necessary, to verify soil improvement shall be specified*

8. *The requirements for special inspection and observation by the Geotechnical engineer shall be specified.*

9. *A Final Verified Report (FVR) documenting the installation of the ground improvement system and confirming that the ground improvement acceptance criteria have been met shall be prepared by the Geotechnical Engineer and submitted to the enforcement agency for review and approval.*

J112.3 Shallow foundations. *VSCs under the shallow foundation shall be located symmetrically around the centroid of the footing or load.*

1. *There shall be a minimum of four stone columns under each isolated or continuous/combined footing or approved equivalent.*

2. *The VSCs or deep foundation elements shall not be used to resist tension or overturning uplift from the shallow foundations.*

3. *The foundation design for the shallow foundation shall consider the increased vertical stiffness of the VSCs as point supports for analysis, unless it is substantiated that the installation of the VSCs result in improvement of the surrounding soils such that the modulus of subgrade reaction, long term settlement, and post-earthquake settlement can be considered uniform throughout.*

J112.4 Installation. *VSCs shall be installed with vibratory probes. Vertical columns of compacted unbounded aggregate shall be formed through the soils to be improved by adding gravel near the tip of the vibrator and progressively raising and re-penetrating the vibrator which will results in the gravel being pushed into the surrounding soil. Gravel aggregate for VSCs shall be well graded with a maximum size of 6" and not more than 10% smaller than 3/8" after compaction.*

J112.5 Construction documents. *Construction documents for VSCs, as a minimum, shall include the following:*

1. *Size, depth, and location of VSCs.*

2. *Extent of soil improvements along with building/structure foundation outlines.*

3. *Field verification requirements and acceptance criteria using CPT/SPT.*

4. *The locations where CPT/SPT shall be performed.*

5. *The Testing, Inspection and Observation (TIO) program shall indicate the inspection and observation required for the VSCs.*

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.

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

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