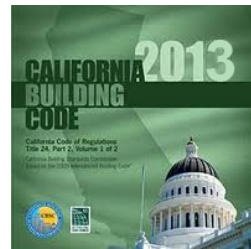




Overview and Application of the 2013 California Building Code

Presented by:
Casey K. Hemmatyar



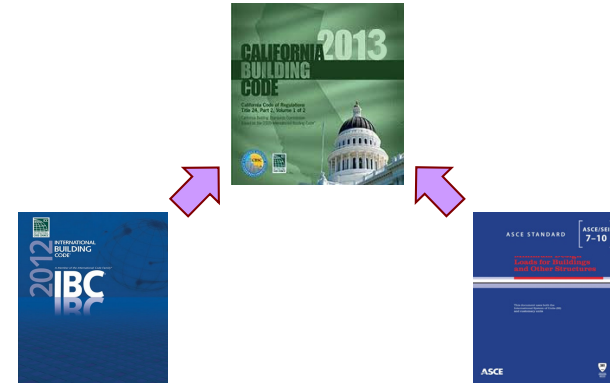
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Model Building Code & Standards



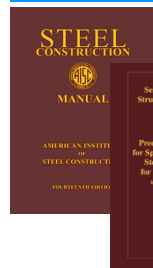
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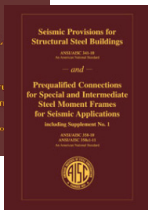
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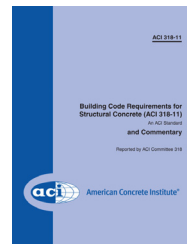
Main Reference Standards



AISC 360-10; Steel Manual



AISC 341-10/358-10; Seismic
Standards



ACI 318-11; Building Code
Requirements for Structural Concrete



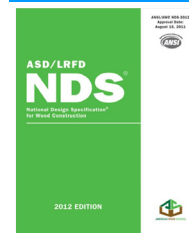
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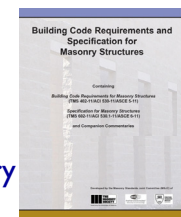
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Main Reference Standards



NDS-2012; National Design
Specifications for Wood Construction



TMS 402-11/ACI 530-11/ASCE 5-11;
Building Code Requirements for Masonry
Structures



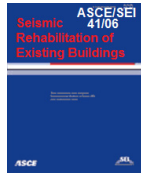
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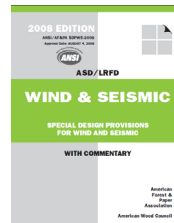
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Main Reference Standards (NOT UPDATED)



ASCE/SEI 41/06; Seismic Rehabilitation of Existing Buildings



SDPWS-2008 Wood Special Design Provisions for Wind and Seismic



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Symbols Used In IBC/CBC

Italicized Terms: Definitions in Chapter 2. Except for Chapter 19 with respect to difference in ACI 318.

Italicized Terms

Marginal Arrows: Deletion from Model Code (IBC 2009)



Thick Single Vertical Lines: Change from previous model code (IBC 2009)



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Symbols Used In IBC/CBC

Thin Vertical Line: Change pertaining to the previous California Building Code (CBC)



Thin Double Vertical Lines: Changes or additions to the previous California Building Code (CBC)



Greater-Than Symbol: Indicates California deletion of California Language



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Symbol(s) Used In ASCE 7-10



FOREWORD

The material presented in this standard has been prepared in accordance with recognized engineering principles. This standard should not be used without first securing competent advice with respect to its suitability for any given application. The publication of the material contained herein is not intended as a representation or warranty on the part of the American Society of Civil Engineers, or of any other person named herein, that this information is suitable for any general or particular use or promises freedom from

infringement of any patent or patents. Anyone making use of this information assumes all liability from such use.

In the margin of Chapters 1 through 23, a bar has been placed to indicate a substantial technical revision in the standard from the 2005 edition. Because of the reorganization of the wind provisions, these bars are not used in Chapters 26 through 31. Likewise, bars are not used to indicate changes in any parts of the Commentary.

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Occupancy Risk Categories

Chapter I; Table I.5-1;
Risk Category of Buildings and Other Structures for
Earthquake, Wind, Snow, Flood and Ice Loads.



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Occupancy Risk Categories

Table I.5-1 Risk Category of Buildings and Other Structures for Flood, Wind, Snow, Earthquake, and Ice Loads

Use or Occupancy of Buildings and Structures	Risk Category
Buildings and other structures that represent a <u>low risk</u> to human life in the event of failure	I
All buildings and other structures <u>except those listed in Risk Categories I, III, and IV</u>	II
Buildings and other structures, the failure of which could pose a <u>substantial risk</u> to human life. Buildings and other structures, not included in Risk Category IV, with potential to cause a substantial <u>economic impact and/or mass disruption of day-to-day civilian</u> life in the event of failure.	III
Buildings and other structures not included in Risk Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) <u>containing toxic or explosive substances</u> where their quantity exceeds a threshold quantity established by the authority having jurisdiction and is sufficient to pose a threat to the public if released.	IV
Buildings and other structures designated as <u>essential facilities</u> . Buildings and other structures, the <u>failure of which could pose a substantial hazard to the community</u> . Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity exceeds a threshold quantity established by the authority having jurisdiction to be dangerous to the public if released and is sufficient to pose a threat to the public if released. Buildings and other structures <u>required to maintain the functionality of other Risk Category IV structures</u> .	IV

*Buildings and other structures containing toxic, highly toxic, or explosive substances shall be eligible for classification to a lower Risk Category if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the substances is commensurate with the risk associated with that Risk Category.



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Occupancy Risk Categories

CHAPTER C1 GENERAL

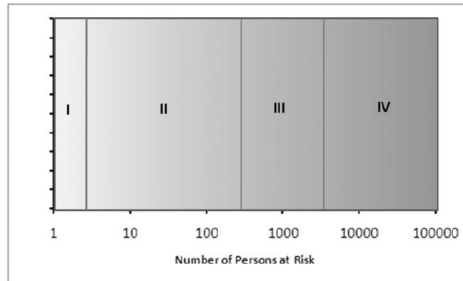


FIGURE C1-1 Approximate Relationship between Number of Lives Placed at Risk by a Failure and Occupancy Category.



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Occupancy Risk Categories

TABLE 1804.5 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 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. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 1,000. • Power generating stations, water treatment facilities for public water, waste water treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code; and Are sufficient to pose a threat to the public if released?
III	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 headquarters, communications and operations centers and other facilities required for emergency response. • Power generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.
IV	Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the International Fire Code; and Are sufficient to pose a threat to the public if released? • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.



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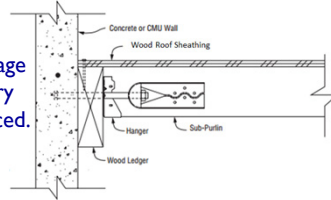
Diaphragms & Wall Anchorage

- Revise IBC 2012 definition of Rigid diaphragm.

Diaphragm, Rigid;

A diaphragm is rigid for the purpose of distribution of story shear and torsional moment *where so indicated in Section 12.3.1 of ASCE7-10, when the lateral deformation of the diaphragm is less than or equal to two times the average story drift.*

- Minimum 280 lb/ft. wall anchorage force for Concrete and Masonry walls will continue to be enforced.



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Seismic Design Criteria

- Seismic Ground Motion Values (MCE_R)
- USGS; updated Source Zone Models, using Next Generation Attenuation (NGA) relationship
- Introducing "Risk Targeted" Maximum Considered Earthquake (MCE_R)
- Ground Motions produced by USGS
- Map compilation consistent Site-Specific Ground Motion Procedures (Chapter 21), ASCE 7-10 and 2009 NEHRP (FEMA P-750)



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Risk-Targeted MCE_R Maps

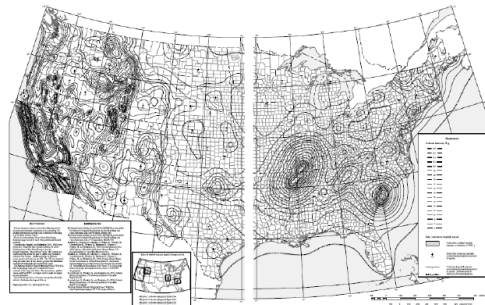


FIGURE 22-1 RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE_R) GROUND MOTION OF 0.2 SEC SPECTRAL RESPONSE ACCELERATION, SITE CLASS B
NEHRP Advisory Committee on Earthquake Hazards Reduction (ACEHR) Meeting



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Site Coefficients F_a & F_v

CHAPTER 11 SEISMIC DESIGN CRITERIA

Table 11.4-1 Site Coefficient, F_a

Site Class	Mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameter at Short Period				
	$S_T \leq 0.25$	$S_T = 0.5$	$S_T = 0.75$	$S_T = 1.0$	$S_T \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7				

Note: Use straight-line interpolation for intermediate values of S_T .

Table 11.4-2 Site Coefficient, F_v

Site Class	Mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameter at 1-s Period				
	$S_T \leq 0.1$	$S_T = 0.2$	$S_T = 0.3$	$S_T = 0.4$	$S_T \geq 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7				

Note: Use straight-line interpolation for intermediate values of S_T .



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Seismic Hazard Maps updates

- Risk-targeted Ground Motions;
Hazard definition changed from motions with
2 percent probability of exceedance in 50 years
Changed to
1 percent chance of Collapse in 50 Years
- NGA use resulted in reduction in Ground Motion in most of California



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Seismic Hazard Maps updates

- Change is aimed at improving seismic design through achieving a more uniform level of collapse prevention.
- It is also aimed at addressing the Geographic differences in the shape of the ground motion vs. annual frequency of exceedance hazard curves.



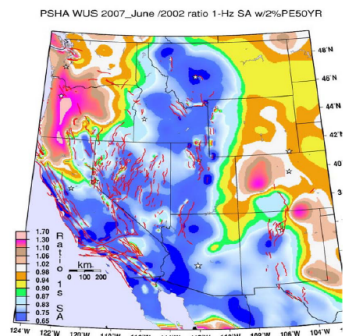
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Seismic Hazard Maps updates



NGA use resulted in reduction in Ground Motion in most of California



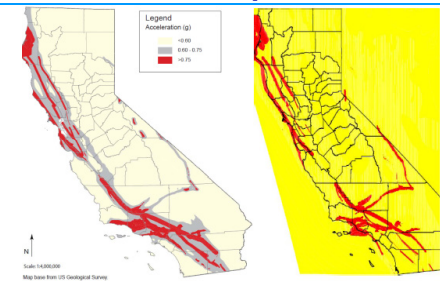
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Seismic Hazard Maps



CBC 2013

CBC 2010

S_1 = mapped MCE_g, 5 percent damped,
spectral response acceleration parameter
at a period of 1 s as defined in Section
11.4.1



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Haiti Earthquake 2010



miyamoto.



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Haiti; 2010



miyamoto.



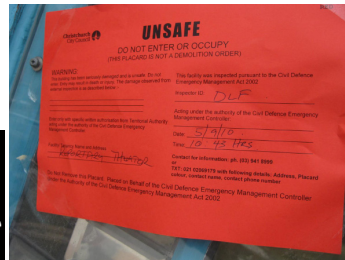
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Christchurch, New Zealand; 2011



miyamoto.



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Tohoku, Japan; 2011



miyamoto.



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CBC 16A;

Min. Seismic Design Parameters for Site Class D;

- $S_{DS}=0.22g$
- $S_{D1}=0.17g$

Min. Seismic Design Category for Site Class D;

- For Risk Category IV: D
- For Risk Category II: C

D is the Minimum Seismic Design Category permitted for DSA & OSHPD 1, 2 & 4 structures.



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Chapter 17A; Inspections

The whole Chapter has been restructured;

- Steel Special inspection shall be in accordance with AISC 360-10/341-10
- Masonry Special Inspection shall be in accordance with TMS 402-11/602-11
- All Steel and masonry requirements are now by reference to the standard



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Chapter 17A; Inspections

- Steel has replaced “Periodic” and “Continuous” special Inspections with “Observe” and “Perform”
- Most items requiring continuous inspection in prior editions of the code are now “Observe”
- “Observe” is defined differently in the steel seismic requirements versus the steel specifications.



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Chapter 17A; Inspections

- OSHPD is amending the definition of “Observer” and “Perform” to maintain the level of Special inspection traditionally provide for the Acute Care Hospitals
- New provisions assume that if a worker can perform a task properly that they will perform it properly every time.
- As currently defined. Special inspectors need not be present on the site when some work identified as “Observer” is being performed.



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Chapter 17A; Inspections

- IOR in consultation with SEOR shall determine the number of special inspectors needed to adequately perform the work with a specified maximum number of welders per inspector. This is to insure that the work is adequately observed.
- Require daily observation as per the steel seismic standard, versus “random”



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Chapter 19A; Concrete

Most of the amendments by IBC 2012 has been implemented in ACI 318-11 due to adoption date sequence

- Maximum spacing for SMRF flexural member hoops is reduced (ACI 318-11 §21.5.3.2) in order to address the buckling issues of longitudinal bars accrued in 2010 Chile earthquake
 - A maximum of 6 inches (not 12 inches anymore)
 - From 8d to 6d (d=Longitudinal bar Dia.)



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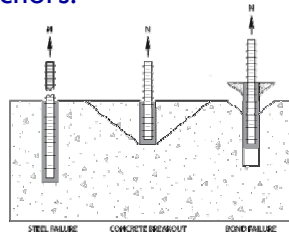
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Chapter 19A; Concrete

- ACI 318-11 Appendix D has introduced provisions for adhesive anchors.



- Appendix D has been completely revised on more time.



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Chapter 21A; Masonry

TMS 402-11/TMS 602-11

- 1/3rd stress increase in load combinations for Wind and seismic have been removed.
- TMS 403-10 Direct Design Handbook for Masonry Structures;
 - It's based on ASCE 7-05/TMS 402-08 and therefore is not adopted.



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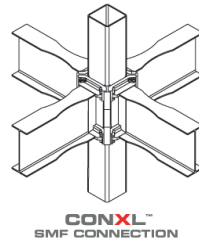
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Chapter 22A; Steel

- Will permit Special Moment Frame with ConCtech ConXL moment connection with composite columns.



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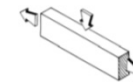
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Chapter 23A; Wood

- There is no significant new amendments in seismic provisions

- Combined bi-axial bending and axial compression



$$\frac{f_{ax}}{F_{ax}} + \left(\frac{f_{bx}}{F_{bx}} + \frac{f_{by}}{F_{by}} \right)^2 < 1.0$$

New

(3.9-4)



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Components requiring Special Seismic Cert.

- Emergency and standby power systems.
- Elevator equipment's (excluding elevator cabs)
- Components with hazardous contents
- Exhaust and smoke control fans
- Switchgear and switchboards
- Motor control centers
- Radiography and fluoroscopy systems in fluoroscopy rooms
- CT systems
- Air conditioning units
- Air handling units
- Chillers, evaporators and condensers
- Cooling towers
- Transformers
- Electrical substations
- UPS inverters and batteries
- Distribution panels
- Control Panels.
- Power isolation and corrections systems
- Motorized surgical lights
- Internal communication servers and routers
- Electrical busways and grounding systems
- Motorized operating tables system
- Exceptions to special seismic certifications requirements
- Equipment and components weighing less than 20 lbs. supported directly on structures
- Movable (mobile and temporary equipment and components
- Pipes, ducts, conduits and cable trays and
- Underground tanks



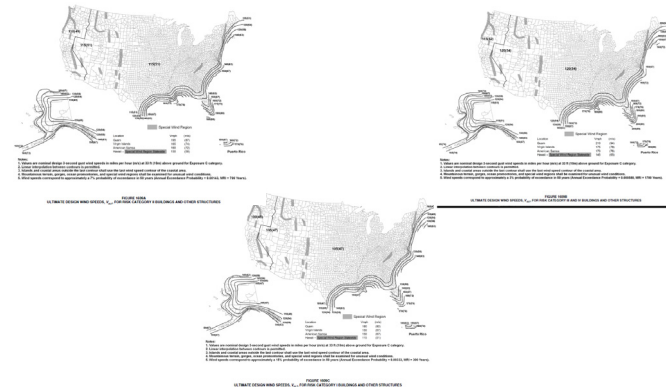
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Wind Hazard Maps



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Wind Hazard Maps



- “Risk Category” II Strength map corresponds to 700 year Return Period (much longer than ASCE 7-05)
- “Risk Category” III and IV structures use 1700 year RP winds
- “Risk Category” I structures use 300 year RP winds



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Wind



- Revised load factors for wind in allowable stress design (ASD) and load resistance factor design (LRFD) load combinations wind load factor ;
 - 1.0 for Strength Design,
 - 0.6 for ASD
- Removal of the Importance Factor for wind,
- Reinstating applicability of Exposure D in hurricane prone regions,



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Acknowledgement

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- Miyamoto International
- American Wood Council
 - Simpson Strong-Tie



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Questions;

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Thank You



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