

2016 California Building Standards Code Adoption

Office of
Statewide Health Planning and Development **OSHDP**

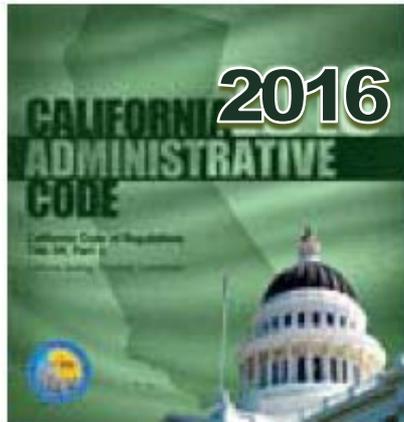
Facilities Development Division
The Building Department for California's Hospitals

Hospital Building Safety Board Meeting

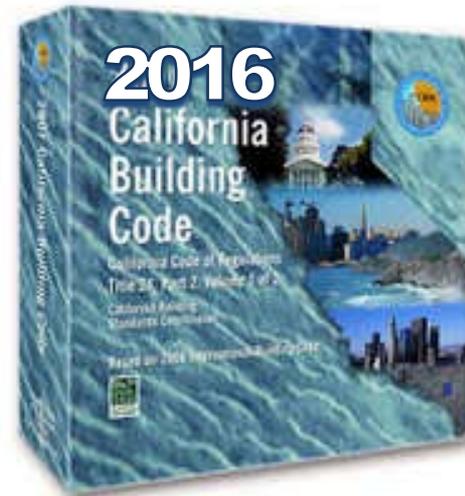


February 10, 2015

2016 California Building Standards Code (CBSC 2016)



**Amendments for
the CAC 2016**



**Amendments for
the CBC 2016**

Objective/Agenda

Allow interested groups or persons opportunities to comment on:

- OSHPD's structural amendments for the CBSC 2016.
 - Introduce Structural Performance Category SPC-4D for Nonconforming Buildings.
 - Address Adoption of International Building Code, 2015 (IBC 2015).

CBSC Requirements

1. Do not conflict, overlap or duplicate other Building Standards
2. Remain within the parameters established by enabling legislation
3. Adoption required by public interest
4. Not unreasonable, arbitrary, unfair, or capricious.
5. Cost to the public is reasonable, based on overall benefit

CBSC Requirements

6. Not unnecessarily ambiguous or vague
7. National standards and model codes are incorporated
8. Consistent format with that adopted by the Commission
9. IF promoting fire and panic safety, approved by the State Fire Marshall

OSHPD Policy on Code Adoption

Adopt National Codes/Standards unless amendments are required for (Consistent with H&SC Sections 12928 & 17958.7.a):

1. Statutory Requirements
2. Geological Conditions
3. Climatological Conditions
4. Topographical Conditions

2015 Triennial Code Adoption Cycle

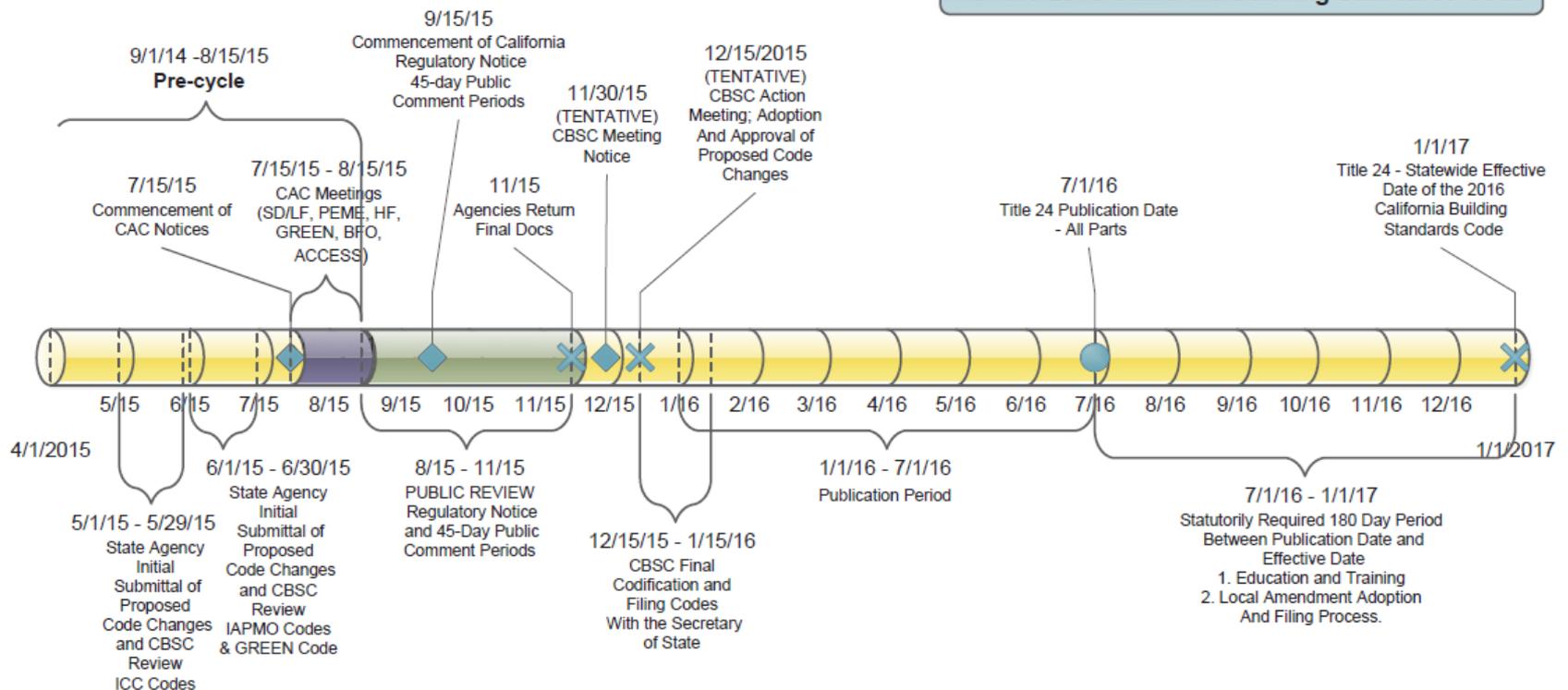
- Triennial update of CBSC to match 2015 IBC and revised standards
- The CSBC 2016 effective date 1/1/2017

2015 Triennial Code Adoption Cycle

January 1, 2017 Effective Date

2015 Triennial Code Adoption Cycle

For the 2016 California Building Standards Code

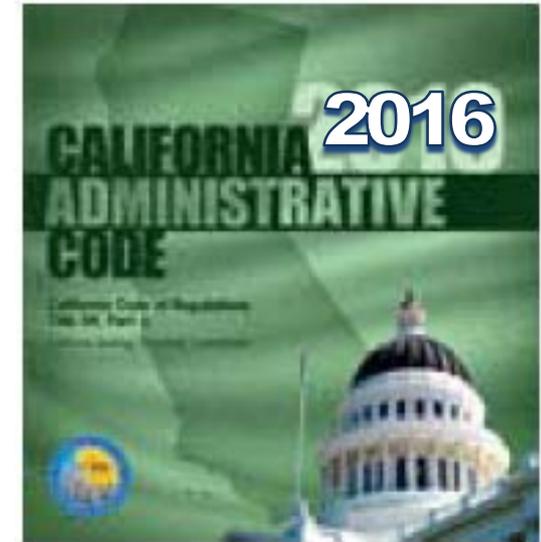


2016 California Administrative Code

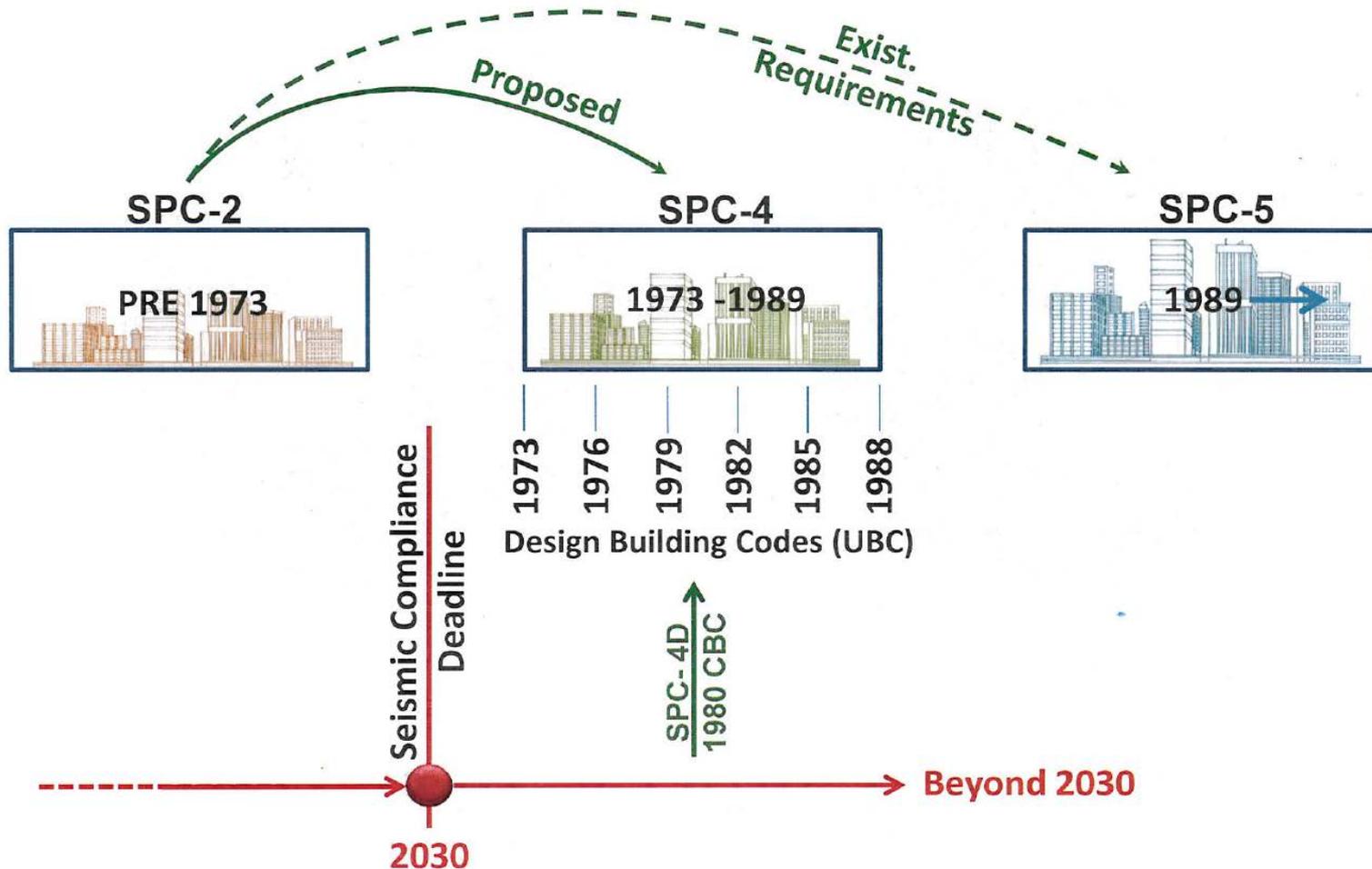
An Overview of Amendments For CAC 2016

2016 California Administrative Code (CAC 2016)

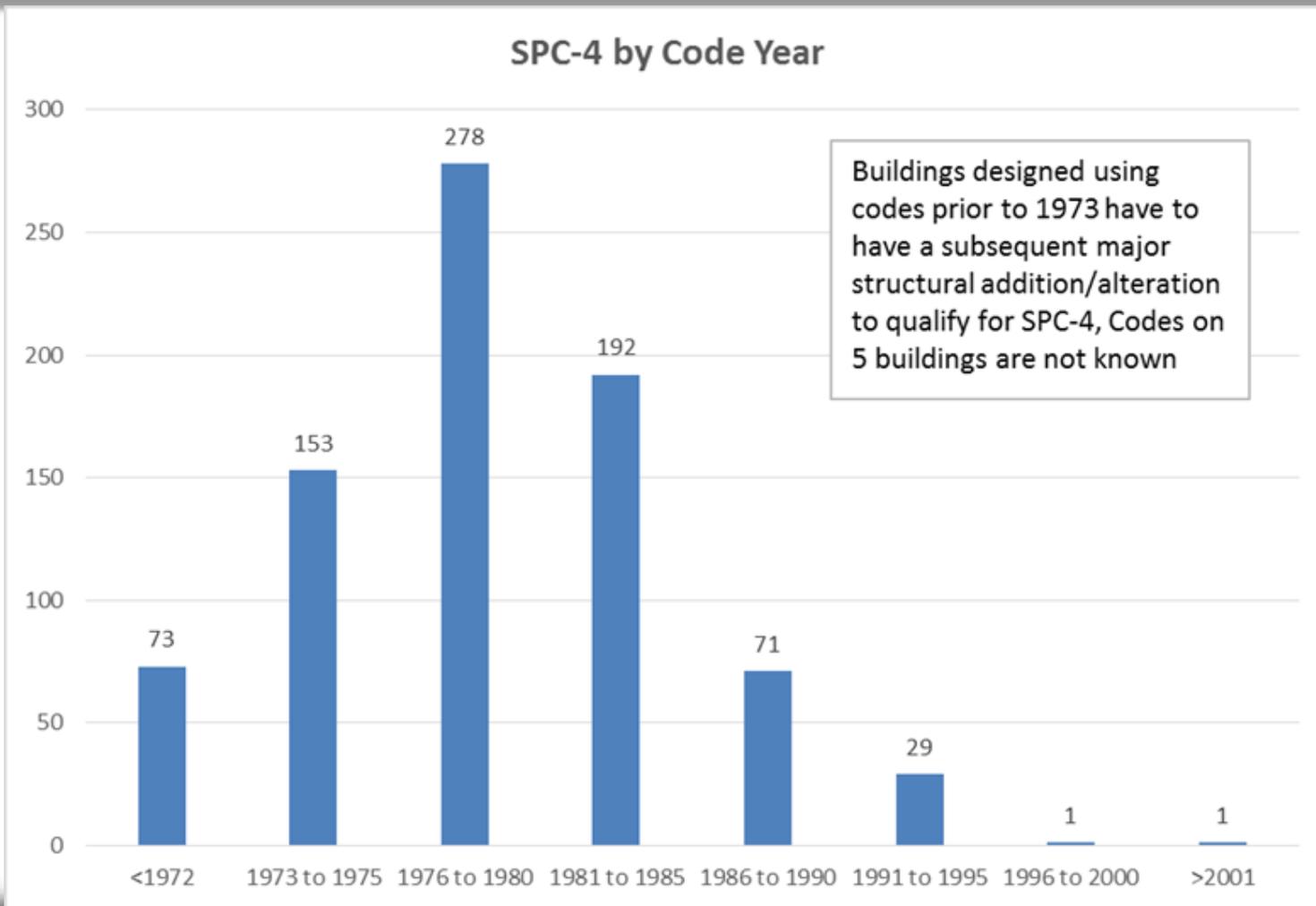
- Introduce Structural Performance Category SPC-4D.
- Nonconforming Buildings (Building originally built to pre-1973 Code) can be upgraded to SPC-4D (Instead of SPC-5) to provide service beyond 2030.



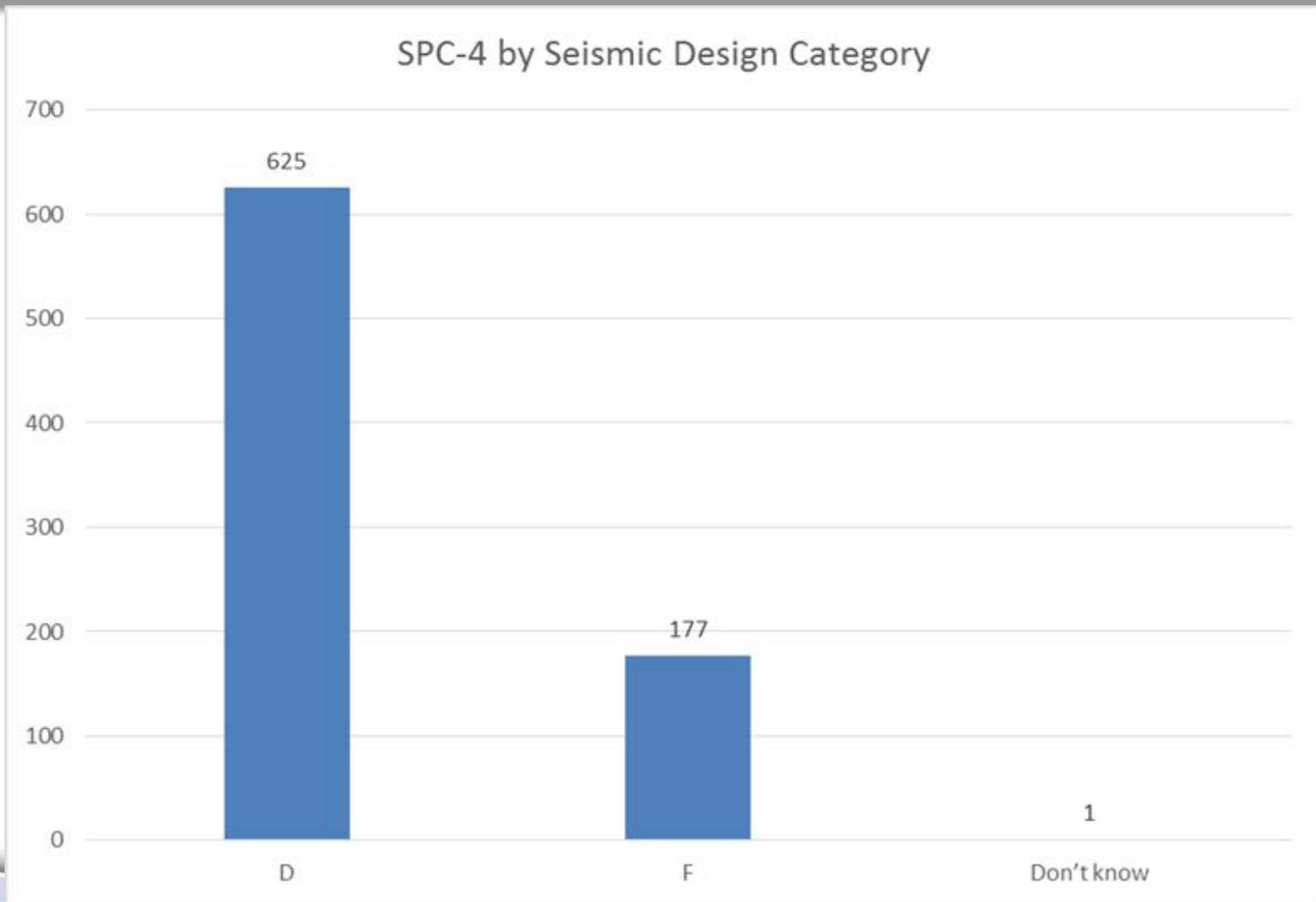
Seismic Performance of SPC-4D Buildings



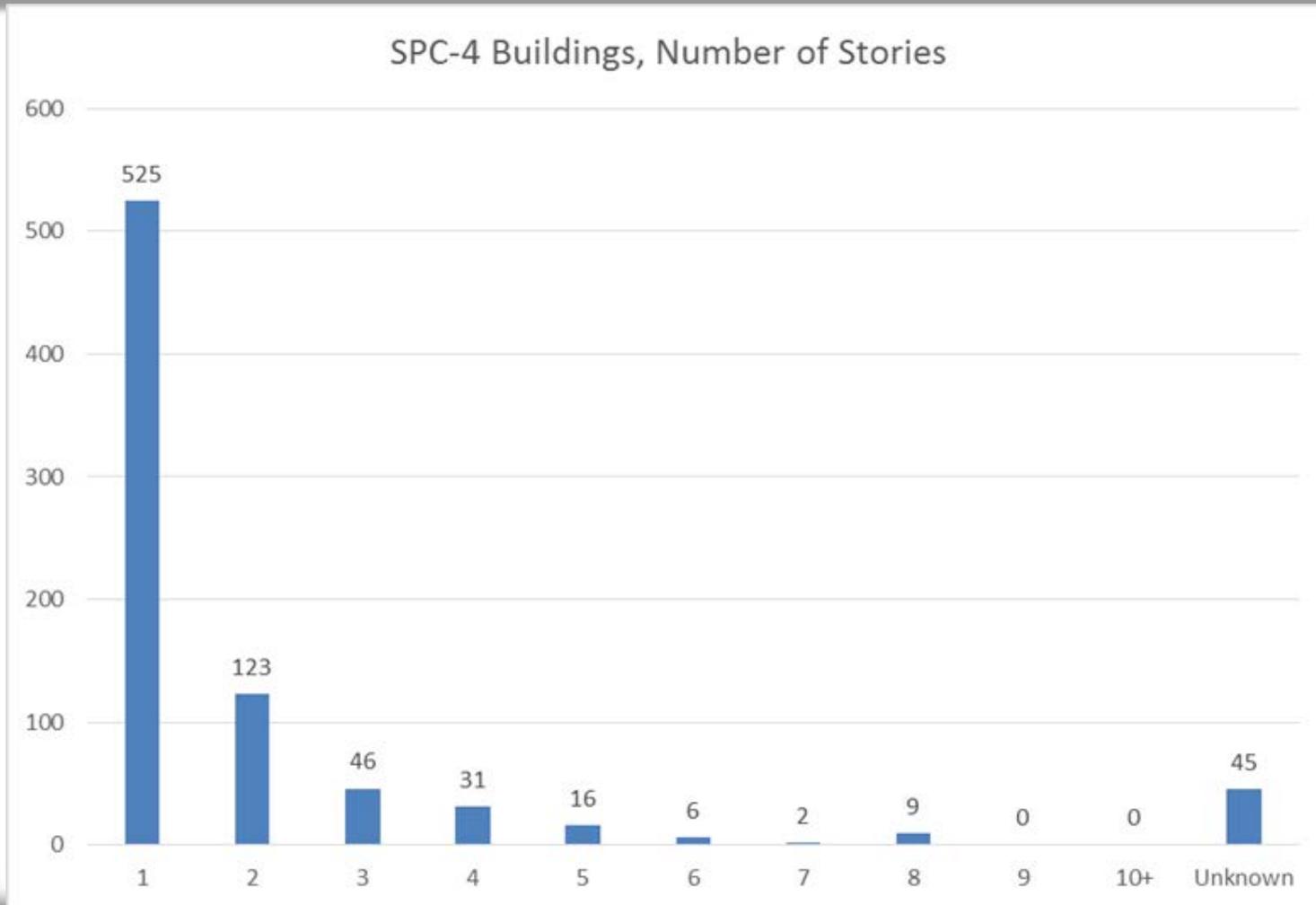
SPC-4 Buildings by Code Year



SPC-4 Buildings by Design Category



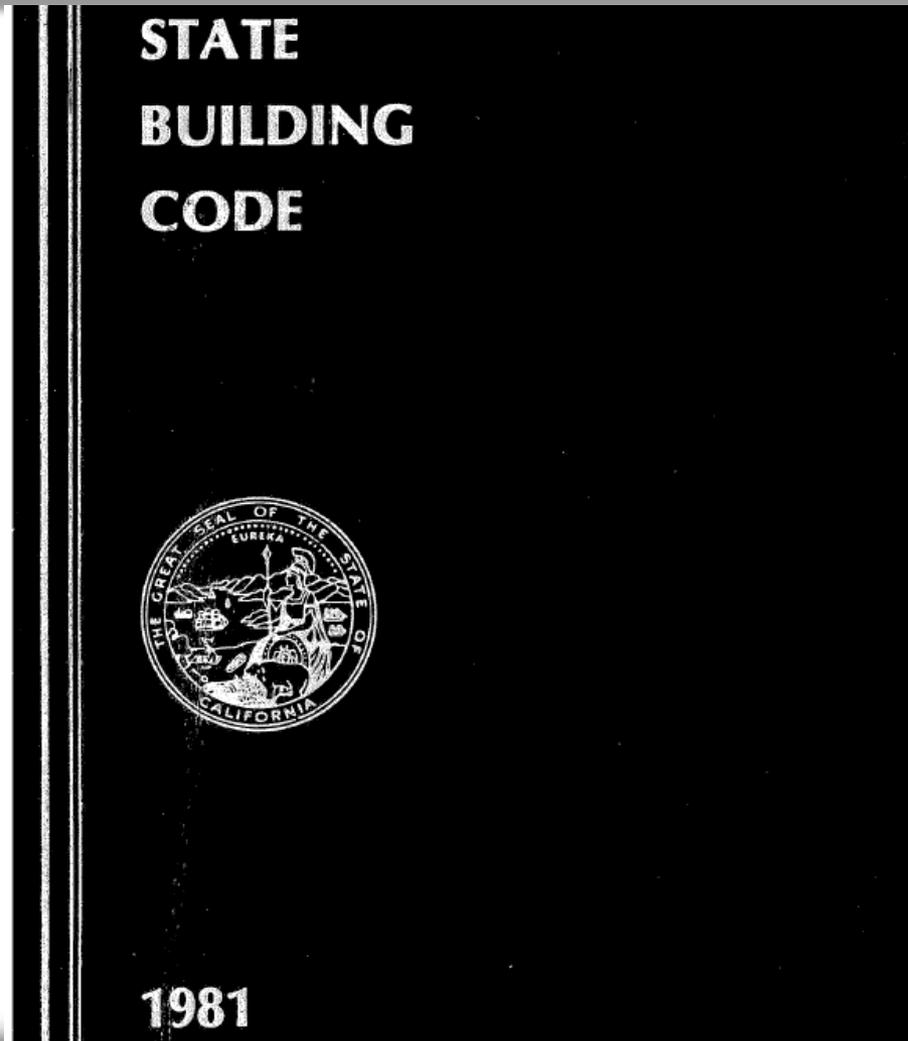
SPC-4 Buildings by Number of Stories



What is SPC-4D?

- **STRUCTURAL PERFORMANCE CATEGORY SPC-4D** is a performance category equivalent to buildings meeting the minimum prescriptive requirements of the 1980 CBC.

First State Building Code in California



What Constitutes the 1980 CBC?

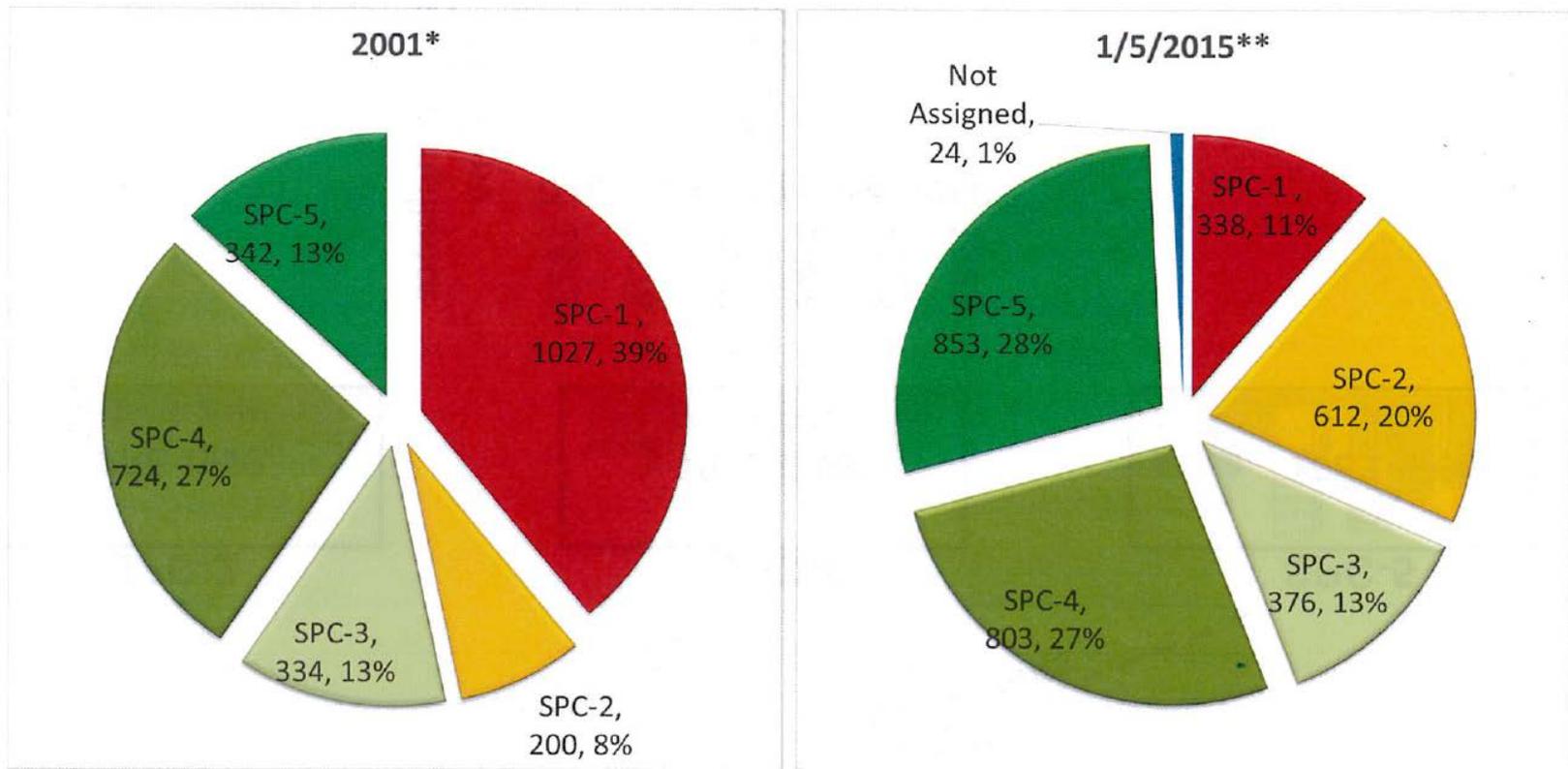
The California Building Code, 1980 (CBC 1980) consists of:

1. Uniform Building Code, 1979 (UBC 1979)
2. California Code of Regulations, Title 24- Building Standards, dated February 2, 1980.
3. California Code of Regulations, Title 22 – Social Security, dated October 13, 1979.
4. California Code of Regulations, Title 17 – Public Health, dated October 13, 1979.

What is Damage Control Structural Performance Category?

- **Damage Control Structural Performance** is a performance category at a midway point between Life Safety Structural Performance Category (SPC 2) and Immediate Occupancy Structural Performance Category (SPC 5).
- Damage Control Structural Performance Category in ASCE 41 is deemed equivalent to SPC-4D.

Progress in Seismic Compliance



*Based on 2001 Hospital Survey Results based on hospital "self-report" and then "state-of-the-art" FEMA 178 standards from 1996
 ** SPC-5 includes buildings currently under construction

Intent of SB 1953: # 1

- The state shall take steps to ensure that the **expected earthquake performance** of hospital buildings housing inpatients and providing **primary basic services is disclosed to public agencies** that have a need and a right to know
- Because the **medical industry cannot immediately bring all hospital buildings into compliance** with the Alfred E. Alquist Hospital Facilities Seismic Safety Act.

Intent of SB 1953: # 2

- The state shall **encourage structural retrofits or replacements of hospital buildings** housing inpatients and providing primary basic services that place **lives at risk because of their potential for collapse** during an earthquake.

Intent of SB 1953: # 3

- The state shall also **encourage retrofits and enhancements** to critical hospital architecture, equipment, and utility and communications systems **to improve the ability of hospitals to remain operational** for those hospitals **that do not pose risk to life.**

Statutory Authority

- H&SC § **130005(b)**. The office may define earthquake performance categories as it deems necessary to meet the intent of SB 1953 and the Alfred E. Alquist Hospital Facilities Seismic Safety Act (HSSA 83).
- H&SC § **18941**. All building standards shall be administered and enforced and...written on a performance basis consistent with state and nationally recognized standards for building construction in view of the use and occupancy of each structure to preserve and protect the public health and safety.

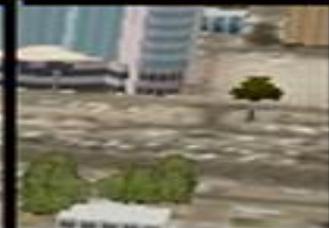
Structural Performance Categories (SPC)

Significant Risk of Collapse in a Major EQ

Low Risk of Collapse in a Major EQ

May be Capable of Providing Services to the Public after a Major EQ

Reasonably Capable of Providing Services to the Public after a Major EQ

2008-2020	2030	2030+	2030+	2030+
SPC1	SPC2	SPC3	SPC4	SPC5
				

Structural Performance Category 1 (SPC 1)

- Buildings posing a significant risk of collapse and a danger to the public.
- These are pre-1973 code buildings and buildings not originally built under an OSHPD or OSA Permit (Non-Conforming Buildings).
- These buildings must be brought up to the SPC 2 or higher level by January 1, 2020 or be removed from General Acute Care Service.

Structural Performance Category 2 (SPC 2)

- These buildings have low risk of collapse in a major earthquake and do not significantly jeopardize life.
- These are non conforming buildings.
- These buildings must be brought up to the SPC-4D or SPC-5 by January 1, 2030 or be removed from General Acute Care Service.

Structural Performance Category 3 (SPC 3)

- Conforming buildings in Near Fault Sites (NFS) with Pre-Northridge Steel Special Moment Resisting Frame (SMRF) connections.
- These buildings may experience structural damage, which does not significantly jeopardize life, and may provide service after a major earthquake.
- SPC-3 buildings can provide GAC service to 2030 & beyond.
- Building is either SPC 3 or not. No building can be upgraded to SPC 3.

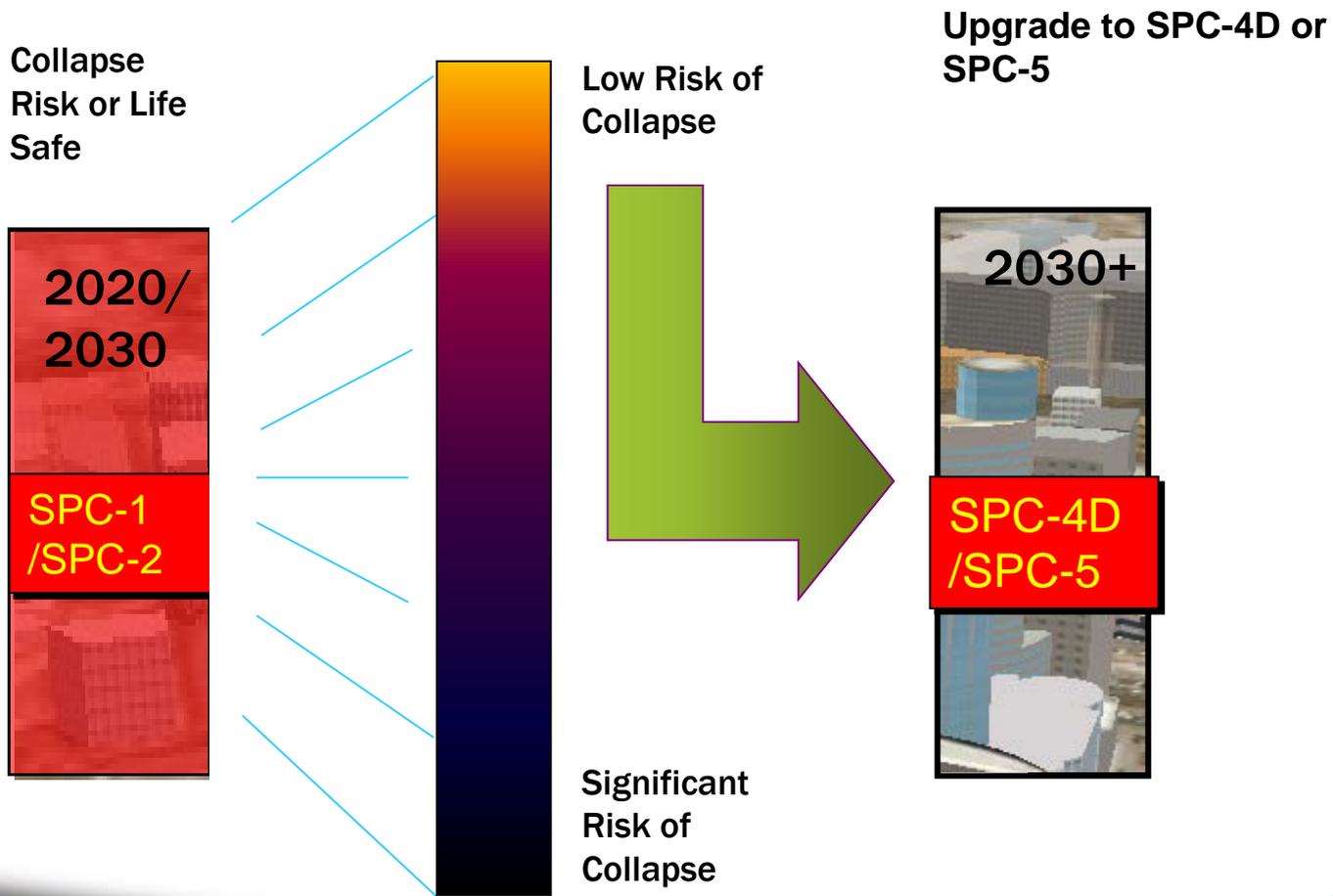
Structural Performance Category 4 (SPC 4)

- Conforming buildings permitted by OSHPD or OSA prior to 1989 Code.
- May experience some structural damage but still may provide services to the public following major earthquake.
- No deadline for these buildings. May be used up to January 1, 2030 and beyond.
- Building is either SPC 4 or not. No building can be upgraded to SPC 4.

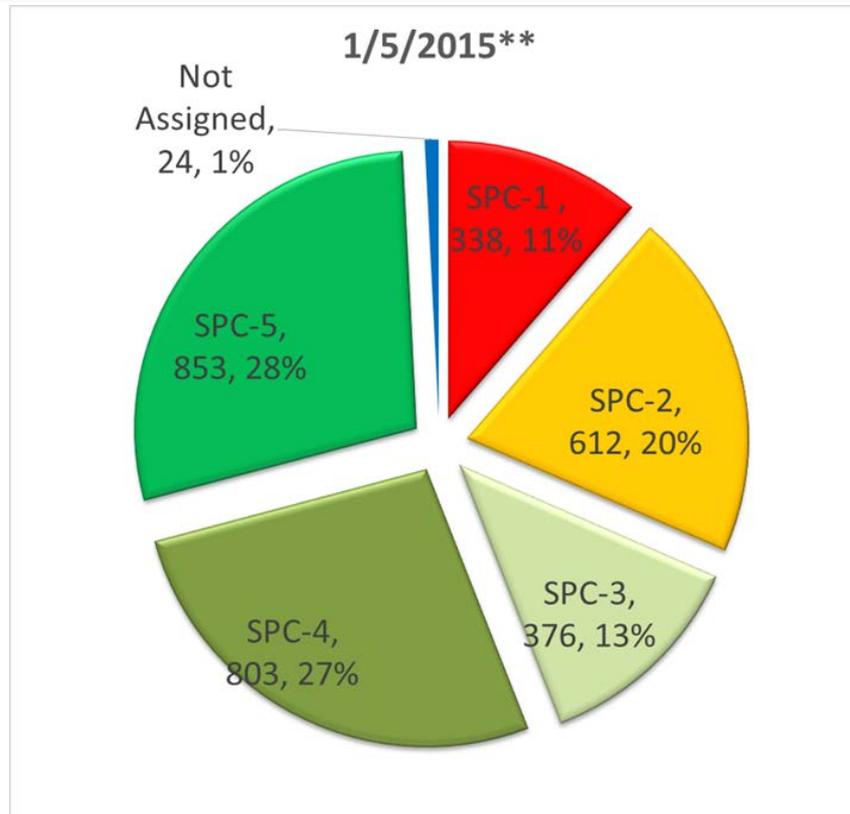
Structural Performance Category 5 (SPC 5)

- Conforming buildings permitted to the CBC 1989 or later versions of the Code (except those classified as SPC 3).
- Reasonably capable of providing services to the public following major earthquake.
- No deadline for these buildings. May be used up to January 1, 2030 and beyond.

SPC-1/SPC- 2 Buildings Upgrade Options



Current SPC Rating of GAC Hospital Buildings



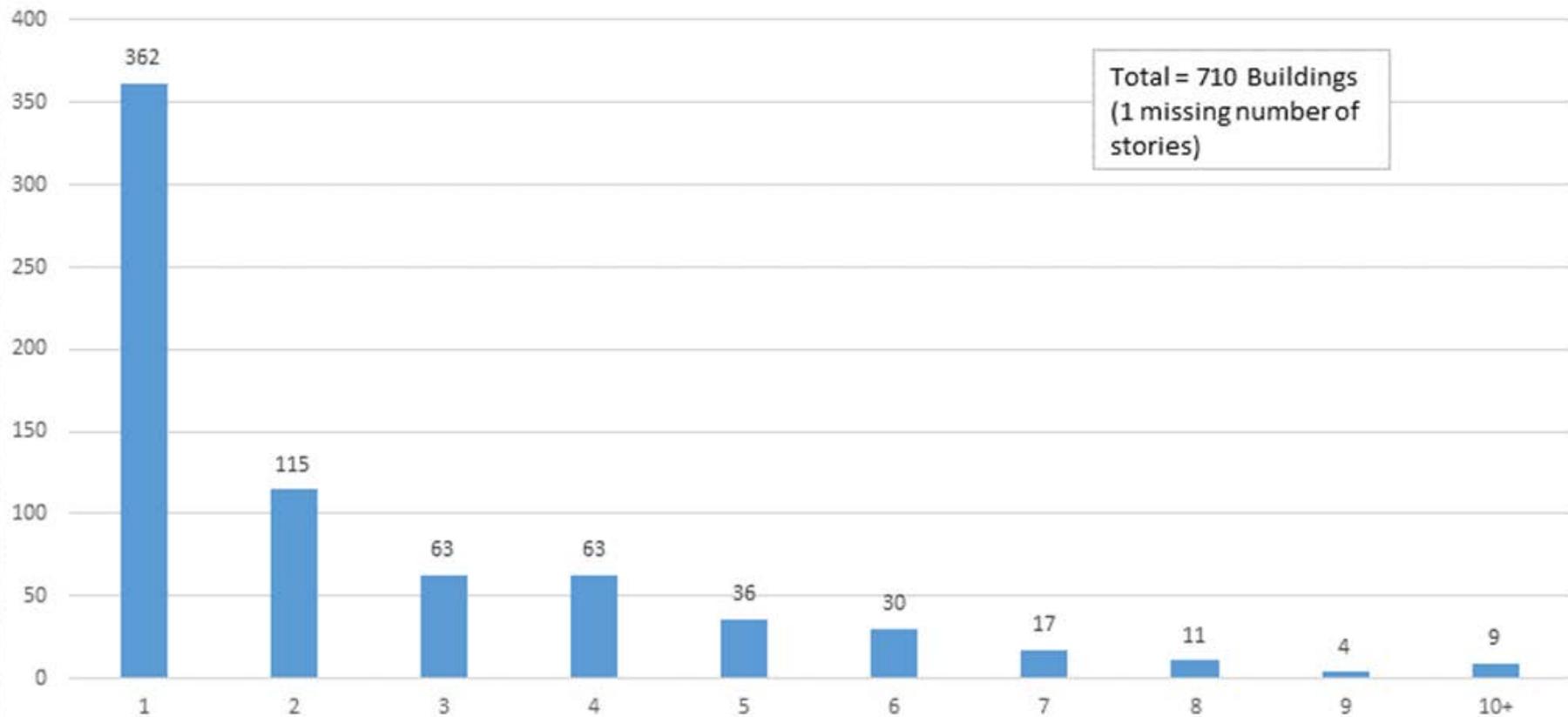
Total Acute Care Building Count = 3006

SPC-1/SPC-2 Buildings = 950

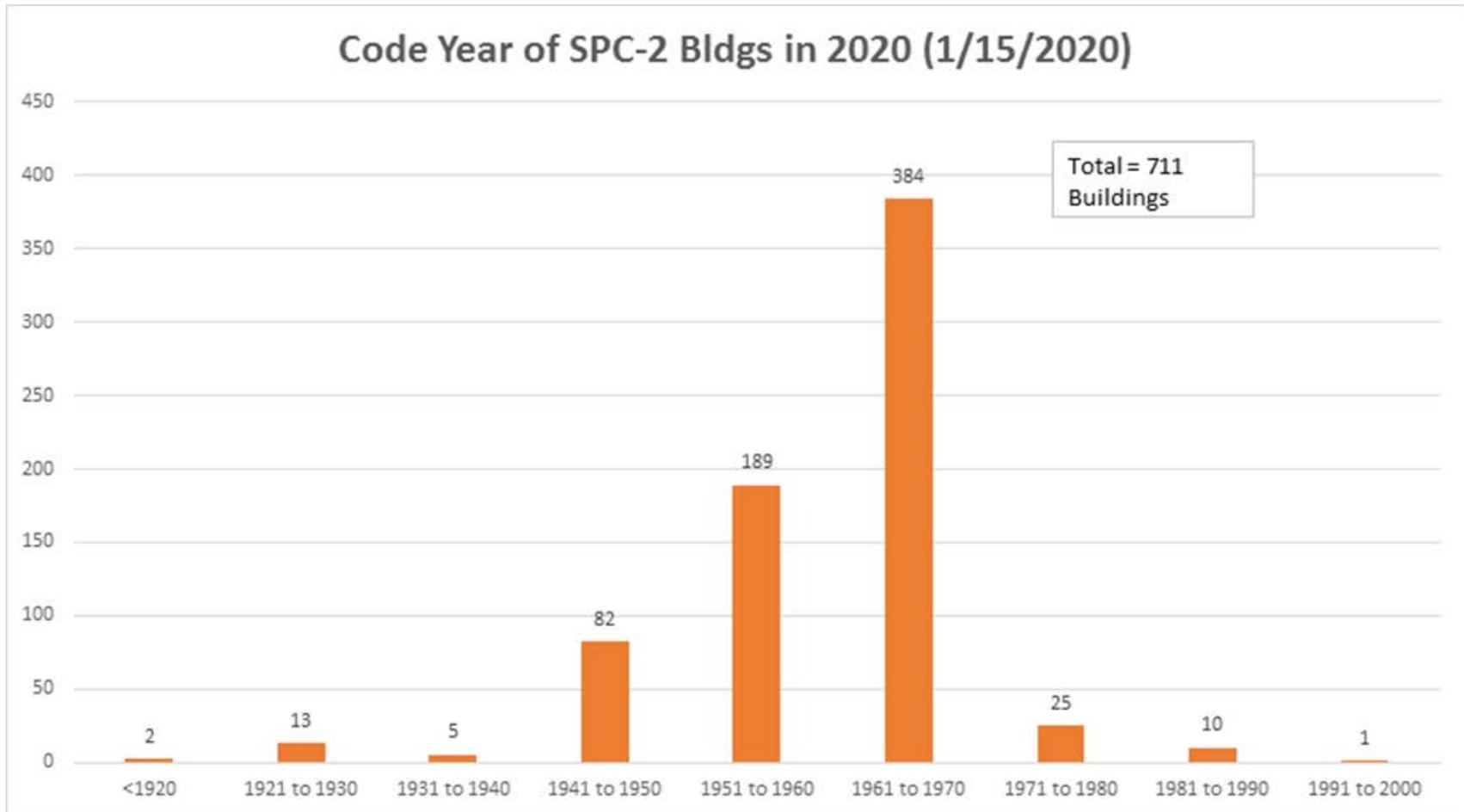
** SPC-5 includes buildings currently under construction

Expected No. of Stories in SPC- 2 Bldgs.

No of Stories in SPC-2 Bldgs in 2020 (1/15/2020)



Vintage of SPC-2 Bldgs. in 2020



Performance Expectation for SPC-4D Bldgs.

- May control damage to permit return to function similar to SPC-3 or 4 buildings but not as quickly as SPC-5 buildings.
- Performance should be equivalent to SPC-3 and SPC-4 buildings.

Why SPC-4D?

- To make compliance with SB 1953 program cost effective.
- To ensure availability of Hospitals in rural and medically underserved areas.
- IEBC 2015/ASCE 41-13 adopted damage control structural performance level as a discrete performance category.
- Statute requires OSHPD to adopt model code and national standards.

Seismic Evaluation Vs. Seismic Retrofit

- Traditionally seismic evaluation was at 75% of new building code seismic design forces (ASCE 31-03).
- Seismic evaluation requirements in the CAC Chapter 6 are based on FEMA 178
 - ❖ SPC 2: 67% of Life Safety based on CBC 1995
 - ❖ SPC 4: 83% of Immediate Occupancy based on CBC 1995
- CBC Chapter 34A SPC-2 upgrade requirements are consistent with this philosophy.

Seismic Evaluation Vs. Seismic Retrofit

- Seismic Retrofits are usually at 100% of new building code seismic design force level (ASCE 41-06).
- ASCE 41-13 merged ASCE 31-03/ASCE 41-06 into single documents and permits seismic evaluation level forces to be used for retrofit (for Risk Category II Buildings).

Seismic Evaluation Vs. Seismic Retrofit

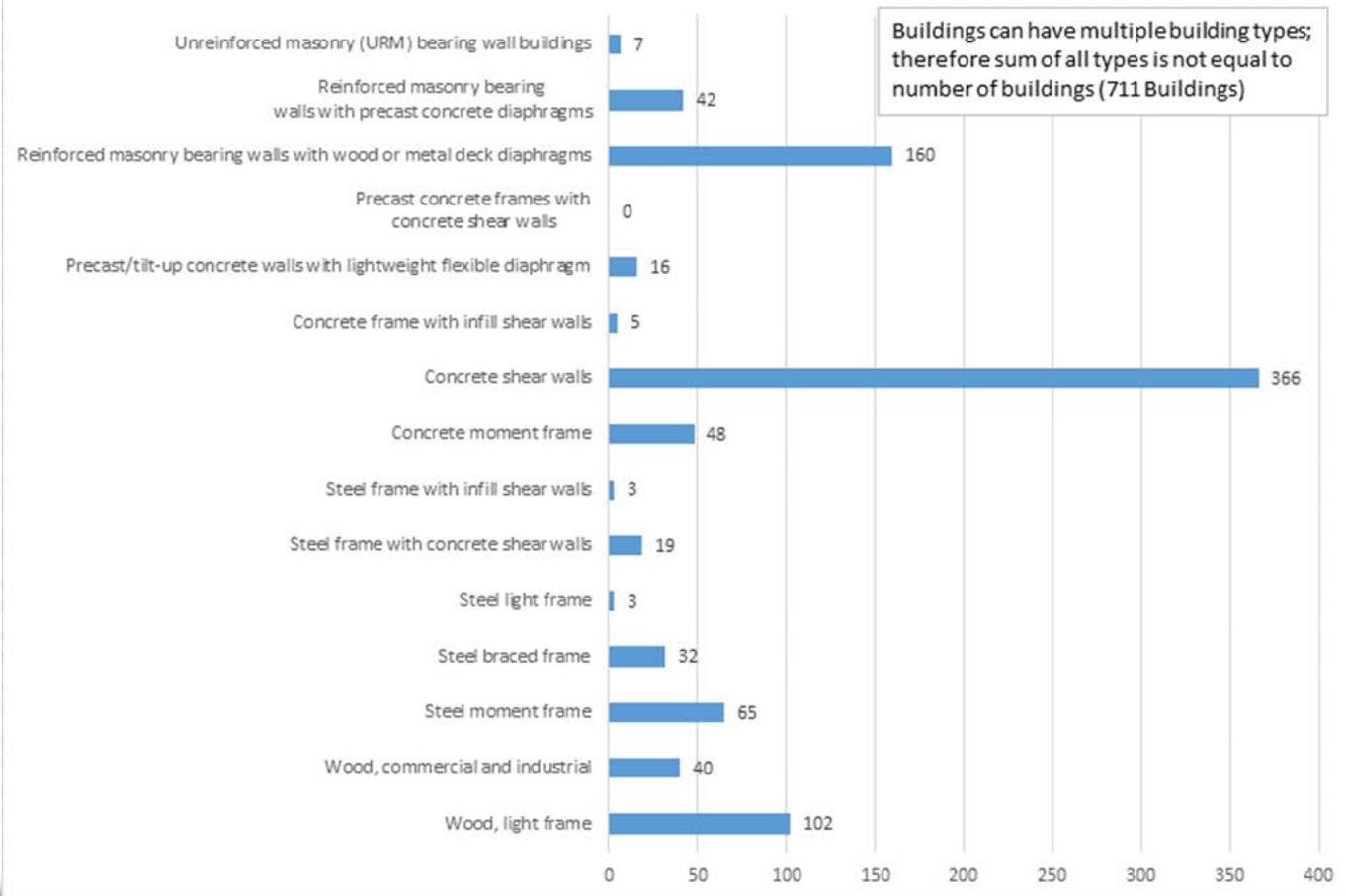
- ❖ OSHPD is adopting ASCE 41-13 philosophy of structural retrofit for SPC-4D Performance level
 - This is consistent with International Existing Building Code (IEBC) philosophy of permitting some alterations at 75% of IBC level forces

Some Nonconforming Hospital Buildings will NOT be Eligible for SPC-4D Upgrade

1. Hospital buildings with the potential for surface fault rupture and surface displacement at the building site;
2. Unreinforced Masonry shear wall buildings;
3. Precast Concrete buildings.

Building Type SPC-2 Bldgs. in 2020

Building Types in SPC-2 Bldgs in 2020 (1/15/2015)



Simplify and Streamline Compliance

- **No** seismic evaluation (check list) will be required to change SPC-1/SPC-2 buildings to SPC-4D
 - Submit **analysis** to seismic compliance unit, or
 - Submit **retrofit** projects to OSHPD regions.
 - SPC rating will be changed by a process equivalent to those for SPC-5.
 - Proof of performance consistent with SPC-4D will be required.

IEBC Tables 301.1.4.1 AND 301.1.4.2

**[BS] TABLE 301.1.4.1
PERFORMANCE OBJECTIVES FOR USE IN ASCE 41 FOR COMPLIANCE WITH
INTERNATIONAL BUILDING CODE-LEVEL SEISMIC FORCES**

RISK CATEGORY (Based on IBC Table 1604.5)	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-1N EARTHQUAKE HAZARD LEVEL	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-2N EARTHQUAKE HAZARD LEVEL
I	Life Safety (S-3)	Collapse Prevention (S-5)
II	Life Safety (S-3)	Collapse Prevention (S-5)
III	Damage Control (S-2)	Limited Safety (S-4)
IV	Immediate Occupancy (S-1)	Life Safety (S-3)

**[BS] TABLE 301.1.4.2
PERFORMANCE OBJECTIVES FOR USE IN ASCE 41 FOR COMPLIANCE WITH
REDUCED INTERNATIONAL BUILDING CODE-LEVEL SEISMIC FORCES**

RISK CATEGORY (Based on IBC Table 1604.5)	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-1E EARTHQUAKE HAZARD LEVEL
I	Life Safety (S-3)
II	Life Safety (S-3)
III	Damage Control (S-2). See Note a
IV	Immediate Occupancy (S-1)

a. Tier 1 evaluation at the Damage Control performance level shall use the Tier 1 Life Safety checklists and Tier 1 Quick Check provisions midway between those specified for Life Safety and Immediate Occupancy performance.

PERFORMANCE OBJECTIVE (IEBC Table 301.1.4.1/ASCE 41 Table 2-2)

Performance Objective Used with ASCE 41-13 for Compliance with International Building Code Level Forces

Risk Category	Structural Performance Level with BSE-1N/Design Earthquake	Structural Performance Level with BSE-2N/MCE _R
Full SPC-2 Upgrade*	Life Safety (S-3)	None
I & II	Life Safety (S-3)	Collapse Prevention (S-5)
III/SPC-4D*	Damage Control (S-2)	Limited Safety (S-4)
IV/SPC-5*	Immediate Occupancy (S-1)	Life Safety (S-3)

* Requires Mitigation of the CAC Chapter 6 Article 10 Deficiencies.

Limitations for the CBC 1980 Based SPC-4D Provisions

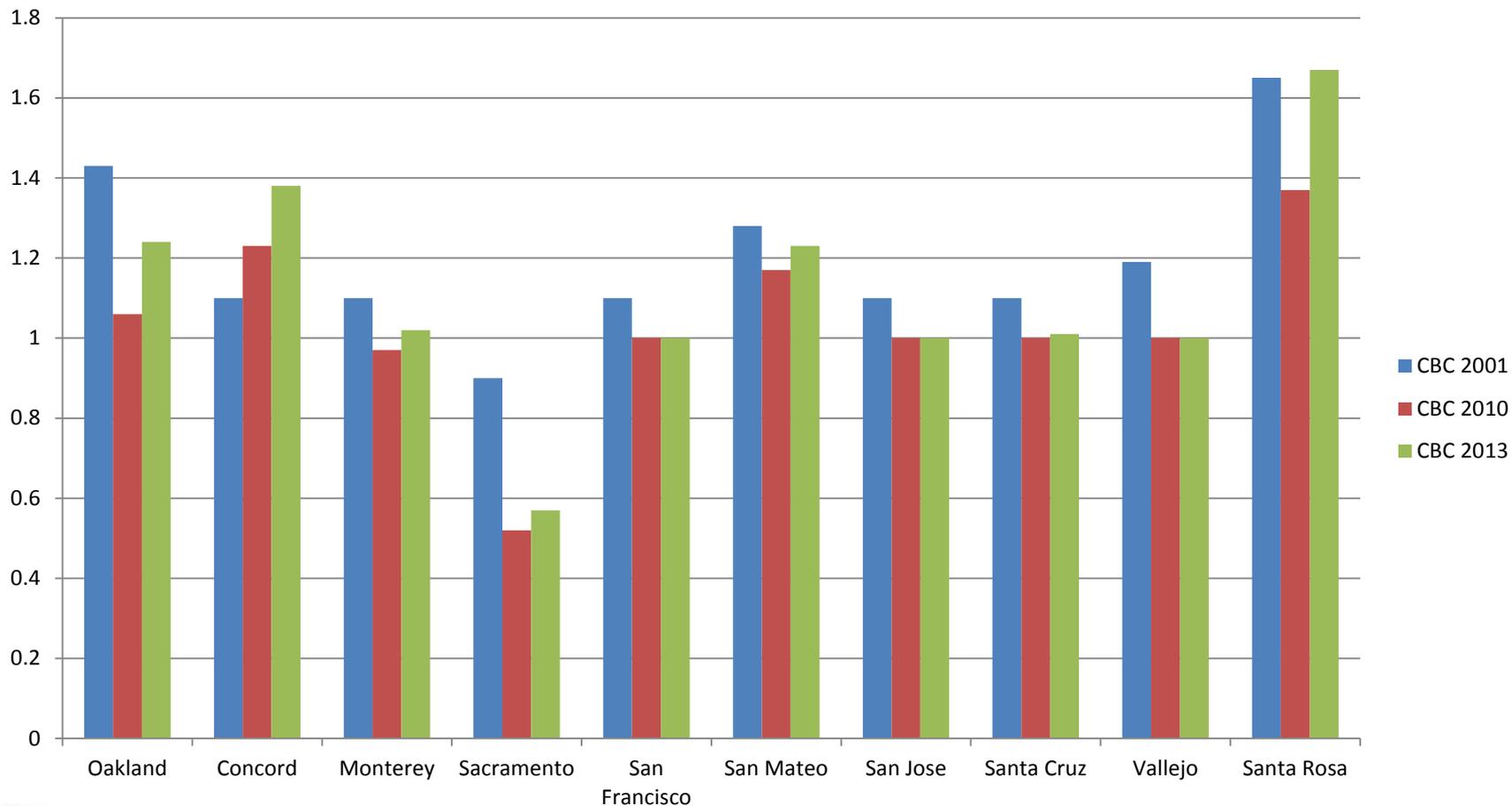
Following buildings will require performance based evaluation using ASCE 41:

- Buildings with prohibited structural irregularities.
- Buildings taller than 5-stories or 65' height with any irregularity.

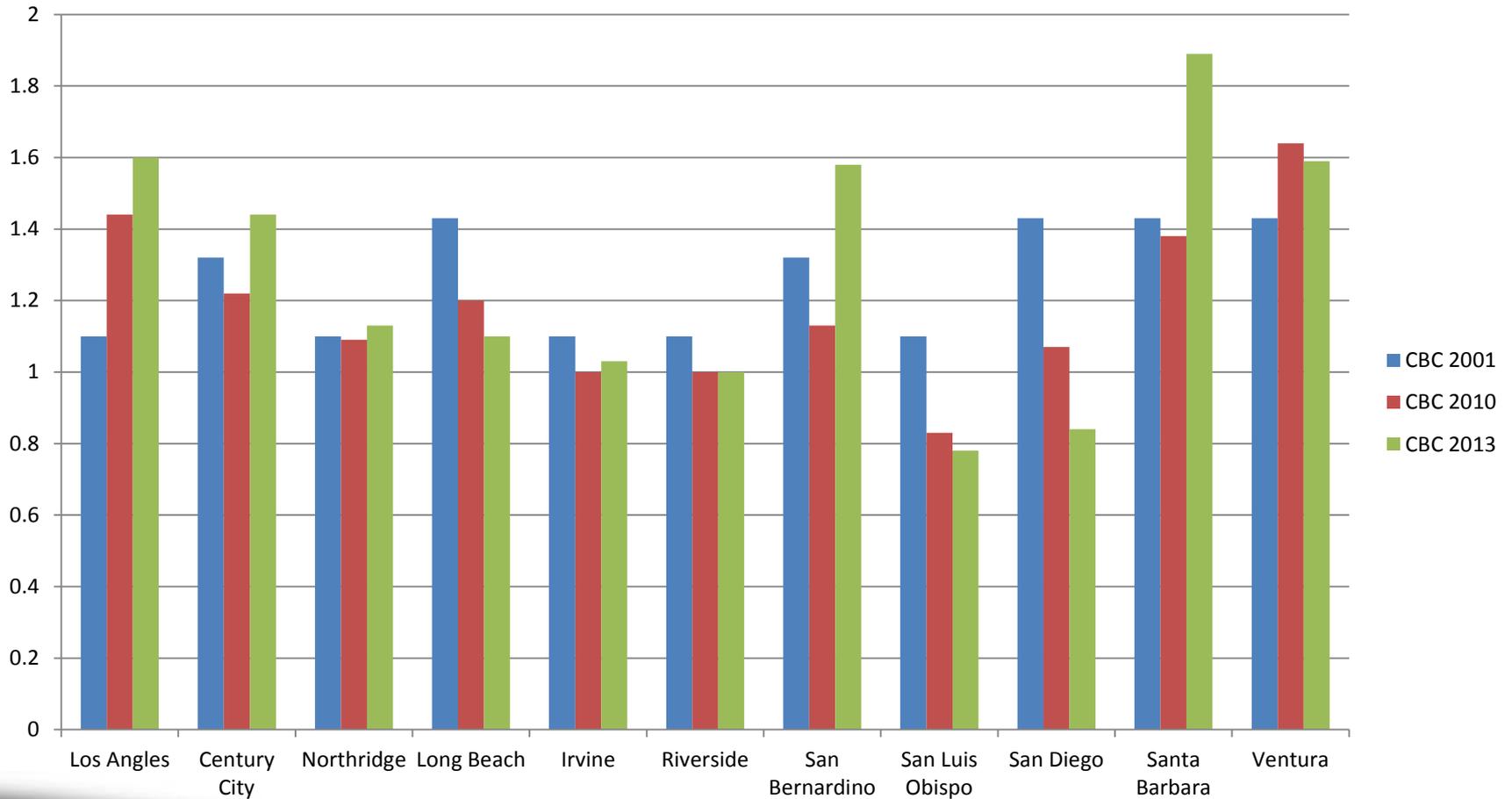
SPC-4D Construction Documents Review

- Building Characterization required:
 - Existing Construction documents review.
 - Field testing and inspections; and
 - Field observation of exposed conditions.
- Buildings without original construction documents will require comprehensive materials testing.
- Nonconforming buildings didn't go through OSHPD's plan review or field tests/inspections.

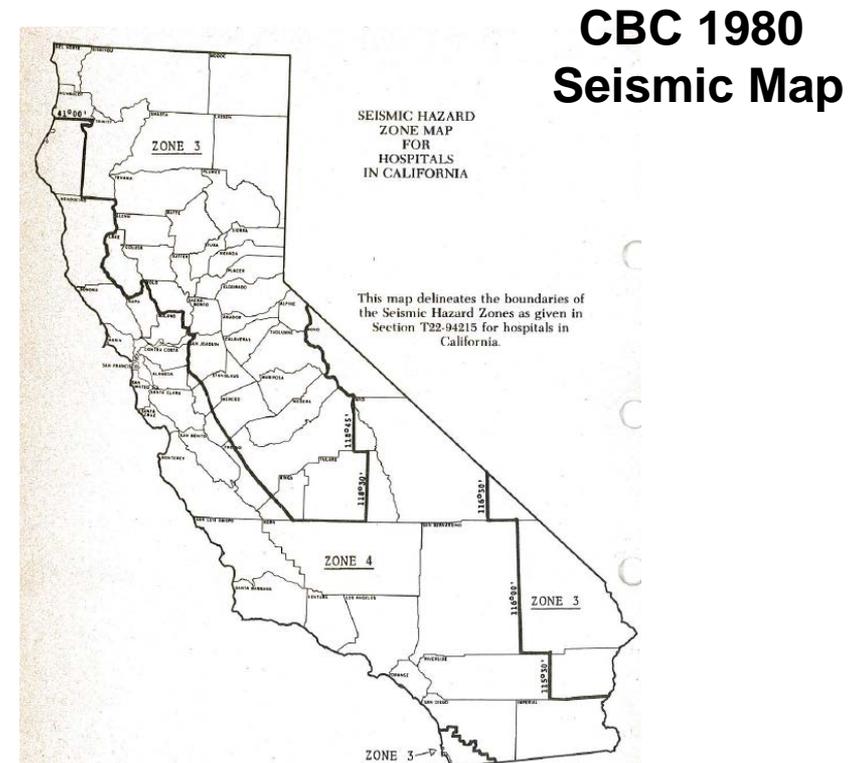
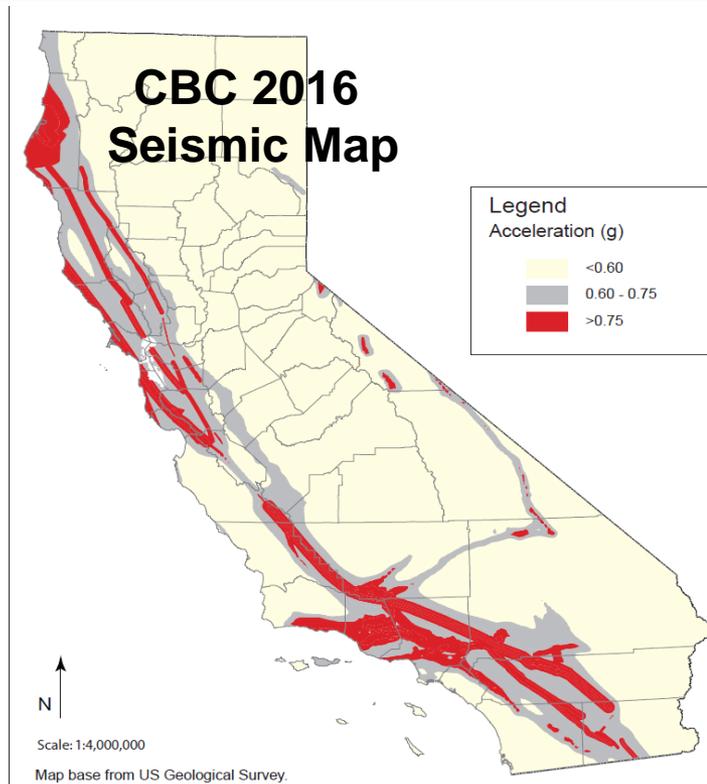
Short-Period Design Accelerations (S_{DS}) Northern CA



Short-Period Design Accelerations (S_{DS}) Southern CA

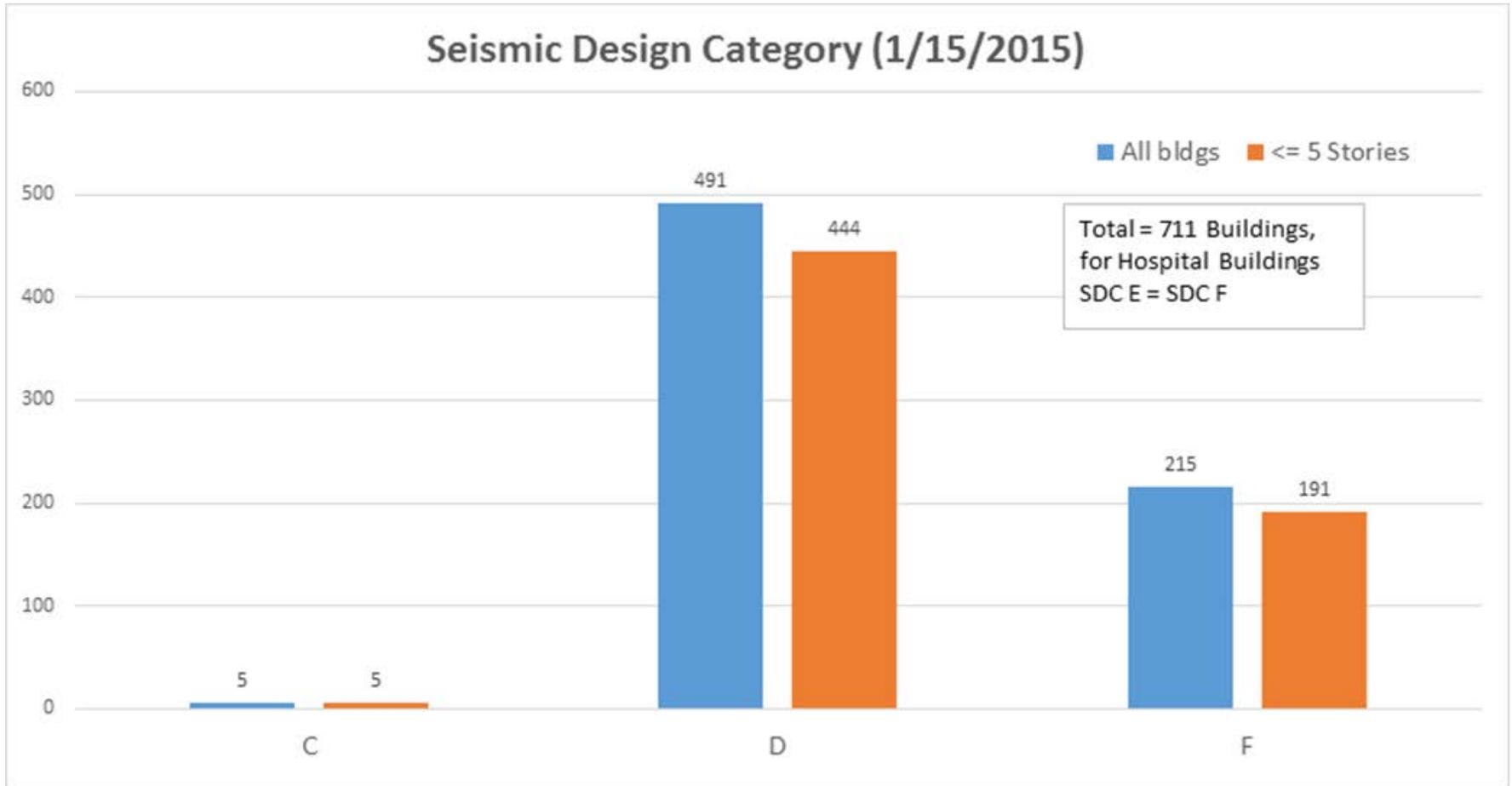


CBC 2016 SDC F Vs. CBC 1980 Zone 4



**SDC F is not comparable to Seismic Zone 4 because of Near Field Effects.
SDC D encompass all of Seismic Zone 3 & large part of Seismic Zone 4**

Buildings in SDC D vs. F



Summary of SPC-4D Provisions

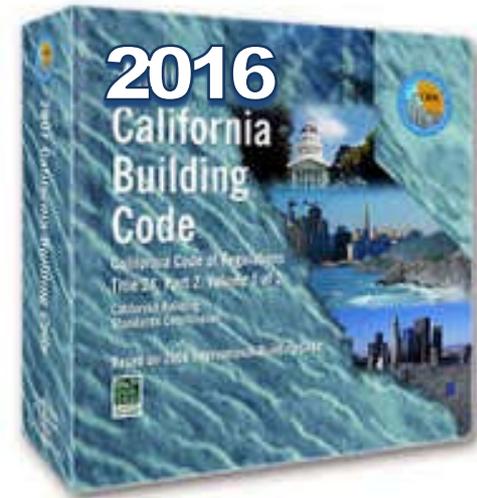
- Nonconforming buildings can be upgraded to SPC-4D to provide services beyond 2030.
- The CBC 1980 can be used to upgrade a building to SPC-4D.
- ASCE 41-13 Damage Control Structural Performance level can be used for SPC-4D analysis or retrofit.
- **No** Seismic Evaluation Checklist, much simpler enforcement.

2016 California Building Code

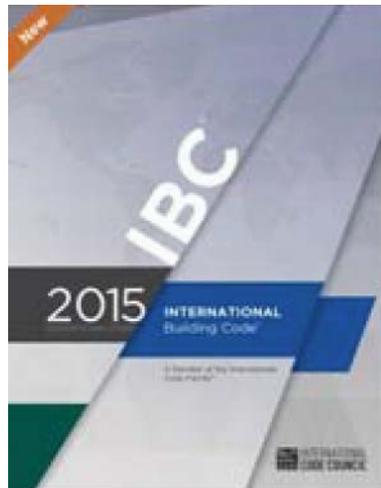
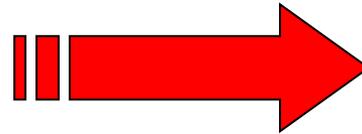
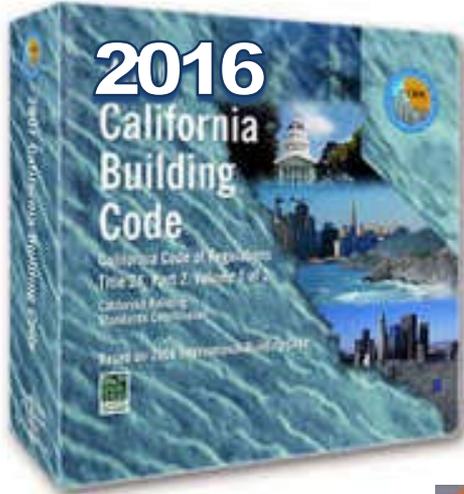
An Overview of Amendments For CBC 2016

2016 California Building Code (CBC 2016)

- Only structural technical changes to the CBC 2016 are addressed.
- Technical changes for nonstructural disciplines will be addressed in a separate package.

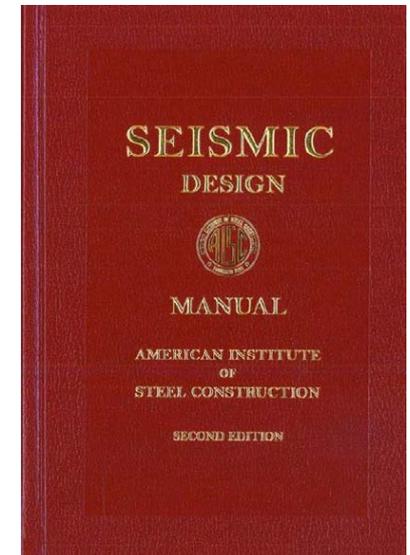
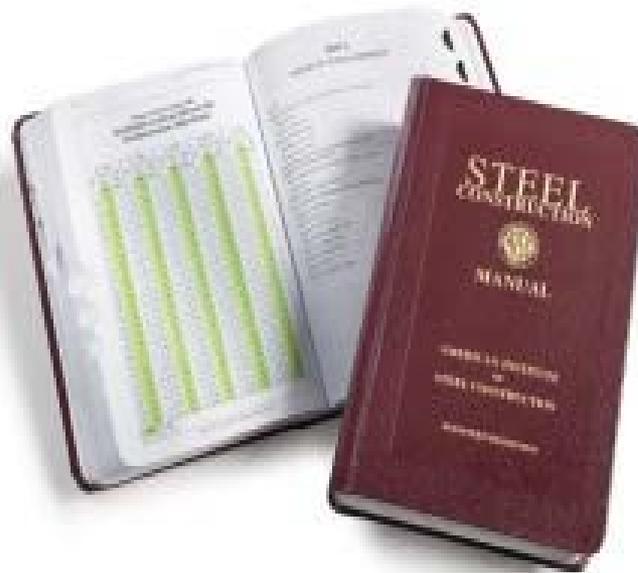


2016 California Building Code (CBC 2016)



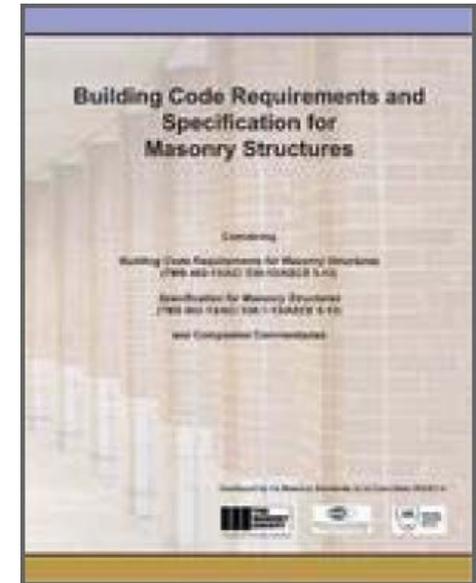
Major Reference Standards NOT Updated

1. ASCE 7-10: Minimum Design Loads
2. AISC 360-10: Steel Design
3. AISC 341-10/358-10: Seismic Design of Steel



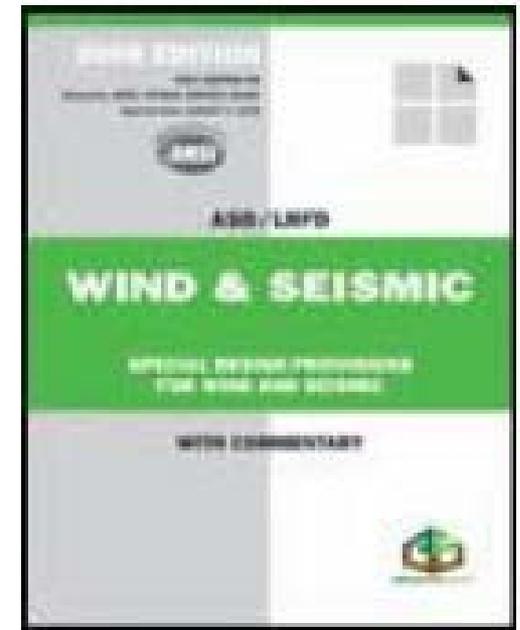
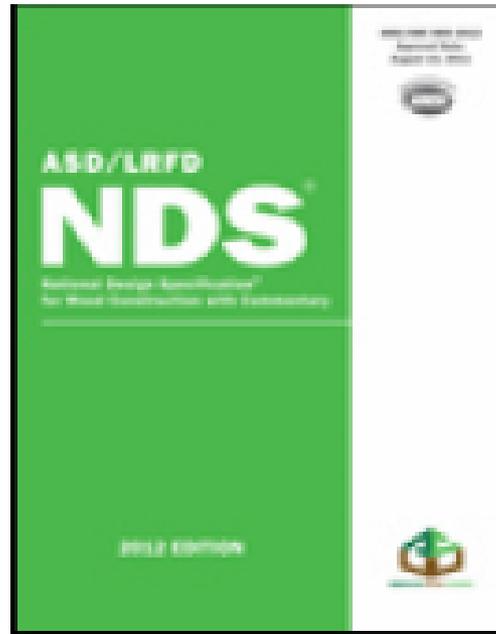
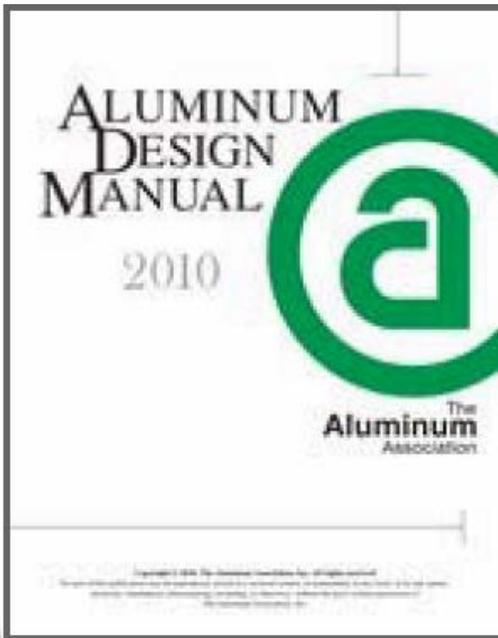
Major Reference Standards Updated

1. ASCE 41-13: Seismic Evaluation and Retrofit of Existing Buildings
2. ACI 318-14: Concrete Design
3. TMS-402/602-13: Masonry Design



Major Reference Standards Updated

1. ADM1-15: Aluminum Design
2. NDS-15: Wood Design
3. SDPWS-15: Seismic Design of Woods



2016 CBC: Design Demand/Forces An Overview

- **No** Changes in seismic hazard maps
 - CBC 2016 will have same ground motions as the CBC 2013.
 - ASCE 7-10 is the basis for ground motions in both the CBC 2013 & CBC 2016.
 - Demand/Forces for design in the CBC 2013 & CBC 2016 are pretty much identical.

2016 CBC: Steel Design

An Overview

- **No** Changes in Steel Design
 - AISC 360-10, AISC 341-10 & AISC 358-10 are the basis for capacity in both the CBC 2013 & CBC 2016
 - SidePlate moment connections will be permitted in accordance with AISC 358-10, Supp. # 2 with OSHPD amendments.

Impact of Limited Changes on Pre-Approvals

- **All** Pre-Approvals for the CBC 2013 can be used for the CBC 2016
 - 2013 OSHPD Preapproved Details (OPDs) will be permitted for the CBC 2016.
 - 2013 OSHPD Preapproval of Manufacturer's Certification (OPMs) will be permitted for the CBC 2016 **with no Caveats.**

2016 CBC: Existing Structures An Overview

- IBC 2015 removed existing structures Chapter 34 from scope.
- IEBC 2015 replaced IBC 2012 Chapter 34.
- IEBC 2015 Chapter 4 is pretty much identical to IBC 2012 Chapter 34

2016 CBC: Existing Structures

An Overview

- ❖ 17 pages in IBC 2012(/CBC 2013)
Chapter 34 replaced by 304 pages in
IEBC 2015.
- ❖ OSHPD propose to keep the CBC
Chapter 34A
 - ❖ Will adopt IEBC 2015 Chapter 4
instead of IBC 2012 Chapter 34 as
primary basis for Chapter 34A.

Fundamental Difference between CBC Chapter 34A & IEBC Provisions

- **CBC Chapter 34A (based on IEBC 2015 Chapter 4):** Additions, Alterations, and Repairs are at new building code force level.
- **IEBC 2015 (Except Chapter 4):** Alterations and repairs are at 75% of new building code force level
 - Repairs can be in accordance with original design code, with 75% of current code seismic demand as minimum.
- **IEBC 2015:** Additions are at new code force level.

CBC 2016 Chapter 34A

OSHPD 1 & 4 Buildings

- Additions, Alterations, and Repairs can follow one of the three (3) approaches:
 1. New Building Provisions: Sections 3403A (Additions), 3404A (Alterations), and 3405A (Repairs)
- This is based on IEBC 2015 Chapter 4 (pretty much same as IBC 2012 Chapter 34)

CBC 2016 Chapter 34A

OSHPD 1 & 4 Buildings

- Additions, Alterations and Repairs can follow one of the three (3) approaches:

2. Incidental or Minor Provisions for Nonconforming Buildings: Section 3411A (Permits $I_e = I_p = 1.0$, instead of 1.5)

- This is mandated by H&SC Section 129875.
- Replaces IEBC 2015 work area compliance method in Chapters 5 through 13.

CBC 2016 Chapter 34A

OSHPD 1 & 4 Buildings

- Additions, Alterations and Repairs can follow one of the three (3) approaches:

3. ASCE 41-13 based Provisions: Sections 3412A through Sections 3819A.

- Include provisions mandated by HSSA 83 and SB 1953.
- Performance based provisions based on IEBC Chapter 4.

Existing Structures Provisions for OSHPD 1 & 4 Buildings

- Existing structures structural provisions will be in Chapter 34A of the CBC 2016
- Will be consistent with IEBC 2015, with modifications required by OSHPD's statutory mandate.
- It will be about 20-pages in the CBC 2016 Chapter 34A & not in more than 300-pages in the CEBC
- Much less regulations to achieve the same goal.

Reasons for Not Adopting IEBC 2015

An Overview

- IEBC 2015 will greatly increase the complexity of regulations by creating a parallel code to the CBC.
- Much of the IEBC will have to be amended to meet the statutory mandate.

Reasons for Not Adopting IEBC 2015 (Continued)

- IEBC defines “Existing Building” as a building that has a building permit & NOT occupancy
- Significant changes can be made during construction prior to occupancy without complying with the CBC.

Reasons for Not Adopting IEBC 2015 (Continued)

- IEBC 2015 addresses all disciplines & NOT just structural. Amendments for all disciplines need to be incorporated into the CEBC.
- CBC 34A amendments for systems, services, utilities, means of egress, removal of general acute care services from buildings need to be incorporated into the IEBC.
- Performance Objective in IEBC (Table 301.1.4.1) is adopted in the CBC 2016 Chapter 34A.

DSA: 2013 CBC Ch. 34 vs 2016 CEBC

2013 CBC Ch. 34 – (E) Buildings

3401-3411
Prescriptive C.M.

X 3412
Compliance
Alternatives

3413-3416
SFM (E) Building
Requirements

3417-3423
DSA-SS Seismic
Strengthening
Provisions

2016 CEBC – CA (E) Building Code

Ch. 1-2
Admin & Definitions

Ch. 3: Prov. for all
Compliance Methods

Ch. 4: Prescriptive
Compliance Method

Ch. 5-13
Work Area C.M. **NEW**

Ch. 14
Performance C.M.

Appendices for URM,
Cripple Walls, etc.

Identical

Identical &
Renamed

Alt.

NEW

Relocate to end of Ch. 4

2016 CBC: Special Inspections & Tests

An Overview

- **Special Inspections and Tests shall be provided by “Approved Agencies”** employed by the Owner (& NOT AOR/SEOR or Contractor):
 - Responsibility for special inspection belongs to **“Approved Inspection Agencies”** and only indirectly to “Special Inspectors”, employed by the agencies.

2016 CBC: Approved Testing and Inspection Agencies

- A testing agency accredited to ISO 17025 shall be deemed to be an “Approved Testing Agency.”
- An inspection agency accredited to ISO 17020 shall be deemed to be an “Approved Inspection Agency.”

2016 California Building Code

Major Changes in CBC 2016

Chapter 16A

Amendments in Chapter 16A Structural Design

Amendments to Chapter 16A

Structural Design

- ❖ No major change between the CBC 2013 and CBC 2016.
- ❖ Design criteria requirement for wind tunnel test is deleted, since the CBC 2016 adopted ASCE 49-12 for wind tunnel tests (Section 1616A.1.1)

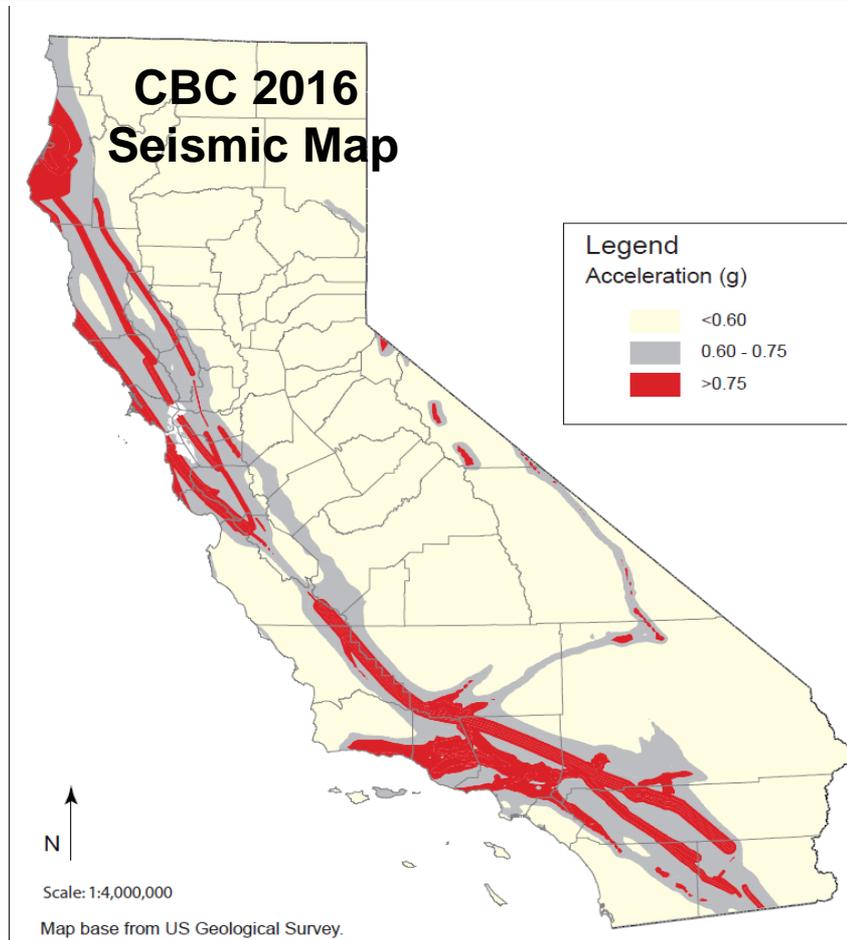
Amendments to Chapter 16A Structural Design

- ❖ NFPA 13-16 demand & capacities will be accepted without re-calculations, since they are consistent with ASCE 7-10/ACI 318-14.

Base Isolated Buildings in SDC D can be Designed by Linear Procedure

- ❖ Linear procedure can be used for base isolated buildings in Seismic Design Category D (Section 1616A.1.36).

CBC 2016 Seismic (S_1) Map



- ❖ Base isolated buildings in non-red areas (SDC D) can use linear procedure.

Amendments in Chapter 17A Special Inspections and Tests

Special Inspection at Fabricator's Shop

(Section 1704A.2.5)

- *Special inspection* of the fabricated items shall be performed during fabrication.
- Special inspections during fabrication **are not required** where the fabricator maintains **approved** detailed fabrication and quality control procedures acceptable to the building official.
- Approval shall be based upon review of fabrication and quality control procedures and **periodic inspection**.

Modular Structures/Equipment Skids can use Fabricator's Shop Exception (Section 1703A.6)

- Modular Structures/Equipment Skids can use Fabricator's shop exception to avoid on-site quality assurance inspection.
- Explicitly permitted by Section 1703A.6

Quality Assurance Vs. Quality Control

Quality Assurance (QA). Special Inspections and testing by an approved agency employed by the Owner. Nondestructive testing (NDT) and project specific testing required by approved construction documents shall be performed by the approved agency responsible for Quality Assurance.

Quality Control (QC). Inspections and materials/functionality testing provided by the fabricator, erector or other responsible contractor as applicable.

Typical Split between QA and QC (AISC 341-10)

**TABLE J6-1
Visual Inspection Tasks Prior to Welding**

Visual Inspection Tasks Prior to Welding	QC		QA	
	Task	Doc.	Task	Doc.
Material identification (Type/Grade)	O	-	O	-
Welder identification system	O	-	O	-
Fit-up of Groove Welds (including joint geometry) <ul style="list-style-type: none"> - Joint preparation - Dimensions (alignment, root opening, root face, bevel) - Cleanliness (condition of steel surfaces) - Tacking (tack weld quality and location) - Backing type and fit (if applicable) 	P/O**	-	O	-
Configuration and finish of access holes	O	-	O	-
Fit-up of Fillet Welds <ul style="list-style-type: none"> - Dimensions (alignment, gaps at root) - Cleanliness (condition of steel surfaces) - Tacking (tack weld quality and location) 	P/O**	-	O	-
<p>** Following performance of this inspection task for ten welds to be made by a given welder, with the welder demonstrating understanding of requirements and possession of skills and tools to verify these items, the Perform designation of this task shall be reduced to Observe, and the welder shall perform this task. Should the inspector determine that the welder has discontinued performance of this task, the task shall be returned to Perform until such time as the Inspector has re-established adequate assurance that the welder will perform the inspection tasks listed.</p>				

Perform (P) is equivalent to Continuous Inspection.

Observe (O) is equivalent to Periodic Inspection

Inspectors shall work Under the Direction of RDP

§129825. ...Inspectors..

(a)the inspector shall act under the direction of the architect or structural engineer, or both, and be responsible to the board or authority.

➤ Added to Section 1704A.2

2016 CBC: Certificate of Compliance Requirements

- **“Certificate of Compliance” shall be submitted to the building official** (in addition to the submittal of reports of special inspections and tests):
 - Requirements for “Certificate of Compliance” that used to apply to special seismic certification only is expanded to 7 (seven) different categories.

Certificate of Compliance (Section 1704A.5)

- **“Certificate of Compliance” shall be submitted to the building official:**
 1. Fabrication of structural load bearing or lateral load resisting members.
 2. Manufacturer’s Certification of non-structural components supports and attachments.
 3. Special Seismic Certification of equipment & components.

Certificate of Compliance (Section 1704A.5)

- **“Certificate of Compliance”** Continued:
 4. Pre-Construction tests for shotcrete.
 5. Open web steel joist and joist girders.
 6. Weldability of reinforcing bars.
 7. Mill certs for reinforcing bars.

Basis of Special Inspection Exemption for Fabricator's Shop

- ✓ OSHPD shall enforce quality control provisions in the Code
- ✓ Inspectors shall work under the direction of Registered Design Professionals (RDP)
- ✓ Fabricator shall be approved by OSHPD on a project by project basis.
- ✓ Fabricator shall submit a “Certificate of Compliance” for the fabricated items.

Exceptions to Special Seismic Certification Requirements

1. *Equipment and components weighing not more than ~~20~~ **50** lbs. supported directly on structures or surface mounted on components not required to have special seismic certification by this section.*
2. *Electric motors, pumps, and compressors up to 20 hp. ~~not more than 10 hp. rigidly supported directly on structures (and not mounted on other equipment or components) with supports and attachments in accordance with this code.~~*
3. *Electrical Controllers, Switches, Transformers, Circuit Breakers, and fuses up to 10 lbs. or 10 amperes.*

Component Requiring Special Seismic Certification

1. *Emergency and standby power systems.*
2. *Elevator equipment (excluding elevator cabs).*
3. *Components with hazardous contents.*
4. *Exhaust and Smoke control fans.*
5. *Switchgear and Switchboards.*
6. *Motor control centers.*
7. *Radiography and fluoroscopy systems. ~~in fluoroscopy rooms.~~*
8. *CT (Computerized Tomography) systems.*

Component Requiring Special Seismic Certification

9. *Air conditioning units.*
10. *Air handling units.*
11. *Chillers and associated evaporators and condensers.*
12. *Cooling Towers.*
13. *Transformers.*
14. *Electrical substations.*
15. *UPS and batteries.*
16. *Distribution panels.*
17. *Control panels.*

Component Requiring Special Seismic Certification

18. *Power isolation and correction systems.*
19. *Motorized surgical lighting systems.*
20. *Motorized operating table systems.*
21. *Internal communication servers and routers.*
22. *Medical gas and vacuum systems.*
23. *Electrical busways.*
24. *Equipment powered by life safety and critical branches.*

Amendments in Chapter 18A Soils and Foundations

Amendments in Chapter 18A

- Provisions for Earth Retaining Shoring and Vibro Stone Columns for Ground Improvement **moved** from Appendix J to Chapter 18A.
- Appendix J will **no longer be adopted.**
 - Appendix J was creating perception that entire site grading is in OSHPD jurisdiction.
 - **ONLY** grading supporting OSHPD regulated facilities are in OSHPD jurisdiction and **NOT** site grading.

Amendments in Chapter 18A

- Requirements of Underpinning for protection of adjacent structures explicitly added (Sections 1804A.2 & 1808A.3.2).
 - Requires compliance with Chapter 33: Safeguard During Construction.
 - No more Underpinning Design Criteria/Alternate Means of Compliance!

Steel Sheet Piles

- Provision for Steel Sheet Piles shoring are added (Sections 1810A.3.2.3, 1810A.3.5.3.2 & 1810A.3.5.3.3).
 - Inspection, monitoring, and observation requirements will be equivalent to those required for installation of shoring with soldier piles & lagging (Sections 1812A.6 and 1812A.7).

Amendments in Chapter 19A Concrete

ACI 318-14 is Completely Reorganized

- Big improvement over the previous ACI 318 Code.
- Most existing OSHPD amendments to ACI 318 in Chapter 19A are deleted.
- Each building member (beams, columns, slabs, footings, etc.) has its own chapter.
- Each member chapter include provisions for cast-in-place and precast, mildly reinforced and prestressed.

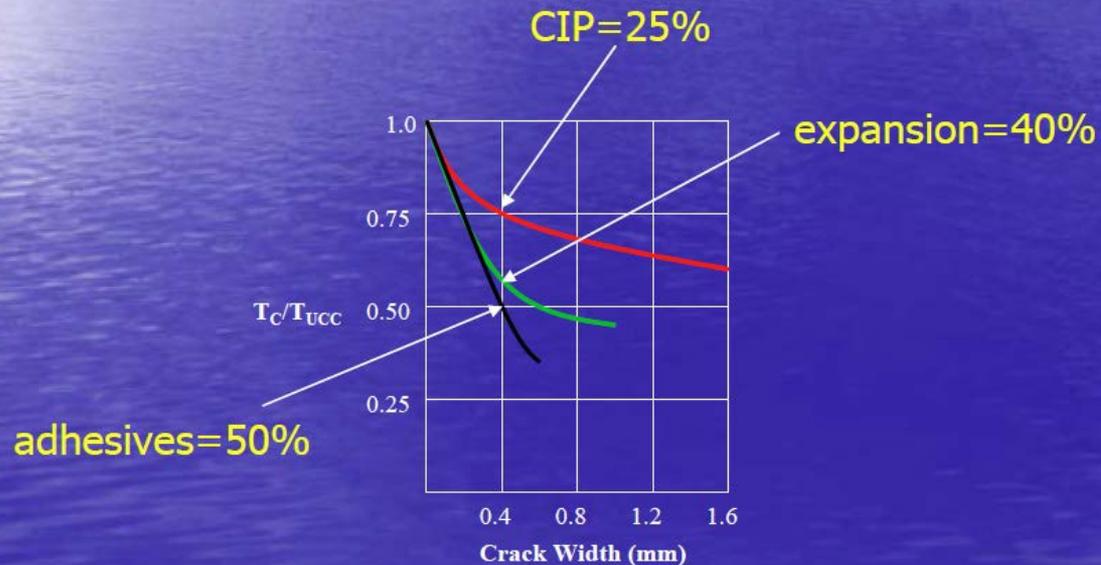
ACI 318-14 is Completely Reorganized

- Added provisions for structural systems and diaphragms.
- All requirements (except those related to concrete anchors) related to construction are in Chapter 26.

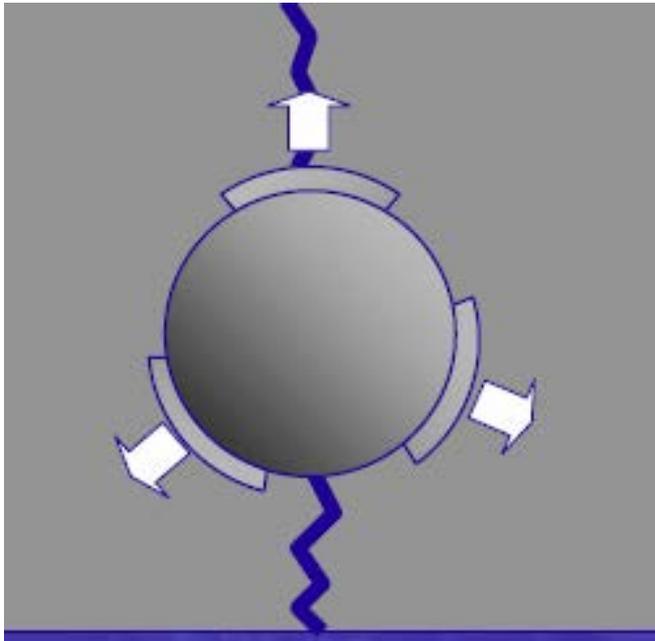
Allowable Stress Values for Anchors Removed from IBC/CBC

- Allowable stress values for anchors were not based on cracked concrete test.

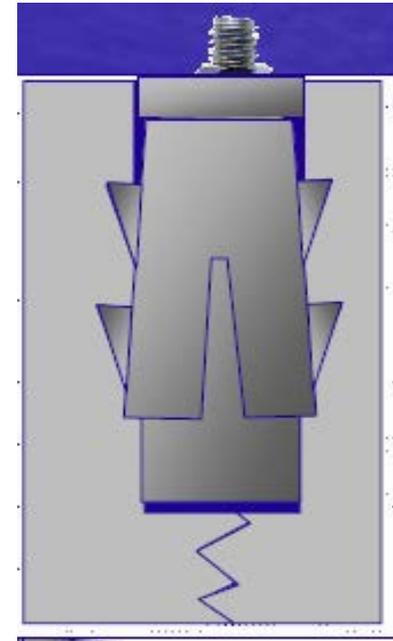
- Anchors lose capacity when in a crack
 - Ex: a crack width of 0.4 mm, losses are...



How Post-Installed Anchors Work in Concrete



- Tri-Segmented Clips
- Grabs at least two sides of crack
- Distribute loads more uniformly
- Provide Some Redundancy



- 2- Teeth per Segment
- Create ledges when installed

Rebar Requirements

- Rebars without mill certs will require all tests in accordance with ACI 318-14 Chapters 19 and 20 (Section 1705A.3.2)
- Chapter 17A requires “Certificate of Compliance” for weldability & mill certs.

Amendments in Chapter 21A Masonry

TMS 402-13/TMS 602-13

- TMS 402-13 had 14 Chapters vs. 8 Chapters in TMS 402-11.
 - ❖ Changes are mostly in format, rather than technical.
 - ❖ Chapter 1 is split into 7 chapters
 - ❖ Chapter 5 (Empirically designed masonry) moved to Appendix A.

Major Technical Change in TMS 402

- Revisions of design requirements for partially grouted shear walls:
 - There is a new 0.75 reduction in shear strength for partially grouted shear walls (Section 9.3.4.1.2)

Masonry Core Testing Requirements

- Core testing requirements for masonry walls built with **single-Wythe** hollow unit concrete masonry unit is deleted based on Masonry Institute of America (MIA) tests:
 - ❖ All single-Wythe CMU with ($f'_m \leq 1500 \text{psi}$) pass this test.
 - ❖ Original requirements was a qualitative tests for multi-Wythe masonry, CBC requirement is quantitative and apply to all Masonry.

Glass Unit, Non-Bearing and Screen Walls Requirements

- OSHPD amendments for the Masonry Non-bearing and Screen Walls are deleted.
 - Glass Unit masonry is addressed in the CBC Section 2110/TMS 402-13. Glass unit masonry to be design for seismic forces.
 - Masonry non-bearing and screen walls can be designed using basic wall design provisions in TM 402-13 Chapter 14
 - Prescriptive design in Chapter 14 is not permitted in Seismic Design Category D or F.

Amendments in Chapter 22A Steel

Amendments in Chapter 22A

- A few changes in requirements
 - Primary reference standards 360-10, 341-10 & 358-10 didn't change from the CBC 2013.
 - Supplement No. 2 for AISC 358-10 adopted with new amendments for the side plate moment connection in Chapter 11.

Amendments in Chapter 23 Wood

Amendments in Chapter 23

- NDS-15 & SDPWS-15 are updated.
 - Technical changes are minor.

Amendments in Chapter 34A

Existing Structures

Basic Performance Objective Equivalent to New Buildings (BPON)

- Conforming Buildings shall satisfy Basic Performance Objective equivalent to New building standards (BPON) in accordance with ASCE 41-13 Table 2-2/IEBC Table 301.1.4.1:
 - ASCE 41-13 Section 2.2.4 requires Tier 3 Systematic Evaluation for BPON.
 - Number of amendments to ASCE 41 reduced from 36 to 15!

Questions, Comments, Suggestions?

Questions?

Send your written Comments to:
Mohammad.Karim@OSHPD.CA.GOV

Why does Emergency Power System Require Special Seismic Certification?

- Because Emergency Power System is **Required for Life-Safety!**
- ✓ **Emergency Power System.** A source of automatic power of **required** capacity and duration **to operate required Life Safety, Fire Alarm, Detection and Ventilation Systems** in the event of a failure of primary power. Emergency power systems are **required for electrical loads where interruption of primary power could results in loss of human life or serious injury.**

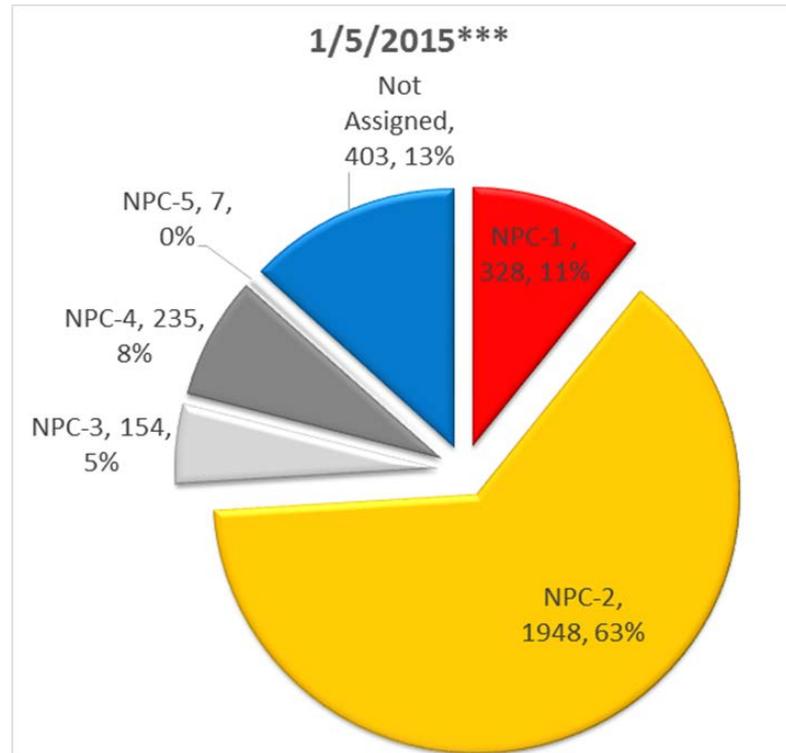
General Acute Care Hospitals

"General acute care hospital" means a health facility having a duly constituted governing body with overall administrative and professional responsibility and an organized medical staff that provides 24-hour inpatient care, including the following basic services: medical, nursing, surgical, anesthesia, laboratory, radiology, pharmacy, and dietary services.

Performance Intent of HSSA 83

- ❖ **Hospital buildings** that house patients who have less than the capacity of normally healthy persons to protect themselves, and that **must be reasonably capable of providing services to the public after a disaster**, shall be designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity, and winds.
- ❖ **In order to accomplish this purpose**, the office shall propose **proper building standards** for earthquake resistance **based upon current knowledge**, and provide an independent review of the design and construction of hospital buildings.

Current NPC Rating of GAC Hospital Buildings



CBC 2016: Essential Facilities

ESSENTIAL FACILITIES. Buildings and other structures that are **intended to remain operational in the event of extreme environmental loading** from flood, wind, snow or earthquakes

CBC 2016: Risk Categories

Risk Category IV. Buildings and other structures **designated as essential facilities.**

Risk Category III. Buildings and other structures that represent a substantial hazard to human life in the event of failure.

Risk Category II. Buildings and other structures except those listed in Risk Categories I, III and IV

ASCE 7-10: Reliability Index

Table C.1.3.1b Anticipated reliability (maximum probability of failure) for earthquake¹

Risk Category I and II

Total or partial structural collapse	10% conditioned on the occurrence of Maximum Considered Earthquake shaking
Failure that could result in endangerment of individual lives	25% conditioned on the occurrence of Maximum Considered effects

Risk Category III

Total or partial structural collapse	6% conditioned on the occurrence of Maximum Considered Earthquake shaking
Failure that could result in endangerment of individual lives	15% conditioned on the occurrence of Maximum Considered Earthquake shaking

Risk Category IV

Total or partial structural collapse	3% conditioned on the occurrence of Maximum Considered Earthquake shaking
Failure that could result in endangerment of individual lives	10% conditioned on the occurrence of Maximum Considered Earthquake shaking

¹Refer to the NEHRP Recommended Provisions Seismic Regulation for Buildings and Other Structures, FEMA P750, for discussion of the basis of seismic reliabilities.

Design Impact of Risk Category

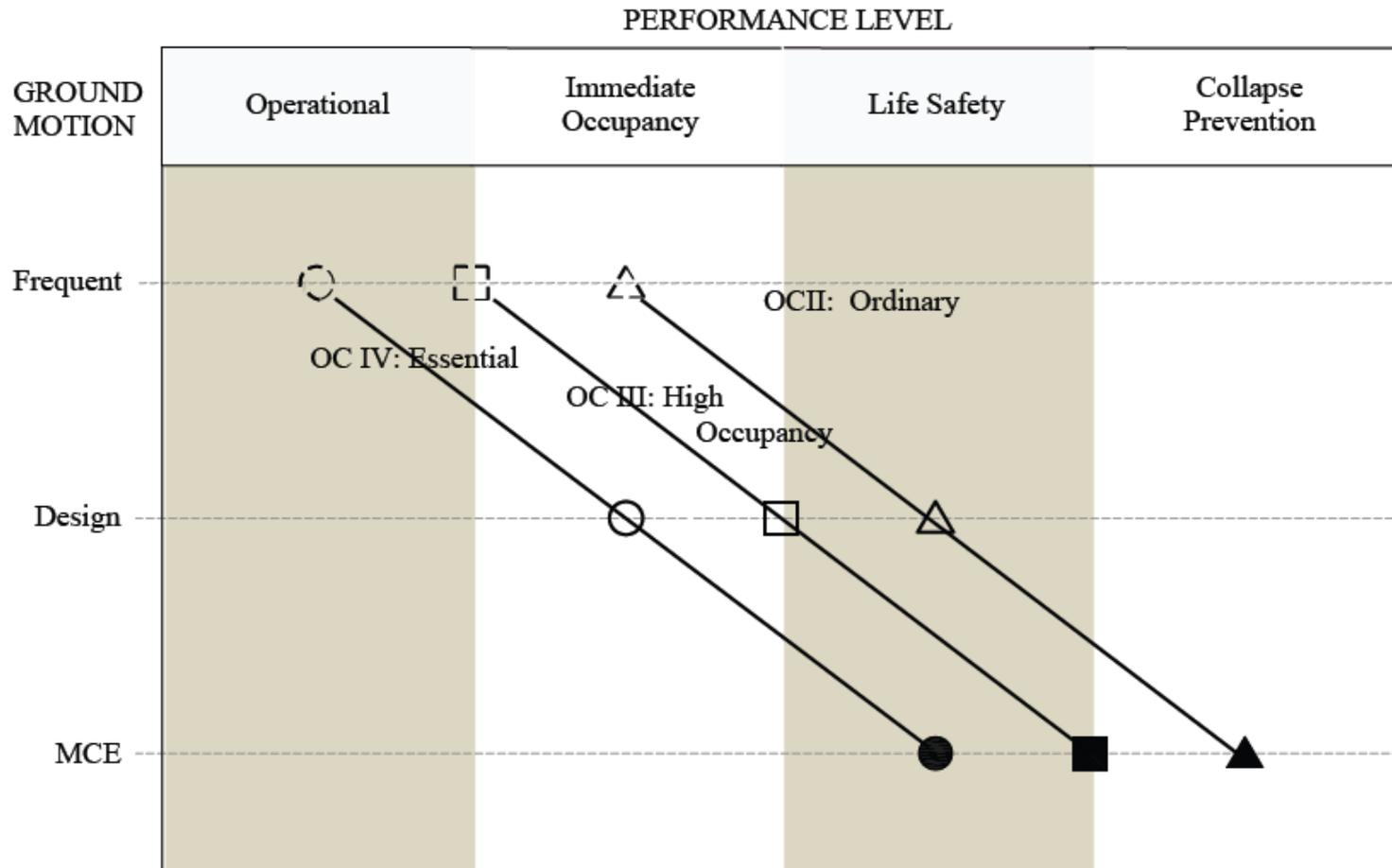
❖ Importance Factors

Risk Category	Structural Importance Factor, I_e	Nonstructural Importance Factor, I_p
II	1.0	1.0 or 1.5
III	1.25	1.0 or 1.5
IV	1.5	1.0 or 1.5

IBC 2015 Vs. CBC 2016

	2016 CBC Risk Category	IBC Risk Category
Acute Care Hospitals	IV	IV
Acute Psychiatric Hospitals	IV	II if < 50 patients III if ≥ 50 patients
Multi-story Skilled Nursing Facilities	IV	II if < 50 patients III if ≥ 50 patients
Single-story Skilled Nursing Facilities other than light frame construction	IV	II if < 50 patients III if ≥ 50 patients
Single-story Skilled Nursing Facilities of light frame construction	II or III	II if < 50 patients III if ≥ 50 patients

ASCE 41: Performance Level



H&SC § 129875: SNF & ICF

The Legislature recognizes the relative safety of single-story, wood-frame, and light steel frame construction for use in housing patients requiring skilled nursing and intermediate care services and it is, therefore, the intent of the Legislature to provide for reasonable flexibility in seismic safety standards for these structures.

What is Substantial Structural Improvement?

- Improvement of a building or structure, cost of which exceed more than 50% of the market value of structures, before the improvements (IBC/IEBC Section 202)
- Triggers flood resistant design compliance requirements

What is Substantial Structural Alteration in Accordance with IEBC?

- Alteration of more than 30% of the total floor or roof areas of the building or structure have been or proposed to be involved in structural alterations **within a 5-year period** (IEBC Section 907.4.2)
- Triggers compliance with reduced (75%) IBC level forces for non-SDC F buildings. Other non-SDC F structures can use 10% D/C ratio reduction on-top of 25% reduction in force.

CBC Chapter 34A vs. IEBC 2015

Topics	CBC Chapter 34A	IEBC 2015
Scope	<ol style="list-style-type: none">1) Structural Provisions for Existing Building.2) Only covers OSHPD 1 & 4 Buildings	<ol style="list-style-type: none">1) Complete Code for existing buildings parallel to IBC:<ol style="list-style-type: none">a) Administrative provisions;b) Covers all disciplines; andb) Historical buildings.2) Covers all Occupancy Groups and Risk Categories.
Pages	14 pages, including 9-pages to comply with OSHPD's statutory mandate	304 pages including large number of appendix pages and non-structural pages. Pages to satisfy statutory mandate will still be required.

CBC Chapter 34A vs. IEBC 2015

Topics	CBC Chapter 34A	IEBC 2015
Repairs for Substantial Damage	90% of current code demand	Building Code force at the time of original construction with 75% of current code forces as a minimum

CBC Chapter 34A vs. IEBC 2015

Topics	CBC Chapter 34A	IEBC 2015
Prescriptive Compliance Method (IEBC Chapter 4/IBC 2012 Chapter 34)	New Building level demand with permitted 5% increase in Demand/Capacity (D/C) ratio for gravity and 10% D/C ratio increase for seismic (Based on IEBC Chapter 4)	New Building level demand with permitted 5% increase in Demand/Capacity (D/C) ratio for gravity and 10% D/C ratio increase for seismic (Chapter 4 identical to CBC except for OSHPD amendments)

CBC Chapter 34A vs. IEBC 2015

Topics	CBC Chapter 34A	IEBC 2015
<p>Work Area Compliance Method (IEBC Chapters 5 through 13)</p>	<p>Incidental and Minor Provisions for Non-Conforming Buildings (H&SC Section 129875)</p>	<p>Chapters 5 through 13 classify work as Level 1 (Existing Nonstructural Components), Level 2 (Reconfiguration of Space or new equipment) and Level 3 (Work Area larger than 50% of buildings area).</p> <ol style="list-style-type: none"> 1. Requires compliance ONLY in “Reconfigured Spaces” and NOT the areas affected by incidental work or work not intended by the Owner but required by code (Section 202). 2. Structural alteration covering more than 30% area within 5-years triggers seismic compliance at 75% of IBC new code forces (Section 907.4.3). In SDC D & E, additional 10% D/C ratio increase permitted for less than 30% work area.

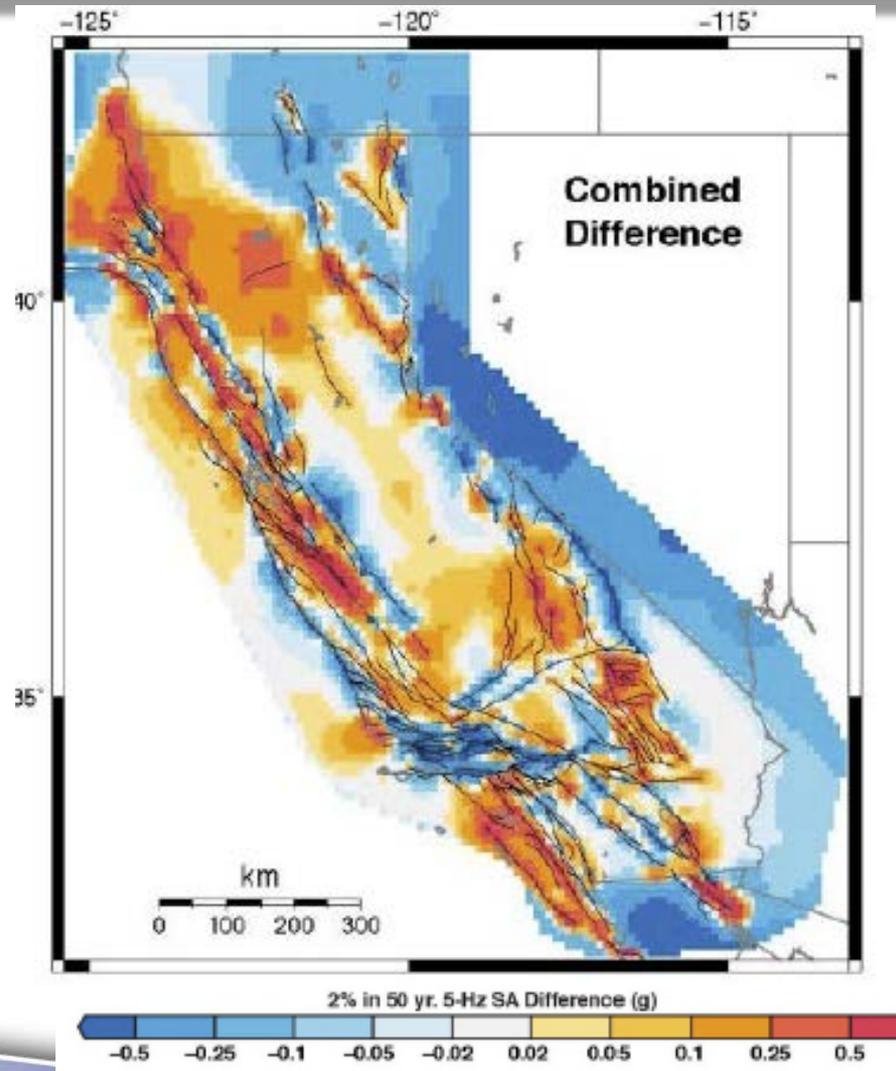
CBC Chapter 34A vs. IEBC 2015

Topics	CBC Chapter 34A	IEBC 2015
<p>Performance Compliance Method (IEBC Chapter 14)</p>	<p>ASCE 41-13 consistent with IEBC Chapter 4 and HSSA 83/SB 1953:</p> <ol style="list-style-type: none"> 1) How to satisfy Structural Performance Category (SPC) and Nonstructural Performance Category (NPC) requirements; 2) Systems, Services, Utilities; 3) Means of Egress; and 4) Removal General Acute Care Services from Buildings 	<p><u>Alternative to Chapters 5 through 13</u></p> <ol style="list-style-type: none"> 1) Most additions are required to be at IBC new building code force level; 2) Most alterations and repair are at 75% of IBC new code force level; and 3) Use appendices for Risk Category I & II buildings only. <p>Inconsistent with HSSA 83/SB 1953 requirements.</p>

CBC Chapter 33 vs. IEBC 2015 Chapter 15

Topics	CBC Chapter 33	IEBC 2015 Chapter 15
Construction Safeguards	Covers complete construction Safeguards including Demolition, Site Work, etc.	Covers mostly safeguards during construction, Demolition, Site Work, etc. are outside the scope.

2014-2008 Ground Motion Differences



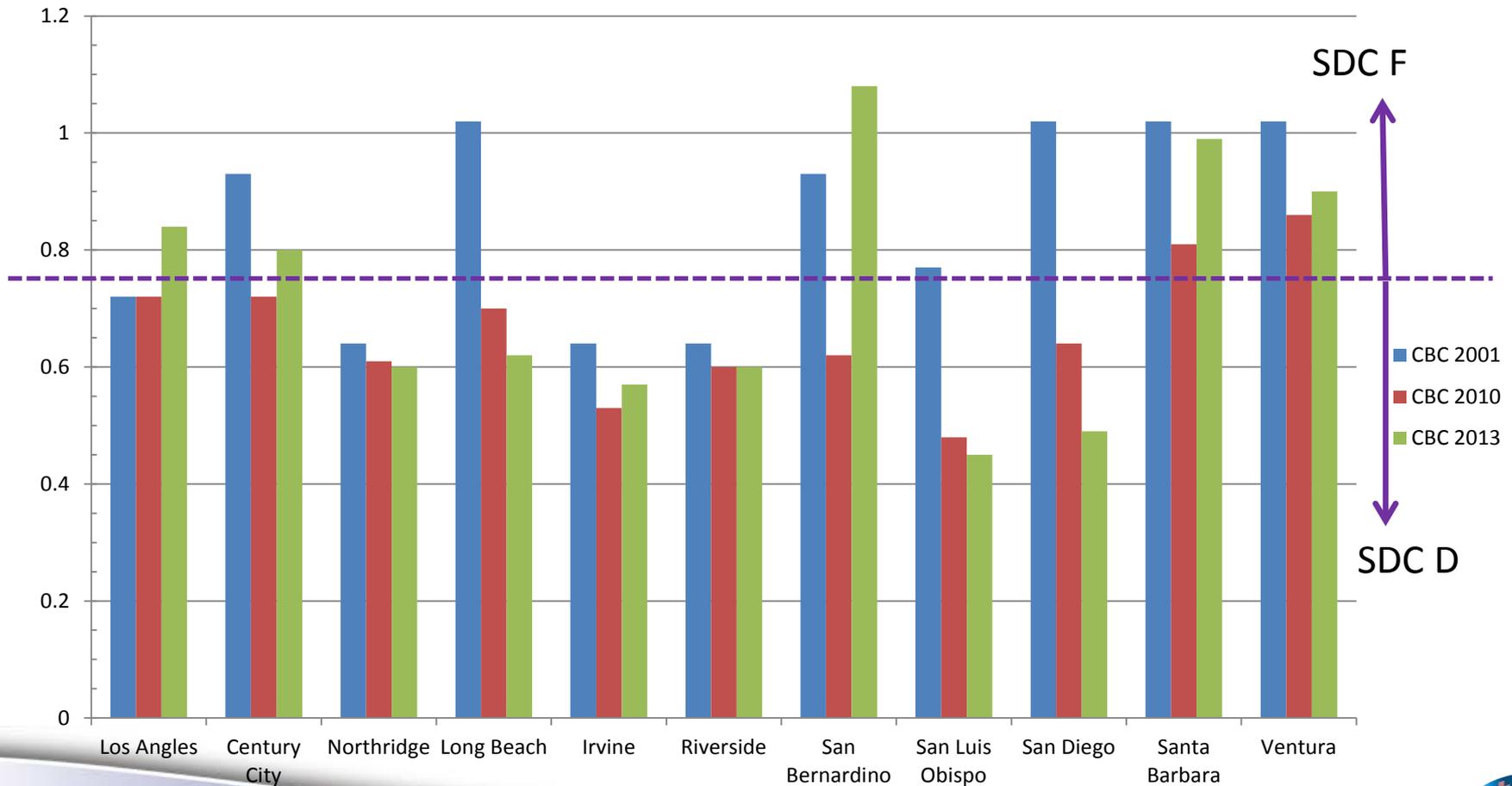
Comparison of Ground Motion Parameters

Region	City	CBC ² 2001			CBC ² 2007 and 2010			CBC ² 2013		
	(Site Location)	Zone	S _{DS} ⁴ (g)	S _{D1} ⁵	SDC ³	S _{DS} ⁴ (g)	S _{D1} ⁵	SDC ³	S _{DS} ⁴ (g)	S _{D1} ⁵
Southern California	Los Angeles	4	1.10	0.72	D	1.44	0.72	F	1.60	0.84
	Century City	4	1.32	0.93	D	1.22	0.72	F	1.44	0.80
	Northridge	4	1.10	0.64	D	1.09	0.61	D	1.13	0.60
	Long Beach	4	1.43	1.02	D	1.20	0.70	D	1.10	0.62
	Irvine	4	1.10	0.64	D	1.00	0.53	D	1.03	0.57
	Riverside	4	1.10	0.64	D	1.00	0.60	D	1.00	0.60
	San Bernardino	4	1.32	0.93	D	1.13	0.62	F	1.58	1.08
	San Luis Obispo	4	1.10	0.77	D	0.83	0.48	D	0.78	0.45
	San Diego	4	1.43	1.02	D	1.07	0.64	D	0.84	0.49
	Santa Barbara	4	1.43	1.02	F	1.38	0.81	F	1.89	0.99
	Ventura	4	1.43	1.02	F	1.64	0.86	F	1.59	0.90
	Population Weighted Mean			1.25	0.83		1.16	0.65		1.22

Notes:

1. FEMA P-750: NEHRP Recommended Seismic Provisions (2009).
2. CBC = California Building Code.
3. SDC = Seismic Design Category
4. S_{DS} = Short period design ground motion parameter for site class D.
5. S_{D1} = 1-second period design ground motion parameter for site class D.

Long-Period Design Accelerations (S_{D1}) Southern CA



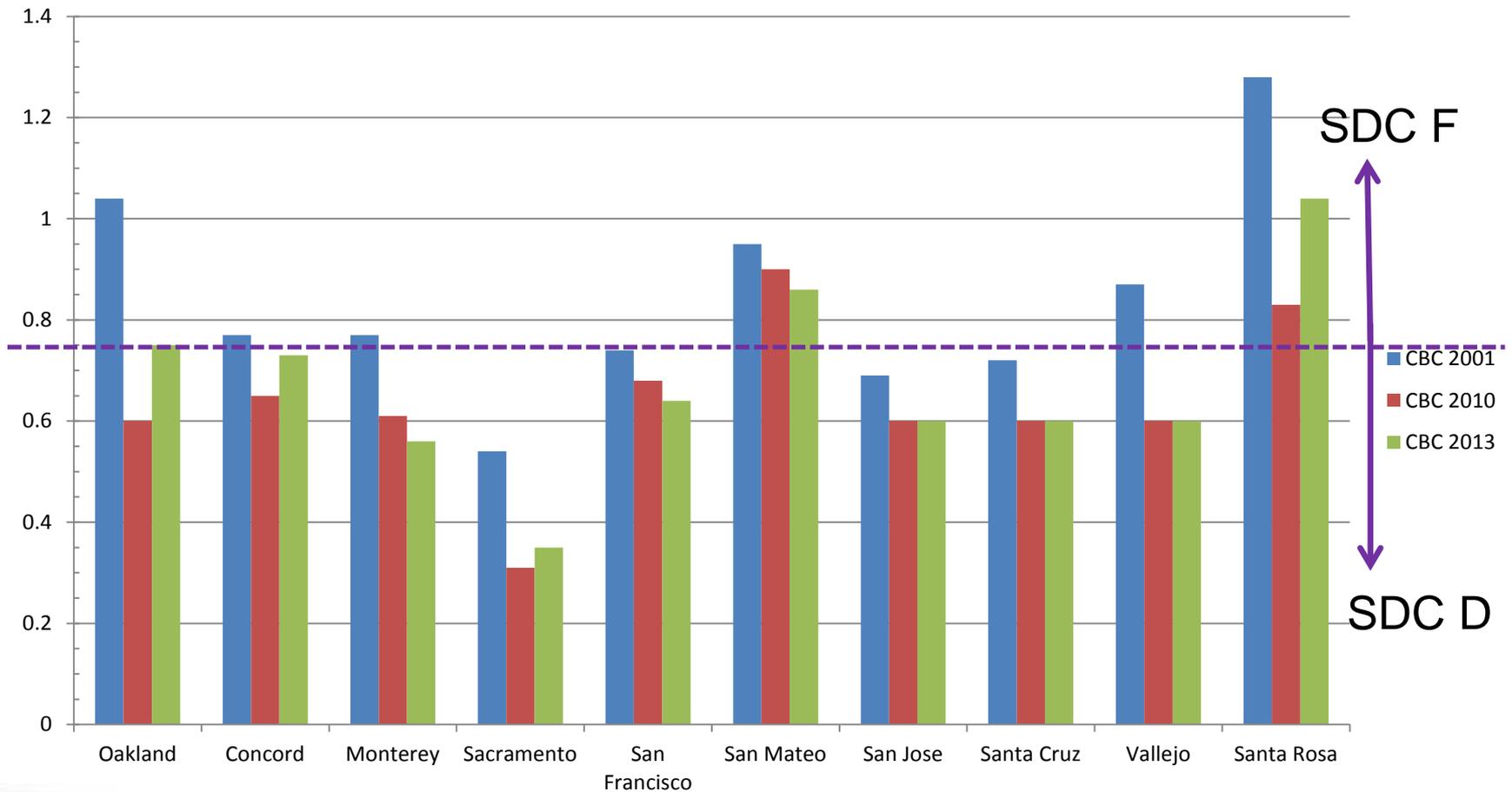
Comparison of Ground Motion Parameters

Region	City (Site Location)	CBC ² 2001			CBC ² 2007 and 2010			CBC ² 2013		
		Zone	S _{DS} ⁴ (g)	S _{D1} ⁵	SDC ³	S _{DS} ⁴ (g)	S _{D1} ⁵	SDC ³	S _{DS} ⁴ (g)	S _{D1} ⁵
Northern California	Oakland	4	1.43	1.04	D	1.06	0.60	D	1.24	0.75
	Concord	4	1.10	0.77	D	1.23	0.65	D	1.38	0.73
	Monterey	4	1.10	0.77	D	0.97	0.61	D	1.02	0.56
	Sacramento	3	0.90	0.54	D	0.52	0.31	D	0.57	0.35
	San Francisco	4	1.10	0.74	D	1.00	0.68	D	1.00	0.64
	San Mateo	4	1.28	0.95	F	1.17	0.90	F	1.23	0.86
	San Jose	4	1.10	0.69	D	1.00	0.60	D	1.00	0.60
	Santa Cruz	4	1.10	0.72	D	1.00	0.60	D	1.01	0.60
	Vallejo	4	1.19	0.87	D	1.00	0.60	D	1.00	0.60
	Santa Rosa	4	1.65	1.28	F	1.37	0.83	F	1.67	1.04
	Population Weighted Mean			1.18	0.81		1.00	0.61		1.08

Notes:

1. FEMA P-750: NEHRP Recommended Seismic Provisions (2009).
2. CBC = California Building Code.
3. SDC = Seismic Design Category
4. S_{DS} = Short period design ground motion parameter for site class D.
5. S_{D1} = 1-second period design ground motion parameter for site class D.

Long-Period Design Accelerations (S_{D1}) Northern CA



SPC-4 Buildings by Year Built

