New Grad Initiative: Building Codes & Standards Framework

April 4, 2022
Upcoming SEAONC Events

- April 5: In-Person Member Appreciation Event
- April 6 & 13: Spring Seminar: Practical Design Considerations for Foundation Systems
- April 14: SEAONC SE3 Book Club
- April 22: New Grad Initiative: Intro to the Existing and Historic Building Code
- May 21: SAP Evaluator Training
Thank You To Our Annual Sponsors
Thank You To Our Firm Sponsors

2022 sponsorship opportunities available!
Contact office@seaonc.org for more information
Presentation Outline

Part 1: Building Codes, Reference Standards, and Authority Having Jurisdiction

Part 2: Code Update Cycle

Part 3: Reading the CBC
Presentation Outline

Part 1: Building Codes, Reference Standards, and Authority Having Jurisdiction

Part 2: Code Update Cycle

Part 3: Reading the CBC
Building Codes

- A Building Code is a set of rules that specify the minimum standards for construction of buildings and non-building structures.
Building Codes

- Model Building Codes are developed and maintained at a national level by the International Code Council (ICC)
- They are not enforceable until they are adopted by a state or local jurisdiction
Building Codes

- The adoption process varies by state
  - Some leave it up to local jurisdictions
  - Some adopt a state code, but only update 6 or 9 years
  - Some adopt a new code every 3 years without amendments (just use the IBC)
  - Some take a year to amend the IBC (i.e. CA)

Building Codes

- Code are posted online for free
- …but the underlying standards are not…
Building Codes

● There are many different model codes that govern structural requirements:
  ○ New Construction:
    ■ International Building Code (IBC)
    ■ International Residential Building Code (IRC)
  ○ Existing Buildings:
    ■ International Existing Building Code (IEBC)

● Many other disciplines:
  ○ International ______ Code (Fire, Mechanical, Plumbing, Energy Conservation, Green Construction, etc.)
Building Codes

- The California Building Codes are based on national model codes
- CA modifies specific provisions and adds new ones
- General rule in CA, Do not use the model codes directly on your project
Building Codes

● “California Building Standards Code” has 13 parts
● Codes that govern structural requirements in California:
  ○ New Construction:
    ■ CA Building Code (CBC)
    ■ CA Residential Building Code (CRC)
  ○ Existing Buildings:
    ■ CA Existing Building Code (CEBC)
    ■ CA Historic Building Code (CHBC)
Building Codes

- Every project is associated with a building code
Standards

- The Code does not have everything, it relies on underlying Standards from other organizations.
- *Code* is a model that is adaptable by law.
- *Standard* is a set of technical definitions, specifications, and guidelines.
- A code tells you what you need to do, and a Standard tells you how to do it.
Standards

- Each Code has a specific list of reference standards in Chapter 35
Standards

- There are tons of referenced Standards
- Many of them you already use!
  - ASCE 7 (design loads)
  - ASCE 41 (existing building evaluation and retrofit)
  - AISC 340, 361 (steel)
  - ACI 318 (concrete)
  - AWS SDPWS (wood)
  - TMS 402 (masonry)
Authority Having Jurisdiction (AHJ)

- AHJ are responsible for enforcement (ensuring construction projects satisfy the requirements of the Building Code)
  - Permitting process provides checks on the design team
  - Inspection process provides checks on the contractor
Authority Having Jurisdiction (AHJ)

- AHJs occur at all levels of government
- Local
  - Local Building Department
  - Local Port Authority
  - Local Department of Public Works
- State (CA specific)
  - Public schools (K-12, UC, CSU, and Community Colleges)
  - Hospitals
- Federal
  - Federal standards
Part 1 Recap

● Building Codes and reference standards establish minimum requirements for buildings

● AHJs are responsible for enforcing the Building Code
  ○ Permitting (checks on design team)
  ○ Inspection (checks on contractor)

● Each project is governed by a Building Code that is enforced by an AHJ
Presentation Outline

Part 1: Building Codes, Reference Standards, and Authority Having Jurisdiction

Part 2: Code Update Cycle

Part 3: Reading the CBC
Code Update Cycle - General Process

- Knowledge of buildings is always changing
  - Research and academia
  - New technologies
  - Lessons learned from disasters
- Each Code and Standard has an update cycle where provisions can be modified and added
## Code Update Cycle - General Process

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IBC, 3 yrs</strong></td>
<td>IBC 2018</td>
<td>IBC 2021</td>
<td>IBC 2024</td>
<td>IBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CBC, 3 yrs</strong></td>
<td>CBC 2019</td>
<td>CBC 2022</td>
<td>CBC 2025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ASCE, 6 yrs</strong></td>
<td>ASCE 7-16</td>
<td>ASCE 7-22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASCE</td>
</tr>
<tr>
<td><strong>ASCE, 6 yrs</strong></td>
<td>ASCE 41-17</td>
<td>ASCE 41-23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASCE</td>
</tr>
<tr>
<td><strong>AISC, 6 yrs</strong></td>
<td>AISC 341-16</td>
<td>AISC 341-22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AISC</td>
</tr>
<tr>
<td><strong>AISC, 6 yrs</strong></td>
<td>AISC 360-16</td>
<td>AISC 360-22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AISC</td>
</tr>
<tr>
<td><strong>ACI, 5 yrs</strong></td>
<td>ACI 318-19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ACI 318-24</td>
<td></td>
</tr>
<tr>
<td><strong>AWC SDPWS, 3 yrs</strong></td>
<td>AWC</td>
<td>AWC SDPWS- 2021</td>
<td>AWC SDPWS- 2024</td>
<td></td>
<td>AWC SDPWS- 27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ASCE 7 History

- First Loading Standard ANSI A58.1
- 1972
- 1982
- ASCE assumed development in 1985
- 1988 = first edition of ASCE 7
ASCE 7 History
Main Committee

- General
- Dead & Live Load Combs.
- Flood
- Snow & Rain
- Ice
- Seismic
- Wind
- Tsunami

Task Com. Task Com.
ASCE 7

Steering Committee

Main Committee

- General
- Dead & Live
- Load Combs.
- Flood
- Snow & Rain
- Ice
- Seismic
- Wind
- Tsunami

Task Com.
Task Com.
VOTING Membership Individuals consist of a representative group of technical experts from a range of stakeholders affected by the development and promulgation of the Standard.

Voting Members shall include the following balance requirements:

- Consumers: 20 – 40%
- Producers: 20 – 40%
- General Interest (including Regulatory) = 20 – 40%
- Regulatory = 0 – 15% (minimum of 1 member)

ASSOCIATE Membership Individuals who wish to contribute to the activities of the ASCE 7 Main Committee, but do not have voting authority, but whose comments must be responded to in Letter Ballot.
VOTING Membership Individuals consist of a representative group of technical experts from a range of stakeholders affected by the development and promulgation of the Standard.

- Voting Members shall include the following balance requirements:
  - Consumers: 20 – 40%
  - Producers: 20 – 40%
  - General Interest (including Regulatory): 20 – 40%
  - Regulatory: 0 – 15%

ASSOCIATE Membership Individuals who wish to contribute to the activities of the ASCE 7 Main Committee, but do not have voting authority.

MORE THAN 350 MEMBERS OF ASCE 7-16
ASCE 7

Consensus process

ASCE is ANSI-accredited consensus body.

Consensus includes balloting and resolution of members and public!

However consensus does not mean that everyone agrees!
During a ballot, committee members shall respond to items by casting votes as follows:

- Affirmative
- Affirmative with comment
- Negative
- Abstain
During a ballot, committee members shall respond to items by casting votes as follows:

- Affirmative
- Affirmative with comment
- Negative
- Abstain

SECOND STEP
- Persuasive editorial
- Persuasive substantive
- Non-persuasive or unrelated
ASCE 7

- ASCE 7 Seismic Subcommittee (SSC) works closely with the Building Seismic Safety Council’s (BSSC).

- BSSC evaluates new systems and methods and SSC improves and refines existing provisions.

REFERENCE: 2009 NEHRP Provisions and their Relationship to ASCE/SEI 7-10; R.O. Hamburger, 2010
ASCE 7 Cycle Process

Receive proposals

Main Committee

Provide comments

Sub Committee

Resolve comments

Develop proposals

Member ballot

Ballot committee

Sub Committee

Sub Committee

Sub Committee

Sub Committee
ASCE 7

2016 Cycle took **FIVE years** & **478** Main Committee PROPOSALS
ASCE 7 Code Cycle

Development Steps:

• Chairman is selected by SEI CSAD Committee
  ▪ Ron Hamburger – ASCE 7-16 Chair
  ▪ Ron Hamburger – ASCE 7-22 Chair
  ▪ TBD – ASCE 7-28 Chair
ASCE 7 Code Cycle

Development Steps:

• Open Call for Membership is issued
  • Atmospheric Ice Loads – 9 Voting & 2 Associate Members
  • Dead & Live Loads – 12 Voting Members
  • Flood Loads – 10 Voting Members
  • General Provisions – 27 Voting Members
  • Load Combinations – 18 Voting Members
  • Seismic Loads – 45 Voting & 66 Associate Members
  • Snow & Rain Loads – 28 Voting Members
  • Tsunami Loads & Effects – 16 Voting & 14 Associate Members
  • Wind Loads – 29 Voting & 57 Emeritus & Associate Members
ASCE 7 Code Cycle

Development Steps:

- Proposed Changes are submitted for consideration
  - Someone has a good idea on how to improve the standard and develops a proposal
    - Committee member
    - Task committee member
    - Member of the general public
Development Steps:

- Proposed Changes are submitted for consideration
  - Use a standard form (downloaded from ASCE website) and identify:
    - Identity of submitter
    - Proposed change
    - Reason why this is proposed
ASCE 7 Code Cycle

Development Steps:

• Sub Committee Balloting
  • All members of Task Committee vote, both Voting and Associate Members.
    • Affirm
    • Affirm with Comment
    • Negative – Comment Mandatory
  • All Negative Comments (both Voting & Associate Members) must be resolved by a vote of the Task committee
  • Task Committee not required to conform to ANSI balloting requirements, but most do.
Development Steps:

- **Main Committee Balloting**
  - All members of Main Committee vote, both Voting and Associate Members.
    - Affirm
    - Affirm with Comment
    - Negative – Comment Mandatory
  - All Negative Comments (both Voting & Associate Members) must be resolved by a vote of the Main committee.
  - 50% of Voting Members must vote.
  - 2/3 of those voting must approve proposal.
ASCE 7 Code Cycle

Development Steps:

• CSC & CSAD votes to go to Public Comment
  • These committees review the process that ASCE 7 went through, not content.
  • Need to conform to ANSI procedures
Development Steps:

- Public Comment Period
  - Prior to adoption entire revised standard is placed out to 45-day public comment
  - Public Comments resolved through the same voting process as Main Committee ballots
ASCE 7 Code Cycle

Development Steps:

• New Standard Approved for publishing by CSC.
  • CSC reviews that Public Comment process was handled properly and that there are no protests to the procedures used to write the standard.
Code Update Cycle - International Building Code
Code Update Cycle - International Building Code

1 Year Process that occurs every 3 years


Code Change Agenda Published

CAH Results Published

ICC Code Development Process
# Code Update Cycle - International Building Code

<table>
<thead>
<tr>
<th>Year</th>
<th>IBC 2018</th>
<th>IBC 2021</th>
<th>IBC 2024</th>
<th>CBC 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>IBC 2018</td>
<td>IBC 2021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td></td>
<td></td>
<td>IBC 2024</td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2027</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2028</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **IBC, 3 yrs**
  - Call for Committees (06/2020)
  - IBC Change Proposals (01/2022)
  - Code Action Hearings (04/2022)
  - Public Comment Hearings (09/2022)
  - Final Voting (10/2022)
  - IBC '24 Updates

- IBC 2024 Published

- CBC 2025
Code Update Cycle - CA Building Code
Code Update Cycle - CA Building Code

- “California Building Standards Code”
  - 13 separate parts (Administrative, Building, Residential, Electrical, Mechanical, Plumbing, Energy, State Historic, Fire, Existing Building, Green Building, Reference Standards)
- “CA Building Code” is only one part of the “CA Building Standards Code”
Code Update Cycle - CA Building Code

- **California Building Standards Commission (CBSC)**
  - 10 members, appointed by governor
  - Oversee the adoption, approval, and publication of Title 24

- **Code Advisory Committees (CAC)**
  - Accessibility
  - Building, Fire, and Other
  - Green Building
  - Health Facilities
  - Plumbing, Electrical, Mechanical & Energy
  - Structural Design/Lateral Force
Lots of other players:
  - Many state adoption agencies
  - Each one has a specific scope and authority and will have their own public hearings and submit their adopted building standards to CBSC
Code Update Cycle - CA Building Code

<table>
<thead>
<tr>
<th>Year</th>
<th>Code Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>IBC 2018</td>
</tr>
<tr>
<td>2021</td>
<td>IBC 2021</td>
</tr>
<tr>
<td>2022</td>
<td>IBC 2024</td>
</tr>
<tr>
<td>2023</td>
<td>IBC</td>
</tr>
<tr>
<td>2024</td>
<td>CBC 2022 Updates</td>
</tr>
<tr>
<td>2025</td>
<td>CBC 2022</td>
</tr>
<tr>
<td>2026</td>
<td>CBC 2022</td>
</tr>
<tr>
<td>2027</td>
<td>CBC 2022</td>
</tr>
<tr>
<td>2028</td>
<td>CBC 2022</td>
</tr>
</tbody>
</table>

CBC Change Proposals (05/21)
CAC Meetings (05/21 to 08/21)
BSC approval (12/21)
Code Update Cycle - Local Building Code

- Local amendments
  - Most local AHJs have no amendments
  - Local government can adopt more restrictive requirements as “reasonably necessary because of local climatic, geologic, or topographic conditions”
- Additional requirements, beyond the CBC, may occur at local levels
<table>
<thead>
<tr>
<th>Code Family</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBC, 3 yrs</td>
<td>IBC 2018</td>
<td>IBC 2021</td>
<td>IBC 2022</td>
<td>IBC 2024</td>
<td>IBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBC, 3 yrs</td>
<td>CBC 2019</td>
<td>CBC 2022</td>
<td>CBC 2025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASCE, 6 yrs</td>
<td>ASCE 7-16</td>
<td>ASCE 7-22</td>
<td>ASCE 41-17</td>
<td>ASCE 41-23</td>
<td>ASCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AISC, 6 yrs</td>
<td>AISC 341-16</td>
<td>AISC 341-22</td>
<td>AISC 360-16</td>
<td>AISC 360-22</td>
<td>AISC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACI, 5 yrs</td>
<td>ACI 318-19</td>
<td></td>
<td>ACI 318-24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWC SDPWS, 3 yrs</td>
<td>AWC</td>
<td>AWC SDPWS- 2021</td>
<td>AWC SDPWS- 2024</td>
<td>AWC SDPWS- 27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Code Update Cycle - What to use?

<table>
<thead>
<tr>
<th>Ref Standards Identified in IBC update process</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Ref Standards</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBC, 3 yrs</td>
<td>IBC 2018</td>
<td>IBC 2021</td>
<td>IBC 2024</td>
<td>IBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBC, 3 yrs</td>
<td>CBC 2019</td>
<td>CBC 2022</td>
<td>CBC 2025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASCE, 6 yrs</td>
<td>ASCE 7-16</td>
<td>ASCE 7-22</td>
<td>ASCE 41-17</td>
<td>ASCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AISC, 6 yrs</td>
<td>AISC 341-16</td>
<td>AISC 341-22</td>
<td>AISC 360-16</td>
<td>AISC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACI, 5 yrs</td>
<td>ACI 318-19</td>
<td></td>
<td>ACI 318-24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWC SDPWS, 3 yrs</td>
<td>AWC</td>
<td>AWC SDPWS- 2021</td>
<td>AWC SDPWS- 2024</td>
<td>AWC SDPWS- 27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- IBC: International Building Code
- CBC: Canadian Building Code
- ASCE: American Society of Civil Engineers
- AISC: American Institute of Steel Construction
- ACI: American Concrete Institute
Code Update Cycle - “locking in” a code

- Each project will “lock in” the code once it is submitted for permit, that code will govern the project even if new versions are published.
  - Construction administration and design build elements follow the “locked in” code
- The governing code is clearly stated on the drawing general notes

<table>
<thead>
<tr>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBC 2019</td>
<td>CBC 2022</td>
<td>CBC 2025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Project Design
- Permit
- Construction

CBC 2019
Locked in

Design Build Element
Code Update Cycle - “locking in” a code

- This also applies to multi-phase projects
  - All subsequent phases (2, 3, 4, etc.) are permitted under the same code as the first one
  - Multi-phase project requires coordination with AHJ (managed by prime design professional)
Code Update Cycle - SEA committee involvement

- SEA committees play an important role in the code and standard development process
  - They track upcoming changes and notify members
  - Some have voting rights to influence what gets passed (i.e. NHERP documents)
  - Members are often involved in code committees and can be great mentors
Code Update Cycle - PE/SE license

- PE/SE tests also have referenced codes and standards
  - They have their own update cycle that may not align with AHJ adoption
  - National Tests → DO NOT USE CBC
- Check NCEES website to identify IBC and AASHTO codes used for the exam.

---

<table>
<thead>
<tr>
<th>ABBREVIATION</th>
<th>DESIGN STANDARD TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASHTO</td>
<td>AASHTO LRFD Bridge Design Specifications, 8th edition, American Association of State Highway &amp; Transportation Officials, Washington, DC.</td>
</tr>
<tr>
<td>ACI 318</td>
<td>Building Code Requirements for Structural Concrete, 2014 edition, American Concrete Institute, Farmington Hills, MI.</td>
</tr>
<tr>
<td>AISC</td>
<td>Seismic Design Manual, 3rd edition, American Institute of Steel Construction, Chicago, IL.</td>
</tr>
<tr>
<td>AISI S100</td>
<td>North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 edition, with AISI S520-15 and AISI S400-15/AS-16, American Iron and Steel Institute, Washington, DC.</td>
</tr>
</tbody>
</table>
Part 2 - Recap

- Updating codes and standards is a long process.
- CBC is updated every 3 years, take time to review changes when that happens (i.e. 12/2022, 12/2025, etc.)
- Use reference standards noted in the CBC, not the latest issued.
- When joining a new project identify which CBC you are using.
Presentation Outline

Part 1: Building Codes, Reference Standards, and Authority Having Jurisdiction

Part 2: Code Update Cycle

Part 3: Reading the CBC
Reading the CBC

● The California Building Code is full of information and can be a bit overwhelming

● Part 3 discussion points:
  ○ State adoption agencies
  ○ Reference standards
  ○ Margin notations
  ○ CBC overview
Reading the CBC - state agency scope

- There are a lot of adopting state agencies
- Code adoption vs enforcement
  - Most are involved in code adoption only and rely on local jurisdictions to enforce the code
  - OSHPD and DSA are well known because they adopt and enforce their code provisions
- Most of these agencies are not involved with building design, which ones to care about?
Reading the CBC - state agency scope

- Matrix adoption table occurs at beginning of each CBC chapter
  - Each adopting agency gets a column

### California Building Code – Matrix Adoption Table

**Chapter 16 – Structural Design**

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

<table>
<thead>
<tr>
<th>Adopting agency</th>
<th>BSC</th>
<th>BSC-CG</th>
<th>SFM</th>
<th>HCD 1</th>
<th>HCD 2</th>
<th>1/AC</th>
<th>DSA AC</th>
<th>SS</th>
<th>SS/CC 1</th>
<th>1R</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopt entire chapter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adopt entire chapter as amended</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(amended sections listed below)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adopt only those sections that are listed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>listed below</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reading the CBC - state agency scope

- Only 4 agencies of the 14 adopt CBC chapters 16 or 16A
  - Chapter 16
    - BSC
    - HCD (1 & 2)
    - DSA (SS/CC)
    - OSHPD (1R, 2, 3, & 5)
  - Chapter 16A
    - DSA (SS)
    - OSHPD (1 & 5)
Reading the CBC - state agency scope

- General scope of agencies (ref: Ch 1) related to building design (they adopt chapter 16 or 16A):
  - BSC and HCD 1&2
    - “typical” buildings handled by local building department
  - DSA
    - SS/CC - alternate community college provisions
    - SS - public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings
  - OSHPD
    - 1 - general acute care hospital buildings
    - 1R - non-compliant acute care facilities
    - 2 - skilled nursing and intermediate care facilities
    - 3 - licensed clinic and separate outpatient clinical services
    - 4 - correctional treatment centers
    - 5 - acute psychiatric hospital buildings
Reading the CBC - state agency scope

- Chapter 16
  - BSC, HCD 1&2, DSA-SS/CC, OSHPD 1R,2,3,&5 adopt chapter 16
  - “general” provisions apply to all agencies listed above

- Special amendments
  - Look out for the brackets and italicized text!
  - Usually specific to OSHPD and DSA projects
Reading the CBC - state agency scope

- Chapter 16A
  - DSA-SS, OSHPD 1&4
  - “General” provisions only apply to agencies that adopt chapter 16A
- Special amendments
  - Look out for the brackets and italicized text!

“General” provision
Applies to agencies that adopt Ch 16A (DSA-SS, OSHPD 1&4)

“DSA-SS” only

“OSHPD 1 & 4” only
● Margin symbols used to identify changes and deleted language
● Symbols explained in 1st part of CBC (page viii of CBC 2019):

Symbols in the margins indicate where changes have been made or language has been deleted.

|| This symbol indicates that a change has been made to a California amendment.

> This symbol indicates deletion of California amendment language.

| This symbol indicates that a change has been made to International Code Council model language.

This symbol indicates deletion of International Code Council model language.
Reading the CBC - Referenced Standards

- Ch 35 lists all of the referenced standards
Reading the CBC - Referenced Standards

- Ch 35 - ASCE 7 example
  - Standard version is listed here
  - They identify all locations where a particular standard is referenced in the CBC

**CHAPTER 35**

**REFERENCED STANDARDS**

---

**1607.8.1 Handrails and guards.** Handrails and guards shall be designed to resist a linear load of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1.1 of ASCE 7. Glass handrail assemblies and guards shall comply with Section 2407.

**Exceptions:**

1. For one- and two-family dwellings, only the single concentrated load required by Section 1607.8.1.1 shall be applied.

2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an occupant load less than 50, the minimum load shall be 20 pounds per foot (0.29 kN/m).

**1607.8.1.1 Concentrated load.** Handrails and guards shall be designed to resist a concentrated load of 200 pounds (0.89 kN) in accordance with Section 4.5.1.1 of ASCE 7.
Reading the CBC - Referenced Standards

- Sometimes the underlying standard is modified/replaced by the state agency
  - Often focused on exemptions and exceptions
Reading the CBC - Document Overview

- “California Building Standards Code” has 13 parts
  - Part 2 - CBC (2 volumes)
  - Part 2.5 - CRC
  - Part 8 - CHBC
  - Part 10 - CEBC
Two volumes, first one not really used by structural engineers:
- Ch 1 - Scope and Administration
- Ch 2 - Definitions
- Ch 3 - Occupancy Classification and Use
- Ch 4 - Special Detailed Requirements Based on Occupancy and Use
- Ch 5 - General Building Heights and Areas
- Ch 6 - Fire and Smoke Protection Features
- Ch 7A - Materials and Construction Methods for Exterior Wildfire Exposure
- Ch 8 - Interior Finishes
- Ch 9 - Fire Protection and Life Safety Systems
- Ch 10 - Means of Egress
- Ch 11,11A,11B - Accessibility related stuff
- Ch 12 - Interior Environment
- Ch 13 - Energy Efficiency
- Ch 14 - Exterior Walls
- Ch 15 - Roof Assemblies and Rooftop
Reading the CBC - Document Overview

- Volume 2 - you will spend most of your time in Chapter 16, 17, and 18
  - Ch 16,16A - Structural Design
  - Ch 17,17A - Special Inspection and Tests
  - Ch 18,18A - Soils and Foundations
  - Ch 19,19A - Concrete
  - Ch 20 - Aluminum
  - Ch 21,21A - Masonry
  - Ch 22,22A - Steel
  - Ch 23 - Wood
  - Ch 24 - Glass and Glazing
  - Ch 25 - Gypsum Board, Gypsum Panel Products and Plaster
  - Ch 26 - Plastic
  - Ch 27 - Electrical
  - Ch 28 - Mechanical Systems
  - Ch 30 - Elevators and Conveying Systems
  - Ch 31 - Special Construction (window cleaning and exterior maintenance, public pools, Radiation, Food Establishments, Marine Oil Terminals)
  - Ch 32 - Encroachments into the Public Right-of-Way
  - Ch 33 - Safeguards During Construction
  - Ch 35 - Referenced Standards
Reading the CBC - Document Overview

● Chapter 16
  ○ 1601 - General
  ○ 1602 - Notations
  ○ 1603 - Construction Documents
  ○ 1604 - General Design Requirements
  ○ 1605 - Load Combinations
  ○ 1606 - Dead Loads
  ○ 1607 - Live Loads
  ○ 1608 - Snow Loads
  ○ 1609 - Wind Loads
  ○ 1610 - Soil Lateral Loads
  ○ 1611 - Rain Loads
  ○ 1612 - Flood Loads
  ○ 1613 - Earthquake Loads
  ○ 1614 - Atmospheric Ice Loads
  ○ 1615 - Tsunami Loads
  ○ 1616 - Structural Integrity
Reading the CBC - Document Overview
Reading the CBC - Document Overview

- **CBC - Chapter 16**
  - 1601 - General
  - 1602 - Notations
  - 1603 - Construction Documents
  - 1604 - General Design Requirements
  - 1605 - Load Combinations
  - 1606 - Dead Loads
  - 1607 - Live Loads
  - 1608 - Snow Loads
  - 1609 - Wind Loads
  - 1610 - Soil Lateral Loads
  - 1611 - Rain Loads
  - 1612 - Flood Loads
  - 1613 - Earthquake Loads
  - 1614 - Atmospheric Ice Loads
  - 1615 - Tsunami Loads
  - 1616 - Structural Integrity

- **ASCE 7**
  - Ch 1 - General
  - Ch 2 - Combination of Loads
  - Ch 3 - Dead Loads
  - Ch 4 - Live Loads
  - Ch 5 - Flood Loads
  - Ch 6 - Tsunami Loads and Effects
  - Ch 7 - Snow Loads
  - Ch 8 - Rain Loads
  - Ch 9 - Reserved
  - Ch 10 - Ice Loads-Atmospheric Icing
  - Ch 11 - Seismic Design Criteria
  - Ch 12 to 23 - Seismic Chapters
  - Ch 26 to 31 - Wind Chapters
Reading the CBC - Document Overview

- 1603 - Construction Documents
  - Identifies information that must be included on your drawings
  - Includes live loads, wind and seismic factors, geotech bearing values, etc.
Reading the CBC - Document Overview

- CBC 1604 (General Design Requirements) vs ASCE Chapter 1 (General)
- Example: Risk Category Table

CBC Table 1604.5

ASCE 7 Table 1-5.1
CBC 1604 (General Design Requirements) vs ASCE Chapter 1 (General)

Example: Deflection Limits

CBC Table 1604.3

No ASCE 7 equivalent
Reading the CBC - Document Overview

- Load combos, dead load, live load (CBC 1605-1608, ASCE ch 2-4)
- Example: Live Loads

CBC Table 1607.1

ASCE 7 Table 1-5.1
READING THE CBC - DOCUMENT OVERVIEW

- Soil lateral loads (CBC 1610, no ASCE chapter)

**SECTION 1610 SOIL LATERAL LOADS**

1610.1 General. Foundation walls and retaining walls shall be designed to resist lateral soil loads. Soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless determined otherwise by a geotechnical investigation in accordance with Section 1803. Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Retaining walls free to move and rotate at the top shall be permitted to be designed for active pressure. Design lateral pressure from surcharge loads shall be added to the lateral earth pressure load. Design lateral pressure shall be increased if soils at the site are expansive. Foundation walls shall be designed to support the weight of the full hydrostatic pressure of undrained backfill unless a drainage system is installed in accordance with Sections 1805.4.2 and 1805.4.3.

Exception: Foundation walls extending not more than 8 feet (2438 mm) below grade and laterally supported at the top by flexible diaphragms shall be permitted to be designed for active pressure.

<table>
<thead>
<tr>
<th>DESCRIPTION OF BACKFILL MATERIAL</th>
<th>UNIFIED SOIL CLASSIFICATION</th>
<th>DESIGN LATERAL SOIL LOADa (pound per square foot per foot of depth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-graded, clean gravels; gravel-sand mixes</td>
<td>GW</td>
<td>Active pressure</td>
</tr>
<tr>
<td>Poorly graded clean gravels; gravel-sand mixes</td>
<td>GP</td>
<td></td>
</tr>
<tr>
<td>Silty gravels, poorly graded gravel-sand mixes</td>
<td>GM</td>
<td></td>
</tr>
<tr>
<td>Clayey gravels, poorly graded gravel-and-clay mixes</td>
<td>GC</td>
<td></td>
</tr>
<tr>
<td>Well-graded, clean sands; gravely sand mixes</td>
<td>SW</td>
<td></td>
</tr>
<tr>
<td>Poorly graded clean sands; sand-gravel mixes</td>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>Silty sands, poorly graded sand-silt mixes</td>
<td>SM</td>
<td></td>
</tr>
<tr>
<td>Sand-silt clay mix with plastic fines</td>
<td>SM-SC</td>
<td></td>
</tr>
<tr>
<td>Clayey sands, poorly graded sand-clay mixes</td>
<td>SC</td>
<td></td>
</tr>
<tr>
<td>Inorganic silts and clayey silts</td>
<td>ML</td>
<td></td>
</tr>
<tr>
<td>Mixture of inorganic silt and clay</td>
<td>ML-CL</td>
<td></td>
</tr>
<tr>
<td>Inorganic clays of low to medium plasticity</td>
<td>CL</td>
<td></td>
</tr>
<tr>
<td>Organic silts and silt clays, low plasticity</td>
<td>OL</td>
<td>Note b</td>
</tr>
<tr>
<td>Inorganic clayey silts, elastic silts</td>
<td>MH</td>
<td>Note b</td>
</tr>
<tr>
<td>Inorganic clays of high plasticity</td>
<td>CH</td>
<td>Note b</td>
</tr>
<tr>
<td>Organic clays and silty clays</td>
<td>OH</td>
<td>Note b</td>
</tr>
</tbody>
</table>

For SI: 1 pound per square foot per foot of depth = 0.157 kPa/m, 1 foot = 304.8 mm.

a. Design lateral soil loads are given for moist conditions for the specified soils at their optimum densities. Actual field conditions shall govern. Submerged or saturated soil pressures shall include the weight of the buoyant soil plus the hydrostatic head.

b. Unsuitable as backfill material.

c. The definition and classification of soil materials shall be in accordance with ASTM D2487.
Outside of Dead and Live Loads CBC defers to ASCE.

SECTION 1612
FLOOD LOADS

1612.1 General. Within flood hazard areas as established in Section 1612.3, all new construction of buildings, structures and portions of buildings and structures, including substantial improvement and restoration of substantial damage to buildings and structures, shall be designed and constructed to resist the effects of flood hazards and flood loads. For buildings that are located in more than one flood hazard area, the provisions associated with the most restrictive flood hazard area shall apply.

1612.2 Design and construction. The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and coastal A zones, shall be in accordance with Chapter 5 of ASCE 7 and ASCE 24.

SECTION 1609
WIND LOADS

1609.1 Applications. Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. The type of opening protection required, the basic design wind speed, V, and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

SECTION 1614
ATMOSPHERIC ICE LOADS

1614.1 General. Ice-sensitive structures shall be designed for atmospheric ice loads in accordance with Chapter 10 of ASCE 7.

SECTION 1615
TSUNAMI LOADS

1615.1 General. The design and construction of Risk Category III and IV buildings and structures located in the Tsunami Design Zones defined in the Tsunami Design Geodatabase shall be in accordance with Chapter 6 of ASCE 7, except as modified by this code.
Reading the CBC - Document Overview

- **CBC - Chapter 16**
  - 1601 - General
  - 1602 - Notations
  - 1603 - Construction Documents
  - 1604 - General Design Requirements
  - 1605 - Load Combinations
  - 1606 - Dead Loads
  - 1607 - Live Loads
  - 1608 - Snow Loads
  - 1609 - Wind Loads
  - 1610 - Soil Lateral Loads
  - 1611 - Rain Loads
  - 1612 - Flood Loads
  - 1613 - Earthquake Loads
  - 1614 - Atmospheric Ice Loads
  - 1615 - Tsunami Loads
  - 1616 - Structural Integrity

- **ASCE 7**
  - Ch 1 - General
  - Ch 2 - Combination of Loads
  - Ch 3 - Dead Loads
  - Ch 4 - Live Loads
  - Ch 5 - Flood Loads
  - Ch 6 - Tsunami Loads and Effects
  - Ch 7 - Snow Loads
  - Ch 8 - Rain Loads
  - Ch 9 - Reserved
  - Ch 10 - Ice Loads-Atmospheric Icing
  - Ch 11 - Seismic Design Criteria
  - Ch 12 to 23 - Seismic Chapters
  - Ch 26 to 31 - Wind Chapters

- ~40 pages in CBC (1/2 of them are maps)
- ~370 pages in ASCE 7
Reading the CBC - Document Overview

- CBC - Chapter 17, Special Inspections and Tests
  - 1701 - General
  - 1702 - New Materials
  - 1703 - Approvals
  - 1704 - Special Inspection and Tests, Contractor Responsibility and Structural Observation
  - 1705 - Required Special Inspection and Tests
  - 1706 - Design Strengths of Materials
  - 1707 - Alternative Test Procedure
  - 1708 - In-Situ Load Tests
  - 1709 - Preconstruction Load Tests

Structural observations
Statement of Special Inspections
Reading the CBC - Document Overview

- CBC - Chapter 18, Foundations
  - 1801 - General
  - 1802 - Design Basis
  - 1803 - Geotechnical Investigation
  - 1804 - Excavation, Grading and Fill
  - 1805 - Dampproofing and Waterproofing
  - 1806 - Presumptive Load-Bearing Values of Soils
  - 1807 - Foundation Walls, Retaining Walls, and Embedded Posts and Poles
  - 1808 - Foundations
  - 1809 - Shallow Foundations
  - 1810 - Deep Foundations
1806 - Presumptive Load-Bearing Values of Soils

**SECTION 1806**

**PREVIOUS LOAD-BEARING VALUES OF SOILS**

1806.1 Load combinations. The presumptive load-bearing values provided in Table 1806.2 shall be used with the allowable stress design load combinations specified in Section 1605.3. The values of vertical foundation pressure and lateral bearing pressure given in Table 1806.2 shall be permitted to be increased by one-third where used with the alternative basic load combinations of Section 1605.3.2 that include wind or earthquake loads.

**TABLE 1806.2**

<table>
<thead>
<tr>
<th>CLASS OF MATERIALS</th>
<th>VERTICAL FOUNDATION PRESSURE (psf)</th>
<th>LATERAL BEARING PRESSURE (psf/ft below natural grade)</th>
<th>LATERAL SLIDING RESISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Crystalline bedrock</td>
<td>12,000</td>
<td>1,200</td>
<td>0.70</td>
</tr>
<tr>
<td>2. Sedimentary and foliated rock</td>
<td>4,000</td>
<td>400</td>
<td>0.35</td>
</tr>
<tr>
<td>3. Sandy gravel and gravel (GW and GP)</td>
<td>3,000</td>
<td>200</td>
<td>0.35</td>
</tr>
<tr>
<td>4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)</td>
<td>2,000</td>
<td>150</td>
<td>0.25</td>
</tr>
<tr>
<td>5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)</td>
<td>1,500</td>
<td>100</td>
<td>—</td>
</tr>
</tbody>
</table>

For SI: 1 pound per square foot = 0.0479 kPa, 1 pound per square foot per foot = 0.157 kPa/m.

a. Coefficient to be multiplied by the dead load.

b. Cohesion value to be multiplied by the contact area, as limited by Section 1806.3.2.
1807 - Foundation Walls, Retaining Walls, and Embedded Posts and Poles

- 1807.2.3 - Safety Factors
- 1807.3 - Embedded post equations

1807.2.3 Safety factor. Retaining walls shall be designed to resist the lateral action of soil to produce sliding and overturning with a minimum safety factor of 1.5 in each case. The load combinations of Section 1605 shall not apply to this requirement. Instead, design shall be based on 0.7 times nominal earthquake loads, 1.0 times other nominal loads, and investigation with one or more of the variable loads set to zero. The safety factor against lateral sliding shall be taken as the available soil resistance at the base of the retaining wall foundation divided by the net lateral force applied to the retaining wall.

Exception: Where earthquake loads are included, the minimum safety factor for retaining wall sliding and overturning shall be 1.1.
Reading the CBC - Document Overview

- 1808 - Foundations
- 1809 - Shallow Foundations
- 1810 - Deep Foundations
- Cross reference ACI 318 for concrete foundation requirements
Conclusions

- For each project: Identify the governing building code

Diagram:
- Project
  - New Construction
    - Small Residential → CRC
    - Typical Projects → CBC
  - Existing Building Renovation/Retrofit
    - Typical Projects → CEBC
    - Historic Projects → CHBC
Conclusions

- For each project: Identify the AHJ (CBC chapter)
Conclusions

- Projects will “lock in” the code once it is submitted for permit, that code will govern the project even if new versions are published.
Conclusions

- Do not use the IBC in CA
- Each CBC has a specific set of reference standards
  - Does not change until next CBC, even if newer versions of the standard are published
Conclusions

- Every three years take a moment to understand CBC updates
  - December 2022 (CBC 2022 eff. 01/2023)
    - ACI 318-19
  - December 2025 (CBC 2025 eff. 01/2026)
    - **ASCE 7-22**
    - AISC 341-22 and 360-22
- Look for markings in the margins to identify changes in chapter 16/16A
- Update your general notes and specifications!
## Conclusions

<table>
<thead>
<tr>
<th>Year</th>
<th>IBC</th>
<th>CBC</th>
<th>ASCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>IBC 2018</td>
<td>CBC 2019</td>
<td>ASCE 7-16</td>
</tr>
<tr>
<td>2021</td>
<td>IBC 2021</td>
<td>CBC 2022</td>
<td>ASCE 7-22</td>
</tr>
<tr>
<td>2022</td>
<td>CBC '22 Updates</td>
<td>CBC 2025</td>
<td>ASCE 7-28 Updates</td>
</tr>
<tr>
<td>2023</td>
<td>IBC 2024</td>
<td>CBC '25 Updates</td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td>IBC '27 Updates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>CBC '28 Updates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>IBC '30 Updates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2027</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2028</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Yellow boxes are approximate and should be verified in the future**

---

**Notes:**
- IBC: International Building Code
- CBC: Canadian Building Code
- ASCE: American Society of Civil Engineers
- NHERP: National Earthquake Hazards Reduction Program
- PUC: Public Utility Commission

---

**ASCE 7-16 Updates**

NHERP PUC (ASCE 7-28)

NHERP 20__ (ASCE 7-28)

ASCE 7-28 Updates

NHERP PUC (ASCE 7-34)

NHERP 2025? (ASCE 7-34)

ASCE 7-34 Updates