This seminar reviews and analyzes selected significant changes from the 2021 to the 2024 edition of the International Building Code (IBC). Although the focus of the presentation is on revisions to the IBC fire- and life-safety provisions, additional areas of discussion include accessibility, construction materials and building services. The seminar assists building officials, fire officials, plans examiners, inspectors and design professionals in identifying the specific code changes that have occurred and understanding the reasoning behind the changes. A substantial number of significant structural changes will also be discussed.
1604.4 Flexible vs Rigid Diaphragms

- Diaphragms difficult to assign as either flexible or rigid per ASCE 7, or
- Diaphragms per SDPWS
- Envelope analysis and design components for more severe load condition, or
- Semirigid analysis

1604.5 Risk Category

- Every building is assigned a risk category

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>I – Low hazard to human life</td>
<td>II – Ordinary buildings (not RC I, III or IV)</td>
<td>III – Substantial hazard to human life</td>
<td>IV – Essential facilities</td>
</tr>
</tbody>
</table>

Table 1604.5 Risk Categories

- Power generating stations
  - No IBC definition
  - 75 MWAC established as smallest power-producing unit
  - Risk Category III
Table 1604.5 Risk Categories

**RC IV**
- Essential facilities
- **Building where loss of function represents a substantial hazard to occupants or users**
  - Public utility facilities providing power generation, potable water treatment, or wastewater treatment

Credit: www.greshamsmith.com
Public Domain - Wikimedia

Table 1604.5 Risk Categories – Group I-2 & I-3

<table>
<thead>
<tr>
<th>Institutional Occupancy</th>
<th>RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-2 24-hr medical care for 6+ persons incapable of self-preservation</td>
<td>x</td>
</tr>
<tr>
<td>I-3 Prisons/jails/detention for 6+ persons</td>
<td></td>
</tr>
<tr>
<td>Condition 1 – self-preservation capability</td>
<td>x</td>
</tr>
<tr>
<td>Other than Condition 1</td>
<td>x</td>
</tr>
</tbody>
</table>
- Essential facilities
- **Buildings where loss of function represents a substantial hazard to occupants or users**

202 Definitions – PV Systems

- Photovoltaic (PV) systems
- **Ground-mounted**
  - Independent system without useable space underneath
  - Installed directly on the ground
- **Elevated**
  - Independent support structure designed with useable space beneath
    - Minimum clear height 7.5 feet
  - Intended for secondary use
    - e.g. vehicle shade or parking

1604.5.2 Photovoltaic (PV) Panel Systems

<table>
<thead>
<tr>
<th>PV Systems &amp; Elevated PV Support</th>
<th>Risk Category (RC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ground mounted for Group R-3 only</td>
<td>x</td>
</tr>
<tr>
<td>2 Ground mounted other than 1 &amp; 5</td>
<td>x</td>
</tr>
<tr>
<td>3 Elevated other than 4, 5 &amp; 6</td>
<td>x</td>
</tr>
<tr>
<td>4 Rooftop and elevated PV on top of buildings</td>
<td>Same as building RC</td>
</tr>
<tr>
<td>5 Paired with ESS &amp; dedicated backup for RC IV building</td>
<td>x</td>
</tr>
<tr>
<td>6 Elevated &amp; used for emergency vehicle parking</td>
<td>x</td>
</tr>
</tbody>
</table>
1604.5 Risk Category – Parking Garages

Exception 2
Freestanding parking garages not used for the storage of emergency services vehicles, and not providing means of egress for buildings or structures assigned to a higher risk category, shall be assigned to Risk Category II.

- Most parking garages now RC II
- Can exclude drive aisles in net area calcs
- Table 1604.5 footnote “a”

1607 Live Loads

The live loads used in the design of buildings and other structures shall be the maximum loads expected by the intended use or occupancy but shall not be less than the minimum uniformly distributed live loads given in Table 1607.1. Live loads acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

- Moved from 1607.14
### 1607.3 Live Loads – Partial Loading

- Floors and Roofs
  - Moved from 1607.13 and 1607.14 and modified
  - DL + patterned LL
  - Produce greatest load effect
- Reduced LL permitted

### Table 1607.1 Minimum Live Loads

<table>
<thead>
<tr>
<th>OCCUPANCY OR USE</th>
<th>UNIFORM (psf)</th>
<th>CONCENTRATED (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Apartments (see residential)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Access floor systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office use</td>
<td>50</td>
<td>2,000</td>
</tr>
<tr>
<td>Computer use</td>
<td>100</td>
<td>2,000</td>
</tr>
<tr>
<td>3. Armories and drill rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Assembly areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed seats</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Follow spot, projections, and control rooms</em></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Lobbies</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Movable seats</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Stage floors</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Platforms (assembly)</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Bleachers, folding and telescopic seating and grandstands</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Stadiums and arenas with fixed seats</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Other assembly areas</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>15. Garages and vehicle floors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger vehicles only garages</td>
<td>40</td>
<td>See § 1607.7</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>See § 1607.8</td>
<td></td>
</tr>
<tr>
<td>Fire trucks and emergency vehicles</td>
<td>See § 1607.8</td>
<td></td>
</tr>
<tr>
<td>Forklifts and movable equipment</td>
<td>See § 1607.8</td>
<td></td>
</tr>
<tr>
<td><strong>17. Helipads</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helicopter takeoff weight 3,000 lb or less</td>
<td>40</td>
<td>See § 1607.6.1</td>
</tr>
<tr>
<td>Helicopter takeoff weight more than 3,000 lb</td>
<td>80</td>
<td>See § 1607.6.1</td>
</tr>
</tbody>
</table>

- Primarily reformatting

### Table 1607.1 Minimum Live Loads

<table>
<thead>
<tr>
<th>OCCUPANCY OR USE</th>
<th>UNIFORM (psf)</th>
<th>CONCENTRATED (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>15. Garages and vehicle floors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger vehicles only garages</td>
<td>40</td>
<td>See § 1607.7</td>
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<tr>
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</tr>
<tr>
<td>Helicopter takeoff weight more than 3,000 lb</td>
<td>80</td>
<td>See § 1607.6.1</td>
</tr>
</tbody>
</table>

- Primarily reformatting

- Remaining sections renumbered

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33 1607.5 Partition Loads

In office buildings and in other buildings where partition locations are subject to change, provisions for partition weight shall be made, whether or not partitions are shown on the construction documents, unless the specified live load is 80 psf or greater. The partition load shall be not less than a uniformly distributed live load of 15 psf and shall not be reduced per Section 1607.13.

Exception: A partition live load is not required where the minimum specified live load is 80 psf or greater.

- Consistent with ASCE 7-22 § 4.3.2
- Partition live loads are not reducible
  - Can be relocated and clustered differently

34 1607.8.2 Fire Trucks and Emergency Vehicles

Emergency vehicle loads need not be assumed to act concurrently with other uniform live loads.

- Consistent with ASCE 7-22 new section §4.10.4
- Operating loads
- Wheel and outrigger reactions
  - Outriggers up to 60,000 lb

35 1607.6 Helipads

- Extend marking requirements to ALL helipads
- Not just for 3000 lbs

10
146
41
D40

Maximum take-off weight x 2000 lbs

www.ffa.gov AC No: 150/53390-20 (2023)

36 1607.9 Handrails and Guards

- Consistent with ASCE 7-22 § 4.5
- 50 plf uniform load
  - Not concurrent with 200 lb concentrated load
  - Does not apply to unoccupiable roofs

The ground snow loads to be used in determining the design snow loads for roofs shall be determined in accordance with the reliability-targeted (strength-based) ground snow load values in Chapter 7 of ASCE 7 or Figures 1608.2(1) and 1608.2(2) through 1608.2(4) for the contiguous United States and Table 1608.2 for Alaska. Site-specific case studies shall be determined in accordance with Chapter 7 of ASCE 7 and shall be approved by the building official made in areas designated "CS" in Figures 1608.2(1) and 1608.2(2) and for all sites within the CS area shall be approved. Ground snow load determination for each site shall be based on an extreme value statistical analysis of data available in the vicinity of the site using a value with a 2 percent annual probability of being exceeded (50-year mean recurrence interval). Snow loads are zero for Hawaii, except in mountainous regions as approved by the building official.
Where required, the ground snow loads, $p_g$, of Figures 1608.2(1) through 1608.2(4) and Table 1608.2 shall be converted to allowable stress design ground snow loads, $p_{g(asd)}$, using Equation 16-17.

$$p_{g(asd)} = 0.7 \times p_g$$  \hspace{1cm} \text{(Equation 16-17)}

where:

- $p_{g(asd)}$ = Allowable stress design ground snow load.
- $p_g$ = Ground snow load determined from Figures 1608.2(1) through 1608.2(4) and Table 1608.2.

Many IBC and IRC provisions still rely on ASD values.

ASCE Hazard tool also provides ASD values (asce7hazardtool.online)

- Free resource

**Code Change**

**Example**

**Example**

**Example**

**Example**

**Example**

**Define**

**Definition**

Basic wind speed, $V$.

The wind speed used for design, as determined in Chapter 16.

Windborne debris region.

Areas within hurricane-prone regions located:

1. Within 1 mile of the mean high-water line where an Exposure D condition exists upwind at the waterline and the basic wind speed, $V$, is 130 mph or greater; or
2. In areas where the basic design wind speed, $V$, is 140 mph or greater.

For Risk Category II buildings and structures and Risk Category III buildings and structures, except health care facilities, the windborne debris region shall be based on Figure 1609.3(1) and 1609.3(2). For Risk Category III health care facilities, and Risk Category IV buildings and structures and Risk Category III health care facilities, the windborne debris region shall be based on Figure 1609.3(3) and Figure 1609.3(4), respectively.

Wind Design Geodatabase.

The ASCE database (version 2022-1.0) of geocoded wind speed design data.

The ASCE Wind Design Geodatabase of geocoded wind speed design data is available at https://asce7hazardtool.online.

- “basic design wind speed” changed throughout IBC
- ASCE Wind Design Geodatabase provides values (asce7hazardtool.online)
  - Based on risk category
  - Free resource

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The basic design wind speed, $V$, in mph, for the determination of the wind loads shall be determined by Figures 1609.3(1) through 1609.3(12). The basic design wind speed, $V$, for use in the design of Risk Category I buildings and structures shall be obtained from Figures 1609.3(1), 1609.3(5), and 1609.3(6). The basic design wind speed, $V$, for use in the design of Risk Category II buildings and structures shall be obtained from Figures 1609.3(2), 1609.3(7), and 1609.3(8). The basic design wind speed, $V$, for use in the design of Risk Category III buildings and structures shall be obtained from Figures 1609.3(3), 1609.3(9), and 1609.3(10). The basic design wind speed, $V$, for use in the design of Risk Category IV buildings and structures shall be obtained from Figures 1609.3(4), 1609.3(11), and 1609.3(12). Basic wind speeds for Hawaii, US Virgin Islands, and Puerto Rico shall be determined by using the ASCE Wind Design Geodatabase. The ASCE Wind Design Geodatabase is available at https://asce7hazardtool.online, or an approved equivalent.

- Related technical and editorial changes throughout IBC
- Consistent with ASCE 7-22
- Hawaii, US Virgin Islands, and Puerto Rico per ASCE Wind Design Geodatabase
The design and construction of Risk Category III and IV buildings and other structures located in the tornado-prone region as shown in Figure 1609.5 shall be in accordance with Chapter 32 of ASCE 7, except as modified by this code.

- Risk Category III and IV buildings
- Tornado-prone region
- New ASCE 7 Chapter 32
Buildings and other structures classified as Risk Category III or IV and located in the tornado-prone region as shown in Figure 32.1-1, including the main wind force resisting system (MWFRS) and all components and cladding (C&C) thereof, shall be designed and constructed to resist the greater of the tornado loads determined in accordance with the provisions of this chapter or the wind loads determined in accordance with Chapters 26 through 31, using the load combinations provided in Chapter 2.

- Design for greater of tornado loads or wind loads
- Evaluate both MWFRS and C&C

**Design for Tornado Loads Not Required**

<table>
<thead>
<tr>
<th>$V_T$ (mph)</th>
<th>V (mph)</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>120</td>
<td>B</td>
</tr>
<tr>
<td>70</td>
<td>140</td>
<td>C</td>
</tr>
<tr>
<td>80</td>
<td>160</td>
<td>D</td>
</tr>
<tr>
<td>90</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>280</td>
<td></td>
</tr>
</tbody>
</table>

$V_T$ = tornado speed (Chapter 32)

- $V = $ basic wind speed (Chapter 26)
- Exposure category (Chapter 26)
- Only used to determine applicability – not to determine loads

---

**Not for Storm Shelter Design**

A building or other structure designed for tornado loads determined exclusively in accordance with Chapter 32 cannot be designated as a storm shelter without meeting additional critical requirements provided in the applicable building code and ICC 500, the ICC/NSSA Standard for the Design and Construction of Storm Shelters...

**423.4 Storm Shelters**

- Critical services $\rightarrow$ RC IV
  - 911 call stations
  - Emergency ops centers
  - Fire, rescue, ambulance and police stations
- Storm shelter per ICC 500
  - $V = 250$ mph (red zone)
**Tornado Speed, \( V_T \)**

- Risk Category III & IV
- 16 maps
- Based on effective plan area, \( A_e \)
- 1 ft\(^2\) to 4 million ft\(^2\)

**Effective Plan Areas, \( A_e \)**

- Required to maintain functionality of essential facility

---

**1611.1 Design Rain Load**

Each portion of a roof shall be designed to sustain the load of rainwater as per the requirements of Chapter 8 of ASCE 7. Rain loads shall be based on the summation of the static head, \( q_s \), hydraulic head, \( q_h \), and ponding head, \( q_p \), using Equation 8.1-19. The hydraulic head shall be based on hydraulic test data or hydraulic calculations assuming a flow rate corresponding to a rainfall intensity equal to or greater than the 15-minute duration storm with return period given in Table 1611.1. Rainfall intensity shall be determined in inches per hour for 15-minute duration storms for Risk Category given in Table 1611.1. The design rainfall shall be based on the 100-year 15-minute duration event, or on other rainfall rates determined from approved local weather data. Alternatively, a design rainfall of twice the 100-year hourly rainfall rate indicated in Figures 1611.1(1) through 1611.1(5) shall be permitted. The ponding head shall be based on structural analysis as the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored dead load.

- Consistent with ASCE 7-22 §8.2
- Ponding head added
- Primary drain typically designed for 1-hour duration
- Secondary drain must be designed for 15-minute duration
- Option for 2x hourly rate deleted
1611.1 Rain Loads

R = 5.2(d_s + d_h + d_p)  
(IBC Equation 16-20)

- R – rain load on undeflected roof
- d_s – static head
- d_h – hydraulic head
- d_p – ponding head

Secondary drainage system for structural loading (SDSL)
- Roof drainage system through which water is drained when primary drainage system blocked
- SDSL > 2” above primary drain

Existing IBC rainfall maps deleted
Intensity based on risk category
ASCE Hazard Tool
- Free resource for determining rain load
- 15-min and 60-min intensities

1612.3 Flood Loads – 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. Elevators, escalators, conveying systems and their components shall conform to ASCE 24 and ASME A17.1/CSA B44 as applicable.

Exception: Temporary structures complying with Section 3103.6.1.3.

- Elevators & escalators per ASCE 24 and ASME A17.1
- New exception for temporary structures
- Similar provisions for wind and seismic
Summary of ASCE 7-22 s2 Major Flood Load Changes

- Flood Hazard Area increased from 100-year flood plain to 500-year flood plain for Risk Categories II, III, and IV structures
- Significant reorganization
- New provisions
  - Flood Velocity
  - Wave Effects
  - Scour
  - Debris Impact

Design Stillwater Flood Depth, \(d_f\)

- Flood Hazard Area
- Design Flood Elevation
- Normal Water Level
- 100-year Flood Elevation

Design Stillwater Flood Depth

- Mean Water Level (MNL)
- Pre-Erosion Land Elevation
- Post-Erosion Land Elevation
- Datum Specified on Adopted Flood Hazard Map
- Flood Parameters in Coastal Areas
Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable. The seismic design category for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

Exceptions:
1. Detached one- and two-family dwellings, assigned to Seismic Design Category A, B or C, or located where the mapped short-period spectral response acceleration, $S_S$, is less than 0.4 g.
2. Temporary structures complying with Section 3103.6.1.4.

Application based on SDC alone not $S_S$

New exception for temporary structures

Seismic ground motion values Determination of Seismic Design Category. Seismic ground motion values shall be determined in accordance with the section. Structures shall be assigned to a Seismic Design Category based on one of the following methods, unless the authority having jurisdiction or geotechnical data determines that Site Class DE, E or F soils are present at the site.

1. Based on the structure risk category using Figures 1613.2(1) through 1613.2(7).
2. Determined in accordance with ASCE 7.

Where Site Class DE, E or F soils are present, the Seismic Design Category shall be determined in accordance with ASCE 7.

Site Classification

<table>
<thead>
<tr>
<th>Site Class</th>
<th>$V_s$ (ft/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Hard rock</td>
<td>&gt;5,000</td>
</tr>
<tr>
<td>B. Medium hard rock</td>
<td>2,500 to 3,000</td>
</tr>
<tr>
<td>C. Soft rock</td>
<td>1,000 to 2,500</td>
</tr>
<tr>
<td>D. Very dense soil or soft rock sand or hard clay</td>
<td>3,000 to 1,450</td>
</tr>
<tr>
<td>E. Dense sand or very stiff clay</td>
<td>&gt;1,000 to 1,450</td>
</tr>
<tr>
<td>F. Loose sand or medium stiff clay</td>
<td>&gt;500 to 1,000</td>
</tr>
</tbody>
</table>

Average shear wave velocity parameter, $V_s$, is derived from the measured shear wave velocity profile from the ground surface to a depth of 100 ft.

Seismic Design Categories

Adapted from ASCE 7-22 Table 20.2-1

Based on shear wave velocity tests only

Use if soil properties unknown

Figures 1613.2(1) & (2) Western and Eastern U.S.
Ballasted, roof-mounted photovoltaic panel systems need not be rigidly attached to the roof or supporting structure. Ballasted, unattached PV panel systems shall be designed and installed only on roofs with slopes not more than one unit vertical in 12 units horizontal. Ballasted, unattached PV panel systems shall be designed to resist and accommodate sliding and uplift in accordance with ASCE 7 Chapter 13, resulting from lateral and vertical forces as required by Section 1605, using a coefficient of friction determined by acceptable engineering principles. In structures assigned to Seismic Design Category C, D, E or F, ballasted nonpenetrating systems shall be designed to accommodate seismic displacement determined by nonlinear response-history or other approved analysis or shake-table testing, using input motions consistent with ASCE 7 lateral and vertical seismic forces for nonstructural components on roofs.

- Ballasted, unattached PV systems
  - Roofs ≤ 1:12
  - Designed to accommodate sliding per ASCE 7
  - Simplified provisions

Where required, automatic sprinkler systems, including anchorage and bracing, shall comply with ASCE 7 and Section 903.3.1.1.

- Nonstructural components
- Consistent with ASCE 7-22
- Clearances for sprinkler drops and sprigs
- Consistent with NFPA 13
- Standard for the Installation of Sprinkler Systems

General. Buildings and other structures and portions thereof shall be designed to resist the strength load combinations specified in ASCE 7, Section 2.3, the allowable stress design load combinations specified in ASCE 7, Section 2.4, or the alternative allowable stress design load combinations of Section 1605.

Exceptions:
1. The modifications to load combinations of ASCE 7 Section 2.3, ASCE 7 Section 2.4, and Section 1605 specified in ASCE 7 Chapters 18 and 19 shall apply.
2. Where the allowable stress design load combinations of ASCE 7 Section 2.4 are used, flat roof snow loads of 30 pounds per square foot and roof live loads of 30 pounds per square foot or less need not be combined with seismic load. Where flat roof snow loads exceed 30 pounds per square foot, 20 percent shall be combined with seismic loads.

- Strength Design per ASCE 7 Section 2.3
- ASD per ASCE 7 Section 2.4
- Alternative ASD per 1605.2
- ASD snow load values adjusted for new risk-based approach
**1614 – Atmospheric Ice Loads**

Example: Nominal Ice Thickness, \( t \), for Risk Category IV

- \( >2,100 \text{ ft} \) special icing regions
- \( >6,000 \text{ ft} \) special icing regions

ASCE 7-22 Fig 10.4-2D

Courtesy of ASCE

---

**1615.1 Tsunami Loads – 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.

**Exception:** Temporary structures complying with Section 3103.6.1.6.

- New exception for temporary structures

---

**Summary of ASCE 7-22 Major Tsunami Load Changes**

- Updated subsidence maps
- High-resolution maps for highly populated areas (CA)
- Higher order models permitted
- Overtopped wall pressure provisions updated
- Tumbling debris impact on interior columns for SoG design
- Building drag coefficient simplified
- Clarification for push-over analysis
- Provisions for hydrodynamic load on pipes
- Debris impact zone extended to grounding limit or resilient structures
- Debris damming for warehouses and parking garages
- Improved provisions for scour and pore pressure softening around foundations
- Exception for SDC D-F if SFRS is adequate to resist tsunami loads

---

**asce7tsunami.online**

ASCE Tsunami Hazard Tool

ASCE Tsunami Design Guidelines 2022
1803.5.4 Ground-water table

Groundwater. A subsurface soil geotechnical investigation shall be performed to determine whether if:
1. The existing ground-water table (groundwater) is above or within 5 feet (1524 mm) below the elevation of the lowest floor level where such floor is located below the finished ground level adjacent to the foundation.
2. The groundwater depth will affect the design and construction of buildings and structures.

Exception: A subsurface soil investigation to determine the location of the ground-water table shall not be required where waterproofing is provided in accordance with Section 1805.

- "geotechnical investigation" used throughout
- Waterproofing exception deleted
- Groundwater depth required for design
- Example: identifying hydrostatic pressures

1809.14 & 1810.3.12 Grade Beams

- Applicable to shallow and deep foundations
- High seismic regions
- Designed per ACI 318 and ASCE 7

1810.3.2.8 Higher Allowable Stresses

- Pile tests justify higher tabulated values
- Not to justify values higher than tabulated

Table 1810.3.2.6 (excerpt) Allowable Stresses for Materials Used in Deep Foundation Elements

<table>
<thead>
<tr>
<th>Material Type and Condition</th>
<th>Maximum Allowable Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Steel in compression</td>
<td>0.5 ft ≤ 32,000 psi</td>
</tr>
<tr>
<td></td>
<td>0.35 ft ≤ 24,000 psi</td>
</tr>
<tr>
<td>5. Steel in tension</td>
<td>0.5 ft ≤ 32,000 psi</td>
</tr>
<tr>
<td>Other pipes, tubes or H-piles, when fitted in accordance with Section 1810.3.2.8</td>
<td>0.35 ft ≤ 24,000 psi</td>
</tr>
<tr>
<td>Helical piles</td>
<td>0.6 ft ≤ 0.5 ft</td>
</tr>
</tbody>
</table>
Concrete
Chapter 19

1901.2.1 Concrete with GFRP Reinforcement

- Glass fiber-reinforced polymer (GFRP)
- ACI 440.11-22 for design
- ASTM D7957 for manufacture
- Uses include
  - Near MRI equipment
  - Highly corrosive environments
  - Bridge decks
  - Parking garages
  - Marine structures

CODE CHANGE

1905 Seismic Requirements

<table>
<thead>
<tr>
<th>Section</th>
<th>Summary of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901.2, 1901.3</td>
<td>Reflects conceptual changes to Section 1905 supplemental seismic provisions</td>
</tr>
<tr>
<td>1902.1</td>
<td>1902.1.1 added for design earthquake diaphragm displacement in ASCE 7-22</td>
</tr>
<tr>
<td></td>
<td>Permited as zero for diaphragms idealized as rigid</td>
</tr>
<tr>
<td>1903.2</td>
<td>Deleted – duplicated 1901.6</td>
</tr>
<tr>
<td>1905.1</td>
<td>Implements conceptual change to Section 1905 supplemental seismic provisions</td>
</tr>
<tr>
<td>1905.2</td>
<td>New definitions added from ASCE 7-22 Chapter 14 which is not adopted in 2024 IBC</td>
</tr>
<tr>
<td></td>
<td>Cast-in-Place Concrete Equivalent Diaphragms</td>
</tr>
<tr>
<td></td>
<td>Precast Concrete Diaphragms</td>
</tr>
<tr>
<td>1905.1.2, 1905.3, 1905.1.4, 1906.4, 1905.5, 1905.7</td>
<td>Deletions and additions implement conceptual changes to Section 1905</td>
</tr>
<tr>
<td>1905.6</td>
<td>SDC A or B: detached single- and two-family dwellings up to 3 stories constructed with stud bearing walls permitted to have plain concrete footings without longitudinal reinforcement</td>
</tr>
<tr>
<td></td>
<td>Structures in SDC C – F: plain structural concrete not permitted with exceptions</td>
</tr>
</tbody>
</table>

Reorganized and revised – supplemental to ACI 318 seismic design

Masonry
Chapter 21
2101.2 Design Methods

- Compression-controlled section requirements added for strength design of reinforced masonry under flexure and axial load
- Updated mortar requirements for adhered masonry veneer
- New Appendix D – GFRP Reinforced Masonry
  - Limited to SDC A - C for elements not part of seismic force-resisting system
- Removal of TMS 402 Appendix A: Empirical Design
  - Empirical design via reference to TMS 402-16

Chapter 22 Steel – Reorganization

- 2201 General: Content added from other sections
- 2202 Identification of Steel for Structural Purposes: Content deleted and comparable language added to 2201.2
- 2203 Protection of Steel for Structural Purposes: Content deleted and comparable language added to 2201.3
- 2204 Connections: Content deleted and comparable language added to 2201.4
- 2205 Structural Steel: Renumbered as 2202 and renamed to capture composite structural steel and concrete
- 2206 Composite Structural Steel and Concrete Structures: Content deleted and enabling language added to 2202
- 2207 Steel Joists: No section number change
- 2208 Steel Cable Structures: Renumbered as 2214
- 2209 Steel Storage Racks: No section number change
- 2210 Cold-Formed Steel: Renumbered as 2214 and new Section 2208 Steel Deck created
- 2211 Cold-Formed Steel Light-Frame Construction: Renumbered as 2205
  - New Section 2210 Metal Building Systems Created
  - New Section 2211 Industrial Boltless Steel Shelving Created
  - New Section 2212 Industrial Steel Work Platforms Created
  - New Section 2213 Steel Stairs, Ladders and Guarding for Storage, Racks and Industrial Steel Work Platforms Created

Chapter 22 Referenced Steel Standards

Steel
Chapter 22
2210 Metal Building Systems

- New definition
- Structural steel per 2202
- CFS per 2204
- Steel joists per 2207
- Steel cable per 2214
- Special inspection per 1705.2.6

2211 Industrial Boltless Steel Shelving

2212 Industrial Steel Work Platforms

2213 Stairs, Ladders and Guards
Wood
Chapter 23

CODE CHANGE

2303.2 FRT Wood

- ASTM E84 extended 20 min
- FRT wood and plywood including connections
  - All untreated adjustments
  - Plus adjustment for fire-retardant treatment
- FRT LVL recognized

CODE CHANGE

Table 2304.6.1 WSP Wind Capacity

- Tabulated values modified for basic wind speeds consistent with ASCE 7-22
- New footnote provides prescriptive option for framing species with specific gravity lower than 0.42

CODE CHANGE

2304.10.1 Fire Protection of Connections

- Connections in Type IV-A, IV-B and IV-C construction
- Required fire protection for time associated with
  - Columns
  - Primary structural frame other than columns
- ASTM E119 testing of connections not required
2305.1 Wood Shear Walls and Diaphragms

- Language modified to allow for CLT shear walls and diaphragms
- Capacity reductions account for permanent lateral loads such as soils

2305.1 Wood Shear Walls and Diaphragms

- Revised shear provisions
- New provisions for taper cuts
- Notching provisions clarified
- Built-up column provisions clarified
- Revised provisions for multiple member shear connections
- Revised fire design chapter to coordinate with FDS

2308.2.7 Hillside Light-frame Wood Construction

- New load path requirements intended to improve seismic performance of hillside light-frame wood buildings

Table 2308.11.4 Wind Uplift

- Roof-to-wall connection uplift loads updated to ASCE 7-22
- Tabulated for 90-140 mph
- Exposure B, C and D
- Assume 24” overhangs
2309.1 Wood Frame Construction Manual

- Updates align with SDPWS-2021 provisions
- C&C-based roof tables consistent with ASCE 7-22
- Snow load tables add strength-based GSL values
  - Enable use with new strength-based maps and ASD-based snow loads

Image courtesy of AWC

Resources
Available for use or that can be used for support or help

Codes and Standards

IBC Significant Changes
Textbook with Solved Examples

- Figures, flow charts, design aids, and example problems
- Loads: dead, live, rain, snow, ice, wind (including tornado), earthquake, flood and tsunami

STRUCTURE Magazine Articles

- Nov '23 - Roof Assemblies (Ch 15)
- Dec '23 - Special Inspection (Ch 17) and Soils/Foundations (Ch 18)
- Jan '24 - Concrete (Ch 19) and Masonry (Ch 21)
- Feb '24 - Steel (Ch 22)
- Mar '24 - Structural Design (Ch 16) – Risk Categories
- Apr '24 - Structural Design (Ch 16) – ASCE 7-22 Loads
- May '24 - Wood (Ch 23)
- Jun '24 - Glass and Glazing (Ch 24)
- Jul '24 - Temporary Structures (Ch 31)
Webinar Series – ICC Learn Live

Demystifying Loads for Building Officials – 2024 IBC and ASCE 7-22

Topics in this series for 2024:
- Load Path, Load Combinations and Risk Categories: June 12
- Dead, Live and Rain Loads: July 10
- Snow and Ice Loads: August 14
- Wind and Tornado Loads: September 11
- Earthquake Loads: October 9
- Flood and Tsunami Loads: November 13
- Temporary Structures: December 11

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