Significant 2012 IBC, NDS and 2008 SDPWS Changes

Speaker’s Name
Title
American Wood Council

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Course Description

- This course will provide a brief overview of code and standards development to give context to current building code allowances and design procedures as well as future code pursuits. Topics will include recent International Code Council (ICC) and American Wood Council efforts related to code advancement, and the latest changes to the International Building Code (IBC), National Design Specification (NDS) for Wood Construction and Special Design Provisions for Wind and Seismic (SDPWS).

Learning Objectives

- At the end of this program, participants will be able to:
  - Identify building code issues that are leading to code changes.
  - Discuss recent changes to wood design standards that affect the design of wood structures.
  - Discuss recent changes to the building code.
  - Understand reasons for the changes to the IBC and the wood design standards.
The American Wood Council (AWC) provides wood design and construction information to assist building industry professionals, develops structural and fire performance data on a wide range of traditional and engineered wood products, and engages in long-term research.

Who...

• History of AWC:

  • 1902 – National Lumber Manufacturers Association
  • 1965 – National Forest Products Association
  • 1991 – American Wood Council – Codes & Engineering
  • 1993 – American Forest & Paper Association
  • 2010 – American Wood Council
What & How....

- AWC...
- Codes and Standards
- Environmental Regulations
- Green Building

2009 IBC
2012 IBC
AWC STANDARDS
2015 IBC
PRESENT & NEAR FUTURE 2009 & 2012 IBC

International Building Code

- 2009/2012 IBC - most used currently
- Cycle just ended for 2015 IBC
  - Contents are known
  - Sneak peek at a few changes
Significant Changes to IBC

• 509.2 Horizontal Separation of Buildings
• Pedestal/Podium Buildings
• Requirements continue to evolve for flexibility
• Permitted use groups expanded
• Separate wood building on top of higher construction type
Significant Changes to 2009 IBC

• 509.2 Horizontal Separation of Buildings

**509.2. Group S-2 enclosed or open parking garage with Group A, B, M, R or S above.** Horizontal Building Separation Allowance.

1. Focus taken off Parking Garages
2. Re-directs to Occupancy Classification
3. Structure as two separate and distinct buildings for
   - Height and Area limitations
   - Types of construction
   - Fire wall continuity
4. Occupancies below 3-hour horizontal assembly:
   - Group R, A, B, S-2 and M

Significant Changes to 2012 IBC

• 509.2 510.2 Horizontal Separation of Buildings

510.2 Horizontal building separation allowance. A building shall be considered as separate and distinct buildings for the purpose of determining area limitations, continuity of fire walls, limitation of number of stories and type of construction where all of the following conditions are met:

1. The buildings are separated with a horizontal assembly having a fire-resistance rating of not less than 2 hours.
2. The building below the horizontal assembly is not greater than one story above grade plane.
3. The building below the horizontal assembly is of Type IA construction.

ASCE 7-10
Ch. 11 Seismic Design Criteria - NEW

STRUCTURAL HEIGHT: The vertical distance from the base to the highest level of the seismic force-resisting system of the structure. For pitched or sloped roofs, the structural height is from the base to the average height of the roof.
Significant Changes to 2012 IBC

- IBC 1609.1.1 References ASCE 7-05 ASCE 7-10 has changes for wind design
- Chapter 6 26-31
- 3 Maps for 4 Risk Categories (II, III, and IV)
  - Removal of occupancy factor
ASCE 7 Exposure Categories

• B  Suburban, use as DEFAULT unless others apply
  >60% to 80% of all buildings are in this category

• C  Open country, 1500 ft creates this category

• D  Water, including on hurricane coast!

Change in ASCE 7-10

ASCE 7-10 Wind Speed Maps

• New “strength design”- basis maps show higher wind speeds (Speeds
  are for ultimate event)
  • Effective pressures remain about the same

• www.atcouncil.org/windspeed

NEW!
ASCE 7

Figure 2. Illustration of hurricane prone regions (FEMA P-804).

ASCE 7 Wind Speeds

Table 1. Wind Speed Conversion

<table>
<thead>
<tr>
<th>ASCE 7-05 Basic Wind Speeds</th>
<th>85</th>
<th>90</th>
<th>100</th>
<th>110</th>
<th>120</th>
<th>130</th>
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<td>based on 50 yr. return period 3 second gust (mph)</td>
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<td>142</td>
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<td>142</td>
<td>155</td>
<td>168</td>
<td>181</td>
<td>194</td>
</tr>
</tbody>
</table>

Based on 50 yr. return period 3 second gust (mph)

Based on 700 yr. return period 3 second gust (mph)
ASCE 7-10

- ASCE 7-10 Wind Provisions and Effects on Wood Design and Construction
  - By Line and Coulbourne
- Download for free at www.awc.org
  - [http://www.awc.org/pdf/ASCE7-10WindChanges.pdf](http://www.awc.org/pdf/ASCE7-10WindChanges.pdf)

ASCE 7-10

- ASCE 7-10 Seismic Design Provisions
- Biggest change seismic ground motion maps – NEW seismic hazard data USGS and related Changes – Building Seismic Safety Council
  - Reflect risk-targeted magnitudes
  - Probabilistic ground motions
  - Unifying risk (rather than hazard)
  - Deterministic ground motions near active faults.
ASCE 7-10

- Regional basis - slight increase or decrease in design ground motions, on average. Exceptions:
  - Central and Eastern U.S. - short-period ground motions substantially lower.
  - City sites such as St. Louis, Chicago, and New York, where the changes lower the Seismic Design Category (SDC).
  - Western U.S. - modest increase, or decrease, in design ground motions (plus or minus 10 percent).
  - City sites - substantially change design ground motions, due primarily to changes in underlying hazard functions. For instance, there have been sizable increases in the San Bernardino, Calif., area and significant decreases in the San Diego area.

ASCE 7

- ASCE 7-10 Seismic Design Provisions of ASCE 7-10 Changes from ASCE 7-05 (Part I & II)
  - By Dowty & Ghosh
  - Download for free:
    - [http://cenews.com/article/8402/seismic-design-provisions-of-asce-7-10-changes-from-asce-7-05](http://cenews.com/article/8402/seismic-design-provisions-of-asce-7-10-changes-from-asce-7-05)
    - [http://cenews.com/article/8576/seismic_design_provisions_of_asc e_7_10__changes_from_asce_7_05](http://cenews.com/article/8576/seismic_design_provisions_of_asc e_7_10__changes_from_asce_7_05)
12.3 DIAPHRAGM FLEXIBILITY, CONFIGURATION IRREGULARITIES, AND REDUNDANCY

12.3.1 Diaphragm Flexibility. The structural analysis shall consider the relative stiffnesses of diaphragms and the vertical elements of the seismic force-resisting system. Unless a diaphragm can be idealized as either flexible or rigid in accordance with Sections 12.3.1.1, 12.3.1.2, or 12.3.1.3, the structural analysis shall explicitly include consideration of the stiffness of the diaphragm (i.e., semirigid modeling assumption).

ASCE 7-05

12.3.1.1 Flexible Diaphragm Condition. Diaphragms constructed of untopped steel decking or wood structural panels are permitted to be idealized as flexible in structures in which the vertical elements are steel or composite steel and concrete braced frames, or concrete, masonry, steel, or composite shear walls. Diaphragms of wood structural panels or untopped steel decks in one- and two-family residential buildings of light-frame construction shall also be permitted to be idealized as flexible.

Significant Changes to 2012

IBC 2009

1613.4 Alternative to ASCE 7. The provisions of Section 1613.4 shall be permitted as alternative to the relevant provisions of ASCE 7.

1613.4.1 Assumption of Flexible Diaphragm. The following text at the end of Section 12.3.1.1 of ASCE 7.

Diaphragms constructed of wood structural panels or untopped steel decking shall also be permitted to be idealized as flexible provided all of the following conditions are met:

1. Toppings of concrete or similar materials are not placed over wood structural panel diaphragms except for nonstructural toppings no greater than 1/4 inch (6.35 mm) thick.
2. Each line of vertical elements of the seismic force-resisting system complies with the allowance shown of Table 12.12.1.
3. Vertical elements of the seismic force-resisting system are light-frame walls sheathed with wood structural panels used for shear resistance or wood shears.
4. Portions of wood structural panel diaphragms that cantilever beyond the vertical elements of the lateral-force-resisting system are designed in accordance with Section 4.2.5.2 of AITP/SEPWS.
12.3 DIAPHRAGM FLEXIBILITY, CONFIGURATION IRREGULARITIES, AND REDUNDANCY

12.3.1 Diaphragm Flexibility. The structural analysis shall consider the relative stiffnesses of diaphragms and the vertical elements of the seismic force-resisting system. Unless a diaphragm can be idealized as either flexible or rigid in accordance with Sections 12.3.1.1, 12.3.1.2, or 12.3.1.3, the structural analysis shall explicitly include consideration of the stiffness of the diaphragm (i.e., semi-rigid modeling assumptions).

ASCE 7-05

12.3.1.1 Flexible Diaphragm Condition. Diaphragms constructed of untopped steel decking or wood structural panels are permitted to be idealized as flexible in structures in which the vertical elements are steel or composite steel and concrete framed, or concrete, masonry, steel, or composite shear walls. Diaphragms of wood structural panels or untopped steel decks in one- and two-family residential buildings of light-frame construction shall also be permitted to be idealized as flexible.

ASCE 7-10

12.3.1.1 Flexible Diaphragm Condition. Diaphragms constructed of untopped steed decking or wood structural panels are permitted to be idealized as flexible if any of the following conditions exist:

a. In structures where the vertical elements are steel braced frames, steel and concrete composite braced frames or concrete, masonry, steel, or steel and concrete composite shear walls.

b. In one- and two-family dwellings.

c. In structures of light-frame construction where all of the following conditions are met:

1. Topping of concrete or similar materials is not placed over wood structural panel diaphragms except for nonstructural toppings no greater than 1/8 inch (3.2 mm) thick.

2. Each line of vertical elements of the seismic force-resisting system complies with the allowable story drift of Table 12.12-1.

Significant Changes to 2012

IBC 2009

1413.6 Alternatives to ASCE 7. The provisions of Section 1413.6 shall be permitted as alternatives to the relevant provisions of ASCE 7.

1012.4.1 Assumption of Flexible Diaphragms. Add the following text at the end of Section 12.3.1.1 of ASCE 7:

Diaphragms constructed of wood structural panels or untopped steel decking shall be permitted to be idealized as flexible provided all of the following conditions are met:

1. Toppings of concrete or similar materials are not placed over wood structural panel diaphragms except for nonstructural toppings no greater than 1/8 inch (3.2 mm) thick.

2. Each line of vertical elements of the seismic force-resisting system complies with the allowable story drift of Table 12.12-1.

3. Vertical elements of the seismic force-resisting system are light-frame walls stabilized with wood structural panels rated for shear resistance or steel shear.

4. Portions of wood structural panel diaphragms that cantilever beyond the vertical elements of the lateral force-resisting system are designed in accordance with Section 4.2.5.2 of AISI/PDA SDPWS.

ASCE 7-10

12.3.1.1 Flexible Diaphragm Condition. Diaphragms constructed of untopped steel decking or wood structural panels are permitted to be idealized as flexible if any of the following conditions exist:

a. In structures where the vertical elements are steel braced frames, steel and concrete composite braced frames or concrete, masonry, steel, or steel and concrete composite shear walls.

b. In one- and two-family dwellings.

c. In structures of light-frame construction where all of the following conditions are met:

1. Topping of concrete or similar materials is not placed over wood structural panel diaphragms except for nonstructural toppings no greater than 1/8 inch (3.2 mm) thick.

2. Each line of vertical elements of the seismic force-resisting system complies with the allowable story drift of Table 12.12-1.
Significant Changes to 2012 ASCE 7-10

12.3.1.3 Calculated Flexible Diaphragm Condition

Diaphragms not satisfying the conditions of Sections 12.3.1.1 or 12.3.1.2 are permitted to be idealized as flexible where the computed maximum in-plane deflection of the diaphragm under lateral load is more than two times the average story drift of adjoining vertical elements of the seismic force-resisting system of the associated story under equivalent tributary lateral load as shown in Fig. 12.3.1. The loadings used for this calculation shall be those prescribed by Section 12.8.

\[ \Delta \text{DIAPHRAGM} \geq 2 \times \Delta \text{SHEARWALLS} \]

Significant Changes to 2012 IBC

- Anchor Bolts ACI 318 Appendix D and NDS

(\textit{was 1911.1 IBC 2009})
Significant Changes to 2012 IBC

- Anchor Bolts
- ACI 318 Appendix D and NDS

( was 1912.1 IBC 2009)

SECTION 1909
ANCHORAGE TO CONCRETE—STRENGTH DESIGN

1909.1 Scope. The provisions of this section shall govern the strength design of anchors installed in concrete for purposes of transmitting structural loads from one connected element to the other. Healed bolts, headed studs and hooked (J- or L-) bolts cast in concrete and expansion anchors and undercut anchors installed in hardened concrete shall be designed in accordance with Appendix D of ACI 318 as modified by Sections 1905.1.9 and 1905.1.10, provided they are within the scope of Appendix D.

The strength design of anchors that are not within the scope of Appendix D of ACI 318, and as amended in Sections 1905.1.9 and 1905.1.10, shall be in accordance with an approved procedure.

Significant Changes to 2012 IBC

- Anchor Bolts
- 1905.1.9 ACI 318 Appendix D and NDS

1905.1.9 ACI 318, Section D.3.3. Delete ACI 318 Sections D.3.3.4 through D.3.3.7 and replace with the following:

D.3.3.1 - The anchor design strength associated with concrete failure modes shall be taken as 0.75f_c and 0.75f_c where f_c is given in D.4.3 or D.4.4 and N_c and V_c are determined in accordance with D.5.2, D.5.3, D.5.4, D.6.2 and D.6.3, assuming the concrete is cracked unless it can be demonstrated that the concrete is uncracked.

D.3.3.5 - Anchors shall be designed to be governed by the steel strength of a ductile steel element as determined in accordance with D.5.1 and D.6.1, unless either D.3.3.6 or D.3.3.7 is satisfied.
Significant Changes to 2012 IBC

- Anchor Bolts – ACI Appendix D and NDS
- SEAOC Seismology Committee


Significant Changes to 2012 IBC

- Anchor Bolts
- 1905.1.9 ACI 318 Appendix D and NDS

Exception:

1. Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the forces determined in accordance with ASCE 7. Equation 12.11.1 or 12.14-10 need not satisfy Section D.3.3.5.
2. D.3.3.5 need not apply and the design shear strength in accordance with D.6.2.1(c) need not be computed for anchor bolts attaching wood sill plates of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stem walls provided all of the following are satisfied:

- The sill plate is of 2-inch or 3-inch nominal thickness.
2009 IBC

2303.1.1 Sawn lumber: Sawn lumber used for load-supporting purposes, including end-joint or edge-glued lumber, shall be identified by the grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with DOC PS 20 or equivalent. Grading practices and identification shall comply with rules published by an agency approved in accordance with the procedures of DOC PS 20 or equivalent procedures. In lieu of a grade mark on the lumber, a certificate of inspection as to species and grade issued by a lumber grading or inspection agency meeting the requirements of this section is permitted to be accepted for precut, remanufactured or rough-sawn lumber and for sizes larger than 3 inches (76 mm) nominal thickness.

Approved end-jointed lumber is permitted to be used interchangeably with solid-sawn members of the same species and grade.

2012 IBC

2303.1.1 Certificate of inspection. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber grading or inspection agency meeting the requirements of this section is permitted to be accepted for precut, remanufactured or rough-sawn lumber and for sizes larger than 3 inches (76 mm) nominal thickness.

2303.1.1.2 End-jointed lumber. Approved end-jointed lumber is permitted to be used interchangeably with solid-sawn members of the same species and grade. End-jointed lumber used in an assembly required to have a fire-resistance rating shall have the designation "Heat Resistant Adhesive" or "HRA" included in its grade mark.

Significant Changes to 2012 IBC

- Finger Jointed Sawn Lumber
- 2303.1.2 Sawn lumber - Approved end-jointed lumber is permitted to be used interchangeably with solid-sawn members of the same species and grade.
- Note HRA for 1 hr walls
Significant Changes to 2012 IBC

- 2301.2 ICC standard ICC 400-07 ICC 400-12, Standard on the Design and Construction of Log Structures
Significant Changes to 2012 IBC

- SECTION 2305 GENERAL DESIGN REQUIREMENTS FOR LATERAL FORCE-RESISTING SYSTEMS
- 2305.1 General. Structures using wood-frame shear walls or wood-frame diaphragms to resist wind, seismic or other lateral loads shall be designed and constructed in accordance with AF&PA SDPWS and the applicable provisions of Sections 2305, 2306 and 2307.

2306.2 Wood diaphragms. 2306.2.1 Wood-frame structural panel diaphragms. Wood-frame structural panel diaphragms shall be designed and constructed in accordance with AF&PA SDPWS. Where panels are fastened to framing members with staples, requirements and limitations of AF&PA SDPWS shall be met and wood structural panel diaphragms are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.2.1(1) or 2306.2.1(2). The allowable shear capacities in Tables 2306.2.1(1) and 2306.2.1(2) are permitted to be increased 40 percent for wind design.

2306.2.2 Single diagonally sheathed lumber diaphragms. Single diagonally sheathed lumber diaphragms shall be designed and constructed in accordance with AF&PA SDPWS.

2306.2.3 Double diagonally sheathed lumber diaphragms. Double diagonally sheathed lumber diaphragms shall be designed and constructed in accordance with AF&PA SDPWS.

2306.2.4 Gypsum board diaphragm ceilings. Gypsum board diaphragm ceilings shall be in accordance with Section 2508.5.
Significant Changes to 2009 IBC

- Diaphragm and Shear wall deflection with staples only
- SDPWS
- Allowable shear tables - nails & staples only

\[ \Delta = \frac{5yL^2}{8Eab} + \frac{yL}{4Gr} + 0.188Le_\sigma + \frac{\Sigma(A_x,u)}{2b} \]  (Equation 23-1)

Significant Changes to 2012 IBC

- Diaphragm and Shear wall deflection with staples
- Wood structural panels
- Wood-frame
- Allowable shear tables - nails and staples only
- SDPWS

\[ \Delta = \frac{5yL^2}{8Eab} + \frac{yL}{4Gr} + 0.75he_\sigma + \frac{\Sigma(A_x,u)}{2b} \]  (Equation 23-1)

\[ \Delta = \frac{8ybh^3}{EAb} + \frac{yh}{Gr} + 0.122Le_\sigma + \frac{\Sigma(A_x,u)}{2b} \]  (Equation 23-2)
Significant Changes to 2012 IBC

2306.3 Wood structural panel shear walls. Wood-frame shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Wood structural panel shear walls are permitted to resist horizontal forces using the allowable capacities. Where panels are fastened to framing members with staples, requirements and limitations of AF&PA SDPWS shall be met and the allowable shear values set forth in Table 2306.3—2306.3(1), 2306.3(2) or 2306.3(3) shall be permitted. Allowable capacities in Table 2306.3 The allowable shear values in Tables 2306.3(1) and 2306.3(2) are permitted to be increased 40 percent for wind design. Panels complying with ANSI/APA PRP-210 shall be permitted to use design values for Plywood Siding in the AF&PA SDPWS.

NEW ANSI/APA PRP-210 Plywood Siding:
- Durability
- Thickness by thickness
- Siding shear walls
4.3.7 Shear Wall Systems

4.3.7.1 Wood Structural Panel Shear Walls: Shear walls sheathed with wood structural panel sheathing shall be permitted to be used to resist seismic and wind forces. The size and spacing of fasteners at shear wall boundaries and panel edges shall be as provided in Table 4.3A. The shear wall shall be constructed as follows:

4. The width of the nailed face of framing members and blocking shall be 2" nominal or greater at adjoining panel edges except that a 3" nominal or greater width at adjoining panel edges and staggered nailing at all panel edges are required where:
   a. Nail spacing of 2" on center or less at adjoining panel edges is specified, or
   b. 10d common nails having penetration into framing members and blocking of more than 1-1/2" are specified at 3" on center, or less at adjoining panel edges, or
   c. Required nominal unit shear capacity on either side of the shear wall exceeds 700 psf in Seismic Design Category D, E, or F.

**Exception:** Where the width of the nailed face of framing members is required to be 3" nominal, two framing members that are 2" in nominal thickness shall be permitted to be used provided they are fastened together with fasteners designed in accordance with the NDS to transfer the induced shear between members. When fasteners connecting the two framing members are spaced less than 4" on center, they shall be staggered.
Wood Design Standards

- Standards become part of the code “to the prescribed extent” of the reference only
- Editions are specific
  - 2009 IBC references 2005 NDS
  - 2012 IBC reference 2012 NDS
2012 WFCM

- Wood Frame Construction Manual
- 2012 WFCM uses ASCE 7-10 wind design provisions

Significant Changes—2012 NDS

- New equation for bending and axial compression
- Chapter 5 glulam provisions
- Chapter 6 poles and piles
- Chapter 12 split ring and shear plate provisions
Chapter 3 – Behavioral Equations

- Combined bi-axial bending and axial compression

\[
\frac{f_c}{F_{c'}} + \frac{f_{b1}}{F_{b1}' \left[ 1 - (f_c/F_{ce1}) \right]} + \frac{f_{b2}}{F_{b2}' \left[ 1 - (f_c/F_{ce2}) - (f_{b1}/F_{be})^2 \right]} \leq 1.0 \quad (3.9-3)
\]

Chapter 3 – Behavioral Equations

- Combined bi-axial bending and axial compression (* if this new third term is negative see C 15.4)

\[
\frac{f_c}{F_{ce2}} + \left( \frac{f_{b1}}{F_{be}} \right)^2 < 1.0 \quad (3.9-4)
\]

New *
Chapter 5 – Glued Laminated Timber

• Significant changes
  • New adjustment factors
  • Stress interaction
  • Shear reduction
  • Clarified or added
  • Curved members
  • Double-tapered
  • Tapered straight

Chapter 5 – Glulam

• New adjustment factors
  • Stress interaction
  • TCM
  • Tapered
  • Shear reduction
  • Nonprismatic

Table 5.3.1 Applicability of Adjustment Factor
Glued Laminated Timber

<table>
<thead>
<tr>
<th>ASD only</th>
<th>ASD and LRFD</th>
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<tr>
<td>Load Factor</td>
<td>Shear Stability Factor</td>
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<tr>
<td>( F_h = F_h )</td>
<td>( C_D )</td>
</tr>
<tr>
<td>( F_t = F_t )</td>
<td>( C_D )</td>
</tr>
<tr>
<td>( F_v = F_v )</td>
<td>( C_D )</td>
</tr>
</tbody>
</table>

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Chapter 5 – Glulam

- Clarified or added
  - Tapered straight
  - Double-tapered
  - Curved members

Chapter 11- Dowels

11.3.6 Dowel Diameter

11.3.6.1 When used in Tables 11.3-1A and 11.3-1B, the fastener diameter shall be taken as D for unthreaded full-body diameter fasteners and Df for reduced body diameter fasteners or threaded fasteners except as provided in 11.3.6.2. For bolts meeting the requirements of ANSI/ASME Standard B18.2.1 for full-body diameter bolts, the fastener diameter shall be taken as D (see Appendix L).

11.3.7 Dowel Diameter

11.3.7.1 Where used in Tables 11.3.1A or 11.3.1B, the fastener diameter shall be taken as D for unthreaded full-body diameter fasteners and Df for reduced body diameter fasteners or threaded fasteners except as provided in 11.3.7.2.
11.3.7 Dowel Diameter

11.3.7.1 Where used in Tables 11.3.1A or 11.3.1B, the fastener diameter shall be taken as D for unthreaded full-body diameter fasteners and \( D_b \) for reduced body diameter fasteners or threaded fasteners except as provided in 11.3.7.2.

11.3.7.2 For threaded full-body fasteners (see Appendix L), D shall be permitted to be used in lieu of \( D_b \) where the bearing length of the threads does not exceed \( \frac{3}{4} \) of the full bearing length in the member holding the threads. Alternatively, a more detailed analysis accounting for the moment and bearing resistance of the threaded portion of the fastener shall be permitted (see Appendix L).
Chapter 11- Dowels

Dia. Fastener = D

Dia. Fastener = Dr

Threaded length ≤ ℓm/4

Threaded length > ℓm/4


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Significant Changes—2012 NDS

- New Design Values for Southern Pine
- ALSC approved interim design values
  - June 1, 2013
- AWC compiles them
  - NDS Supplement
- More information
  - www.southernpine.com

Significant Changes—2008 SDPWS

- 2006 IBC — 2005 SDPWS optional
- 2009& 2012 IBC — 2008 SDPWS mandatory
Significant Changes—2008 SDPWS

- Special Design Provisions for Wind and Seismic


Significant Changes—2008 SDPWS

- Top updates to 2008 SDPWS
- High load diaphragms
- Combined shear and uplift with WSPs
- Unblocked shear walls
- WSP over gypsum shear walls
Significant Changes—2008 SDPWS

- **PSW Increased Strength Limit**
  - Increased strength limit for perforated shear walls - Section 4.3.5.3 (3)
  - 1740 plf nominal seismic shear capacity
    - (980 plf nominal in 2005 SDPWS)
  - 2435 plf nominal wind shear capacity
    - (1370 plf nominal in 2005 SDPWS)
  - Tests with 10d nails @ 2" o.c. edge

**Table 4.3.3.5 Shear Capacity Adjustment Factor, C₀**

<table>
<thead>
<tr>
<th>Wall Height, h</th>
<th>Maximum Opening ¹</th>
<th>Percent Full-Height Sheathing ²</th>
<th>Effective Shear Capacity Ratio</th>
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<tbody>
<tr>
<td></td>
<td>h/3</td>
<td>h/2</td>
<td>2h/3</td>
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<tr>
<td>8' Wall</td>
<td></td>
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<td></td>
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<tr>
<td>10' Wall</td>
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</table>

- **Tests with 10d nails @ 2" o.c. edge**

**Figure 4D Typical Shear Wall Height-to-Width Ratio for Perforated Shear Walls**
Significant Changes—2008 SDPWS

• PSW Shear Strength Equation

• Section 4.3.3.5

\[
C_o = \left( \frac{r}{3-2r} \right) \frac{L_{tot}}{\sum L_i} \quad (4.3-5)
\]

\[
r = \frac{1}{1 + \frac{A_o}{h \sum L_i}} \quad (4.3-6)
\]

Significant Changes—2008 SDPWS

• Using WSPs for combined shear and uplift
Significant Changes—2008 SDPWS

- Using WSPs for combined shear and uplift
- Choose shear wall design
- Determine uplift forces by calculation or using the WFCM
- Enter Table 4.4.1 of SDPWS to find a wall with needed uplift capacity
- Check that nailing exceeds what is required for shear design alone

---

Significant Changes—2008 SDPWS

- Using WSPs for combined shear and uplift

Diagrams included for all critical details, including mid-story height connections
Significant Changes—2008 SDPWS

- AWC - Combined Wind Uplift & Shear - WSP

http://www.structuremag.org/article.aspx?articleID=1270

Significant Changes—2008 SDPWS

- Combined Wind Uplift & Shear - WSP
- Design Example: www.apawood.org
Significant Changes- 2008 SDPWS

• Standard Nails and Cut Washers

Appendix A

### Table A2 Standard Cut Washers

<table>
<thead>
<tr>
<th>Dimensions of Standard Cut Washers</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>Inside Diameter (in.)</td>
</tr>
<tr>
<td>Basic</td>
</tr>
<tr>
<td>1.000</td>
</tr>
<tr>
<td>1.375</td>
</tr>
<tr>
<td>1.750</td>
</tr>
<tr>
<td>2.000</td>
</tr>
<tr>
<td>2.375</td>
</tr>
<tr>
<td>2.500</td>
</tr>
</tbody>
</table>

**Table A1 Standard Common, Box, and Sinker Nails**

<table>
<thead>
<tr>
<th>Type</th>
<th>6d</th>
<th>7d</th>
<th>8d</th>
<th>9d</th>
<th>10d</th>
<th>11d</th>
<th>12d</th>
<th>13d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>D = diameter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L = length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H = head diameter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>Basic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.000</td>
<td>0.063</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>1.375</td>
<td>0.155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.750</td>
<td>0.194</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.000</td>
<td>0.148</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.375</td>
<td>0.185</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.500</td>
<td>0.195</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**NEAR FUTURE............2015**
Coming in 2015 IBC

- Slightly broader application of WFCM
- Re-organization of Conventional Wood Frame Construction Provisions (2308)
- Revised span tables based on new Southern Pine design values

Coming in 2015 IBC

- Slightly broader application of WFCM
  - Chapter 2 loads
  - Applicable to non-residential construction
  - Permitted resource
Coming in 2015 IBC

2301.2 General design requirements. The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:

1. Allowable stress design in accordance with Sections 2304, 2305 and 2306.
2. Load and resistance factor design in accordance with Sections 2304, 2305 and 2307.
3. Conventional light-frame construction in accordance with Sections 2304 and 2309.

Exception: Buildings designed in accordance with the provisions of the AIA/SP-ICCFM shall be deemed to meet the requirements of the provisions of Section 2006.

4. WFCM in accordance with Section 2006
5. The design and construction of log structures shall be in accordance with the provisions of ICC 400.

2309.1 General. The requirements of this section are intended for conventional light-frame construction. Other methods are permitted to be used, provided a satisfactory design is submitted showing compliance with other provisions of this code. Interior non-load-bearing partitions, ceilings and curtain walls of conventional light-frame construction are not subject to the limitations of this section. Alternatively, compliance with AIA/SP-ICCFM shall be permitted subject to the limitations therein and the limitations of this code. Detached one- and two-family dwellings and multiple single-family dwellings (duplexes) not more than three stories above grade plane in height with a separate means of egress and their accessory structures shall comply with the International Residential Code.

SECTION 2009
WOOD FRAME CONSTRUCTION MANUAL

2309.1 WFCM. Structural design in accordance with the WFCM shall be permitted for buildings in any site group subject to the limitations of Section 113 of the WFCM and the load assumptions contained therein. Structural elements beyond those limitations shall be designed in accordance with accepted engineering practice.


Coming in 2015 IBC

- Reformatted height and area provisions
- Provisions for Cross Laminated Timber
Coming in 2015 IBC

- Revise 510 levels above grade:

**SECTION 510 SPECIAL PROVISIONS**

**510.2 Horizontal building separation allowance.** A building shall be considered as separate and distinct buildings for the purpose of determining area limitations, continuity of fire walls, limitation of number of stories and type of construction where all of the following conditions are met:

1. The buildings are separated with a horizontal assembly having a fire-resistance rating of not less than 3 hours.
2. The building below the horizontal assembly is not greater than one story above grade plane.

Coming in 2015 IBC

- Inclusion of Cross Laminated Timber in Type IV construction type (and reference of ANSI/APA PRG 320-2012)
Why CLT is Different than Glulam?!

- Cross Laminated Timber (CLT)
- Glued Laminated Timber (GLT)

- Thick Orthotropic Plate

Graphics provided by FPInnovations

Coming in 2015 IBC

- New standard referenced for engineered wood rim boards – ANSI/APA PRR 410-2011

Standard for Performance-Rated Cross-Laminated Timber
Resource

- CLT Handbook now available
- www.masstimber.com
- Free download

What’s next?

- International Building Code (IBC)
- ASD/LRFD National Design Specifications (NDS)
- Minimum Design Loads for Buildings and Other Structures
What's Next—Some Thoughts

- Simplification needed
- Practicality needed
- Code cycle extended to 6 years
- ASCE 7
  - Load calculations simplified
  - Cycle extended to 6 years

RESOURCES
Resources

- 2012 IBC Changes for Wood Design

Resources

http://www.awc.org/helpoutreach/ecourses/index.html

2008 SDPWS - Diaphragm Deflection Design - Webinar

John “Buddy” Showalter, P.E.
VP, Technology Transfer
American Wood Council
Resources

- Wind & Seismic Standards
- More details on changes
- Wood Design Focus papers
  - 2005 Special Design Provisions for Wind and Seismic (SDPWS)
  - 2008 Special Design Provisions for Wind and Seismic
  - Use of Wood Structural Panels to Resist Combined Shear and Uplift from Wind

Download free at
www.awc.org
Resources

• 2012 NDS Changes
• http://www.structuremag.org/Archives/2012-1/C-CodesStandards-Showalter-Jan12.pdf

Resources

• ALLOWABLE USE OF WOOD IBC 2009 & 2012

http://www.awc.org/codes/cowdindex.html