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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:
1. Identify building code issues that are leading to code changes.
2. Discuss recent changes to wood design standards that affect the design of wood structures.
3. Discuss recent changes to the building code.
4. Understand reasons for the changes to the IBC and the wood design standards.

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

Today’s Program:

- Describe major model codes for structural and fire
- Describe the major wood standards referenced in the model codes
- Describe significant changes in model codes and referenced wood standards
International Building Code

- Cycle just ended for 2015 IBC
  - Contents are known
  - Sneak peek at a few changes

- 2006/2009 IBC – most used currently

Present & Near Future 2009 & 2012 IBC

Illinois

State Adoptions

The 2012 IECC applies to residential and commercial construction for which permits are issued statewide. The Illinois State Board of Education has adopted the 2006 IBC, IPC, IMC, IPG, IFPC, IGFC, IECC, IEBC for Pre-K thru 12 public Education Facilities (other than vehicular), but do not apply to Chicago. IBC adopted by Dept. of Health for hospitals where local codes do not apply.

- 2009 International Existing Code
- 2009 International Energy Conservation Code
- 2009 International Fire Code
- 2009 International Fuel Gas Code
- 2009 International Mechanical Code
- 2009 International Property Maintenance Code

http://www.iccsafe.org/g r/Pages/IL.aspx
Significant Changes to IBC

Significant Changes to 2009 & 2012 IBC

Table 503

- Story heights in unprotected (nonrated) construction—Types IIB and IIIB—reduced for certain use groups
  - S-1, B, and M
- No other changes to standard heights and areas in 2012
- Watch for restructured height and area formulas and tables in 2015
  - No technical changes to thresholds

Table 503 – Tabular Heights Adjusted for Type IIB and IIIB Use Groups B, M, S-1, and S-2

Allowable stories for these use groups reduced in Table 503

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>NONCOMBUSTIBLE</th>
<th>MIXED</th>
<th>COMBUSTIBLE</th>
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<tbody>
<tr>
<td></td>
<td>TYPE IIA</td>
<td>TYPE IIB</td>
<td>TYPE IIIA</td>
</tr>
<tr>
<td>S-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEIGHT/SF</td>
<td>495/500</td>
<td>2/35</td>
<td>495/500</td>
</tr>
<tr>
<td>AREA</td>
<td>20,000</td>
<td>40,000</td>
<td>40,000</td>
</tr>
<tr>
<td>S-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEIGHT/SF</td>
<td>495/500</td>
<td>2/35</td>
<td>495/500</td>
</tr>
<tr>
<td>AREA</td>
<td>30,000</td>
<td>60,000</td>
<td>60,000</td>
</tr>
</tbody>
</table>

507.7 Occupancy A-3 Unlimited Area

- Group A-3 Assembly occupancies can now be unlimited in area, with conditions:
  - Full open frontage of 60 feet all around
  - Sprinklers
  - No stage
  - Exits at grade
  - Types III & IV
Significant Changes to 2009 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 2012 IBC

509.2 510.2 Horizontal Separation of Buildings

SR2. 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, and 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.
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 2009 IBC

509.2 Horizontal Separation of Buildings

509.2 Group S2 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

Pedestal Buildings – Clarified 509.8 510.9

Multiple buildings above a horizontal assembly.

◆ 2 or more buildings above S-2 or bldg.
◆ Bldgs. above are separate and distinct from each other

510.9 Multiple buildings above a horizontal assembly. Where two or more buildings are provided above the horizontal assembly separating a Group S-2 parking garage or building below from the buildings above, in accordance with the special provisions in Sections 510.2, 510.3 or 510.8, the buildings above the horizontal assembly shall be regarded as separate and distinct buildings from each other and shall comply with all other provisions of this code as applicable to each separate and distinct building.
Significant Changes to 2012 IBC

- IBC 1609.1.1 References ASCE 7-05-ASCE 7-10 has changes for wind design
- New “strength design” - basis maps show higher wind speeds
  - Effective pressures remain about the same
- Separate wind map for each Risk Category (I-IV)
- Exposure D will be applicable

Significant Changes to 2012 IBC

- ASCE 7-10 Wind Provisions and Effects on Wood Design and Construction
  - By Line and Coulbourne
- Download for free at www.awc.org
Significant Changes to 2009 IBC

- Additional special inspections required for wood frame main wind reinforcing systems in higher wind regions
  - Section 1706.1
- 1704.6.2 New special inspection requirement for installation and bracing of long-span
  - >60 ft trusses
  - Section 1704

Significant Changes to 2012 IBC

- Additional special inspections required for wood frame main wind reinforcing systems in higher wind regions
  - Section 1706.1 1705.10
- 1704.6.2 1705.5.2 special inspection requirement for installation and bracing of long-span
  - >60 ft trusses
  - Section 1704

Anchor Bolts  ACI 318 Appendix D and NDS

(was 1911.1 IBC 2009)

SECTION 1901  ANCHORAGE TO CONCRETE—ALLOWABLE STRESS DESIGN

1901.1 Scope: The provisions of this section shall govern the allowable stress design of headed bolts and headed stud
anchors cast in normal-weight concrete for purposes of transmitting structural loads from one connected element to the
other. These provisions do not apply to anchors installed in hardened concrete or where load combinations include
earthquake loads or effects. The bearing area of headed anchors shall be not less than one and one-half times the shank
diameter. Where strength design is used, or where load combinations include earthquake loads or effects, the design strength of
anchors shall be determined in accordance with Section 1901. bolts cast conform to ASTM A 307 or an approved equiva-

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. Headed bolts, headed studs and hooked (L or L1)
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 1901.1.3 and 1903.1.10, provided they are within the
design scope of Appendix D.

The strength of anchors that are not within the scope of Appendix D of ACI 318, and as modified in Sections
1901.1.3 and 1903.1.10, shall be in accordance with an approved procedure.
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

Exceptions:

1. Anchor bolts designed to resist wall out of plane forces with design strength equal to or greater than the force determined in accordance with ACI 3.1 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(1) need not be computed for anchor bolts attaching wood wall plates of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stem walls provided all of the following are satisfied:

a. The allowable in-plane shear strength of the anchor determined in accordance with ACI Appendix D.3.3.5 is not less than 0.75f_a and 0.75f_d, where f_a is given in D.3.3.4 or D.3.4.4 and f_a and f_d are determined in accordance with D.3.4 or D.3.4.4. Assuming the concrete is cracked unless it can be demonstrated that the concrete remains uncracked.

b. A.3.3.5 - Anchor bolts shall be designed to be governed by the net strength of a ductile yield element as determined in accordance with D.5.2 and D.5.2.1, unless either D.3.5.6 or D.3.5.7 is satisfied.

Significant Changes to 2012 IBC

2009 IBC

2303.1.1 Screw lumber. Screw lumber used for load-bearing purposes, including end-jointed or edge-glued lumber, machine-screw-milled or machine-evaluated 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 29 or equivalent. Screwing practices and identification requirements of grades are published by an agency approved in accordance with the procedures of DOC PS 29 or equivalent procedures. In lieu of a grade mark on the material, a certificate of inspection issued by a lumber grading or inspection agency meeting the requirements of this section is permitted to be accepted for screw, machine-milled or machine-evaluated screw lumber and for sizes larger than 3 inches (76 mm) nominal thickness.

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

2303.1.1.1 Certificate of inspection. In lieu of a grade mark on the material, a certificate of inspection issued by a lumber grading or inspection agency meeting the requirements of this section is permitted to be accepted for screw, machine-milled or machine-evaluated screw lumber and for sizes larger than 3 inches (76 mm) nominal thickness.

Approval of 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

Finger Jointed Sawn Lumber

- WWPA
- http://www2.wwpa.org/Portals/9/docs/PDF/FF-HRA.pdf

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.
Significant Changes to 2012 IBC

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 allwood 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

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(1), 2306.3(2), or 2306.3(3) shall be permitted. Allowable capacities in Table 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

Significant Changes to 2012 IBC

2306.3 Diaphragm and Shear wall deflection with staples only
• Wood structural panels
• Wood-frame
• Allowable shear tables – nails & staples only
• SDPWS
Significant Changes to 2012 IBC

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 4.3.3A. The shear wall shall be constructed as follows:

a. The width of the milled face of framing members and blocking shall be 2" nominal or greater at adjoining panel edges except that a 3/4" 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. 104 common nails having pin-lengths 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 150 psf in Seismic Design Category E, F, or G.

Exception: Where the width of the milled face of framing members is required to be 3/4" 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 ASD 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
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

\[
\frac{f_{w1}}{F_{w1}} + \frac{f_{w2}}{F_{w2}}\left[1 - \left(\frac{f_{w2}}{F_{w2}}\right) - \left(\frac{f_{w1}}{F_{w1}}\right)^2\right] \leq 1.0 \quad (3.9-3)
\]
Chapter 3 – Behavioral Equations

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

\[ \frac{f_c}{F_{ce2}} + \left( \frac{f_t}{F_{te}} \right)^2 < 1.0 \]  

(3.9-4)

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
  - Shear reduction

<table>
<thead>
<tr>
<th>Table 5.3.1 Applicability of Adjustment Factor Glulam Laminated Timber</th>
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<tr>
<td>Low Double-Tan</td>
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<tr>
<td>Bending Stress</td>
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<td>Time to Failure</td>
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<tr>
<td>End Resistant to Buckle</td>
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<td>Clear Width and Gauge</td>
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<table>
<thead>
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<th>AND and LRFD</th>
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<tbody>
<tr>
<td>Low Double-Tan</td>
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<tr>
<td>Bending Stress</td>
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<td>Time to Failure</td>
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<tr>
<td>End Resistant to Buckle</td>
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<td>Clear Width and Gauge</td>
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</tbody>
</table>

- Clarified or added
  - Curved members
  - Double-tapered
  - Tapered straight
Chapter 5 – Glulam

❖ Adjustment factors
  - $C_v$ volume
  - Not cumulative with $C_L$
  - $\min (C_v, C_L)$

$$C_v = \left( \frac{21}{L} \right)^{1/3} \left( \frac{12}{d} \right)^{1/6} \left( \frac{51.25}{b} \right)^{1/6} \leq 1.0$$

| Table 5.3.1 Applicability of Adjustment Factors for Structural Glued Laminated Timber |
|-----------------------------------|-------------------|-------------------|
| ASD only                          | ASD and LRFD      | LRFD only         |
| Structural Factor                 | Member Stress     | Member Stress     |
| Sectional Factor                  | Sectional Factor  | Sectional Factor  |
| Member Stress                     | Membrane Stress   | Membrane Stress   |
| Diaphragm Stress                  | Diaphragm Stress  | Diaphragm Stress  |
| Member Stress                     | Membrane Stress   | Membrane Stress   |
| Membrane Stress                   | Membrane Stress   | Membrane Stress   |
| Diaphragm Stress                  | Diaphragm Stress  | Diaphragm Stress  |
| $F_1 = F_2$                       | $C_1$             | $C_2$            |
| $C_3$                             | $C_4$             | $C_5$            |
| $C_6$                             | $C_7$             | $C_8$            |
| $C_9$                             | $C_{10}$          | $C_{11}$         |
| $C_{12}$                          | $C_{13}$          | $C_{14}$         |
| $C_{15}$                          | $C_{16}$          | $C_{17}$         |

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

What's Changed?
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

PSW Shear Strength Equation

The PSW Shear Strength Equation is given by:

\[ C_0 = \left( \frac{r}{3-2r} \right) \sum L_i \]  

(4.3-5)

where

\[ r = \frac{1}{1 + \frac{A_o}{h \sum L_i}} \]  

(4.3-6)

Here, \( C_0 \) is the shear capacity adjustment factor, \( h \) is the height of the wall, \( A_o \) is the area of the perforation, and \( L_i \) are the lengths of the individual openings.
Using WSPs for combined shear and uplift

Diagrams included for all critical details, including mid-story height connections

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

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PSW Increased Strength Limit

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

---

PSW Shear Strength Equation

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

<table>
<thead>
<tr>
<th>Wall Height, h</th>
<th>Maximum Opening Height</th>
<th>k1</th>
<th>k2</th>
<th>k3</th>
<th>k4</th>
<th>k5</th>
<th>k6</th>
<th>k7</th>
<th>k8</th>
<th>k9</th>
<th>k10</th>
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<tr>
<td>10” Wall</td>
<td>3”-4”</td>
<td>1.0</td>
<td>1.0</td>
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<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
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<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>12” Wall</td>
<td>3”-4”</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
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<td>0.8</td>
<td>0.8</td>
<td>0.7</td>
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</tr>
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</table>

---

PSW Shear Strength Equation

**Section 4.3.3.5**

\[
C₀ = \left( \frac{r}{3-2r} \right) \sum L_i \quad (4.3-5)
\]

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

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

Standard Nails and Cut Washers

Appendix A

Table A2 Standard Cut Washers

| Dimensions of Standard Cut Washers | | |
|-----------------------------------|---|---|---|
| Inside Diameter (in) | 3/16 | 0.435 | 0.433 |
| Outside Diameter (in) | 0.600 | 0.603 |
| Thickness (in) | 0.036 | 0.036 |

Table A1 Standard Common, Box, and Stikler Nails

<table>
<thead>
<tr>
<th>Nail Type</th>
<th>Dimensions</th>
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<tbody>
<tr>
<td>Common</td>
<td>3/16 x 0.61</td>
</tr>
<tr>
<td>Box</td>
<td>3/16 x 0.61</td>
</tr>
<tr>
<td>Stikler</td>
<td>3/16 x 0.61</td>
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</tbody>
</table>

*Tables for standardized SDPWS dimensions are used by permission of ANSI/WPMA.

**Near Future**

2015 IBC

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 applications
  - Permitted resource
Coming in 2015 IBC

**Reformatted height and area provisions**

**Provisions for Cross Laminated Timber**


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**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.

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Coming in 2015 IBC

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

Coming in 2015 IBC

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

Coming in 2015 IBC

**Fire Test**

**ASTM E119 Fire Endurance Test**
- 5-Ply CLT (approx. 7” thick)
- 5/8” Type X GWB each side
- Sought 2 hour rating
- RESULTS: 3 hours 6 minutes
## Challenges/Officials/2012

### Coming in 2015 IBC

#### Fire Test

American Wood Council
ASTM E119 Fire Endurance Test
- 5-Ply CLT (approx. 7" thick)
- 5/8" Type X GWB each side
- Sought 2 hour rating
- RESULTS: 3 hours 6 minutes


### Type IV Construction

**602.4 Type IV**. Type IV construction (Heavy Timber, HT) is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid or laminated wood without concealed spaces. The details of Type IV construction shall comply with the provisions of this section. Fire retardant treated wood framing complying with Section 2303.3 shall be permitted within exterior wall assemblies with a 2-hour rating or less. Exterior walls complying with Section 602.4.1 or 602.4.2 shall also be permitted. Minimum solid sawn nominal dimensions are required for structures built using Type IV construction (HT). For glued-laminated members the equivalent net finished width and depths corresponding to the minimum nominal width and depths of solid sawn lumber are required as specified in Table 602.4. Cross laminated timber (CLT) dimensions used in this section are actual dimensions.

### Type IV Construction – Exterior Walls

**602.4.1 Fire-retardant treated wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies with a 2-hour rating or less.**

**602.4.2 Cross-laminated timber complying with Section 2303.1.4 shall be permitted within exterior wall assemblies with a 2-hour rating or less provided:**
- Exterior surface of the cross-laminated timber is protected fire retardant treated wood sheathing complying with 2303.2 and not less than 15/32 inch thick;
- OR
- gypsum board not less than ½ inch thick;
- OR
- a noncombustible material.

### Code modifications to Ch. 23 Wood

**2303.1.4 Structural glued cross laminated timber.** Cross-laminated timbers shall be manufactured and identified as required in ANSI/APA PRG 320-2011.

**CROSS-LAMINATED TIMBER.** A prefabricated engineered wood product consisting of at least three layers of solid-sawn lumber or structural composite lumber where the adjacent layers are cross-oriented and bonded with structural adhesive to form a solid wood element.

### Code modifications to Ch. 35 Wood

ANSI or APA
Coming in 2015 IBC

Type IV Construction – Floors

602.4.2 CLT. Cross laminated timber shall be not less than 4 inches (102 mm) in thickness. It shall be continuous from support to support and mechanically fastened to one another. Cross laminated timber shall be permitted to be connected to walls without a shrinkage gap providing swelling or shrinking is considered in the design. Corbelling of masonry walls under the floor shall be permitted to be used.

Coming in 2015 IBC

Type IV Construction – Interior Walls & Partitions

602.4.8.1 Interior Walls and Partitions. Interior walls and partitions shall be of solid wood construction formed by not less than two layers of 1-inch (25 mm) matched boards or laminated construction 4 inches (102 mm) thick, or of 1-hour fire-resistance-rated construction.

602.4.8.2 Exterior walls. All exterior walls shall be of one of the following:

1. Noncombustible materials; or
2. Not less than 6 inches in thickness and constructed of one of the following:
   1. Fire retardant treated wood in accordance with 2303.2 and complying with 602.4.1 or
   2. Cross laminated timber complying with 602.4.2.

What's next?
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

- 2012 IBC Changes for Wood Design

Resources

- 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

Resources

ALLOWABLE USE OF WOOD IBC 2009 & 2012

http://www.awc.org/codes/ccwdindex.html
This concludes The American Institute of Architects Continuing Education Systems Course

Questions???

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