Introduction to Codes and Standards for Wood Construction

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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
International Building Code

- 2012 IBC – most used currently
  - FBC based on 2012
  - Some states adopting 2015 IBC
1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7 or provisions of the alternate all-heights method in Section 1609.6. The type of opening protection required, the ultimate design wind speed, \( V_{\text{w}} \), and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AF&PA WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-222 shall be 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with Chapter 31 of ASCE 7.
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 (I, 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!
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>Equivalent ASCE 7-10 Basic Wind Speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>based on 50 yr. return period 3 second gust (mph)</td>
<td>based on 700 yr. return period 3 second gust (mph)</td>
</tr>
<tr>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>110</td>
<td>116</td>
</tr>
</tbody>
</table>
ASCE 7 Wind Speeds

Figure 1.1 Basic Wind Speeds for One- and Two-Family Dwellings Based on 700-y Return Period 3-Second Gust Basic Wind Speeds

sign 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.

between contours is permitted.

as outside the last contour shall use the last wind speed contour of the coastal area.

jorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

nd to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).
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
ASCE 7-10 Minimum Design Loads for Buildings and Other Structures

14.5.1 Reference Documents
The quality, testing, design, and construction of members and their fastenings in wood systems that resist seismic forces shall conform to the requirements of the applicable following reference documents:

1. AF&PA NDS
2. AF&PA SDPWS
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

- **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.

- IBC 2009 Included Tables for Nailed and Stapled Diaphragms and Shear walls
- IBC 2012 Stapled Diaphragms
Wood Design Standards

• **National Design Specification (NDS)**
  - ANSI Accredited
  - Used for design of wood structures
    - Scope includes solid sawn lumber and EWPs

• **Special Design Provisions for Wind and Seismic (SDPWS)**
  - Shearwall and Diaphragm Design (Lateral Force Resisting Elements)
    - Covers materials, design, and construction requirements
Wood Design Standards

- **Wood Frame Construction Manual (WFCM)**
  - Based on provisions in NDS and SDPWS
  - **Scope limitations**
    - Previously limited to residential
    - 2015 IBC will allow for light commercial
    - Limits on structure’s dimensions
Wood Design Standards

- Standards become part of the code “to the prescribed extent” of the reference only
- References are edition specific
  - 2012 IBC references
    - 2012 NDS
    - 2008 SDPWS
    - 2012 WFCM
  - 2015 IBC references
    - 2015 NDS
    - 2015 SDPWS
    - 2015 WFCM
2012 WFCM

- Wood Frame Construction Manual
  - 2012 WFCM uses ASCE 7-10 wind design provisions
  - 2012 IRC uses ASCE 7-05 wind design provisions
Southern Pine Values

- **New Design Values for Southern Pine**
- **ALSC approved interim design values**
  - June 1, 2013
- **AWC compiles them**
  - NDS Supplement
    - Addendum for 2012 Supplement
    - Included in 2015 Supplement
- **More information**
  - www.southernpine.com
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
Significant Changes—2008 SDPWS

- AWC - Combined Wind Uplift & Shear - WSP

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

Use of Wood Structural Panels to Resist Combined Shear and Uplift from Wind

By Fred Cuenan P.E. and Rand Dugger P.E.

Radford Cuenan is the Southern Regional Manager and Rand Dugger is the National Manager for the Preservation of Wood Panel Products. The Department of Agriculture with the Southeastern Forest Program.

Structural Performance

performance issues related to extreme events

It is well known that wood structural panel shear walls can be constructed to resist extreme shear forces and uplift forces due to wind. With the publication of the American Wood Council’s (AWC) Specification for Design and Construction of Wood Frame Structures (ESFWC) in 1988, this knowledge was codified into an engineering methodology that became known as the uplift force method. The method is based on the following assumptions:

1. The uplift force is applied to the wood panel shears at the bottom of the wall.
2. The uplift force is distributed evenly along the height of the wall.
3. The uplift force is resisted by the frictional resistance of the wall, which is determined by the coefficient of friction between the wall and the ground.

Recent and Current Prescriptive Engineered Design Tools and Standards

Prescriptive engineered design tools and standards have evolved over time to address the need for wind design and wind load provisions. The building industry and the materials industry have encouraged and supported the development of prescriptive design tools that can be used to design and build structures that are safe and efficient. The advances in prescriptive design tools have been driven by the need to ensure that buildings are designed and built to meet the safety and performance requirements of the code.

http://www.structuremag.org/article.aspx?articleID=1270
Coming in 2015 IBC

- Slightly broader application of WFCM
  - Chapter 2 loads
  - Applicable to non-res
  - Permitted resource
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

www.awc.org
Resources

- 2012 IBC Changes for Wood Design

Educational Resources

- **New Education website!**
- **Self-study courses**
  - Can earn free AIA/ICC credit
- **Topics include**
  - 2012/2015 NDS
  - 2012/2015 SDPWS
  - 2012/2015 WFCM
  - Shear wall design examples
  - And more!

http://awc.org/education
Resources

• Wind & Seismic Standards
• More details on changes
• Wood Design Focus papers
  • 2008 Special Design Provisions for Wind and Seismic (SDPWS)
  • 2015 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

• ALLOWABLE USE OF WOOD IBC 2009 & 2012

http://www.awc.org/codes-standards/buildingcodes/ccwd