

2005 National Design Specification® (NDS®) for Wood Construction

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The 2005 Edition of the *National Design Specification for Wood Construction* is expected to be approved as an American National Standard in December 2004 or early 2005, with a designation ANSI/AF&PA NDS-2005. The 2005 NDS was developed as a dual format specification incorporating design provisions for both allowable stress design (ASD) and load and resistance factor design (LRFD). AF&PA's Wood Design Standards Committee (WDSC) guided it through the consensus process over the course of 2-1/2 years. The primary change in the 2005 NDS is the introduction of LRFD methods to the Specification.

Several format changes to the NDS to accommodate addition of LRFD are summarized in this article and include:

- Revised terminology,
- Expanded applicability of adjustment factor tables,
- Re-format of radial tension design values,
- Revised format of beam and column stability provisions (addition of E_{min} property), and
- Addition of NDS Appendix N – Load and Resistance Factor Design.

A number of other changes introduced in the 2005 Edition include:

- Removal of form factor,
- Revision of repetitive member factor for I-joists,
- Revision of full-design value terminology, and
- Clarification of built-up column provisions.

The NDS Supplement, *Design Values for Wood Construction* has also been updated to provide the latest design values for sawn lumber and glued laminated timber.

Introducing LRFD to NDS – An Overview

Over the years, the WDSC identified benefits of developing a dual format specification which would include: addressing user needs for consistent design information regardless of design format (ASD or LRFD); better utilizing standards committee resources; and providing current design information for the academic community. The 2005 NDS maintains the current 2001 NDS format, familiar to

most wood designers. As a result, NDS 2005 is very similar to the 2001 NDS for ASD design, with few exceptions.

Users familiar with the NDS ASD provisions will also find transition to LRFD straightforward. Behavioral equations, such as those for member and connection design, are the same for both ASD and LRFD. Adjustment factor tables now include applicable factors for determining an adjusted ASD design value or an adjusted LRFD design value. A new Appendix N – *Mandatory Appendix for Load and Resistance Factor Design (LRFD)* outlines requirements that are unique to LRFD and adjustment factors for LRFD.

Terminology

Basic requirements for checking strength are revised to use terminology applicable to both ASD and LRFD. For example, the basic requirement for strength in bending is revised as follows:

"3.3.1 The actual bending stress or moment shall not exceed the adjusted allowable bending design value."

In equation format, this takes the standard form $f_b \leq F_b'$. The term "allowable," typically associated with ASD, is replaced by "adjusted" to be more generally applicable to either ASD or LRFD and to better describe the approach of applying adjustment factors to reference design values. Reference design values (F_{bx} , F_b , F_{cx} , F_c , F_{tx} , E , E_{min}) are multiplied by adjustment factors to determine adjusted design values (F_{bx}' , F_b' , F_{cx}' , F_c' , F_{tx}' , E' , E_{min}').

Applicability of Adjustment Factor Tables

For member design, the adjusted bending design value, F_b' , of a sawn lumber bending member is determined using Table 4.3.1 (shown on the next page) as follows:

For ASD:

$$F_b' = F_b C_D C_M C_t C_L C_F C_{fu} C_i C_r$$

For LRFD:

$$F_b' = F_b K_F \phi_b \lambda C_M C_t C_L C_F C_{fu} C_i C_r$$

where:

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James Ambrose,Patrick Tripeny



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Design of Wood Structures-ASD/LRFD Donald E. Breyer,Kenneth J. Fridley,David G.

Pollock, Kelly Cobeen, 2014-09-05 THE DEFINITIVE WOOD STRUCTURE DESIGN GUIDE FULLY UPDATED Thoroughly revised to incorporate the latest codes and standards the seventh edition of this comprehensive resource leads you through the complete design of a wood structure following the same sequence of materials and elements used in actual design Detailed equations clear illustrations and practical design examples are featured throughout the text THIS NEW EDITION Conforms to the 2012 International Building Code IBC Addresses the new 2012 National Design Specification for Wood Construction NDS Contains dual format Allowable Stress Design Load and Resistance Factor Design ASD LRFD specifications equations and problems Includes ASCE SEI 7 10 load provisions DESIGN OF WOOD STRUCTURES ASD LRFD SEVENTH EDITION COVERS Wood buildings and design criteria Design loads Behavior of structures under loads and forces Properties of wood and lumber grades Structural glued laminated timber Beam design Axial forces and combined loading Wood structural panels Diaphragms Shearwalls Wood connections Nailed connections Bolts lag bolts and other connectors Connection details and hardware Diaphragm to shearwall anchorage Advanced topics in lateral force design 2012 *International Building Code Handbook* Douglas W. Thornburg, John R. Henry, 2013-04-23 A COMPLETE FULL COLOR GUIDE TO THE 2012 INTERNATIONAL BUILDING CODE Updated to reflect the International Code Council 2012 International Building Code this time saving resource makes it easy to understand and apply complex IBC requirements and achieve compliance More than 600 full color illustrations help to clarify the application and intent of many code provisions with an emphasis on the structural and fire and life safety provisions The 2012 International Building Code Handbook provides the information you need to get construction jobs done right on time and up to the requirements of the 2012 IBC Achieve Full Compliance with the 2012 IBC Scope and Administration Definitions Use and Occupancy Classification Special Detailed Requirements Based on Use and Occupancy General Building Heights and Areas Types of Construction Fire and Smoke Protection Features Interior Finishes Fire Protection Systems Means of Egress Accessibility Interior Environment Exterior Walls Roof Assemblies and Rooftop Structures Structural Loads and Design Special Inspections and Tests Soils and Foundations Concrete Aluminum Masonry Steel Wood Glass and Glazing Gypsum Board and Plaster Plastic Plumbing Fixture Count Elevators and Conveying Systems Special Construction Encroachments in the Public Right of Way Safeguards During Construction Existing Structures Referenced Standards **Building Structures** James Ambrose, Patrick Tripeny, 2011-10-18 The comprehensive reference on the basics of structural analysis and design now updated with the latest considerations of building technology Structural design is an essential element of the building process yet one of the most difficult to learn While structural engineers do the detailed consulting work for a building project architects need to know enough structural theory and analysis to design a building Most texts on structures for architects focus narrowly on the mathematical analysis of isolated structural components yet Building Structures looks at the general concepts with selected computations to understand the role of the structure as a building subsystem without the complicated mathematics New to

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