

# CODES AND STANDARDS

updates and discussions  
related to codes and standards

Special inspection is not a new term to the building code. The International Conference of Building Officials' (ICBO) *Uniform Building Code* (UBC) has had special inspection requirements in the code since the 1961 edition. The Building Officials and Code Administrators' (BOCA) *National Building Code* first introduced special inspection provisions in 1988. The ICBO and BOCA codes had a slightly different philosophy and emphasis, which resulted in very different special inspection implementation approaches in ICBO jurisdictions from BOCA jurisdictions. When the International Code Council's (ICC) *International Building Code* (IBC) was first issued in 2000, it merged the ICBO and BOCA special inspection requirements into its Chapter 17. Today, the IBC continues this practice with criteria included in 2015 IBC Chapter 17, titled *Structural Tests and Special Inspections*. The Special Inspections in Chapter 17 are in addition to the inspections identified in Chapter 1 Section 110 and although Chapter 1 will not be covered in this article, Section 110.3.4 Frame Inspection is specific to wood construction elements.

## Background

Special inspection is a quality control measure intended to ensure that certain critical – mostly structural – features incorporated into a structure are constructed properly. This requires inspection by professionals (usually registered design professionals) with specialized skills and experience to verify that the material and workmanship comply with approved plans, specifications, and industry standards. Some aspects of construction may only need periodic inspection, while other aspects of construction require continuous inspection. In

most cases, wood construction is only required to have periodic inspections. The authority to enforce provisions contained in the building code for special inspections rests solely with the local building official. Since a building official certainly cannot be expected to be an expert on all technical building systems contained in a modern structure, inspectors are necessary who have special expertise to evaluate critical building components.

The purpose of special inspections is to provide additional evaluation and inspections above and beyond inspections which are normally performed by the building department, particularly in areas of construction where strength, safety, and construction practices have been determined by the building code, registered design professional, or building official to be sufficiently critical to warrant a special inspector.

Ensuring competence of the special inspector has always been and continues to be the responsibility of the building official.

The registered design professional in responsible charge and engineer of record involved in the design of the project are permitted to act as the approved agency, and their personnel are permitted to act as the special inspector for the work designed by them, provided those personnel are qualified to perform the inspection and are approved by the building official.

## Special Inspections for Wood Construction – Part 1

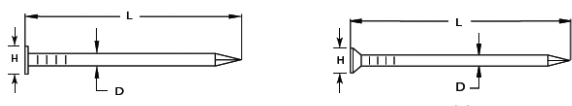
By David P. Tyree, P.E., C.B.O.,  
James B. Smith, P.E. and Michelle  
Kam-Biron P.E., S.E., SECB

## Pre-fabricated Wood Members

The definition of a pre-fabricated item is located in Section 202 of the IBC. The definition notes that any item that is manufactured in accordance

David P. Tyree is the Central Regional Manager, James B. Smith is the Midwest Regional Manager, and Michelle Kam-Biron is the Director of Education at the American Wood Council, Washington, DC.

**Table A1 Standard Common, Box, and Sinker Nails<sup>1</sup>**



		Pennyweight											
Type		6d	7d	8d	10d	12d	16d	20d	30d	40d	50d	60d	
Common	L	2"	2-1/4"	2-1/2"	3"	3-1/4"	3-1/2"	4"	4-1/2"	5"	5-1/2"	6"	
	D	0.113"	0.113"	0.131"	0.148"	0.148"	0.162"	0.192"	0.207"	0.225"	0.244"	0.263"	
	H	0.266"	0.266"	0.281"	0.312"	0.312"	0.344"	0.406"	0.438"	0.469"	0.5"	0.531"	
Box	L	2"	2-1/4"	2-1/2"	3"	3-1/4"	3-1/2"	4"	4-1/2"	5"	-	-	
	D	0.099"	0.099"	0.113"	0.128"	0.128"	0.135"	0.148"	0.148"	0.162"	-	-	
	H	0.266"	0.266"	0.297"	0.312"	0.312"	0.344"	0.375"	0.375"	0.406"	-	-	
Sinker	L	1-7/8"	2-1/8"	2-3/8"	2-7/8"	3-1/8"	3-1/4"	3-3/4"	4-1/4"	4-3/4"	-	5-3/4"	
	D	0.092"	0.099"	0.113"	0.12"	0.135"	0.148"	0.177"	0.192"	0.207"	-	0.244"	
	H	0.234"	0.250"	0.266"	0.281"	0.312"	0.344"	0.375"	0.406"	0.438"	-	0.5"	

<sup>1</sup> Tolerances specified in ASTM F 1667. Typical shape of common, box, and sinker nails shown. See ASTM F1667 for other nail types.

Figure 1. *National Design Specification® for Wood Construction*, Table A1 Standard Common, Box, and Sinker Nails.



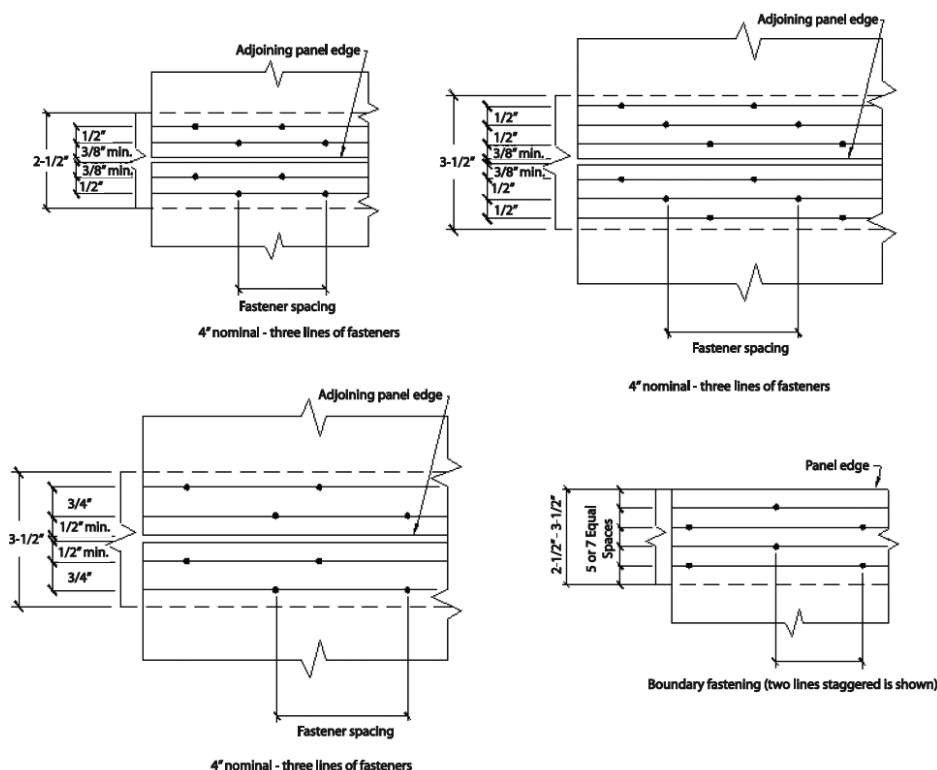


Figure 2. Special design provisions for wind and seismic – high load diaphragm nailing details.

with one of the standards referenced in the code (Chapter 35) is not to be considered a fabricated item and thus is not subject to the special inspection requirements of Section 1704. However, this exception is only permitted if the fabricator maintains approved detailed fabrication and quality control procedures that provide a basis for control of the workmanship and the fabricator's ability to conform to approved construction documents and the code. As an example, most metal plate connected wood trusses, glued laminated timbers (glulam), and I-joists are manufactured to a referenced standard (such as ANSI A190.1 for glulam). Therefore, unless there is an unusual situation where a reference standard is not being used, special inspection of these items is not required by the IBC.

Chapter 23 of the IBC specifies requirements for wood design and construction. Section 2303 specifies the minimum standards and quality control procedures for various wood products. Quality control certification programs such as those implemented by APA—The Engineered Wood Association, Truss Plate Institute, International Accreditation Service (IAS), etc., are covered under provisions specified in IBC Section 1704.2.5.1 for “fabricator approval.” These requirements include a comprehensive audit to stringent industry-specific performance criteria by trained auditors and industry professionals.

IBC Section 1704 outlines requirements for special inspections and tests, contractor

responsibility and structural observation. Since the 2000 IBC was published, this section of the code has changed several times and provides much more guidance for the building official.

## Special Inspection and Tests

Where application is made to the building official for construction as specified in Section 105, the owner or the owner's authorized agent, other than the contractor, shall employ one or more approved agencies to provide special inspections and tests during construction on the types of work listed under Section 1705.

Per Section 1704.2, there are exceptions as to where special inspections are required including: construction of a minor nature or in situations where the building official does not feel special inspection is necessary; portions of structures designed and constructed in accordance with Section 2211.7 for cold-formed steel light frame construction or conventional light-frame construction in accordance with Section 2308; and, a Group U occupancy which is accessory to a residential occupancy including but not limited to those uses listed in Section 312.1. Additionally, it is noted in this section that the contractor is permitted to employ the approved special inspection agency where the contractor is also the owner.

Prior to the start of construction, the approved special inspection agency is required

to provide written documentation to the building official demonstrating that the special inspectors are qualified individuals who demonstrate competence, and relevant experience and training, for the inspection of the particular type of construction or operation requiring special inspection or testing. Generally, it is the opinion of most building officials that the increased involvement by the registered design professional in responsible charge during the construction process of a project will help facilitate early detection of code and structural problems, which can be resolved much more easily when caught at an earlier stage of construction.

The building codes do not specifically state how a special inspector is to be considered qualified. Minimum qualifications are somewhat clarified in IAS *Accreditation Criteria for Special Inspection Agencies* (AC291), but additional assistance can be found in other documents concerning special inspection as well and can be of help to the building official.

## Special Inspection for Wood Construction

Sections 1705.5.1, 1705.11 and 1705.12.2 of the IBC specify special inspection requirements for wood construction, and these are in addition to basic requirements of the frame inspection in Section 110.3.4. The IBC does not contain special inspection requirements for conventional wood frame construction per Section 2308, which is specifically exempted from special inspection as noted previously. The IBC specifies generally that all wood special inspections be “periodic” as opposed to “continuous”, except in Sections 1705.11.1 and 1705.12.2 where continuous special inspection is required during field gluing operations of the main wind force-resisting system in certain high wind areas and of the seismic force-resisting system in seismic areas. Therefore, the special inspection frequency is usually left to the special inspector's discretion unless the structural engineer specifies a specific frequency of inspections in the Statement of Special Inspections.

## Statement of Special Inspections

IBC Section 1704.2.3 requires a “Statement of Special Inspections.” The extent and duration of special inspections, as well as their frequency, should be clearly stated. Not all buildings are created equal; therefore, when considering the statement of special inspections, the required number of inspections for specific elements should take a number of factors into

consideration such as complexity of construction details, the general contractor's wood construction skill and experience, building size, and staffing of the building department.

## High-Load Diaphragms

Under the 2015 IBC, section 1705.5.1 requires special inspection of high-load diaphragms designed and constructed in accordance with Section 2306.2. Per Section 1705.5.1, the special inspector is required to complete the following when inspecting high-load diaphragms:

- inspect the wood structural panel sheathing to determine whether it is the grade and thickness shown on the approved construction documents
- verify the nominal size of framing members at adjoining panel edges
- verify the nail or staple diameter and length (*Figure 1, page 23*)
- determine the number of fastener lines
- verify that the spacing between fasteners in each line and at edge margins agrees with the approved construction documents (*Figure 2*)

Additional special inspection requirements for high wind and high seismic areas are listed in

Sections 1705.11.1 for wind and 1705.12.2 for seismic.

## Metal-Plate-Connected Wood Trusses Spanning 60 Feet or Greater

The 2015 IBC section 1705.5.2 requires special inspection when a metal-plate connected wood truss has a clear span of 60 feet or greater. The special inspector is required to verify that the temporary installation restraint/bracing, and the permanent individual truss member restraint/bracing, are installed in accordance with the approved truss submittal package. This section specifically requires that the owner or his/her authorized agent employ one or more approved agencies to perform inspections on the temporary and permanent truss bracing during construction to verify installation is in accordance with the truss submittal package.

## Special Inspections for Wind and Seismic Resistance

Section 1705.11 requires special inspections for wood buildings in Exposure B

areas where design wind speed,  $V_{asd}$ , as determined in accordance with Section 1609.3.1, is equal to or greater than 120 miles per hour; and in Exposures C & D areas where  $V_{asd}$  is equal to or greater than 110 miles per hour. Continuous special inspection is required during field gluing operations of elements of the main wind force-resisting system, and periodic special inspection is required for nailing, bolting, anchoring and other fastening of elements of the main wind force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs. Section 1705.11.3 goes further to state that special inspections should include periodic inspection for fastening of the following systems and components: roof covering, roof deck, roof framing connections, exterior wall coverings, wall connections to the roof, and floor diaphragms and framing (*Figure 3b, page 26*).

Section 1705.12.2 requires special inspections for wood buildings when the building is located in Seismic Design Categories C, D, E or F. In these Seismic Design Categories, continuous special inspection is required during field gluing operations of elements of the seismic force-resisting system and periodic inspection is required for: nailing, bolting,

ADVERTISEMENT—For Advertiser Information, visit [www.STRUCTUREmag.org](http://www.STRUCTUREmag.org)

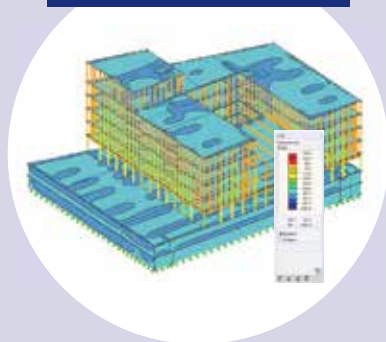
# RFEM 5

## Structural Analysis and Design Software

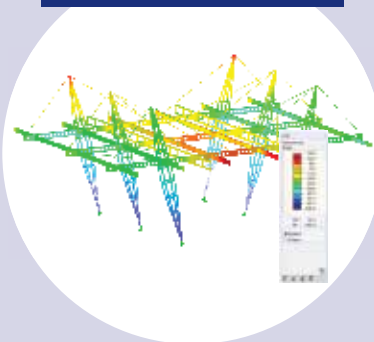
German Engineering Precision.

Designed for American Innovation.

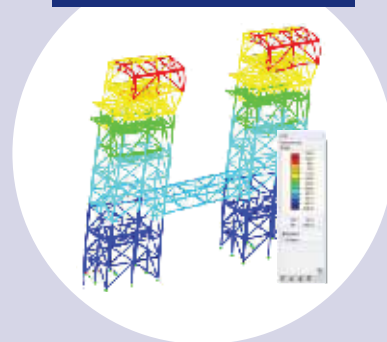
### BIM Integration



### Non-linear Analysis



### Dynamic Analysis



**Dlubal Software, Inc.**  
Philadelphia, Pennsylvania  
(267) 702-2815  
[info-us@dlubal.com](mailto:info-us@dlubal.com)  
[www.dlubal.com](http://www.dlubal.com)



#### Join us:



**Structural Congress**  
February 14-16, 2016



**NASCC**  
April 13-15, 2016

**DOWNLOAD  
FREE TRIAL**  
[www.dlubal.com](http://www.dlubal.com)



Figures 3a and 3b. Periodic special inspection is required for nailing, bolting, anchoring and other fastening of elements of the seismic and main wind force-resisting systems, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs.

anchoring and other fastening of the elements of the seismic force-resisting system, including wood shear walls (Figures 3a and 4), wood diaphragms (Figure 3b), drag struts, braces, shear panels, and hold downs.

Sections 1705.11.1 and 1705.12.2 further provide for an exemption from special inspection for wood shear walls, shear panels, and diaphragms, including nailing bolting, anchoring, and other fastening to other elements of the main wind force-resisting system where the diaphragm fastener spacing is greater than 4 inches. This exception is intended to exempt less highly-stressed lateral force resisting systems from special inspection. Additionally, a general exception to special inspection for seismic force resistance is provided in Section 1705.12 for buildings of light-frame construction not exceeding a building height of 35 feet and located in areas where SDS does not exceed 0.5.

The purpose of special inspection requirements in these areas is to provide additional public safety in higher wind and seismic zones, and to provide assurance for the structural engineer of record and the building department that the structure is being built in accordance with the proper design and performance specifications.

## Structural Observations

When required by Sections 1704.6.1 for those structures assigned to Seismic Design Category D, E or F or Section 1704.2 for those structures sited where  $V_{asd}$ , as determined in accordance with Section 1609.3.1 exceeds 110 mph, structural observations are to be provided on a project. Structural Observation is the visual observation of structural systems by a Registered Design Professional (i.e., licensed engineer or architect) for general conformance with approved construction documents. Structural Observation is intended to assist and supplement the work of the Building Official. Structural Observation by itself does not certify, guarantee, or ensure conformance

with all of the requirements of the approved construction documents. Structural observation does not waive nor is it an alternative to the inspections in Section 110 or the special inspection requirements in Section 1705.

Typically, observation occurs during significant construction stages and at the completion of the structural system. The objective of the structural observation is to become familiar with the progress and quality of the contractor's work, and then determine if the work is being completed in general conformance with approved plans and specifications. Observation is a contract-negotiated activity which is usually performed by the structural engineer as a part of the normal scope of services. Structural observations are mandated for certain high wind or high seismic areas, Risk Category III or IV buildings, and in other circumstances in accordance with IBC Section 1704.6. At the conclusion of the work included in the permit, the structural observer is required to submit to the building official a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.

## Conclusion

Requirement for special inspections in the model building codes have been mandated since 1961; however, special inspections pertaining to wood construction have only been required for the past twenty-five years. Structural provisions in the building codes, including those for special inspection, have evolved based on experience following natural and manmade disasters. Certain types of wood construction require special inspections per IBC Chapter 17. Most commonly specified wood products have quality control and third-party auditing procedures in place that exempt the manufacturer from these additional requirements. High capacity (blocked) diaphragms and applications for certain high wind and high seismic zones, however, are the most common examples where special inspections for wood construction are required. Part 2 of this article will provide perspectives from several States (based on the 2012 IBC) on suggested handling of special inspections regionally. ■

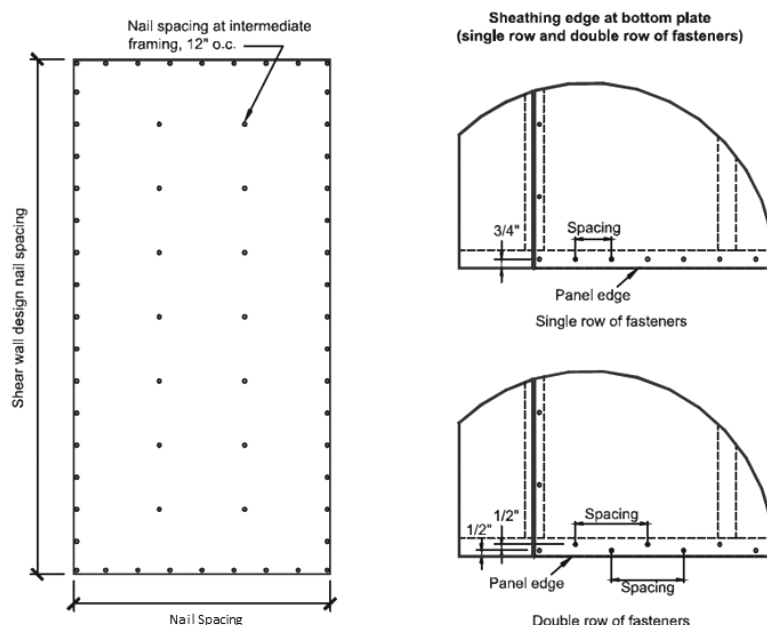


Figure 4. Shear wall nailing details.