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"POST-FRAME BUILDING SYSTEM" DEFINED

NFBA T & R Committee supports development of new standard

December 31, 2010, marked a milestone for the post-frame building industry. On that date, the American Society of Agricultural and Biological Engineers was informed its new standard, ***ASABE S618 Post Frame Building System Nomenclature***, had been approved as an American National Standard by the American National Standards Institute. With 139 different definitions, this new standard establishes terminology to be used in the design, construction, marketing and regulation of post-frame buildings.

All standards are developed for a reason, and the primary purpose of this article is to document the series of events that led to the creation of ASABE S618 by members of the NFBA Technical and Research (T & R) Committee. This article will provide an overview of the development process and an outline of document contents, ending with a brief explanation of the primary difference between post-frame, post-and-beam and timber-frame building systems.

A need becomes apparent

During the NFBA T & R Committee meeting held in conjunction with the Frame Building Expo in Nashville, Tenn., on February 26, 2009, it was moved that "we develop an ASABE standard on post-frame nomenclature in accordance with ANSI standards." This motion unanimously passed and the development process began.

A series of events and activities involving and surrounding the T & R Committee during the previous 18 months led to the February 26 motion. The first of these was a discussion that took place on October 11, 2007, at a T & R Committee meeting in Utica, Ill. The T & R Committee reviewed the latest draft of *Model Specification for Post-Frame Building Systems* at this meeting. Frequently referred to as the *model guide specification*, this document was being developed in part to help expand the use of post-frame buildings by a greater number of architects, engineers and other building designers. Those familiar with specifications of any sort realize proper terminology is critical to such documents. Not surprisingly, considerable discussion at the meeting centered on the definition of a post-frame building, how to categorize different building elements into sections within the model specification and how to title these sections. It was apparent at this meeting that various committee members had slightly different views on what should all be classified as a post-frame building.

On January 16, 2009, the Wood County Building Inspection Administrative Code was released in northeast Ohio. Although Section 406.1 of the WCBIAC is titled "Standards for Post Frame Construction," it was drafted without assistance from NFBA. In many respects the document provides a perfect example of specifications that result when the technical expertise of the T & R committee is not brought into the code development process. Not only does the WCBIAC ignore numerous important post-frame building design elements and factors, but it uses terminology the at-large post-frame building community would consider nonstandard.

During 2008, T & R Committee member Kris Owens raised a concern about improper use of building terminology by people involved in code development work with the International Code Council. Specifically, many code officials were confusing post and beam buildings and timber-frame buildings with post-frame buildings. In effect, this resulted in an unintended restriction placed on use of certain products in post-frame building design and was partially attributed to lack of a "post-frame building" definition in the model codes. In an attempt to address this shortcoming, a motion was passed during the February 26, 2009, T & R committee meeting in Nashville to submit to the ICC the definition of a post-frame building system that had been developed in part for the *Model Specification for Post-Frame Building Systems*. The passing of this motion was supported in large part by the nonstandard post-frame building terminology used in the WCBIAC. The approval of this motion was immediately followed by the motion to develop an ASABE standard on post-frame building nomenclature.

Developing ASABE S618

There are hundreds of nongovernment organizations such as NFBA in the United States that write and maintain standards in one form or another. About 220 of these groups are ANSI-accredited standards developers (ASDs), meaning they meet all ANSI requirements for due process in standard development and all ANSI criteria for the approval, review, and withdrawal of a standard. ASDs may submit their standards to ANSI for review and possible acceptance as American National Standards. Standards recognized in this way have much higher credibility; it is much easier to get such standards adopted by reference in model codes such as the International Building Code and the International Residential Code.

Although NFBA is not an ANSI ASD, ASABE is so accredited and it currently maintains a series of standards of critical importance to post-frame building design. It was natural to work with ASABE on a standard for post-frame building systems nomenclature.

The first step in this process was to form a special ASABE Standard Development Committee and to obtain ASBAE approval for both the composition and task of the committee. T & R Committee member David Bohnhoff spearheaded this effort and agreed to chair a SDC that included fellow T & R Committee members Gary Anderson, Paul Boor, Mike Burkholder, Ben Doerge, John Fullerton, Aaron Halberg, Daniel Hindman, Brent Leatherman, Harvey Manbeck, Pat McGuire, John Minor, Kris Owen, Al Schambach, Leo Shirek, Ron Sutton and Doug Thomsen.

In accordance with ANSI due process requirements, the formation of the committee was advertised nationally, giving others interested in joining the committee the opportunity to do so.

This committee and its task were approved in late spring 2009 by the ASABE SE-03 Standards Committee as Standard Development Project X618. Bohnhoff developed a first draft of the standard during early summer 2009. It is important to note this work and other research at the University of Wisconsin-Madison was made possible in part with the financial support of NFBA.

The original draft was e-mailed to committee members in late July 2009. Changes were incorporated into a second draft of the standard. This second draft was subject to a line-by-line review by the entire committee during the NFBA T & R Committee meeting on October 22, 2009, in Oakbrook, Ill. Changes discussed during this meeting were incorporated into the third draft of the standard. This draft was forwarded to ASABE in April 2010 for an official ballot by the X618 SDC.

The first official ballot of the standard was completed in May 2010. Although the committee approved the standard, numerous comments needed to be addressed. This resulted in a fourth draft of the document that was completed during summer 2010. Because the changes were technical in nature, the standard had to be sent back to ASABE for a second ballot by the X618 SDC. This ballot was officially approved by the SDC on November 28 and subsequently approved by the ASABE SE-03 Standards Committee on December 24, 2010, at which time it was forwarded to ANSI for approval as an American National Standard.

Standards development work at ASABE is handled by Scott Cedarquist, Carla VanGilder, Ted Tees and Travis Tsunemori. Their efforts should be recognized, particularly those of Carla VanGilder, who shepherded ASABE S618 through the development process.

ASABE S618 Overview

Without doubt, ASABE S618 is among the most complete and technically consistent nomenclature documents in existence for a particular building system. Considerable time and effort was put into the 139 definitions appearing in the new standard. Extreme care was taken to make sure terminology was consistent with definitions appearing in other national standards such as the National Design Specifications for Wood Construction and/or with verbiage routinely published or otherwise well-

entrenched in the design community by other major national organizations.

From a structural perspective, a post-frame building system is analogous to the typical low-rise metal building system. Conventional buildings of both types have two-dimensional (2-D) frames that are connected with purlins in the roof and girts in the walls. Diaphragm design procedures now used in the post-frame building industry evolved from those used over a half-century ago in the low-rise metal building systems industry. The similarity between the building systems is reflected in the number of companies that supply cladding systems, fasteners and insulation to both industries and by the number of construction firms that have erected both building types. For these reasons it was important to maintain common terminology for components with identical function within the two building systems. The adoption in ASABE S618 of such terms as primary framing, secondary framing, primary frame, eave, strut and base plate can be attributed directly to their long-established use in the low-rise metal building systems industry.

The new ASABE standard contains 11 sections titled as follows: (1) purpose and scope, (2) normative references, (3) building systems, (4) building subsystems, (5) primary framing members, (6) secondary framing members, (7) diaphragm components, (8) foundation components, (9) foundation types, (10) dimensions and (11) commentary.

Section 3 contains only two definitions, but they are the most important definitions and are repeated here:

> *Post-frame building system: A building characterized by primary structural frames of wood posts as columns and trusses or rafters as roof framing. Roof framing is attached to the posts, either directly or indirectly through girders. Posts are embedded in the soil and supported on isolated footings or are attached to the top of piers, concrete or masonry walls, or slabs-on-grade. Secondary framing members, purlins in the roof, and girts in the walls are attached to the primary framing members to provide lateral support and to transfer sheathing loads, both in-plane and out-of-plane, to the posts and roof framing.*
>
> *Pole-frame building system: A post-frame building in which all posts are round poles. Commonly referred to as a pole building.*

The definition of a post-frame building system is the most involved or complex definition appearing in the standard. Other definitions are as succinct as those given for a pole-frame building system.

Section 4 on building subsystems contains definitions for primary frames, sidewall and endwalls, and diaphragms. A primary frame is defined as "*the two-dimensional interior frame that is formed by the direct attachment of a roof truss/rafter to its respective posts. Also known as a post-frame or a main frame.*" Types of primary frames defined and illustrated in the standard include single-span, multi-span, solid-web, open-web, and hybrid.

Primary framing members (covered in Section 5) are the main structural framing members in a building and include the posts, roof trusses/rafters and any girders that transfer load between roof trusses/rafters and posts. Post types defined in the document include solid-sawn, structural composite lumber, glued-laminated (or glulam), mechanically-laminated (or mechlam), nail-laminated (or nail-lam), screw-laminated (or screw-lam), spliced, unspliced and poles. Posts also are defined by position as endwall, sidewall, corner and jamb. Truss types defined in the standard include light wood, metal plate connected wood, heavy timber, ganged, girder, parallel chord and roof. Special rafter types defined in ASAE S618 include rake, fly, and stacked.

Within the industry, many people improperly refer to some girders as headers. A header is defined as "*a framing member at the top of a window, door or other framed opening. In general, any framing member that ties together the ends of adjacent framing members and may or may not be load bearing.*" A girder is defined as "*a large, generally horizontal, beam. Commonly used in post-frame buildings to support trusses whose bearing points do not coincide with a post. Frequently function as headers over large door and window openings.*" Defined in ASAE S618 under the category of girder are eave girder, ridge beam, truss girder and spaced girder. The primary framing section also includes definitions for knee brace, bearing block, rafter extension and tie-down block.

Secondary framing (covered in Section 6) includes all structural framing members used to transfer load between exterior sheathing and primary framing members and/or to laterally brace primary framing members. This includes all girts, purlins, eave struts and any structural bracing. Girt types defined in ASABE S618 include exterior girt, inset girt, interior girt, notched girt, bottom girt, grade girt, top girt, bookshelf girt and splash plank. The definition for a splash plank reads "*any decay and corrosion resistant girt that is in soil contact or located near the soil surface, that remains visible from the building exterior upon building completion, and is 2 to 4 inches in nominal thickness. Frequently, multiple rows of tongue and groove (T&G) splash plank are used along the base of a wall.*" Note that it is technically incorrect to refer to a nominally 2-inch-thick member as a board. Notably absent from this list of girt terms are skirt, skirting, skirt board and skirting board, all of which traditionally refer to interior wall trim that surrounds a room at the base of the walls (baseboard).

Several different purlin types are defined in Section 6, including purlin-on-edge, purlin-laid-flat, recessed purlin, fully recessed purlin, partially recessed purlin, notched purlin, lapped purlins, rake purlin, ridge purlin, eave purlin, fascia purlin, edge purlin and beveled purlin. Section 6 also contains definitions for eave strut, base plate, sill plate, purlin block, sub-fascia, lookout, track board, track board support and several different types of bracing.

When post-frame building components (purlins, girts, purlin blocks, mechanical fasteners, etc.) are positioned and connected in such a way as to form a diaphragm, the components take on additional names as defined in ASABE S618 Section 7. This includes diaphragm structural framing, structural sheathing, structural sheathing panel, edge fastener, field fastener, seam (or stitch) fastener, anchored seam fastener, shear blocks, diaphragm chords, drag strut and structural ridge cap.

The foundation components section (Section 8) contains descriptions for embedded pier, footing, uplift anchor, collar and grade beam. This is followed by the foundation types section (Section 9), which contains definitions for foundations commonly used to support post-frame building systems (post foundation, pier foundation, pier-and-beam foundation, slab-on-grade foundation and stem-wall foundation).

Clear and concise descriptions for dimensions and points of reference are important when communicating fundamental building information. The following terms have been defined in ASABE S618 Section 10: grade line (grade level), floor level, eave line, rake line, ridge line, foundation depth, post embedment depth, pier embedment depth, clear height, post height, eave height, building height, building bay, frame spacing, clear span, building width, building length, eave overhang distance, rake overhang distance, girt spacing and purlin spacing.

What a post-frame building is not?

Post-frame buildings frequently and incorrectly are referred to as post-and-beam buildings or as timber-frame buildings. The main confusion between framing systems results from the fact they all frequently feature 2-D wood frames with on-center spacings in the 4- to 16-foot range.

In post-frame buildings these 2-D frames are referred to as primary frames, post frames or main frames. In post-and-beam buildings and timber-frame buildings they are commonly referred to as bents. The key to understanding the difference between the three building systems is to focus on these 2-D wood frames. If the main member(s) connecting the posts within a 2-D frame fall into the timber category (timbers are defined as members larger than 5 nominal inches in the least dimension), the building is classified as a post-and-beam building or a timber-frame building.

According to the Timber Frame Business Council, a timber-framed building is "*a specialized version of post and beam building that utilizes wood joinery such as mortise and tenon held in place with wooden pegs*" (http://timberframe.org/faq.html). According to this definition, it is not proper to refer to a post-and-beam building as a timber-frame building when timbers are connected with special metal fasteners, metal plates, and other metal connectors.

TFBC is one of two organizations fully dedicated to timber framing, the other being the Timber Framers Guild. The TFBC (http://www.tfguild.org/) grew out of the TFG in the mid 1990s. Relative to the TFG, the TFBC has more of a promotional focus, offers only company memberships, and is considered an industry nonprofit. Conversely, the TFG is largely an educational organization, offers only individual memberships and is a charitable nonprofit organization. The main publication of the TFG is its quarterly journal titled *Timber Framing*. The June 2003 issue of *Timber Framing* featured a comprehensive glossary of timber framing terms that can be accessed at http://www.tfguild.org/publications/glossary.pdf. Comparing the terminology in this document with terminology in ASBAE S618 goes a long way toward differentiating these two building types.

Summary

Members of the NFBA T & R Committee were instrumental in the development of ASABE S618, a new standard on post-frame building systems nomenclature. This new standard establishes terminology to be used in the design, construction, marketing, and regulation of post-frame buildings. To order a copy of ASABE S618, contact ASABE headquarters at martin@asabe.org. **FBN**

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