Proposed Change as Submitted

Proponent: Sam Francis, American Wood Council (sfrancis@awc.org)

THIS IS A 2 PART CODE change. THE FIRST PART WILL BE HEARD BY THE IBC GENERAL COMMITTEE AND THE SECOND BY THE IBC STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THE IBC STRUCTURAL CODE DEVELOPMENT COMMITTEE.

PART I – IBC GENERAL

Revise as follows:

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 2303.2 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.

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 the exterior surface of the cross-laminated timber is protected by (1) fire retardant treated wood sheathing complying with 2303.2 and not less than 15/32 inch thick; or (2) gypsum board not less than ½ inch thick; or (3) a noncombustible material.

602.4.3 Columns. Wood columns shall be sawn or glued laminated and shall be not less than 8 inches (203 mm), nominal, in any dimension where supporting floor loads and not less than 6 inches (152 mm) nominal in width and not less than 8 inches (203 mm) nominal in depth where supporting roof and ceiling loads only. Columns shall be continuous or superimposed and connected in an approved manner.

602.4.4 Floor framing. Wood beams and girders shall be of sawn, or glued-laminated timber and shall be not less than 6 inches (152 mm) nominal in width and not less than 10 inches (254 mm) nominal in depth. Framed sawn, glued-laminated timber arches, which spring from the floor line and support floor loads, shall be not less than 8 inches (203 mm) nominal in any dimension. Framed timber trusses supporting floor loads shall have members of not less than 8 inches (203 mm) nominal in any dimension.

602.4.5 Roof framing. Wood-frame or glued-laminated arches for roof construction, which spring from the floor line or from grade and do not support floor loads, shall have members not less than 6 inches (152 mm) nominal in width and have not less than 8 inches (203 mm) nominal in depth for the lower half of the height and not less than 6 inches (152 mm) nominal in depth for the upper half. Framed or glued-laminated arches for roof construction that spring from the top of walls or wall abutments, framed timber trusses and other roof framing, which do not support floor loads, shall have members not less than 4 inches (102 mm) nominal in width and not less than 6 inches (152 mm) nominal in depth. Spaced
members shall be permitted to be composed of two or more pieces not less than 3 inches (76 mm) nominal in thickness where blocked solidly throughout their intervening spaces or where spaces are tightly closed by a continuous wood cover plate of not less than 2 inches (51 mm) nominal in thickness secured to the underside of the members. Splice plates shall be not less than 3 inches (76 mm) nominal in thickness. Where protected by approved automatic sprinklers under the roof deck, framing members shall be not less than 3 inches (76 mm) nominal in width.

602.4.4 602.4.6 Floors. Floors shall be without concealed spaces. Wood floors shall be constructed in accordance with 602.4.6.1 or 602.4.6.2.

602.4.6.1 Sawn or glued-laminated planks. Sawn or glued-laminated planks, splined or tongue-and-groove, of not less than 3 inches (76 mm) nominal in thickness covered with 1-inch (25 mm) nominal dimension tongue-and-groove flooring, laid crosswise or diagonally, or 0.5-inch (12.7 mm) particleboard or planks not less than 4 inches (102 mm) nominal in width set on edge close together and well spiked and covered with 1-inch (25 mm) nominal dimension flooring or 15/32-inch (12 mm) wood structural panel or 0.5-inch (12.7 mm) particleboard. The lumber shall be laid so that no continuous line of joints will occur except at points of support. Floors shall not extend closer than 0.5 inch (12.7 mm) to walls. Such 0.5-inch (12.7 mm) space shall be covered by a molding fastened to the wall and so arranged that it will not obstruct the swelling or shrinkage movements of the floor. Corbelling of masonry walls under the floor shall be permitted to be used in place of molding.

602.4.6.2 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.

602.4.5 602.4.7 Roofs. Roofs shall be without concealed spaces and wood roof decks shall be sawn or glued laminated, splined or tongue-and-groove plank, not less than 2 inches (51 mm) nominal in thickness; 11/8-inch-thick (32 mm) wood structural panel (exterior glue); or of planks not less than 3 inches (76 mm) nominal in width, set on edge close together and laid as required for floors; or of cross laminated timber. Other types of decking shall be permitted to be used if providing equivalent fire resistance and structural properties.

Cross laminated timber roofs shall be not less than 3 inch nominal in thickness and shall be continuous from support to support and mechanically fastened to one another.

602.4.6 602.4.8 Partitions and Walls. Partitions and walls shall comply with 602.4.8.1 or 602.4.8.2.

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:
   2.1 Fire retardant treated wood in accordance with 2303.2 and complying with 602.4.1 or 602.4.2.
   2.2 Cross laminated timber complying with 602.4.2.

602.4.7 602.4.9 Exterior Structural Members. Where a horizontal separation of 20 feet (6096 mm) or more is provided, wood columns and arches conforming to heavy timber sizes shall be permitted to be used externally.

Reason: Cross-laminated timber (CLT) is a new technology developed in Europe. It is generally analogous to large section members currently associated with heavy timber in the current code. Its fire performance is most like that of glued-laminated beams, or glu-lams, in traditional Type IV (heavy timber) construction. Therefore it is proposed that the CLT be included in Type IV.
To properly accomplish this, this proposal adds a definition of CLT, adds a consensus-developed product standard and then modifies the text of Type IV to accommodate CLT.

In Item #1, the existing language is maintained but FRTW, currently allowed in walls of Type IV, is pulled out into a subset of nontraditional material permitted to be used in Type IV. CLT is then added as the second subset. This makes it clear that this mode of construction performs like Heavy Timber but is constructed with different techniques. Walls are more like “tilt-up slabs” than HT beams but their fire performance is very similar to HT. Floors are more like slabs but again, their fire performance is similar to HT.

No changes are needed to the sections on columns, floor framing or roof framing because CLT is neither used as a “column” nor a “framing material”. Cross-laminated timber is a large, thick panel composed of crosswise layers of dimension lumber bound with a structural adhesive.

In Section 602.4.4-Floors, the existing language is pulled down into a subparagraph and is unchanged. CLT floors are slightly different than HT so it is put into a second subparagraph with its own requirements. Among the differences is thickness (CLT=4 inches; HT=3 inches topped with a sheathing). Finally, the section is renumbered to accommodate the inserted subsections on general requirements.

In Section 602.4.5-Roofs, the existing language is pulled down, unchanged, into a subparagraph. CLT is again included as a subparagraph. Again the numbering is changed.

In Section 602.4.6-floors, CLT is added as an explicitly permitted form of floor decking. Traditional HT floor decks are 3” or 4” thick planks with various sheathings. Unlike the traditional plank decking, the CLT alternate has no joints to protect. Therefore no sheathing is required on top of the CLT. The structure of the section does not, however, prohibit the use of sheathing on top of a CLT floor deck.

In Section 602.4.7-roofs, CLT is added as an explicitly permitted form of roof decking.

In Section 602.4.8-walls, CLT is added as an acceptable wall system. For interior walls, it is already compliant as an element of solid wood construction meeting the traditional minimum dimensions. This section was modified to break out exterior walls separately so as to correlate with the base paragraph, 602.4 and its CLT subsection, 602.4.2. This eliminates any confusion which might arise between the two sections. By separating the interior and exterior walls, the new minimum wall thickness requirement associated with CLT may be interpreted to apply to all exterior wall construction, including traditional construction. However, it is observed that all common forms of exterior wall construction of Type IV would easily comply with this requirement.

The remaining items are necessary to include the product standard for CLT and a definition for the product. These items form the basis for the inclusion in Chapter 6 and give clarity to this new type of wood construction.

More information on the cross-laminated timber product can be found at our website, www.AWC.org.

Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: A review of the standard proposed for inclusion in the code, ANSI/APA PRG 320-2011 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2012.

Public Hearing Results

Part I of this proposal was heard by the IBC General Code Development Committee.

For staff analysis of the content of ANSI/APA PRG 320-2011 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

PART I – IBC GENERAL
Committee Action: Disapproved

Committee Reason: The proposal was disapproved based upon the need for fire test data on the performance of cross laminated lumber.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Sam Francis, American Wood Council, requests Approval as Submitted.

Commenter’s Reason: The American Wood Council urges the membership to approve Part 1 of this proposal As Submitted. Testimony during the Code Development hearing on this proposal focused on the “lack of fire test data” of Cross Laminated Timber (CLT). This was also the reason given by the Code Development Committee in recommending disapproval, so recent fire
Test data on CLT is being provided to the membership for their consideration. Fire test data is one important consideration in approving this change. A fundamental attribute of heavy timber building fire performance is the time it takes for large sections to lose strength during fire exposure. The char layer created during pyrolysis of the wood protects and insulates the underlying fiber and allows the heavy timber to retain its structural load carrying capacity. Cross Laminated Timber (CLT) has similar characteristics as heavy timber, including large section properties. CLT is insulated in the same manner as HT during pyrolysis. Therefore, it should be sufficient to demonstrate that wood species have the same char rate when manufactured into CLT as they have when manufactured into heavy timber. To that end, the data for individual species are available at the webpage: http://www.awc.org/Code-Officials/2012-IBC-Challenges. Other information regarding CLT is also posted to the website.

One of the other concerns expressed during the hearings was that adhesive might contribute to, or alter, the char rate of wood. The new standard for CLT, which has been recommended for approval by the ICC Structural Committee in S250-12, includes the requirement that the adhesives used to manufacture CLT meet the same elevated temperature performance requirements as adhesives used to manufacture structural composite lumber (SCL) and glued laminated timber. Glued laminated timber is included in the Heavy Timber definition.

Glued laminated timbers have historically been accepted as having similar char rates to solid sawn heavy timber. The basis for that conclusion has been a number of tests performed by various agencies showing the char rates to be similar and, therefore, affording the same protection for fire exposure within the member. Examples of this information are also available at the webpage provided above.

Finally, recent testing by FPInnovations in Canada has determined that CLT has similar char rates to solid sawn heavy timber. That research paper, entitled “Preliminary CLT Fire Resistance Testing Report” is also available at the webpage provided above. The average char rate for the seven CLT tests in which char rate was measured was determined to be 1.5 in./hr, the same average char rate as for solid wood and glued laminated timber.

G142, Part I-12
Final Action: AS AM AMPC D

NOTE: PART II REPRODUCED FOR INFORMATIONAL PURPOSES ONLY – SEE ABOVE

PART II – IBC STRUCTURAL
202, 2303.1.4 (NEW), Chapter 35

Part II of this code change was heard by the IBC Structural code development committee.

PART II- IBC STRUCTURAL

Add new text as follows:

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

Add new standard to Chapter 35 as follows:

ANSI or APA

Add new definition as follows:

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.

PART II – IBC-STRUCTURAL

Committee Action: Disapproved

Committee Reason: This code change was disapproved in favor of S250-12.

Assembly Action: None