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93-Tall-Mass-Timber-Buildings

International Code Council 93-Tall-Mass-Timber-Buildings

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QUESTION NO: 1

One code-recognized method for calculating the fire-resistance rating of exposed wood members and decking is:

- A. ACI 216.1
- B. TMS 0216
- C. ASCE 29 Chapter 5
- D. ANSI/AWC NDS Chapter 16

ANSWER: D

Explanation:

ANSI/AWC NDS Chapter 16 is the code-recognized calculation method for determining the fire-resistance rating of exposed wood members and wood decking. Section 722.1 of the 2021 International Building Code specifically permits the fire resistance of these elements to be calculated in accordance with Chapter 16 of the ANSI/AWC National Design Specification for Wood Construction (NDS). The standard is published by the American Wood Council (AWC), so the designation must use "AWC," rather than "AWS."

Chapter 16 provides an engineering method for evaluating a wood member's ability to continue supporting required loads during a standard fire exposure. Its calculation process accounts for fire-caused loss of section through charring, the effective char depth and residual cross-sectional dimensions, adjustments associated with elevated wood temperatures, and the remaining member capacity under applicable design loads. This makes the method particularly relevant to exposed mass-timber beams, columns, and decking where the wood itself is intended to provide a calculated fire-resistance rating. The design documentation must apply the NDS procedure to the actual member geometry, exposed faces, loading, and protection conditions used in the building.

See [2021 IBC, Chapter 7](#) and the American Wood Council's [National Design Specification for Wood Construction](#).

QUESTION NO: 2

Which of the following products is not included in the definition of mass timber?

- A. Solid sawn lumber
- B. Prefabricated wood I-joists
- C. Glued laminated timber
- D. Cross-laminated timber

ANSWER: B

Explanation:

Prefabricated wood I-joists are not included as mass timber because their shape and dimensions do not satisfy the Type IV mass-timber concept. The 2021 International Building Code defines mass timber as structural elements used in Type IV construction that are primarily solid, built-up, panelized, or engineered wood products and that meet the minimum cross-sectional dimensions established for Type IV construction. A wood I-joist is an efficient, light-frame framing member made from comparatively thin flanges joined by a thin web; it does not provide the large, solid or built-up timber section contemplated by the Type IV construction provisions. Accordingly, its status as an engineered wood product does not by itself make it mass timber. Wood I-joists are instead addressed as prefabricated wood I-joists under IBC Section 2303.1.2 and are manufactured in accordance with ASTM D5055. In plan review and special inspection, the product identification, required design standard, approved construction type, and the member dimensions shown in the construction documents should be verified. See the [2021 IBC Chapter 2 definitions](#) and the [2021 IBC Chapter 23 wood provisions](#).

QUESTION NO: 3

Given: A building of Type IV-B construction is designed to be greater than six stories above grade plane.

At least one layer of required noncombustible protection shall be installed on all of the following building elements except _____ on all floor levels more than four levels below active mass timber construction before erecting additional floor levels during construction.

- A. mezzanines
- B. shafts and vertical exit enclosures
- C. floors as required by IBC Section 602.4
- D. walls and ceilings as required by IBC Section 602.4

ANSWER: B

Explanation:

shafts and vertical exit enclosures is correct. For a Type IV-B building designed to exceed six stories above grade plane, 2021 IFC Section 3303.5 establishes construction-phase fire-safety requirements as mass-timber floor levels are erected. The section requires at least one layer of the noncombustible protection required by IBC Section 602.4 to be installed on building elements located more than four levels, including mezzanines, below the active mass timber construction before additional floor levels are erected. This sequencing requirement limits the number of lower levels that can remain without their required protective layers while construction proceeds upward, helping maintain the intended fire-resistance performance during the vulnerable construction period.

Section 3303.5 specifically provides that shafts and vertical exit enclosures are not considered part of the active mass timber construction for applying this four-level construction-progress measurement. Thus, they are the stated exception in the question. The applicable construction safeguard is found in [2021 IFC Section 3303.5](#). The noncombustible-protection requirements referenced by that provision are in [2021 IBC Section 602.4](#).

QUESTION NO: 4

Which of the following requires continuous special inspection?

- A. Bolted connections
- B. Concealed connections
- C. Anchorage of mass timber construction to deep foundation systems
- D. Adhesive anchors installed horizontally resisting sustained tension loads

ANSWER: D

Explanation:

Adhesive anchors installed horizontally resisting sustained tension loads require continuous special inspection under the International Building Code requirements for concrete construction. Table 1705.3 identifies post-installed adhesive anchors installed in horizontal or upwardly inclined orientations that are designed to resist sustained tension loads as work requiring continuous inspection. Under IBC Chapter 17, continuous special inspection means the special inspector is present continuously while the regulated installation work is being performed.

This level of observation is required because the long-term tensile performance of a horizontally installed adhesive anchor depends heavily on field installation conditions. The inspector observes the critical installation steps specified by the approved anchor evaluation report and manufacturer instructions, including drilling the hole to the required dimensions, properly cleaning the borehole, confirming adhesive preparation and injection, verifying anchor size and embedment, and ensuring compliance with required curing conditions. Continuous inspection also helps confirm that the installed anchor matches the approved structural documents and is suitable for the sustained loading condition. These controls are particularly important because an installation deficiency can remain concealed after the adhesive cures while significantly affecting the anchor's sustained-tension performance. See [2021 IBC, Chapter 17—Special Inspections and Tests](#), especially Table 1705.3, and the [ICC 2021 International Building Code resource page](#).

QUESTION NO: 5

In Type IV-C construction, the fire-resistance rating provided by protection over a connection can be determined by which of the following?

- A. Testing the fasteners used in the assembly.
- B. Testing the protection covering the connection.
- C. Calculating the temperature rise of the structural element being protected.
- D. Calculating the temperature rise of the supported member used in the connection.

ANSWER: B

Explanation:

Testing the protection covering the connection is correct. For mass-timber connections in Type IV-C construction, IBC Section 2304.10.1 requires connections to be protected as necessary to achieve the required fire-resistance rating of the structural element. The fire-resistance rating supplied by the material or assembly protecting the connection is determined under the code-recognized methods in IBC Section 703.3. These methods include fire-resistance testing in accordance with ASTM E119 or UL 263, approved engineering analysis based on those tests, calculations, or other alternatives specifically permitted by Section 703.3. Thus, testing the protective covering or protective assembly under the applicable fire-test criteria is a recognized means of establishing the time for which it protects the connection during a standard fire exposure. The protection must maintain the required performance for the applicable rating period and account for the connection configuration rather than merely demonstrating the behavior of an individual component in isolation. Section 2304.10.1 also establishes a temperature-rise limitation for the connection when its performance is evaluated, ensuring that protected mass-timber connections retain their intended structural function during the required fire-resistance period. See [2021 IBC Section 2304.10](#) and [2021 IBC Section 703.3](#).

QUESTION NO: 6

Where Type X gypsum board serves as noncombustible protection for interior surfaces of wall and ceiling assemblies, all of the following code provisions are correct except:

- A. Screws shall penetrate at least 1 in. into mass timber.
- B. Screws shall be spaced 12 in. on center in both directions.
- C. Panel edges of any layer shall be offset 18 inches from those of the previous layer.
- D. Panel edges of the base layer shall be taped and finished with joint compound.

ANSWER: D

Explanation:

“Panel edges of the base layer shall be taped and finished with joint compound” is the exception because Section 722.7.2.1 directs the finishing requirement to the face layer, not the base layer. Where Type X gypsum board is installed as the prescribed noncombustible protection for mass-timber wall or ceiling assemblies, the face-layer panel edges must be taped and finished with joint compound, and the fastener heads in that face layer must also be covered with joint compound. This finish is part of the tested and codified protective membrane arrangement used when applying the protection-time values for mass timber. The distinction matters because the base layer is an underlying component of a multilayer protective system, while the exposed face layer provides the completed interior surface and is the layer whose joints and fasteners must receive the specified compound treatment. The applicable installation provisions are found in 2021 IBC Section 722.7.2.1, which establishes the fastening, layer-offset, and finishing conditions for Type X gypsum-board protection. See the official [2021 International Building Code, Chapter 7](#) and ICC's [2021 IBC information page](#).

QUESTION NO: 7

Periodic special inspection of sealants or adhesives as specified by the International Building Code Section 703.7 shall be conducted at which of the following locations?

- A. At joints as defined in IBC Section 202.
- B. Where they are a required component of a tested fire-resistance-rated assembly.
- C. At abutting edges and intersections of mass timber building elements required to be fire-resistance rated.
- D. At abutting intersections of mass timber building elements and building elements of other materials where one or the other are required to be fire-resistance rated.

ANSWER: C

Explanation:

At abutting edges and intersections of mass timber building elements required to be fire-resistance rated is correct. Section 703.7 of the 2021 International Building Code requires approved sealant or adhesive at the abutting edges and intersections of mass timber building elements where those elements are required to have a fire-resistance rating. The sealant or adhesive must resist the passage of air, because gaps at these interfaces can adversely affect the continuity and performance of the required fire-resistance-rated construction. Section 1705.20 directly connects this installation requirement to quality assurance in the field by requiring periodic special inspection where the sealants or adhesives prescribed by Section 703.7 are installed. Accordingly, the inspection applies to the rated mass-timber-to-mass-timber edge and intersection locations identified in Section 703.7, rather than to mass timber connections generally. The special inspector verifies that the required material has been installed at the applicable interfaces in accordance with the approved construction documents and the code requirement. See the ICC's [2021 IBC Chapter 7](#) for Section 703.7 and [2021 IBC Chapter 17](#) for the periodic special-inspection provisions in Section 1705.20.

QUESTION NO: 8

Which of the following best describes the required protection for mass timber hoistway enclosure walls in Type IV-C construction?

- A. Noncombustible protection with a minimum 40-minute assigned protection time on both sides of the enclosure
- B. No requirement, but walls must achieve the required fire-resistance rating
- C. Noncombustible protection of at least 1/2 in. gypsum board or equivalent
- D. fire-retardant-treated-wood sheathing, 1/2-inch gypsum board, or a noncombustible material

ANSWER: A

Explanation:

Noncombustible protection with a minimum 40-minute assigned protection time on both sides of the enclosure is required for mass-timber shaft and elevator-hoistway enclosure walls in Type IV-C construction. The Type IV-C provisions permit specified amounts of exposed mass timber, but the code establishes a distinct protective requirement for these enclosure assemblies because they form protected vertical openings and are critical to controlling fire and smoke movement between stories. The required 40 minutes is an *assigned protection time* for the noncombustible protective material, determined using the calculation procedures of Section 722.7; it is not necessarily the total fire-resistance rating of the completed shaft enclosure. The complete wall assembly must also comply with the applicable shaft-enclosure fire-resistance requirements elsewhere in the IBC, including the requirements governing shafts and elevator hoistways. Appropriate protective materials and installation details must therefore provide the stated assigned time while maintaining the assembly's required rating and continuity. The requirement to protect both the interior and exterior faces recognizes that a hoistway enclosure can be exposed to fire from either the shaft side or the occupied-space side. See 2021 IBC Section 602.4.3.6 in [IBC Chapter 6](#) and the assigned-time methods in [IBC Section 722](#).