

Chapter 23 - Wood

Adopt and/or codify entire chapter as amended below:

2001 CBC	PROPOSED ADOPTION	DSA-SS	COMMENTARY
	Adopt entire chapter without amendments		
	Adopt entire chapter with amendments listed below	X	
	Adopt only those sections listed below		
2316A.2	2303.1.3.1 CA	X	Amendment clarifies requirements per code-referenced standards for glue-laminated beam design and fabrication.
2318A.7	2303.4.3 CA	X	Amendment clarifies requirements per code-referenced standards for truss design and fabrication.
2320A.6 2320A.11	2304.3.4 CA	X	Amendment continues minimum requirements for wall framing per 2001 CBC that are not addressed in Section 2308 for wood frame school buildings.
2320A.8 2320A.12	2304.4.1 CA	X	Amendment continues minimum requirements for floor and roof framing per 2001 CBC that are not addressed in Section 2308 for wood frame school buildings.
-	2304.5 CA	X	Editorial
2318A.3.4	2304.9.1.1 CA	X	Amendment clarifies requirements for corrosion resistant fasteners used to attach exterior wood wall coverings, in accordance with recognized national standards.
2306A.4	2304.11.2.2 Exception CA	X	Amendment continues current acceptance of a paved mow strip at exterior wood frame walls if 6" clearance to sill plate is provided.
-	2305.1.1 CA	X	Amendment addresses differences between AF&PA SDPWS, IBC and DSA amendments.
2315A.3.3	2305.2.4.2 CA	X	Amendment continues current requirement per 2001 CBC and maintains statewide consistency for stock or reuse plans and modular/relocatable construction. Otherwise, the requirements vary significantly depending on the project Seismic Design Category (D, E or F).
Table 23A-II-I-1	Table 2306.4.1 footnote m. CA	X	See 2305.2.4.2 CA above.
2513 (not adopted by DSA-SS)	2306.4.5 Exception CA	X	Amendment maintains current requirement per 2001 CBC and maintains statewide consistency for stock or reuse plans and modular/relocatable construction. Otherwise, the requirements vary significantly depending on the project Seismic Design Category (D, E or F).
2320A	2308.2, item 6 exception & item 8 CA	X	Amendments clarify the application of conventional construction provisions for state essential bldgs & public school construction.

Legend for Express Terms:

1. 2006 IBC model code language appears in Times Roman font.
2. DSA-SS amendments appear in *Arial font, italicized and underlined.*

Express Terms	Commentary
<p>SECTION 2301 GENERAL</p> <p>2301.1 Scope. The provisions of this chapter shall govern the materials, design, construction and quality of wood members and their fasteners.</p> <p>2301.2 General design requirements. The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:</p> <ol style="list-style-type: none"> 1. Allowable stress design in accordance with Sections 2304, 2305 and 2306. 2. Load and resistance factor design in accordance with Sections 2304, 2305 and 2307. 3. Conventional light-frame construction in accordance with Sections 2304 and 2308. <p>...</p> <p>SECTION 2302 DEFINITIONS</p> <p>2302.1 Definitions. The following words and terms shall, for the purposes of this chapter, have the meanings shown herein.</p> <p>...</p> <p>SECTION 2303 MINIMUM STANDARDS AND QUALITY</p> <p>2303.1 General.</p> <p>...</p> <p>2303.1.1 Sawn lumber.</p> <p>...</p> <p>2303.1.2 Prefabricated wood I-joists.</p> <p>...</p> <p>2303.1.3 Structural glued-laminated timber. Glued-laminated timbers shall be manufactured and identified as required in AITC A190.1 and ASTM D 3737.</p> <p><u><i>2303.1.3.1 Additional Requirements. For public elementary and secondary schools, community colleges, and state essential services buildings, the construction documents shall indicate the following:</i></u></p> <ol style="list-style-type: none"> <u><i>1. Dry or wet service conditions (NDS 5.1.4.1)</i></u> <u><i>2. Laminating combinations and stress requirements (NDS 5.1.4.1)</i></u> <u><i>3. Species group (refer to Section 2304.11.3, Tables 2306.3.1 and 2306.3.2 footnote a., and AF&PA SDPWS Tables 4.2A and 4.2B, footnote 2).</i></u> 	<p>2303.1.3.1: Amendment clarifies requirements applicable to glue-laminated timber design, fabrication and handling that are contained elsewhere in this code and in referenced standards. The purpose is to reduce the potential for non-conforming glue laminated timber design and fabrication by consolidating references to applicable code and standard provisions.</p>

4. Preservative material and retention, when preservative treatment is required (refer to Section 2304.11.3 and NDS Section 5.3.11).

5. Provisions for protection during shipping and field handling, such as sealing and wrapping in accordance with AITC 111.

When mechanical reinforcement such as radial tension reinforcement is required, such reinforcement shall comply with AITC 404-92 and shall be detailed accordingly in the construction documents. Construction documents shall specify that the moisture content of laminations at the time of manufacture shall not exceed 12% for dry conditions of use.

The design of fasteners and connections shall comply with AITC 117, Section I, item 6 (Connection Design), and NDS Appendix E.

Refer to Section 1704.6.2 for special inspection requirements during fabrication of structural glued laminated timbers.

2303.1.4 Wood structural panels.

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2303.1.5 Fiberboard.

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2303.1.6 Hardboard.

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2303.1.7 Particleboard.

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2303.1.8 Preservative-treated wood.

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2303.1.9 Structural composite lumber.

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2303.1.10 Structural log members.

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2303.1.11 Round timber poles and piles.

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2303.2 Fire-retardant-treated wood.

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2303.3 Hardwood and plywood.

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2303.4 Trusses.

2303.4.1 Design. Wood trusses shall be designed in accordance with the provisions of this code and accepted engineering practice. Members are permitted to be joined by nails, glue, bolts, timber connectors, metal connector plates or other approved framing devices.

2303.4.1.1 Truss designer. The individual or organization responsible for the design of trusses.

2303.4.1.2 Truss design drawings. The written, graphic and pictorial depiction of each individual truss shall be provided to the building official and approved prior to installation. Truss design drawings shall also be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span and spacing;
2. Location of joints;
3. Required bearing widths;
4. Design loads as applicable;
5. Top chord live load (including snow loads);
6. Top chord dead load;
7. Bottom chord live load;
8. Bottom chord dead load;
9. Concentrated loads and their points of application as applicable;
10. Controlling wind and earthquake loads as applicable;
11. Adjustments to lumber and metal connector plate design value for conditions of use;
12. Each reaction force and direction;
13. Metal connector plate type, size, thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;
14. Lumber size, species and grade for each member;
15. Connection requirements for:
 - 15.1. Truss to truss;
 - 15.2. Truss ply to ply; and
 - 15.3. Field splices.
16. Calculated deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable;
17. Maximum axial tensile and compression forces in the truss members; and
18. Required permanent individual truss member bracing and method per Section 2303.4.1.5, unless a specific truss member permanent bracing plan for the roof or floor structural system is provided by a registered design professional.

Where required by one of the following, each individual truss design drawing

shall bear the seal and signature of the truss designer:

1. Registered design professional; or
2. Building official; or
3. Statutes of the jurisdiction in which the project is to be constructed.

Exceptions:

1. When a cover sheet/truss index sheet combined into a single cover sheet is attached to the set of truss design drawings for the project, the single sheet/truss index sheet is the only document that needs to be signed and sealed within the truss submittal package.
2. When a cover sheet and a truss index sheet are separately provided and attached to the set of truss design drawings for the project, both the cover sheet and the truss index sheet are the only documents that need to be signed and sealed within the truss submittal package.

2303.4.1.3 Truss placement diagram. The truss manufacturer shall provide a truss placement diagram that identifies the proposed location for each individually designated truss and references the corresponding truss design drawing. The truss placement diagram shall be provided as part of the truss submittal package, and with the shipment of trusses delivered to the job site. Truss placement diagrams shall not be required to bear the seal or signature of the truss designer.

Exception: When the truss placement diagram is prepared under the direct supervision of a registered design professional, it is required to be signed and sealed.

2303.4.1.4 Truss submittal package. The truss submittal package shall consist of each individual truss design drawing, the truss placement diagram for the project, the truss member permanent bracing specification and, as applicable, the cover sheet/truss index sheet.

2303.4.1.5 Truss member permanent bracing. Where permanent bracing of truss members is required on the truss design drawings, it shall be accomplished by one of the following methods:

1. The trusses shall be designed so that the buckling of any individual truss member can be resisted internally by the structure (e.g. buckling member T-bracing, L-bracing, etc.) of the individual truss. The truss individual member buckling reinforcement shall be installed as shown on the truss design drawing or on supplemental truss member buckling reinforcement diagrams provided by the truss designer.
2. Permanent bracing shall be installed using standard industry bracing details that conform with generally accepted engineering practice. Individual truss member continuous lateral bracing location(s) shall be shown on the truss design drawing.

2303.4.1.6 Anchorage. All transfer of loads and anchorage of each truss to the supporting structure is the responsibility of the registered design professional.

2303.4.1.7 Alterations to trusses. Truss members and components shall not be cut, notched, drilled, spliced or otherwise altered in any way without written concurrence and approval of a registered design professional.

Alterations resulting in the addition of loads to any member (e.g., HVAC equipment, water heater) shall not be permitted without verification that the truss is capable of supporting such additional loading.

2303.4.2 Metal-plate-connected trusses. In addition to Sections 2303.4.1 through 2303.4.1.7, the design, manufacture and quality assurance of metal-plate-connected wood trusses shall be in accordance with TPI 1. Manufactured trusses shall comply with Section 1704.6 as applicable.

2303.4.3 Additional Requirements. For public elementary and secondary schools, community colleges, and state essential services buildings, the use of wood trusses shall be in accordance with the following:

1. The construction documents shall indicate all requirements for the truss design, including:

1.1 Truss profiles and layout, including girder truss locations.

1.2 Design loads, support reactions, uplift or lateral connection forces, and deflection criteria.

1.3 Connection details to structural and non-structural elements (e.g. non-bearing partitions).

1.4 Bridging and bracing attachments to supporting structural elements.

1.5 Wood species and minimum grade (refer to Section 2304.11.3, Tables 2306.3.1 and 2306.3.2 footnote a., and AF&PA SDPWS Tables 4.2A and 4.2B, footnote 2).

1.6 For metal plate connected wood trusses, also refer to ANSI/TPI 1, Section 2.2.

2. Truss design drawings and engineering analysis shall comply with Section 2303.4.1, and Section 2303.4.2 for metal-plate connected trusses. Each truss design drawing or sheet shall bear the signature and stamp or seal of the registered engineer or licensed architect responsible for the truss design.

3. Requirements for Approval.

The truss design drawings and engineering analysis shall be provided to the enforcement agency and approved prior to truss fabrication, in accordance with Title 24, Part 1, Section 4-317 (g). Alterations to the approved truss design drawings or fabricated trusses are subject to the approval of the enforcement agency.

4. Special Inspection of Truss Fabrication.

Refer to Section 1704.6.2 for special inspection requirements during the fabrication of manufactured trusses.

2303.5 Test standard for joist hangers and connectors.

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2303.6 Nails and staples.

2303.4.3:

Amendment clarifies requirements applicable to wood truss design and fabrication inspection that are contained elsewhere in this code and in referenced standards. The purpose is to reduce the potential for non-conforming truss design and fabrication by consolidating references to applicable code and standard provisions.

Substantial revisions of existing DSA amendments regarding wood trusses are proposed. The 2006 IBC model code contains significant new provisions for trusses, addressing requirements for permit plans and specs, and truss design drawings and calculations.

Item 1 indicates truss design requirements that must be specified on the construction documents, in accordance with TPI 1 Sec. 2.2, and as necessary for DSA to complete the plan review and approval process.

Item 2 clarifies requirements of CA law applicable to design professionals responsible for preparation of truss design drawings.

Item 3 clarifies requirements for deferred submittal of truss design drawings and calculations by referencing to Section 4-317 (g) of Part 1, Title 24. The deferred approval process allows for enforcement agency review & approval of the selected truss manufacturer's design.

If a deferred approval process is not employed, a specific manufacturer's truss design must be included in the construction documents (permit or contract

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2303.7 Shrinkage.

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SECTION 2304 GENERAL CONSTRUCTION REQUIREMENTS

2304.1 General. The provisions of this section apply to design methods specified in Section 2301.2.

2304.2 Size of structural members. Computations to determine the required sizes of members shall be based on the net dimensions (actual sizes) and not nominal sizes.

2304.3 Wall framing. The framing of exterior and interior walls shall be in accordance with the provisions specified in Section 2308 unless a specific design is furnished.

2304.3.1 Bottom plates. Studs shall have full bearing on a 2-inch-thick (actual 1½-inch, 38 mm) or larger plate or sill having a width at least equal to the width of the studs.

2304.3.2 Framing over openings. Headers, double joists, trusses or other approved assemblies that are of adequate size to transfer loads to the vertical members shall be provided over window and door openings in load-bearing walls and partitions.

2304.3.3 Shrinkage. Wood walls and bearing partitions shall not support more than two floors and a roof unless an analysis satisfactory to the building official shows that shrinkage of the wood framing will not have adverse effects on the structure or any plumbing, electrical or mechanical systems, or other equipment installed therein due to excessive shrinkage or differential movements caused by shrinkage. The analysis shall also show that the roof drainage system and the foregoing systems or equipment will not be adversely affected or, as an alternate, such systems shall be designed to accommodate the differential shrinkage or movements.

2304.3.4 Additional Requirements. For public elementary and secondary schools, community colleges, and state essential services buildings, the following additional requirements apply:

- 1. Engineering analysis shall be furnished demonstrating compliance of wall framing elements and connections with Section 2301.2, Item 1 or 2.**
- 2. Construction documents shall include detailing of sill plate anchorage to supporting masonry or concrete for all exterior and interior bearing, non-bearing and shear walls.**

Unless specifically designed, sills under exterior walls, bearing walls and shear walls may be bolted to masonry or concrete with 5/8" diameter by 12 inch (16 mm by 305 mm) bolts spaced not more than four (4) feet (1219 mm) on center, with a minimum of two (2) bolts for each piece of sill plate. Anchor bolts shall have a 4 inch minimum and a 12 inch maximum clearance to the end of the sill plate, and 7 inch minimum embedment into concrete or masonry.

Sill plates under non-bearing interior walls and partitions on

plans & specs). This may be problematic if the selected manufacturer, based on award of contract, is not the manufacturer whose trusses were detailed on the contract plans. DSA has determined that the code can not be amended to require the construction documents (e.g. permit / contract plans) to include one manufacturer's truss design, due to potential conflict with Public Contract Code laws that apply to public schools.

2304.3.4:
Amendment continues minimum requirements for wall framing per 2001 CBC that are not addressed in Section 2308 for wood frame school buildings.

concrete floor slabs may be anchored at not more than four (4) feet (1219 mm) on center to resist a minimum allowable stress shear of 100 pounds per linear foot (0.7 kN/m) acting either parallel or perpendicular to the wall.

3. Construction documents shall include detailing and limitations for notches and bored holes in wall studs, plates and sills. Refer to Sections 2308.9.10 and 2308.9.11 for code-prescribed limitations.

2304.4 Floor and roof framing. The framing of wood-joisted floors and wood framed roofs shall be in accordance with the provisions specified in Section 2308 unless a specific design is furnished.

2304.4.1 Additional Requirements. For public elementary and secondary schools, community colleges, and state essential services buildings, the following are required:

1. Engineering analysis shall be furnished demonstrating compliance of floor, roof and ceiling framing elements and connections with Section 2301.2, Item 1 or 2.

2. Construction documents shall include detailing and limitations for notches and bored holes in floor and roof framing members. Refer to Section 2308.10.4.2 and NDS Section 4.4.3.

2304.5 Framing around flues and chimneys. Combustible framing shall be a minimum of 2 inches (51 mm), but shall not be less than the distance specified in Sections 2111 and 2113 and the *International California Mechanical Code*, from flues, chimneys and fireplaces, and 6 inches (152 mm) away from flue openings.

2304.6 Wall sheathing. Except as provided for in Section 1405 for weatherboarding or where stucco construction that complies with Section 2510 is installed, enclosed buildings shall be sheathed with one of the materials of the nominal thickness specified in Table 2304.6 or any other approved material of equivalent strength or durability.

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2304.6.1 Wood structural panel sheathing.

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2304.6.2 Interior paneling.

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2304.7 Floor and roof sheathing.

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2304.8 Lumber decking.

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2304.9 Connections and fasteners.

2304.9.1 Fastener requirements. Connections for wood members shall be designed in accordance with the appropriate methodology in Section 2301.2. The

2304.4.1:

Amendment continues minimum requirements for floor and roof framing per 2001 CBC that are not addressed in Section 2308 for wood frame school buildings.

number and size of fasteners connecting wood members shall not be less than that set forth in Table 2304.9.1.

2304.9.1.1 Additional Requirements. *For public elementary and secondary schools, community colleges, and state essential services buildings, fasteners used for the attachment of exterior wall coverings shall be of hot-dipped zinc-coated galvanized steel, mechanically deposited zinc-coated steel, stainless steel, silicon bronze or copper. The coating weights for hot-dipped zinc-coated fasteners shall be in accordance with ASTM A 153. The coating weights for mechanically deposited zinc coated fasteners shall be in accordance with ASTM B 695, Class 55 minimum.*

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2304.9.2 Sheathing fasteners. Sheathing nails or other approved sheathing connectors shall be driven so that their head or crown is flush with the surface of the sheathing.

2304.9.3 Joist hangers and framing anchors. Connections depending on joist hangers or framing anchors, ties and other mechanical fastenings not otherwise covered are permitted where approved. The vertical load-bearing capacity, torsional moment capacity and deflection characteristics of joist hangers shall be determined in accordance with Section 1715.1.

2304.9.4 Other fasteners. Clips, staples, glues and other approved methods of fastening are permitted where approved.

2304.9.5 Fasteners in preservative-treated and fire-retardant-treated wood. Fasteners for preservative- treated and fire-retardant-treated wood shall be of hot dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. The coating weights for zinc-coated fasteners shall be in accordance with ASTM A 153.

Exception: Fasteners other than nails, timber rivets, wood screws and lag screws shall be permitted to be of mechanically deposited zinc coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum.

Fastenings for wood foundations shall be as required in AF&PA Technical Report No. 7.

2304.9.6 Load path. Where wall framing members are not continuous from foundation sill to roof, the members shall be secured to ensure a continuous load path. Where required, sheet metal clamps, ties or clips shall be formed of galvanized steel or other approved corrosion-resistant material not less than 0.040 inch (1.01 mm) nominal thickness.

2304.9.7 Framing requirements. Wood columns and posts shall be framed to provide full end bearing. Alternatively, column-and-post end connections shall be designed to resist the full compressive loads, neglecting end-bearing capacity. Column-and-post end connections shall be fastened to resist lateral and net induced uplift forces.

2304.10 Heavy timber construction.

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2304.11 Protection against decay and termites.

2304.11.1 General. Where required by this section, protection from decay and termites shall be provided by the use of naturally durable or preservative-treated

2304.9.1.1:

Amendment clarifies requirements for corrosion resistant fasteners used to attach exterior wood wall coverings, in accordance with recognized national standards.

wood.

2304.11.2 Wood used above ground. Wood used above ground in the locations specified in Sections 2304.11.2.1 through 2304.11.2.7, 2304.11.3 and 2304.11.5 shall be naturally durable wood or preservative-treated wood using water-borne preservatives, in accordance with AWWA U1 (Commodity Specifications A or F) for above-ground use.

2304.11.2.1 Joists, girders and subfloor. Where wood joists or the bottom of a wood structural floor without joists are closer than 18 inches (457 mm), or wood girders are closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation, the floor assembly (including posts, girders, joists and subfloor) shall be of naturally durable or preservative-treated wood.

2304.11.2.2 Wood supported by exterior foundation walls. Wood framing members, including wood sheathing, that rest on exterior foundation walls and are less than 8 inches (203 mm) from exposed earth shall be of naturally durable or preservative-treated wood.

Exception: *For public elementary and secondary schools, community colleges, and state essential services buildings, at exterior walls where the earth is paved with an asphalt or concrete slab at least 18 inches (457 mm) wide and draining away from the building, the bottom of sills may be 6 inches (152 mm) above the top of such slab. Other equivalent means of protection may be accepted by the enforcement agency.*

2304.11.2.3 Exterior walls below grade. Wood framing members and furring strips attached directly to the interior of exterior masonry or concrete walls below grade shall be of approved naturally durable or preservative-treated wood.

2304.11.2.4 Sleepers and sills. Sleepers and sills on a concrete or masonry slab that is in direct contact with earth shall be of naturally durable or preservative-treated wood.

2304.11.2.5 Girder ends. The ends of wood girders entering exterior masonry or concrete walls shall be provided with a 1/2-inch (12.7 mm) air space on top, sides and end, unless naturally durable or preservative-treated wood is used.

2304.11.2.6 Wood siding. Clearance between wood siding and earth on the exterior of a building shall not be less than 6 inches (152 mm) except where siding, sheathing and wall framing are of naturally durable or preservative-treated wood.

2304.11.2.7 Posts or columns. Posts or columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be of naturally durable or preservative-treated wood.

Exceptions:

1. Posts or columns that are either exposed to the weather or located in basements or cellars, supported by concrete piers or metal pedestals projected at least 1 inch (25 mm) above the slab or deck and 6 inches (152 mm) above exposed earth, and are separated therefrom by an

230411.2.2 - Exception:
Amendment continues current acceptance of a paved mow strip at exterior wood frame walls if 6" clearance to sill plate is provided.

impervious moisture barrier.

2. Posts or columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building, supported by a concrete pier or metal pedestal at a height greater than 8 inches (203 mm) from exposed ground, and are separated therefrom by an impervious moisture barrier.

2304.11.3 Laminated timbers. The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not fully protected from moisture by a roof, eave or similar covering shall be pressure treated with preservative or be manufactured from naturally durable or preservative-treated wood.

2304.11.4 Wood in contact with the ground or fresh water. Wood used in contact with the ground (exposed earth) in the locations specified in Sections 2304.11.4.1 and 2304.11.4.2 shall be naturally durable (species for both decay and termite resistance) or preservative treated using water-borne preservatives in accordance with AWPA U1 (Commodity Specifications A or F) for soil or fresh water use.

Exception: Untreated wood is permitted where such wood is continuously and entirely below the ground-water level or submerged in fresh water.

2304.11.4.1 Posts or columns. Posts and columns supporting permanent structures that are embedded in concrete that is in direct contact with the earth, embedded in concrete that is exposed to the weather or in direct contact with the earth shall be of preservative-treated wood.

2304.11.4.2 Wood structural members. Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or preservative-treated wood unless separated from such floors or roofs by an impervious moisture barrier.

2304.11.5 Supporting member for permanent appurtenances. Naturally durable or preservative-treated wood shall be utilized for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering to prevent moisture or water accumulation on the surface or at joints between members.

Exception: When a building is located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use durable materials where the structure is exposed to the weather.

2304.11.6 Termite protection. In geographical areas where hazard of termite damage is known to be very heavy, wood floor framing shall be of naturally durable species (termite resistant) or preservative treated in accordance with AWPA U1 for the species, product preservative and end use or provided with approved methods of termite protection.

2304.11.7 Wood used in retaining walls and cribs. Wood installed in retaining or crib walls shall be preservative treated in accordance with AWPA U1 (Commodity Specifications A or F) for soil and fresh water use.

2304.11.8 Attic ventilation. For attic ventilation, see Section 1203.2.

2304.11.9 Under-floor ventilation (crawl space). For under-floor ventilation

(crawl space), see Section 1203.3.

2304.12 Long-term loading. Wood members supporting concrete, masonry or similar materials shall be checked for the effects of long-term loading using the provisions of the AF&PA NDS. The total deflection, including the effects of long-term loading, shall be limited in accordance with Section 1604.3.1 for these supported materials.

Exception: Horizontal wood members supporting masonry or concrete nonstructural floor or roof surfacing not more than 4 inches (102 mm) thick need not be checked for long-term loading.

SECTION 2305 GENERAL DESIGN REQUIREMENTS FOR LATERAL-FORCE-RESISTING SYSTEMS

2305.1 General. Structures using wood shear walls and diaphragms to resist wind, seismic and other lateral loads shall be designed and constructed in accordance with the provisions of this section. Alternatively, compliance with the AF&PA SDPWS shall be permitted subject to the limitations therein and the limitations of this code.

2305.1.1 Additional Requirements: *For public elementary and secondary schools, community colleges, and state essential services buildings, the following limitations shall apply:*

- 1. Refer to Sections 1613.5.6.3 and 1614.1, which require any structure to be assigned to seismic design category "D", unless otherwise required by this code or ASCE 7 to be assigned to seismic design category E or F.**
- 2 Straight-sheathed horizontal lumber diaphragms are not permitted.**
- 3 Gypsum-based sheathing shear walls and portland cement plaster shear walls are not permitted for the seismic force-resisting system of buildings or structures assigned to Occupancy Category III or IV, or buildings designed to be relocatable. Refer to Section 1614.1 for limitations on the use of seismic force-resisting systems per items A.14 and B.24 in Table 12.2-1 of ASCE 7.**
- 4 Shear wall foundation anchor bolt washers (refer to Section 4.3.6.4.3 of the SDPWS) shall conform with the requirements of Section 2305.3.11 of this chapter.**
- 5 The engineering analysis shall include a statement indicating whether the lateral force-resisting system has been designed in accordance with Section 2305 or the AF&PA SDPWS and the limitations of this code.**

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2305.2 Design of wood diaphragms.

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2305.2.4 Construction. Wood diaphragms shall be constructed of wood structural panels manufactured with exterior glue and not less than 4 feet by 8 feet (1219 mm by 2438 mm), except at boundaries and changes in framing where minimum sheet dimension shall be 24 inches (610 mm) unless all edges of the undersized

2305.1.1:

Amendment addresses differences between AF&PA SDPWS standard, IBC and pertinent DSA amendments in Chapter 16 regarding wind/seismic design.

sheets are supported by and fastened to framing members or blocking. Wood structural panel thickness for horizontal diaphragms shall not be less than the values set forth in Tables 2304.7(3), 2304.7(4) and 2304.7(5) for corresponding joist spacing and loads.

2305.2.4.1 Seismic Design Category F. Structures assigned to Seismic Design Category F shall conform to the additional requirements of this section.

Wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic-force-resisting system shall be applied directly to the framing members.

Exception: Wood structural panel sheathing in a diaphragm is permitted to be fastened over solid lumber planking or laminated decking, provided the panel joints and lumber planking or laminated decking joints do not coincide.

2305.2.4.2 Additional Requirements. *For public elementary and secondary schools, community colleges, and state essential services buildings, any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic force-resisting system shall be applied directly to framing members.*

Exception: *Wood structural panel sheathing in a diaphragm is permitted to be fastened over solid lumber planking or laminated decking, provided the panel joints and lumber planking or laminated decking joints do not coincide.*

2305.2.5 Rigid diaphragms.

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2305.3 Design of wood shear walls.

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SECTION 2306 ALLOWABLE STRESS DESIGN

2306.1 Allowable stress design.

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2306.2 Wind provisions for walls.

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2306.3 Wood diaphragms.

2306.3.1 Wood structural panel diaphragms.

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2306.3.2 Shear Capacities modifications

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2306.3.3 Diagonally sheathed lumber diaphragms.

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2306.3.4 Single diagonally sheathed lumber diaphragms.

2305.2.4.2:

Amendment maintains current requirement per 2001 CBC and maintains statewide consistency regarding the application of wood structural panel sheathing to wood framing for stock or reuse plans and modular / relocatable construction, regardless of project location or occupancy.

Also see footnote "m" of Table 2306.4.1

<p>...</p> <p>2306.3.5 Double diagonally sheathed lumber diaphragms.</p> <p>...</p> <p>2306.3.6 Gypsum board diaphragm ceilings</p> <p>...</p> <p>2306.4 Shear walls. Panel sheathing joints in shear walls shall occur over studs or blocking. Adjacent panel sheathing joints shall occur over and be nailed to common framing members (see Section 2305.3.1 for limitations on shear wall bracing materials).</p> <p>2306.4.1 Wood structural panel shear walls. The allowable shear capacities for wood structural panel shear walls shall be in accordance with Table 2306.4.1. These capacities are permitted to be increased 40 percent for wind design. Shear walls are permitted to be calculated by principles of mechanics without limitations by using values for nail strength given in the AF&PA NDS and wood structural panel design properties given in the <i>APA Panel Design Specification</i>.</p>	
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TABLE 2306.4.1 ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE^a FOR WIND OR SEISMIC LOADING^{b, h, i, j, l, m}

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM FASTENER PENETRATION IN FRAMING (inches)	PANELS APPLIED DIRECT TO FRAMING				PANELS APPLIED OVER 1/2" OR 5/8" GYPSUM SHEATHING ^m					
			NAIL (common or galvanized box) or staple size ^k	Fastener spacing at panel edges (inches)			NAIL (common or galvanized box) or staple size ^k	Fastener spacing at panel edges (inches)				
				6	4	3		2 ^e	6	4	3	2 ^e
Structural I Sheathing	5/16	1 1/4	6d (2x0.113" common, 2" x0.099" galvanized box)	200	300	390	510	8d (2 1/2" x0.131" common, 2 1/2" x0.113" galvanized box)	200	300	390	510
			1 1/2 16 Gage	165	245	325	415	2 16 Gage	125	185	245	315
	7/16	1 3/8	8d (2 1/2" x0.131" common, 2 1/2" x0.113" galvanized box)	230 ^d	360 ^d	460 ^d	610 ^d	10d (3" x0.148" common, 3" x0.128" galvanized box)	280	430	550 ^f	730
			1 1/2 16 Gage	155	235	315	400	2 16 Gage	155	235	310	400
15/32	1	1 3/8	8d (2 1/2" x0.131" common, 2 1/2" x0.113" galvanized box)	255 ^d	395 ^d	505 ^d	670 ^d	10d (3" x0.148" common, 3" x0.128" galvanized box)	280	430	550 ^f	730
			1 1/2 16 Gage	170	260	345	440	2 16 Gage	155	235	310	400
	1	1 3/8	8d (2 1/2" x0.131" common, 2 1/2" x0.113" galvanized box)	280	430	550	730	10d (3" x0.148" common, 3" x0.1218" galvanized box)	280	430	550 ^f	730
			1 1/2 16 Gage	185	280	375	475	2 16 Gage	155	235	300	400

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	1	1 1/2 16 Gage	170	255	335	430	2 16 Gage	140	210	280	360
19/32	1 1/2	10d (3" x0.148"common, 3" x0.128"galvanized box)	340	510	665 ^f	870	—	—	—	—	—
	1	1 3/4 16 Gage	185	280	375	475	—	—	—	—	—
		Nail Size (galvanized casing)					Nail Size (galvanized casing)				
5/16 ^c	1 1/4	6d (2" x0.099")	140	210	275	360	8d (2 1/2" x0.113")	140	210	275	360
3/8	1 3/8	8d (2 1/2" x0.113")	160	240	310	410	10d (3" x0.128")	160	240	310 ^f	410

(continued)

Notes to Table 2306.4.1

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

a. For framing of other species: (1) Find specific gravity for species of lumber in AF&PA NDS. (2) For staples find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species. (3) For nails find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = $[1 - (0.5 - SG)]$, where SG = Specific Gravity of the framing lumber. This adjustment factor shall not be greater than 1.

b. Panel edges backed with 2-inch nominal or wider framing. Install panels either horizontally or vertically. Space fasteners maximum 6 inches on center along intermediate framing members for $\frac{3}{8}$ -inch and $\frac{7}{16}$ -inch panels installed on studs spaced 24 inches on center. For other conditions and panel thickness, space fasteners maximum 12 inches on center on intermediate supports.

c. $\frac{3}{8}$ -inch panel thickness or siding with a span rating of 16 inches on center is the minimum recommended where applied direct to framing as exterior siding.

d. Allowable shear values are permitted to be increased to values shown for $\frac{15}{32}$ -inch sheathing with same nailing provided (a) studs are spaced a maximum of 16 inches on center, or (b) panels are applied with long dimension across studs.

e. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails shall be staggered where nails are spaced 2 inches on center.

f. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails shall be staggered where both of the following conditions are met: (1) 10d (3" x 0.148") nails having penetration into framing of more than 1 $\frac{1}{2}$ inches and (2) nails are spaced 3 inches on center.

g. Values apply to all-veneer plywood. Thickness at point of fastening on panel edges governs shear values.

h. Where panels applied on both faces of a wall and nail spacing is less than 6 inches o.c. on either side, panel joints shall be offset to fall on different framing members, or framing shall be 3-inch nominal or thicker at adjoining panel edges and nails on each side shall be staggered.

i. In Seismic Design Category D, E or F, where shear design values exceed 350 pounds per linear foot, all framing members receiving edge nailing from abutting panels shall not be less than a single 3-inch nominal member, or two 2-inch nominal members fastened together in accordance with Section 2306.1 to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered in all cases. See Section 2305.3.11 for sill plate size and anchorage requirements.

j. Galvanized nails shall be hot dipped or tumbled.

k. Staples shall have a minimum crown width of $\frac{7}{16}$ inch and shall be installed with their crowns parallel to the long dimension of the framing members.

l. For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

m. For public elementary and secondary schools, community colleges, and state essential services buildings, refer to Section 2305.2.4.2, which requires any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic force-resisting system to be applied directly to framing members.

See 2305.2.4.2 CA above.

2306.4.2 Lumber sheathed shear walls. Single and double diagonally sheathed lumber diaphragms are permitted using the construction and allowable load provisions of Sections 2306.3.4 and 2306.3.5.

2306.4.3 Particleboard shear walls

...

2306.4.4 Fiberboard shear walls.

...

2306.4.5 Shear walls sheathed with other materials. Shear capacities for walls sheathed with lath, plaster or gypsum board shall be in accordance with Table 2306.4.5. Shear walls sheathed with lath, plaster or gypsum board shall be constructed in accordance with Chapter 25 and Section 2306.4.5.1. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7.

Exception: *For public elementary and secondary schools, community colleges, and state essential services buildings, refer to Section 1614.1, which does not permit the use of shear wall assemblies per Section 2306.4.5 within the seismic force-resisting system of buildings or structures assigned to Occupancy Category III or IV, or buildings designed to be relocatable.*

...

SECTION 2307 LOAD AND RESISTANCE FACTOR DESIGN

2307.1 Load and resistance factor design. The structural analysis and construction of wood elements and structures using load and resistance factor design shall be in accordance with AF&PA NDS.

2307.1.1 Wood structural panel shear walls. In Seismic Design Category D, E or F, where shear design values exceed 490 pounds per foot (7154 N/m), all framing members receiving edge nailing from abutting panels shall not be less than a single 3-inch (76 mm) nominal member or two 2-inch (51 mm) nominal members fastened together in accordance with AF&PA NDS to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered in all cases. See Section 2305.3.11 for sill plate size and anchorage requirements.

SECTION 2308 CONVENTIONAL LIGHT-FRAME CONSTRUCTION

2308.1 General. The requirements of this section are intended for conventional light-frame construction. Other methods are permitted to be used, provided a satisfactory design is submitted showing compliance with other provisions of this code. Interior nonload-bearing partitions, ceilings and curtain walls of conventional light-frame construction are not subject to the limitations of this section. Alternatively, compliance with AF&PA WFCM shall be permitted subject to the limitations therein and the limitations of this code. Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane in height with a separate means of egress and their accessory structures shall comply with the *International Residential Code*.

2308.1.1 Portions exceeding limitations of conventional construction. When portions of a building of otherwise conventional construction exceed the limits of Section 2308.2, these portions and the supporting load path shall be designed in accordance with accepted engineering practice and the provisions of this code.

2306.4.5 Exception:

Amendment maintains current requirement, per 2001 CBC, and maintains statewide consistency for stock or reuse plans and modular/relocatable construction.

Without this amendment, shear wall assemblies, per Section 2306.4.5 (gypsum board, plaster), could be used in seismic design category D (if building is greater than 35' in height), but could not be used in seismic design categories E or F.

This amendment would maintain the current requirement for ductile shear wall systems, which are expected to endure moderate or larger seismic forces with minimal damage, facilitating continued use or minimal post-disaster disruption of occupancy. This requirement would apply to any state essential facility or school building with an occupant load greater than 250.

For the purposes of this section, the term “portions” shall mean parts of buildings containing volume and area such as a room or a series of rooms.

2308.2 Limitations. Buildings are permitted to be constructed in accordance with the provisions of conventional light-frame construction, subject to the following limitations, and to further limitations of Sections 2308.11 and 2308.12.

1. Buildings shall be limited to a maximum of three stories above grade. For the purposes of this section, for buildings in Seismic Design Category D or E as determined in Section 1613, cripple stud walls shall be considered to be a story.

Exception: Solid blocked cripple walls not exceeding 14 inches (356 mm) in height need not be considered a story.

2. Bearing wall floor-to-floor heights shall not exceed a stud height of 10 feet (3048 mm) plus a height of floor framing not to exceed 16 inches (406 mm).
3. Loads as determined in Chapter 16 shall not exceed the following:
 - 3.1. Average dead loads shall not exceed 15 psf (718 N/m²) for combined roof and ceiling, exterior walls, floors and partitions.

Exceptions:

1. Subject to the limitations of Sections 2308.11.2 and 2308.12.2, stone or masonry veneer up to the lesser of 5 inches (127 mm) thick or 50 psf (2395 N/m²) and installed in accordance with Chapter 14 is permitted to a height of 30 feet (9144 mm) above a noncombustible foundation, with an additional 8 feet (2438 mm) permitted for gable ends.
 2. Concrete or masonry fireplaces, heaters and chimneys shall be permitted in accordance with the provisions of this code.
- 3.2. Live loads shall not exceed 40 psf (1916 N/m²) for floors.
- 3.3. Ground snow loads shall not exceed 50 psf (2395 N/m²).
4. Wind speeds shall not exceed 100 miles per hour (mph) (44 m/s) (3-second gust).

Exception: Wind speeds shall not exceed 110 mph (48.4 m/s) (3-second gust) for buildings in Exposure Category B.
5. Roof trusses and rafters shall not span more than 40 feet (12 192 mm) between points of vertical support.
6. The use of the provisions for conventional light-frame construction in this section shall not be permitted for Occupancy Category IV buildings assigned to Seismic Design Category B, C, D, E or F, as determined in Section 1613.

Exception: For public elementary and secondary schools, community colleges, and state essential services buildings, the use of conventional light-frame construction provisions in this section is permitted in accordance with item 8 below.

7. Conventional light-frame construction is limited in irregular structures in Seismic Design Category D or E, as specified in Section 2308.12.6.

2308.2 Item 6 Exception:

Amendment clarifies the application of conventional construction provisions for state essential services buildings (which are under DSA-SS jurisdiction), in accordance with Item 8 below.

8. For public elementary and secondary schools, community colleges, and state essential services buildings, the use of conventional light-frame construction provisions in this section is permitted, subject to the following conditions:

1. The design and construction shall also comply with Section 2304 and Section 2305.
2. In conjunction with the use of provisions in Section 2308.3 (Braced Wall Lines), engineering analysis shall be furnished that demonstrates compliance of lateral-force-resisting systems with Section 2305.
3. In addition to the use of provisions in Section 2308.8 (Floor Joists), engineering analysis shall be furnished that demonstrates compliance of floor framing elements and connections with Section 2301.2, Item 1 or 2.
4. In addition to the use of provisions in Section 2308.9 (Wall Framing), engineering analysis shall be furnished that demonstrates compliance of wall framing elements and connections with Section 2301.2, Item 1 or 2.
5. In addition to the use of provisions in Section 2308.10 (Roof and Ceiling Framing), engineering analysis shall be furnished demonstrating compliance of roof and ceiling framing elements and connections with Section 2301.2, Item 1 or 2.

2308.2.1 Basic wind speed greater than 100 mph (3-second gust). Where the basic wind speed exceeds 100 mph (3-second gust), the provisions of either AF&PA WFCM, or the SBCCI SSTD 10 are permitted to be used.

2308.2.2 Buildings in Seismic Design Category B, C, D or E. Buildings of conventional light-frame construction in Seismic Design Category B or C, as determined in Section 1613, shall comply with the additional requirements in Section 2308.11.

Buildings of conventional light-frame construction in Seismic Design Category D or E, as determined in Section 1613, shall comply with the additional requirements in Section 2308.12.

2308.3 Braced wall lines.

...

2308.4 Design of elements.

...

2308.5 Connections and fasteners.

...

2308.6 Foundation plates or sills.

...

2308.7 Girders.

2308.2 Item 8:

Revision of current amendment clarifies the acceptable use of conventional construction provisions for state essential services buildings and public schools.

These provisions include prescriptive construction provisions that are commonly referenced or used in whole or part, such as Sec. 2308.6 sill plate anchorage, Sec. 2308.8.2 floor framing details, and Sec. 2308.9.2 wall framing.

The use of prescriptive structural design provisions in Sec. 2308 for wall, floor and roof framing, and seismic/wind load-resisting systems within Sec. 2308 are intended for light-frame construction of typically dwelling-type occupancies.

These structural design provisions would have very limited, if any, application to public schools and state essential facilities. In addition, Title 24, Part 1 requires complete structural analysis for gravity load and lateral load resisting systems.

<p>...</p> <p>2308.8 Floor joists.</p> <p>...</p> <p>2308.9 Wall framing.</p> <p>...</p> <p>2308.10 Roof and ceiling framing.</p> <p>...</p> <p>2308.11 Additional requirements for conventional construction in Seismic Design Category B or C.</p> <p>...</p> <p>2308.12 Additional requirements for conventional construction in Seismic Design Category D or E.</p> <p>...</p>	
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