

DESIGN AND CONSTRUCTION GUIDELINES AND STANDARDS

DIVISION 6 • WOODS & PLASTICS

06 10 00 • ROUGH CARPENTRY

SECTION INCLUDES

Dimensional Wood Framing
Sheathing
Prefabricated Trusses
Wood Blocking
Engineered Wood Framing
Termite Shield

RELATED SECTIONS

03 30 00 Concrete
06 20 00 Finish Carpentry
06 50 00 Structural Plastics & Composites
06 65 00 Plastic and Composite Trim
07 62 00 Sheet Metal Trim & Flashing

ABBREVIATIONS-TESTING, CERTIFYING AND GRADING AGENCIES

AITC- American Institute of Timber Construction www.aitc-glulam.org

ALSC- American Lumber Standards Committee www.alsc.org

ANSI- American National Standards Institute www.ansi.org

APA- The Engineered Wood Association, (formerly American Plywood Association) www.apawood.org

AWPA- American Wood Protection Association www.awpa.com

CSA- Canadian Standards Association www.csa.ca

FSC- Forest Stewardship Council www.fscus.org

NIST- National Institute for Standards and Technology www.nist.gov

SFI-Sustainable Forest Initiative www.sfiprogram.org

TPI- Truss Plate Institute www.tpint.org

LOAD CALCULATIONS

DESIGN

Calculate loads and specify the fiber stress for lumber.

Avoid over-designing that will result in unnecessarily high material costs. Spruce, Pine or Fir should be adequate for most conditions; provide a rationale for any other species.

ENVIRONMENTAL ISSUES

PRODUCTS

Use of wood from well-managed forests is preferred. Specify one or more of the following standards: Forest Stewardship Council (FSC); Sustainable Forest Initiative (SFI); or Canadian Standards Association (CSA). Using certified wood encourages a well-managed forest industry.

Look for engineered wood products with certified wood content, recycled or recovered wood, and/or products that are produced within 500 miles of the project site. The use of engineered wood should be evaluated on



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a case-by-case basis as it has many different impacts on a project and on resource usage.



Use products with low VOC content and no added urea formaldehyde. Avoid excessive use of chemicals such as wood preservatives and be attentive to handling requirements for all chemicals.

ENERGY PERFORMANCE



For new construction as well as for renovations, building framing can have a large impact on a building's energy performance. The Energy Star program includes specific requirements in their "Thermal Enclosure System Rater Checklist"

Go to:

http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Thermal_Enclosure_System_Rater_Checklist_Guidebook_Rev04_v5_FIN_AL_508.pdf?9e39-3b1b) for reduced thermal bridging, fully-aligned air barriers, and air sealing. Energy Star details should be integrated into work wherever possible regardless of whether project is aiming for Energy Star rating.

Energy Star details include several options for reduced thermal bridging which impact rough framing design These include continuous, rigid insulation, structural insulated panels (SIPs), insulated concrete forms (ICFs), double wall framing, and "advance framing."

<http://energy.gov/energysaver/articles/advanced-house-framing>

Designers should refer to the Energy Star checklist for more details.

ACOUSTIC (SOUND) SEPARATIONS

The designer must provide wall and floor/ceiling assemblies that provide appropriate sound insulation between units. Provide a minimum of STC 50 rated assemblies between units.

DIMENSIONAL FRAMING

MATERIALS

The following standards apply to the grading, characteristics and design of framing lumber:

- Lumber materials must comply with the most current American Softwood Lumber Standard PS 20, published by NIST; grade stamped.
- Moisture content (MC), must not exceed 19%; *IMPORTANT!* MC15% kiln dried where cladding is to be installed.
- Species need not be specified unless there is a particular structural requirement.

Finger-jointed wood lumber is acceptable for most interior framing except for floor framing and bathroom wall framing. Specify labelled products, certified by an independent ALSC certified lab. By grade:

- Vertical Use Only- No. 1 or No. 2 grade for interior stud use only, where no tension loads exist

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- ❑ Structural Interior Horizontal Structural Elements- No. 1 grade for interior load bearing headers, lintels & beams

The Contractor should submit lumber schedule to the Architect for approval.

TREATED LUMBER

BACKGROUND

The treated wood industry has been undergoing rapid change. Designers are advised to check the latest research reports through www.buildinggreen.com and other industry sources.



Chemical treatment of wood has long raised environmental concerns. By extending the life of wood exposed to weather or moisture, it conserves our wood resources. It does this at the risk of introducing toxic chemicals into the environment, including through direct user contact and through leaching into ground water supplies or into the air when incinerated.

CCA (chromated copper arsenate) treated wood was the industry standard for several decades. It is no longer recommended for residential applications due to the possibility of ingestion through skin contact. 60 billion board feet of this product are in service. As it comes out of service, its disposal presents a major environmental hazard. Disposal of this material should be addressed in the Waste Management Plan. MassDEP requires disposal of PT wood in an approved solid waste facility.

For existing CCA treated wood products remaining in service, the EPA suggests applying penetrating coatings such as oil-based, semi-transparent stains once a year to reduce migration of wood preservative chemicals. Projects involving work associated with existing treated decks or other treated construction should include a requirement to apply preservative coatings in this manner to the associated treated wood.

Alternatives to using treated lumber include naturally decay and insect resistant wood, such as teak, cedar, redwood, cumaru, garapa and ipé. Other alternatives exist in the plastic and composite decking products (See Sections 06 50 00 and 06 65 00). These alternatives are typically significantly more expensive than treated wood.

Decay resistant material is required in the following locations. Use naturally resistant wood, silicate treated wood, or appropriately selected preservative treated wood:

- ❑ Interior and exterior sills on foundations and slabs
- ❑ Exterior exposed framing and covered decking.
- ❑ Wood in contact with concrete and other masonry
- ❑ Ledger boards in exterior masonry walls

MATERIALS

All treated wood products must carry labels identifying preservative treatment type and intended use. See preservative chart below. ACQ and CAB types are recommended by DHCD for most applications.

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Non-Preservative Treatment

Sodium silicate treated wood is a product which appears to have superior characteristics to preservative treated wood, however we do not recommend it's use at this time given it's relatively short period of being in use.

Preservative Treatments

The following chemical preservatives are listed with the American Wood Protection Association (www.awpa.com/references/homeowner.asp), shown here with retention levels required for various uses. Information was excerpted from the AWPA website (partial listing):

Code	Preservative Name	Retention Factor lb/ft³			
		UC2	UC3B	UC4A	UC4B
ACC	Acid Copper Chromate	0.25	0.25	0.50	---
ACQ	Alkaline Copper Quaternary (Type B or C)	0.25	0.25	0.40	0.60
ACQ	Alkaline Copper Quaternary (Type A or D)	0.15	0.15	0.40	0.60
ACZA	Ammoniacal Copper Zinc Arsenate	0.25	0.25	0.40	0.60
CA-B	Copper Azole, Type B	0.10	0.10	0.21	0.31
CA-C	Copper Azole, Type C	0.060	0.060	0.15	0.31
CuN-W	Waterborne Copper Naphthenate	0.070	0.070	0.11	---
CX-A	Copper HDO	0.206	0.206	---	---
SBX	Inorganic Boron (Formosan termites)	0.28	---	---	---

Category **Locations to Use Each Type**

UC2	Interior Damp
UC3B	Exterior Above Ground, Uncoated or Poor Water Runoff
UC4A	Ground Contact, General Use
UC4B	Ground Contact, Heavy Duty

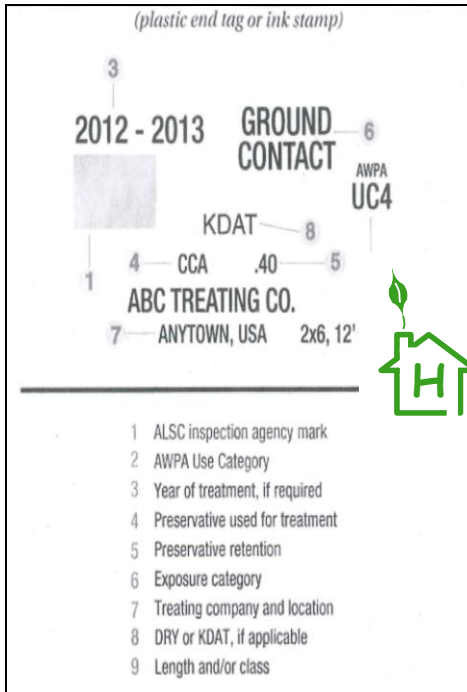
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PRESERVATIVE TREATMENT GRADING

GRADE STAMP BELOW IS COURTESY OF:
ERNFORESTPRODUCTSASSOCIATION



GRADE

Any pressure treated lumber used in an outdoor project must be grademarked by an agency accredited by the American Lumber Standard Committee (ALSC). The grademark indicates that the lumber meets the structural and appearance specifications established for the grade and has been properly seasoned prior to treatment. In addition, the lumber should have a quality mark indicating it has been treated in accordance with the standards set by the American Wood Preservation Association (AWPA). Often the AWPA seal is found on a label located at one end of the board.

Typical grades used in deck construction include Select Structural (the best), No. 1 and No. 2. Most decks are built with either No. 1 or No. 2 grade lumber.

SAFETY PRECAUTIONS

When specifying preservative-treated lumber, also specify the following worker precautions:

- Wash hands after contact;
- Do not allow food to come in contact with the lumber;
- Do not cut the lumber in enclosed spaces;
- Wear gloves and safety goggles while working with the lumber; and
- Never burn treated lumber as it emits toxic gases when burned.

Visual inspection is not an acceptable substitute for a label.

Preservative treatment must comply with AWPA C2 (lumber) and AWPA C9 (plywood). Incising is required for treatment of thin-sapwood species such as douglas-fir, spruce, hemlock and fir.

Arsenic-containing wood preservatives (CCA) are not acceptable.

Preservatives used must be EPA-registered, general use pesticides.

Alkaline Copper Quaternary (ACQ) and Copper Azole (CA) are recommended for all uses where wood will be exposed to high moisture or wet conditions (typically all exterior building components). Variants of these products, such as Micronized Copper Quaternary (MCQ) use very fine particles of copper in suspension rather than copper in solution. These products may not be listed with AWPA, although they have been tested and approved for building code requirements by the International Code Council (ICC).

Acid Copper Chromate (ACC) and Copper HDO (CX-A) should not be used for ground contact, wet, or below ground uses.

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Dipped or heavy brush-coated wood preservative is not acceptable where pressure treatment is required, except at cut ends.

Do not install aluminum flashings in contact with CA or ACQ pressure treated wood. All metal brackets used with these products must be rated for such use.

Boron (SBX) treated lumber is not acceptable for most applications. For limited applications where it is used, such as framing lumber where insect infestation may be a concern, borate pressure-treated wood products shall be minimum .28 pcf retention, (equivalent to a 42 DOT retention), and shall carry a minimum 20 year manufacturer's warranty against termites, carpenter ants and fungal decay.

Untreated fir posts (#1 grade) are an acceptable alternative to pressure treated pine, provided post ends are not in direct contact with concrete or ground and post ends are pre-dipped for 24 -48 hours (8" minimum depth from base), in a non-water soluble, waterproof preservative. Surface brushing is not acceptable.

Fasteners For Pressure-Treated Wood

Use either stainless steel or hot-dipped galvanized fasteners, (meeting ASTM 153) and hot-dipped galvanized connectors, (meeting ASTM-A653), for ACQ and CA pressure-treated wood, (electro-galvanized fasteners are not acceptable as they will be corroded by the chemicals). Consider galvanic action and compatibility of fasteners with the chemicals used to treat the wood.

Where fasteners connecting structural members are exposed to high moisture, or are in contact with ground or concrete, stainless steel fasteners, (Type 304) are strongly recommended.

DEMISING WALLS AND INTERIOR PARTITIONS

DESIGN

For common walls between dwelling units, design assemblies which are tested per ASTM E90 for air borne sound.

In addition, for common ceiling/floor assemblies and for walls between dwellings and public corridors and stairs, design using tested assemblies per ASTM E492 for structure borne sound. Provide details for sound insulation at all penetrations.

Staggered stud and double stud walls must be fire-blocked as required by code, including a minimum of every ten feet horizontally. Fire blocking may be wood, gypsumboard, mineral wool batts, or other approved material. Filling the cavity with spray-applied cellulose may be an acceptable alternative. Mineral wool batts or cellulose are preferred to rigid materials which will transmit structure-borne sound.

Offset electrical outlets and other penetrations in party walls.

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EXECUTION

Include specification requirement that the General Contractor is responsible for maintaining the integrity (including shoring) of the structure where cutting and reframing is necessary.

Panelized interior partitions are not recommended for slabs-on-grade, because they are difficult to level.

SHEATHING

MATERIALS

Plywood must be grade stamped (APA), by the Engineered Wood Association, Teco or Pittsburgh Labs and shall meet the requirements of the latest edition of Voluntary Product Standards PS-1 or PS-2.

Exterior sheathing plywood must be Exposure 1 performance-rated.

Specify sheathing to the span rating and install sheathing with the long dimension (strength axis) of panels across supports- two or more spans. These requirements must also be specified for patching and repairs.

Moisture content of sheathing must not exceed 15% before being covered with insulation or finishes.

Provide plywood and oriented strand board (OSB) according to the following applications. OSB is only acceptable on walls:

- Roofs: 5/8 inch min., 5 ply, Douglas Fir plywood or APA sheathing, Exposure 1.

The following floor sheathing types should typically be used:

- Floors to receive resilient flooring and carpet: 5/8 inch min., 5 ply; Douglas Fir APA Rated Sheathing, Exposure 1, with 3/8 inch APA Sturd-I-Floor rated underlayment is preferred, installed with ring-shank nails; no staples.
- Floors to receive porcelain floor tile: 3/4" minimum tongue-and-groove (T&G), 7-ply; Exterior grade plywood is recommended. Follow assemblies listed in latest edition of Tile Council of America Standards. At a minimum, all plywood floors where tile is to be installed shall be t&g, glued and screwed at 8" o.c. using hot-dipped galvanized screws (typical) and stainless steel screws used at all bathroom floors.
- Floors to receive Hardwood Flooring: 3/4" minimum plywood, glued and screwed with bridging at floor joists.
- Exterior Walls: 1/2" min. plywood or OSB, Exposure 1. Plywood is preferred, in part because cut edges of OSB are seldom field-treated as required. Plywood also has higher permeability, thus allowing faster drying of walls to the exterior. On the other hand, OSB with a water resistive coating together with taping of joints, such as the proprietary Zip system, may be an attractive option by providing an effective air barrier, water barrier, and sheathing in one system.

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- Cut edges of OSB must be field-treated with waterproof sealant to prevent swelling.
- Exterior rated plywood is required for subfloors and underlayments at bathrooms.

EXECUTION

Install subfloors with construction adhesives conforming to APA Specification AFG-01 or ASTM D3498. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). In addition, mechanically fasten all subfloors and underlayments according to APA recommendations. Provide diagonal joist bridging for added floor stiffness and to prevent squeaking. Use screws wherever I-joists or 2x4 truss floor framing is used, and at larger spans.

Provide ply clips or continuous lumber blocking for fastening panel edges of roof sheathing.

Inspect attic roof framing during roof replacement projects and provide hurricane ties as required.

Specify staggered panel end joints and offset joints between subfloor and underlayment. Do not align finish floor joints with intermediate underlayment joints.

BLOCKING

DESIGN

Detail blocking, or note all necessary blocking for all wall-hung hardware, plumbing fixtures, cabinets, grab bars, etc. Be sure to include blocking for the following:

- Drapery tracks to allow drapes to stack clear of the window opening;
- Kitchen cabinets;
- Grab bars and other bathroom accessories;
- At the base of wheel-in showers;
- Electrical fixtures, outlets, hose bibs (on exterior walls), etc.; and
- Between jamb stud and next stud at lockset on all doors.

For bathrooms in adaptable and fully accessible units, detail blocking for grab bars that may be added after occupancy (refer to MAAB/ADA regulations to determine the extent of blocking required).

Nailing $\frac{3}{4}$ " plywood over the full wall of studs is the preferred method of blocking because it allows installation of grab bars anywhere there is plywood, although it reduces overall room dimensions.

Detail corner framing to afford insulation to be installed and to minimize thermal bridging to the extent possible. Consider pre-installing pre-cut foam insulation during framing in areas which will be difficult to insulate after framing is complete.

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Use hot-dipped galvanized steel nails and end nailing for all blocking in wet walls and exterior walls; do not toe-nail or nail within ½” of the edge of blocking or the supporting structural member. Do not use staples to secure blocking.

PREFABRICATED TRUSSES

MATERIALS

The fabricator's shop drawings must be stamped by a structural engineer registered in Massachusetts.

Follow structural spanning, spacing, and bracing requirements in accordance with the Building Code and Truss Institute standards.

Finger-jointed lumber must be Machine Stress Rated, (MSR)-grade-stress tested, finger-jointed wood for truss framing.

DESIGN

Detail trusses to allow for shrinkage and thermal movement and truss uplift and to prevent gypsum board separation and cracking at the ceiling and wall. Use L-shaped truss clips attached to the top of interior walls which will allow the truss to move up and down independently of the wall. Do not nail the trusses directly to any interior walls.

Trusses must be designed to be structurally stable to avoid damage during installation.

Minimum six inch truss bottom chords are preferred to ensure rigid ceilings.

Consider using raised heel roof trusses or design the pitch of the roof to accommodate the full depth of insulation and adequate ventilation

ENGINEERED WOOD FRAMING

DESIGN

The Designer should carefully evaluate which engineered wood products are appropriate based on cost-effectiveness, availability, durability and acceptance by local code officials. If any of these factors are identified as potential problems during design, the Designer should specify conventional framing. Where appropriate, consider listing engineered wood framing as an alternate to base bid.

For non-uniform loading conditions the Contractor shall provide an engineering analysis signed and stamped by a Massachusetts registered structural engineer.

STRUCTURAL GLUED- LAMINATED TIMBER (GLULAMS)

Glulams shall be APA - Engineered Wood Association grade-stamped, in conformance with AITC/ANSI A190.1, American National Standard for Glued Laminated Timber.

Manufacturer's certificate of compliance is required.

Glulams shall be specified for the following characteristics:

- Appearance: graded
 - “architectural” for all exposed applications;

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- “industrial” for all concealed applications.
- ❑ Additional appearance characteristics shall be per Engineered Wood Systems Technical Note EWS Y110;
- ❑ Required design stress (with or without camber);
- ❑ Maximum allowable wane;
- ❑ Adhesives-based on wet or dry use;
- ❑ Fire resistance (where applicable); and
- ❑ Preservative treatments (when applicable) per American Wood Preservers’ Association (AWPA) Standard C28.

I-JOISTS

I-joists shall be grade labeled per allowable spans for uniformly loaded residential construction at various I-joist spacings. They should also be APA Performance Rated (PRI), maximum deflection of L/480, conforming with Performance Standard for APA EWS I-Joists, PRI-400. Rim Boards shall be manufactured and stamped in accordance with APA Rim Boards, PRI-401.

All accessory products such as blocking panels, rim boards, squash blocks, web stiffeners, etc. shall be provided and installed in accordance with APA Performance-Rated I-Joists, Form Z725. When desinging with I-joists do not mix and match details of conventional framing with I-joist framing.

LAMINATED VENEER LUMBER (LVL)

Laminated veneer lumber shall be grade marked per the LVL manufacturer’s published structural design values using methods established in ASTM Standard Specification D5465 for Structural Composite Lumber.

Proprietary engineered products should be carefully evaluated and specified only after availability and cost-effectiveness have been confirmed. The use of LVL’s might be considered a resource efficient material. The manufacturing of LVL’s does not require the harvest of old growth trees,

EXECUTION

Maintain protective covering and or sealants on glulams and I-joists during shipment, storage and handling. Protect from rain and sunlight. Where glulams are “architectural” grade, maintain protective coverings until after installation.

ENGINEERED WOOD FRAMING MISC.

Seal cut ends of glulams with waterproof sealant, immediately after trimming

Store, stack and handle I-joists vertically.

Do not allow workers to walk on or load I-joists until full sheathing and bracing are installed.

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All damaged I-joists should be removed and replaced with new: DO NOT REPAIR DAMAGED I-JOISTS. I-joists which show evidence of excessive moisture (swelling of webs), greying due to sunlight exposure, cracking, checking or splitting, shall not be installed.

FASTENERS

In general, wood fasteners should be chosen to transfer structural loads between the members joined, to limit corrosion of the fastener and deterioration or staining of adjacent materials, and to limit the amount of deflection, particularly in floors. See building code for requirements on fastener type and spacing for different components.

In low-rise construction, the rough carpenters may be expected to install building wrap or another form of air and/or water barrier. It is particularly important in such instances to refer the rough carpenter to the spec. sections on air, water, moisture and thermal barriers.

The Designer should refer to the variety of specialized fasteners and structural connectors available from companies such as, MarinoWare, Simpson and USP.