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USACE / NAVFAC / AFCEC / NASA | UFGS-06 10 00 (August 2016)
Change 2 - 11/18

Preparing Activity: NAVFAC | Superseding
UFGS-06 10 00 (February 2012)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SECTION 06 10 00

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SECTION 06 10 00

ROUGH CARPENTRY
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****
NOTE: This guide specification covers framing, grounds, nailers, blocking, and sheathing of light wooden structures and includes the use of preassembled components and plastic lumber. Wood finished flooring, trim, millwork, siding, heavy timber work, custom woodwork, and finish carpentry are specified in other sections.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

****
NOTE: Design exterior envelope to meet the requirements of UFC 1-200-02, "High Performance and Sustainable Building Requirements" which invokes the requirements within UFC 3-101-01, "Architecture". UFC 1-200-02 and UFC 3-101-01 make references throughout to various ASHRAE documents governing energy efficiency and requirements for the components of building envelope design including moisture control and thermal performance.
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NOTE: The following information should be shown on the project drawings:

1. Sizes and spacing of all wood framing members including trussed rafters and trusses

2. Location, size, type, and thickness of all materials

3. Size and spacing of anchor bolts

4. Details of all connections and anchorage where special conditions exist such as high wind, hurricane, and earthquake areas

5. Design loads

6. Design unit stresses for structural lumber

7. Details of depressed floors to receive ceramic tile.

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN FOREST FOUNDATION (AFF)

ATFS STANDARDS	(2015) American Tree Farm System Standards of Sustainability 2015-2020

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

AITC 111	(2005) Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection
AITC TCM	(2012) Timber Construction Manual, 5th Edition
ANSI/AITC A190.1	(2007) American National Standard, Structural Glued Laminated Timber

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20	(2015) American Softwood Lumber Standard

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Eng Man	(2017) Manual for Railway Engineering

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2022) Nuts for General Applications: Machine Screw Nuts, and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.5.2.1M	(2006; R 2011) Metric Round Head Short Square Neck Bolts
ASME B18.5.2.2M	(1982; R 2010) Metric Round Head Square Neck Bolts
ASME B18.6.1	(2016) Wood Screws (Inch Series)

AMERICAN WOOD COUNCIL (AWC)

AWC NDS	(2015) National Design Specification (NDS) for Wood Construction
AWC WFCM	(2012) Wood Frame Construction Manual for One- and Two-Family Dwellings

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK	(2015) AWPA Book of Standards
AWPA M2	(2019) Standard for the Inspection of Preservative Treated Wood Products for Industrial Use
AWPA M6	(2013) Brands Used on Preservative Treated

	Materials
AWPA P5	(2015) Standard for Waterborne Preservatives
AWPA P18	(2014) Nonpressure Preservatives
AWPA P49	(2015; R 2021) Standard for Fire Retardant FR-1
AWPA T1	(2023) Use Category System: Processing and Treatment Standard
AWPA U1	(2023) Use Category System: User Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA E30	(2016) Engineered Wood Construction Guide
APA E445	(2002) Performance Standards and Qualification Policy for Structural-Use Panels (APA PRP-108)
APA EWS R540	(2013) Builder Tips: Proper Storage and Handling of Glulam Beams
APA EWS T300	(2007) Technical Note: Glulam Connection Details
APA F405	(19) Product Guide: Performance Rated Panels
APA L870	(2010) Voluntary Product Standard, PS 1-09, Structural Plywood
APA S350	(2014) PS 2-10, Performance Standard for Wood-Based Structural-Use Panels

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C208	(2022) Standard Specification for Cellulosic Fiber Insulating Board
ASTM C1136	(2023) Standard Specification for Flexible, Low Permeance Vapor Retarders

	for Thermal Insulation
ASTM C1396/C1396M	(2017) Standard Specification for Gypsum Board
ASTM D198	(2015) Standard Test Methods of Static Tests of Lumber in Structural Sizes
ASTM D696	(2016) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM D1435	(2013) Standard Practice for Outdoor Weathering of Plastics
ASTM D1972	(1997; R 2005) Standard Practice for Generic Marking of Plastic Products
ASTM D2344/D2344M	(2016) Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
ASTM D2898	(2010; R 2017) Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
ASTM D3498	(2019a) Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Stand Board) to Wood Based Floor System Framing
ASTM D6108	(2013) Standard Test Method for Compressive Properties of Plastic Lumber and Shapes
ASTM D6109	(2013) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products
ASTM D6111	(2013a) Standard Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement
ASTM D6112	(2013) Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes
ASTM D6117	(2016) Standard Test Methods for Mechanical Fasteners in Plastic Lumber and Shapes
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM F547	(202) Standard Terminology of Nails for Use with Wood and Wood-Base Materials

ASTM F1667/F1667M	(2021a) Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

CALIFORNIA AIR RESOURCES BOARD (CARB)

CARB 93120	(2007) Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.1	(2016) Particleboard

CSA GROUP (CSA)

CSA Z809-08	(R2013) Sustainable Forest Management

FM GLOBAL (FM)

FM 4435	(2017) Roof Perimeter Flashing

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules	(2015) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules	(2013) Standard Grading Rules for Northeastern Lumber

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

PEFC ST 2002:2013	(2015) PEFC International Standard Chain of Custody of Forest Based Products Requirements

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD ASSOCIATION (CRA)

RIS Grade Use	(1998) Redwood Lumber Grades and Uses

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Spec	(1986; Supple. No. 1, Aug 1993) Standard Specifications for Grades of Southern Cypress

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003	(2014) Standard Grading Rules for Southern Pine Lumber

SUSTAINABLE FOREST INITIATIVE (SFI)

SFI 2015-2019	(2015) Standards, Rules for Label Use, Procedures and Guidance

TRUSS PLATE INSTITUTE (TPI)

TPI 1	(2014) National Design Standard for Metal Plate Connected Wood Truss Construction, Including Commentary and Appendices
TPI HIB	(1991) Commentary and Recommendations for Handling, Installing and Bracing Metal Plate Connected Wood Trusses

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS56	(1973) Structural Glued Laminated Timber
DOC/NIST PS58	(1973) Basic Hardboard (ANSI A135.4)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923	(Rev A; Notice 1; Notice 2; Notice 3; Notice 4) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)
CID A-A-1924	(Rev A; Notice 3) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors
CID A-A-1925	(Rev A; Notice 3) Shield Expansion (Nail Anchors)
FS UU-B-790	(Rev A; Notice 2) Building Paper Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 770	Formaldehyde Standards for Composite Wood Products

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17	(2015) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5	(2017) Western Lumber Grading Rules

1.2 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S"

classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

[Structural Glued Laminated Members; G[, [_____]]

][Trussed Rafters; G[, [_____]]

][Trussed Joists; G[, [_____]]

][Fabricated Structural Members; G[, [_____]]

] Modifications of Structural Members; G[, [_____]]

Drawings of structural laminated members, fabricated wood trusses, engineered wood joists and rafters, and other fabricated structural members indicating materials, shop fabrication, and field erection details; including methods of fastening.

[Nailers and Nailing Strips; G[, [_____]]

Drawings of field erection details, including materials and methods of fastening nailers in conformance with Factory Mutual wind uplift rated systems specified in other Sections of these specifications.

] SD-03 Product Data

[Salvaged Lumber

][Recovered Lumber

][Underlayment

] Plastic Lumber

Fiberboard Wall Sheathing

Cellulose Honeycomb Panels

Fire-retardant Treatment

Structural-use and OSB Panels

Oriented Strand Board

Adhesives

[Biobased Content for Strawboard Panels; S

][Biobased Content for Cork Underlayment; S

][Recycled Content for Plastic Lumber; S

][Recycled Content for Fiberboard Underlayment; S

][Recycled Content for Cork Underlayment; S

][Recycled Content for Fiberboard Wall Sheathing; S

][Recycled Content for Cellulose Honeycomb Panels; S

] SD-05 Design Data

Modifications of Structural Members; G[, [_____]]

Design analysis and calculations showing design criteria used to accomplish the applicable analysis.

SD-06 Test Reports

Preservative-treated Lumber and Plywood

SD-07 Certificates

[Certificates of Grade

][Certified Sustainably Harvested Virgin Lumber; S

][Certified Sustainably Harvested Natural-decay and Insect-resistant Wood; S

][Certified Sustainably Harvested Framing Lumber; S

][Certified Sustainably Harvested Structural Glued Laminated Timber; S

][Certified Sustainably Harvested Plywood Subflooring; S

][Certified Sustainably Harvested Structural-use and OSB Panel Subfloor Sheathing; S

][Certified Sustainably Harvested Plywood Combination Subfloor Underlayment; S

][Certified Sustainably Harvested Plywood Wall Sheathing; S

][Certified Sustainably Harvested Structural-use and OSB Panel Wall Sheathing; S

][Certified Sustainably Harvested Plywood Roof Sheathing; S

][Certified Sustainably Harvested Plywood Diaphragm; S

][Certified Sustainably Harvested Structural-use and OSB Panel Diaphragm; S

][Certified Sustainably Harvested Plywood Shear Wall; S

][Certified Sustainably Harvested Structural-use and OSB Panel Shear Wall; S

][Certified Sustainably Harvested Plywood for Other Uses; S

][Certified Sustainably Harvested Structural-use and OSB Panels for Other Uses; S

][Certified Sustainably Harvested Plywood Underlayment; S

] Preservative Treatment

[Indoor Air Quality for Particleboard Underlayment; S

][Indoor Air Quality for Fiberboard Underlayment; S

][Indoor Air Quality for Strawboard Panels; S

][Indoor Air Quality for Fiberboard Wall Sheathing; S

][Indoor Air Quality for Aerosol Adhesives; S

][Indoor Air Quality for Non-aerosol Adhesives; S

] SD-10 Operation and Maintenance Data

Plastic

When not labeled, identify types in Operation and Maintenance Manual.

Take-back Program

Include contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling or reuse.

1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Store wood I-beams and glue-laminated beams and joists on edge. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and special fastening requirements. [Handle and store laminated timber in accordance with AITC 111 or APA EWS R540.] Do not use materials that have visible moisture or biological growth. Remove defective and damaged materials and provide new materials. Store separated reusable wood waste convenient to cutting station and area of work.

1.4 GRADING AND MARKING

1.4.1 Lumber

****

NOTE: Finger-jointed lumber is not allowed for Air Force construction.

****

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency must be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view must not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

1.4.2 Structural Glued Laminated Timber

Mark each member with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of structural glued laminated timber products. The marking must indicate compliance with ANSI/AITC A190.1 and must include all identification information required by ANSI/AITC A190.1.[Structurally end-jointed lumber must also be certified and grade marked in accordance with ANSI/AITC A190.1.]

1.4.3 Plywood

Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark must identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870. Surfaces that are to be exposed to view must not bear grademarks or other types of identifying marks.

1.4.4 Structural-Use and OSB Panels

Mark each panel with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the panel. The mark must indicate end use, span rating, and exposure durability classification. Oriented Strand Board (OSB), APA F405.

1.4.5 Preservative-Treated Lumber and Plywood

The Contractor is responsible for the quality of treated wood products. Each treated piece must be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor must provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

1.4.6 Fire-Retardant Treated Lumber

****

NOTE: Do not use fire-retardant treated plywood on Navy projects.

****

Mark each piece in accordance with AWPA M6, except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber must be distinguished by a permanent penetrating blue stain. Labels of a nationally recognized independent testing agency will be accepted as evidence of conformance to the fire-retardant requirements of AWPA M6.

1.4.7 Hardboard, Gypsum Board, and Fiberboard

Mark each sheet or bundle to identify the standard under which the material is produced and the producer.

1.4.8 Plastic Lumber

****
NOTE: The marking system indicated below is intended to provide assistance in identification of products for making subsequent decisions as to handling, recycling, or disposal.
****

Label plastic products to be incorporated into the project in accordance with ASTM D1972, or provide product data indicating polymeric information in the Operation and Maintenance Manual.

a. Type 1: Polyethylene Terephthalate (PET, PETE).
b. Type 2: High Density Polyethylene (HDPE).
c. Type 3: Vinyl (Polyvinyl Chloride or PVC).
d. Type 4: Low Density Polyethylene (LDPE).
e. Type 5: Polypropylene (PP).
f. Type 6: Polystyrene (PS).
g. Type 7: Other. Use of this code indicates that the package in question. is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber must be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes must be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products must be as follows at the time of delivery to the job site:

a. Framing lumber and board, 19 percent maximum

b. Timbers 125 mm 5 inches and thicker, 25 percent maximum

[c. Roof planking, 15 percent maximum

] d. Materials other than lumber; moisture content must be in accordance with standard under which the product is produced

1.7 PRESERVATIVE TREATMENT

****
NOTE: Water-borne preservatives are leach resistant, paintable, and easily worked. Whenever certain exposed uses require minimized swelling,

shrinking, or splitting, then require that a water repellent be added to the treatment. Requirement of an independent inspection agency report or the AWPA Quality Mark verifies that the product was prepared and treated in accordance with its appropriate AWPA Standard and other specification requirements. Consult the EFD applied biologist for further guidance regarding specific treatments listed or additional treatments that may be required for special use items. All lumber and woodwork in humid locations or project locations with Environmental Severity Classifications (ESC) of C3 thru C5 must be preservative treated. Humid locations are those in ASHRAE climate zones 0A, 1A, 2A, 3A, 3C, 4C and 5C (as identified in ASHRAE 90.1). See UFC 1-200-01 for determination of ESC for project locations. As a substitute for treated lumber, plastic lumber and naturally durable heartwood reduces potential leaching of chemicals used in wood treatment.

****

****

NOTE: According to the IARC and TCLP, noncompliant products include, but are not limited to, Chromated Copper Arsenate (CCA) treatments, Ammoniacal Copper Zinc Arsenate (ACZA) treatments, and those using pentachlorophenol or creosote. Compliant pressure preservative treatments include, but are not limited to, Ammoniacal Copper Quaternary (ACQ), and Copper Boron Azole (CBA). Certified sustainably harvested wood processed as treated wood is available by special order.

ACQ pressure-injected wood does not contain arsenic or chromium and is not classified as hazardous waste by EPA. Due to copper toxicity to aquatic organisms, it is not recommended for use near bodies of water.

****

Treat wood products with waterborne wood preservatives conforming to AWPA P5. Pressure treatment of wood products must conform to the requirements of AWPA BOOK Use Category System Standards U1 and T1. Pressure-treated wood products must not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products must not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and must not be classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards. In accordance with AWPA U1 provide non-copper preservative treatment such as EL2, PTI or SBX,DOT for products in direct contact with sheet metal.

a. 4 kg per cubic meter 0.25 pcf intended for above ground use.

b. 6.4 kg per cubic meter 0.40 pcf intended for ground contact and fresh water use. 9.6 kg per cubic meter 0.60 pcf intended for Ammoniacal

Copper Quaternary Compound (ACQ)-treated foundations. 12.8 to 16.1 kg per cubic meter 0.80 to 1.00 pcf intended for ACQ-treated pilings. All wood must be air or kiln dried after treatment. Specific treatments must be verified by the report of an approved independent inspection agency, or the AWPA Quality Mark on each piece.[Do not incise surfaces of lumber that will be exposed.] Minimize cutting and avoid breathing sawdust. Brush coat areas that are cut or drilled after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution.[All lumber and woodwork must be preservative treated.] Plastic lumber must not be preservative treated. The following items must be preservative treated:

(1) Wood framing, woodwork, and plywood up to and including the subflooring at the first-floor level of structures having crawl spaces when the bottoms of such items are 600 mm 24 inches or less from the earth underneath.

(2) Wood members that are in contact with water.

(3) Exterior wood steps, platforms, and railings; and all wood framing of open, roofed structures.

(4) Wood sills, soles, plates, furring, and sleepers that are less than 600 mm 24 inches from the ground, furring and nailers that are set into or in contact with concrete or masonry.

(5) Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.7.1 Existing Structures

****

NOTE: Permathrin is manufactured from water-based pyrethrum, degrades in sunlight, and affects air quality less than petroleum-based insecticides. Borate is considered safe for humans and other mammals, but is not for use in high-moisture areas.

****

Use borate, permathrin, or a sodium silicate wood mineralization process to treat wood. Use borate for interior applications only.

1.7.2 New Construction

****

NOTE: Boron-based preservative is not recommended for use of wood in direct contact with ground because of the potential for leaching out of the preservative. Boron-based preservative has nonrestrictive handling requirements and low mammalian toxicity.

****

Use a boron-based preservative conforming to AWPA P18, sodium silicate wood mineralization process, or Ammoniacal Copper Quaternary Compound to treat wood. Use boron-based preservatives for above-ground applications only.

1.8 FIRE-RETARDANT TREATMENT

****

NOTE: Items to be treated should be listed in this paragraph. Fire-retardant treatment should be specified when necessary to provide required fire resistance for the structure. Where wood will be exposed to heat or high humidity, as well as where wood is exposed on the exterior of buildings, specify exterior fire retardant treatment. Do not use fire-retardant treated plywood on Navy projects.

****

Fire-retardant treated wood must be pressure treated with fire retardants conforming to AWPA P49. Fire retardant treatment of wood products must conform to the requirements of AWPA U1, Commodity Specification H and AWPA T1, Section H. Treatment and performance inspection must be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material must bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting must be subjected to an accelerated weathering technique in accordance with ASTM D2898 prior to being tested. Such items which will not be inside a building, and such items which will be exposed to heat or high humidity, must receive exterior fire-retardant treatment. [Fire-retardant-treated wood products must be free of halogens, sulfates, ammonium phosphate, and formaldehyde.]Items to be treated include the following:

a. [_____].

1.9 QUALITY ASSURANCE

1.9.1 Drawing Requirements

For fabricated structural members, trusses, qlu-lam members, indicate materials, details of construction, methods of fastening, and erection details. Include reference to design criteria used and manufacturers design calculations. Submit drawings for all proposed modifications of structural members. Do not proceed with modifications until the submittal has been approved.

1.9.2 Data Required

Submit calculations and drawings for all proposed modifications of structural members. Do not proceed with modifications until the submittal has been approved.

1.9.3 Humidity Requirements

****

NOTE: Comfort standards typically allow humidity to fluctuate to save energy costs. The amount of humidity control needed will vary with climate region and types of carpentry used.

****

Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

1.9.4 Plastic Lumber Performance

Plastic lumber intended for use in exterior applications must have no fading or discoloration and no change in dimensional stability as tested in accordance with ASTM D1435 for a period of [1][3][5][_____] year[s].

1.10 ENVIRONMENTAL REQUIREMENTS

During and immediately after installation of treated wood, engineered wood products, and laminated wood products at interior spaces, provide temporary ventilation.

1.11 CERTIFICATIONS

[1.11.1 Certified Wood Grades

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

****

NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Sustainably Harvested Wood is a product which comes from a third-party Forestry Certification Program and thus carries certain characteristics: 1) Protection of biodiversity, species at risk and wildlife habitat, sustainable harvest levels, protection of water quality, and prompt regeneration (e.g., replanting and reforestation); 2) Third-party certification audits performed by accredited certification bodies; 3) Publicly available certification audit summaries; 4) Multi-stakeholder involvement in a standards development process; 5) Complaints and appeals process.

Verify suitability, availability within the region, cost effectiveness and adequate competition before specifying these sustainably harvested wood certifications - if these conditions are verified for the project locale, include the following section. For projects pursuing LEED, delete certifications other than FSC; for all other projects pursuing third-party certification allow the entire list of third party certifications.

****

][1.11.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001[, ATFS STANDARDS, CSA Z809-08, SFI 2015-2019, or other third party program certified by PEFC ST 2002:2013]. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

]1.11.3 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

****
NOTE: Include the following section where these products are used on the interior of the building (defined as inside of the weatherproofing system).
****

[1.11.3.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

]

****
NOTE: Include the following section where these products are used on the interior of the building (defined as inside of the weatherproofing system).
****

[1.11.3.2 Composite Wood, Wood Structural Panel and Agrifiber Products

For purposes of this specification, composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), strawboard, panel substrates, and door cores. Provide products certified to meet requirements of both 40 CFR 770 and CARB 93120. Provide current product certification documentation from certification body.

]PART 2 PRODUCTS

2.1 MATERIALS

****
NOTE: Specify lower grades and engineered wood products for large-dimension timbers when appropriate.
****

2.1.1 Virgin Lumber

****
NOTE: Old growth timber comes from trees over 200 years old. In industry, it is high quality lumber in "upper" or "architectural" grades. Lumber suppliers should know which timber is old growth and which is not, but sources are not always tracked. Designer must verify suitability, availability within the region, cost effectiveness and adequate competition for certified sustainably harvested virgin lumber before specifying this certification - if these conditions are verified for the project locale, include the bracketed statement.
****

Lumber fabricated from old growth timber is not permitted. Avoid companies who buy, sell, or use old growth timber in their operations, when possible.[Provide certified sustainably harvested virgin lumber.]

[2.1.2 Salvaged Lumber

****
NOTE: Salvaged lumber includes lumber from deconstruction or demolition of existing buildings or structures. Large-dimension timbers from first-growth trees are a limited resource; use in original dimensions if possible. Using salvaged materials contributes to maximizing sustainability on all projects. Include submittal and coordinate with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.
****

Provide salvaged lumber where specified. Unless otherwise noted, salvaged lumber must be delivered clean, denailed, and free of paint, finish materials, and other contamination. Lumber must meet the other criteria within this section. Provide documentation certifying products are from salvaged lumber sources.

][2.1.3 Recovered Lumber

****
NOTE: Recovered lumber includes previously harvested lumber pulled from riverbeds or otherwise abandoned. Using recovered materials contributes to maximizing sustainability on all projects. Include submittal and coordinate with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.
****

Use recovered lumber where practical. Unless otherwise noted, recovered lumber must be delivered clean and free of contamination. Provide grading certificates for any recovered wood materials used in structural applications. Lumber must meet the other criteria within this section. Provide documentation certifying products are from recovered lumber sources.

]2.1.4 Natural Decay- and Insect-Resistant Wood

****
NOTE: Naturally durable wood is a chemical-free alternative to treated wood. The heartwood of the following species is considered naturally durable wood. Decay resistant species include redwood, South American ipe, bald cypress, longleaf yellow pine, elm, cedar, black locust, American chestnut, angico, and black walnut. Termite resistant species include redwood and Eastern red cedar.
****

[Naturally durable wood must be certified sustainably harvested natural-decay and insect-resistant wood.]An occasional piece with corner sapwood is permitted if 90 percent or more of the width of each side on

which the sapwood occurs is heartwood.[The primary species to use on this project is [redwood], [_____].]

[2.1.5 Plastic Lumber

****
NOTE: Plastic lumber is a durable, weather-resistant, recyclable, and low maintenance material. Plastic lumber is integrally colored and homogenous and so does not require painting. For lengths greater than 1.8 m 6 feet or where deflection and creep are significant considerations (e.g., fencing, decking, and bollards), consider plastic lumber with fiber such as recycled cellulose or glass to improve stability and resistance to screw pullout. Typical plastic lumber applications include dimensional lumber, landscape timber, decking, parking stops, speed bumps, benches, tables, waste receptacles, playground structures, fencing, and signage.
****

****
NOTE: Plastic lumber used for landscaping timbers and posts is an EPA designated product for recycled content. Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition before specifying this product. A resource that can be used to identify products with recycled content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. Other products with recycled content are also acceptable when meeting all requirements of this specification.

Research shows products are available from US national manufacturers above the minimum recycled content stated.
****

HDPE lumber must contain a minimum of 90 percent total recycled content. Mixed plastics and cellulose lumber must contain a minimum of 100 percent total recovered materials content, with a minimum of 50 percent post-consumer recycled content. HDPE/fiberglass lumber must contain a minimum of 95 percent total recovered materials content with a minimum of 75 percent post-consumer recycled content. Other mixed resin lumber must contain a minimum of 95 percent total recovered materials content with a minimum of 50 percent post-consumer recycled content. Provide data identifying percentage of recycled content for plastic lumber.

2.1.5.1 Shear Parallel to Length

Maximum 1,550 K/m2 1,000 psi in accordance with ASTM D2344/D2344M.

2.1.5.2 Density

ASTM D6111.

2.1.5.3 Compressive Strength

a. Secant Modulus: Minimum 108,511 K/m2 70,000 psi in accordance with ASTM D6108.

b. Stress at 3 percent strain: Minimum 2,325 K/m2 1,500 psi in accordance with ASTM D6108.

c. Compression Parallel to Grain: Minimum 4,650 K/m2 3,000 psi in accordance with ASTM D6112.

d. Compression Perpendicular to Grain: Minimum 1,550 K/m2 1,000 psi in accordance with ASTM D6112.

2.1.5.4 Flexural Strength

Minimum 3,100 K/m2 2,000 psi in accordance with ASTM D6109.

2.1.5.5 Tensile Strength

Minimum 1,938 K/m2 1,250 psi in accordance with ASTM D198.

2.1.5.6 Coefficient of Thermal Expansion

Maximum 0.000044 mm/mm/degree C 0.000080 in/in/degree F in accordance with ASTM D696.

2.1.5.7 Screw Withdrawal

0.35 K350 lbs in accordance with ASTM D6117.

2.1.5.8 Nail Withdrawal

0.15 K150 lbs in accordance with ASTM D6117.

]2.2 LUMBER

2.2.1 Structural Lumber

****

NOTE: When the minimum allowable unit stresses for structural lumber are not indicated on the drawings, check with the structural engineer. The following minimum allowable unit stresses are commonly used:

1. 7200 kPa Fb, 4800 kPa Ft, 5400 kPa Fc with 8300 MPa E 1050 Fb, 700 Ft, 780 Fc with 1,200,000E for engineered uses, i.e., structural lumber used in fabrication of bolted trusses and other fabricated structural members for engineered uses, except trussed rafters.

2. 8300 kPa Fb, with 8300 MPa E 1200 Fb, with 1,200,000E for repetition member uses, i.e., joists, rafters including trussed type, decking, and headers.

****

[Except where a specific grade is indicated or specified,] Any of the species and grades listed in AWC NDS that have allowable unit stresses in

kPa pounds per square inch (psi) not less than [[_____] Fb, [_____] Ft, [_____] Fc, with [_____] E] [allowable unit stresses indicated]. Use for joists, rafters, headers, trusses, beams (except collar beams), columns, posts, stair stringers, girders, and all other members indicated to be stress rated.[Structural lumber exposed to view in [_____] must be appearance grade [of [_____] species][of any species] meeting the allowable unit stresses [specified][indicated].] Design of members and fastenings must conform to AITC TCM. Other stress graded or dimensioned items such as blocking, carriages, and studs must be standard or No. 2 grade except that studs may be Stud grade.

2.2.2 Framing Lumber

****
NOTE: Finger-jointed lumber is not allowed for Air Force construction.
****

****
NOTE: Except for projects requiring huge quantities of lumber, delete species and grades not normally used where project is located. Edit the listing to suit the locality and the project.
****

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Framing lumber such as studs, plates, caps, collar beams, cant strips, bucks, sleepers, nailing strips, and nailers and board lumber such as subflooring and wall and roof sheathing must be one of the species listed in the table below. Minimum grade of species must be as listed. [Finger-jointed lumber may be used in the same applications as solid lumber of an equivalent species and grade, provided the finger-jointed lumber meets all the requirements of the certification and the quality control programs of the rules writing agency having jurisdiction and all applicable requirements of DOC/NIST PS56.][Provide certified sustainably harvested framing lumber.]

Table of Grades for Framing and Board Lumber			
Grading Rules	Species	Framing	Board Lumber
WWPA G-5 standard grading rules	Aspen, Douglas Fir-Larch, Douglas Fir South, Engelmann Spruce-Lodgepole Pine, Engelmann Spruce, Hem-Fir, Idaho White Pine, Lodgepole Pine, Mountain Hemlock, Mountain Hemlock-Hem-Fir, Ponderosa Pine-Sugar Pine, Ponderosa Pine-Lodgepole Pine, Subalpine Fir, White Woods, Western Woods, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 3 m 10 feet and shorter)	All Species: No. 3 Common
WCLIB 17 standard grading rules	Douglas Fir-Larch, Hem-Fir, Mountain Hemlock, Sitka Spruce, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 3 m 10 feet and shorter)	All Species: Standard

Table of Grades for Framing and Board Lumber			
Grading Rules	Species	Framing	Board Lumber
SPIB 1003 standard grading rules	Southern Pine	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 3 m 10 feet and shorter)	No. 2 Boards
SCMA Spec standard specifications	Cypress	No. 2 Common	No. 2 Common
NELMA Grading Rules standard grading rules	Balsam Fir, Eastern Hemlock-Tamarack, Eastern Spruce, Eastern White Pine, Northern Pine, Northern Pine-Cedar	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 3 m 10 feet and shorter)	All Species: No. 3 Common except Standard for Eastern White and Northern Pine
RIS Grade Use standard specifications	Redwood	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 3 m 10 feet and shorter)	Construction Heart

Table of Grades for Framing and Board Lumber			
Grading Rules	Species	Framing	Board Lumber
NHLA Rules rules for the measurement and inspection of hardwood and cypress lumber	Cypress	No. 2 Dimension	No. 2 Common

2.2.3 Structural Glued Laminated Timber

****
NOTE: Specify appearance grade of lumber in glued laminated members when required by aesthetic considerations. Insert stress requirements necessary when not indicated on drawings. Wet condition should be specified when moisture content of member in service will exceed 16 percent for repeated and prolonged periods. Architectural or Premium Appearance Grade should be specified only when appearance is of major importance. Special stains and sealers may be specified in lieu of a penetrating sealer when required by aesthetic considerations. Individual wrapping should be specified when protection during erection is necessary. Preservative treatment in lieu of sealing should be specified for exposure conditions named in ANSI/AITC A190.1.
****

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

****
NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the last bracketed statements requiring no added urea-formaldehyde resins.
****

ANSI/AITC A190.1, allowable working stress values for loads of normal duration in kPa pounds per square inch (psi) not less than the following:

Bending Members, [_____] Fb, [_____] Fv, [_____] E.
Compression Members, [_____] Fc, [_____] E.
Tension Members, [_____] Ft, [_____] E.

Fabricated with wet-use adhesives. Beams must use [glue-laminated][and] [laminated-strand][laminated-veneer] lumber. Posts and studs must use laminated-strand lumber. Joists must use laminated-veneer lumber. Members must be [Industrial] [Architectural] [Premium] Appearance Grade, sealed with a penetrating sealer, and [individually wrapped] [bundle wrapped] as standard with the manufacturer and approved. Members must be complete with hardware for joining laminated members and for their connection to other construction.[Provide certified sustainably harvested structural glued laminated timber.][When located on the interior of buildings, provide products with no added urea-formaldehyde resins.]

2.3 PLYWOOD, STRUCTURAL-USE, AND ORIENTED STRAND BOARD (OSB) PANELS

****

NOTE: Thicknesses and index or Span Rating numbers 16 ratings are used at 400 mm (modular SI spacing). Thickness and index or Span Rating number are minimums for usual loading and support spacing. Specific job conditions such as unusual loading, support spacing, surfacing material, and exposure may necessitate using other types of plywood or structural-use panels. Refer to American Plywood Association construction guides for additional guidance on specifying structural panel products.

****

****

NOTE: In humid locations or project locations with Environmental Severity Classifications (ESC) C3 thru C5, specify all plywood to have full penetration, preservative treatment. Except for special applications, use only exterior type plywood. Humid locations are those in ASHRAE climate zones 0A, 1A, 2A, 3A, 3C, 4C and 5C (as identified in ASHRAE 90.1). See UFC 1-200-01 for determination of ESC for project locations.

****

****

NOTE: In humid locations or project locations with Environmental Severity Classifications (ESC) C4 and C5, do not use Particle Board or Oriented Strand Board (OSB) in locations exposed to weather. These products are unstable in wet and humid conditions and cannot be preservative treated. Humid locations are those in ASHRAE climate zones 0A, 1A, 2A, 3A, 3C, 4C and 5C (as identified in ASHRAE 90.1). See UFC 1-200-01 for determination of ESC for project locations.

****

APA L870, APA S350, APA E445, and APA F405 respectively.

2.3.1 Subflooring

****

NOTE: Plywood, structural-use, and OSB panels, to receive floor finishes may be applied as (1)

subflooring only; (2) combination subfloor-underlayment; or (3) subflooring with underlayment applied over the subfloor.

Use subparagraph PLYWOOD or STRUCTURAL-USE AND OSB PANELS for plywood or structural-use or OSB panel subflooring to receive direct application of T&G finish wood flooring or to receive underlayment for floor covering such as carpet, resilient tile, linoleum, and other nonstructural floor finishes.

Use subparagraphs PLYWOOD and STRUCTURAL-USE AND OSB PANELS in conjunction with paragraphs UNDERLAYMENT and HARDBOARD UNDERLAYMENT when a separate underlayment application is desired.
****

2.3.1.1 Plywood

****
NOTE: Identification Index 32/16 or Span Rating 24/16 should be specified for supports 400 mm 16 inches o.c. and 48/24 should be specified for supports 600 mm 24 inches o.c. Plywood or structural-use panel subflooring to receive square-edge wood flooring must be specified to have T&G edges or edges to be supported by approved blocking or framing.
****

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

C-D Grade, Exposure 1 durability classification, Span rating of [24/16] [48/24] or greater.[Provide certified sustainably harvested plywood subflooring.]

2.3.1.2 Structural-Use and OSB Panels

****
NOTE: Identification Index 32/16 or Span Rating 24/16 should be specified for supports 400 mm 16 inches o.c. and 48/24 should be specified for supports 600 mm 24 inches o.c. Plywood or structural-use panel subflooring to receive square-edge wood flooring must be specified to have T&G edges or edges to be supported by approved blocking or framing.
****

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region,

cost effectiveness, and adequate competition before specifying this certification.
****

Sheathing grade with durability equivalent to Exposure 1, Span Rating of [32/16] [48/24] or greater. OSB, APA E445, Rated Sturd-I-Floor.[Provide certified sustainably harvested structural-use and OSB panel subfloor sheathing.]

2.3.2 Combination Subfloor-Underlayment

****
NOTE: Use subparagraphs PLYWOOD and STRUCTURAL-USE AND OSB PANELS for combination subfloor-underlayment where application of an underlayment is not desired. This method is suitable for most types of finish flooring or floor covering and is normally more economical than an application of subflooring with an application of underlayment.
****

2.3.2.1 Plywood

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

[Underlayment Grade, Exposure 1][, or][Exterior Type, C-C (Plugged) Grade].[Provide certified sustainably harvested plywood combination subfloor underlayment.] Minimum thickness must be as listed below [except where indicated to have greater thickness].

Support Spacing	Underlayment Minimum Thickness
400 mm 16 inches	12.7 mm 1/2 inch for Group 1 species
	15 mm 19/32 inch for Group 2 and 3 species
	18 mm 23/32 inch for Group 4 species
600 mm 24 inches	18 mm 23/32 inch for Group 1 species
	22 mm 7/8 inch for Group 2 and 3 species
	25 mm 1 inch for Group 4 species

2.3.2.2 Structural-Use Panel

Combination subfloor-underlayment grade with durability equivalent to [Interior plywood with Exterior glue (Exposure 1)] [Exterior plywood],

Span Rating of [16] [20] [24] [48] or greater.

2.3.3 Wall Sheathing

2.3.3.1 Plywood

****
NOTE: Plywood wall sheathing 9.5 mm 3/8 inch thick should be specified for supports spaced 400 mm 16 inches on center, and 12.7 mm 1/2 inch thick plywood wall sheathing should be specified for supports spaced 600 mm 24 inches on center.
****

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

C-D Grade, Exposure 1, and a minimum thickness of [9.5] [12.7] mm [3/8] [1/2] inch[, except where indicated to have greater thickness].[Provide certified sustainably harvested plywood wall sheathing.][Provide exterior grade material with phenol resin for interior and exterior applications.]

2.3.3.2 Structural-Use and OSB Panels

****
NOTE: Structural-use panels 9.5 mm 3/8 inch thick with a Span Rating of 16/0 or greater should be specified for supports 400 mm 16 inches o.c. and panels 11 mm 7/16 inch thick with a Span Rating of 24/0 or greater should be specified for supports 600 mm 24 inches o.c.
****

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Sheathing grade with durability equivalent to Exposure 1, Span Rating of [16/0] [24/0] or greater. OSB, APA Rated Sheathing. OSB must be a phenolic-glued board.[Provide certified sustainably harvested structural-use and OSB panel wall sheathing.]

2.3.4 Roof Sheathing

2.3.4.1 Plywood

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective.

Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

C-D Grade, Exposure 1, with an Identification Index of not less than [24/0] [_____].[Provide certified sustainably harvested plywood roof sheathing.] Provide exterior grade material with phenol resin for all applications.

2.3.4.2 Structural-Use Panel

Sheathing grade with durability equivalent to Exposure 1, Span Rating of [24/0] [_____] or greater.

2.3.5 Diaphragms

2.3.5.1 Plywood

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

[Structural I][Structural II], [C-C][C-D] grade, Exposure 1, and a minimum thickness of [_____] mm inch.[Provide certified sustainably harvested plywood diaphragm.]

2.3.5.2 Structural-Use and OSB Panels

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Sheathing grade with durability equivalent to Exposure 1 and a minimum thickness of [_____] mm inch.[Provide certified sustainably harvested structural-use and OSB panel diaphragm.]

2.3.6 Shear Walls

2.3.6.1 Plywood

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

[Structural I] [Structural II], [C-C] [C-D] [_____] Grade and a minimum thickness of [_____] mm inch.[Provide certified sustainably harvested

plywood shear wall.]

2.3.6.2 Structural-Use and OSB Panels

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Sheathing grade with durability equivalent to Interior plywood with Exterior glue (Exposure 1) and a minimum thickness of [_____] mm inch.[Provide certified sustainably harvested structural-use and OSB panel shear wall.]

2.3.7 Other Uses

2.3.7.1 Plywood

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Plywood for [_____]. C-D Grade, Exposure 1.[Provide certified sustainably harvested plywood for other uses.]

2.3.7.2 Structural-Use and OSB Panels

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Structural-use and OSB panels for [_____]. Sheathing grade with durability equivalent to Exposure 1 and a minimum thickness of [_____] mm inch.[Provide certified sustainably harvested structural-use and OSB panels for other uses.]

2.4 UNDERLAYMENT

****
NOTE: Underlayment will be limited to plywood in areas of high moisture or occasional wetting of the finished floor. Particle board is permitted on Army projects only.
****

****
NOTE: The 2002 Farm Bill - Section 9002, Federal Procurement of Biobased Products, requires each

Federal Agency to develop a procurement program which will ensure that items composed of biobased products will be purchased to the maximum extent practical and which is consistent with applicable provisions of Federal procurement law.
****

Underlayment must conform to one of the following:

2.4.1 Hardboard

AHA A135.4 service class, sanded one side, 6 mm 1/4 inch thick, 1200 mm 4 feet wide.

[2.4.2 Particleboard

****
NOTE: The Buyers and Specifiers Guide for CPA contains useful information about product materials and VOC content.
****

****
NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the last bracketed sentences requiring products with indoor air quality certifications as defined in Part 1 of this specification.
****

CPA A208.1, Grade 1-M-1, 6 mm 1/4 inch thick, 1200 by 1200 mm 4 by 4 feet. Compressed [straw] fibers with [phenol formaldehyde][polymeric methylene diisocyanate (PMDI)] resin binder.[Products must contain no added urea-formaldehyde resins. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for particleboard underlayment.]

]2.4.3 Plywood

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Plywood must conform to APA L870, underlayment grade with exterior glue, or C-C (Plugged) exterior grade 9 mm 11/32 inch thick, 1200 mm 4 feet wide.[Provide certified sustainably harvested plywood underlayment.]

2.4.4 Oriented Strand Board

OSB underlayment grade 6 mm 0.225 inch.

2.4.5 Fiberboard

****

NOTE: Fiberboard is an EPA designated product for recycled content. Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition before specifying these products. A resource that can be used to identify products with recycle content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. Other products with recycled content are also acceptable when meeting all requirements of this specification.

NOTE: Research shows products are available from US national manufacturers above the minimum recycled content stated.

****

****

NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the last bracketed sentences requiring products with indoor air quality certifications as defined in Part 1 of this specification.

****

Use [structural fiberboard, minimum 80 percent recycled newspaper.] [gypsum fiberboard, minimum 15 percent post-consumer newspaper.][Provide data identifying percentage of recycled content for fiberboard underlayment.][agrifibe particleboard.][particleboard or MDF.][Products must contain no added urea-formaldehyde resins. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for fiberboard underlayment.]

[2.4.6 Strawboard Panels

****

NOTE: Strawboard panels must meet accepted industry standards at a minimum. Determine standards for reliable products and include in this paragraph, if currently referenced standards are not applicable.

****

****

NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the last bracketed sentences requiring products with indoor air quality certifications as defined in Part 1 of this specification.

****

Minimum 70 percent agricultural waste straw with no added formaldehyde binders. Submit data identifying percentage of biobased content for strawboard panels.[Products must contain no added urea-formaldehyde resins. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for strawboard panels.]

][2.4.7 Cork

****
NOTE: Cork must meet accepted industry standards at a minimum. Determine standards for reliable products and include in this paragraph, if currently referenced standards are not applicable.
****

****
NOTE: Cork is an EPA designated product for recycled content. Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition before specifying this product. A resource that can be used to identify products with recycle content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. Other products with recycled content are also acceptable when meeting all requirements of this specification.

Research shows products are available from US national manufacturers above the minimum recycled content stated.

Cork is recognized as a biobased material. Use materials with biobased content where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying product biobased content requirements. A resource that can be used to identify products with biobased content is the "Catalog" tab within the USDA's "Biopreferred" website at http://www.biopreferred.gov. Other products with biobased content are also acceptable when meeting all requirements of this specification.
****

Minimum 85 percent total recycled content. Provide data identifying percentage of recycled content for cork underlayment.[Minimum 85 percent biobased content. Provide data identifying percentage of biobased content for cork underlayment.]

]2.5 OTHER MATERIALS

2.5.1 Hardboard Underlayment

DOC/NIST PS58, service class, sanded on one side, 6 mm 1/4 inch thick 1200 mm 4 feet wide.

[2.5.2 Fiberboard Wall Sheathing

****
NOTE: Fiberboard is an EPA designated product for recycled content. Use materials with recycled

content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition (including verification of bracketed percentages included in this guide specification) before specifying product recycled content requirements. A resource that can be used to identify products with recycle content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. Other products with recycled content are also acceptable when meeting all requirements of this specification.

Research shows products are available from US national manufacturers above the minimum recycled content stated. Some manufacturers and regions have higher percentages (for components that have a threshold less than 100 percent). Based on research, select or insert desired minimum percentages.

****

****

NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the last bracketed sentences requiring products with indoor air quality certifications as defined in Part 1 of this specification.

****

ASTM C208, 600 mm wide by [13 mm thick for supports 400 mm (o.c.)] [20 mm thick for supports 600 mm o.c.] or 1200 mm wide by [13 mm thick for supports 400 mm o.c.] [20 mm thick for supports 600 mm o.c.], except only 1200 mm wide by 13 mm thick sheathing over supports at 400 mm o.c. may be applied without corner bracing of framing. 2 feet wide by [1/2 inch thick for supports 16 inches (o.c.)] [25/32 inch thick for supports 24 inches o.c.] or 4 feet wide by [1/2 inch thick for supports 16 inches o.c.] [3/4 inch thick for supports 24 inches o.c.], except only 4 feet wide by 1/2 inch thick sheathing over supports at 16 inches o.c. may be applied without corner bracing of framing. Sheathing must be asphalt impregnated or asphalt coated to render the sheathing water resistant but vapor permeable. Structural fiberboard must contain a minimum of 80 percent recycled content. Non-structural fiberboard must contain a minimum of [100][_____] percent post-consumer recycled content. Provide data identifying percentage of recycled content for fiberboard wall sheathing.[Products must contain no added urea-formaldehyde resins. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for fiberboard wall sheathing.]

]2.5.3 Gypsum Wall Sheathing

ASTM C1396/C1396M, 12.7 mm 1/2 inch thick [fire retardant (Type X) 16 mm 5/8 inch thick]; 1200 mm 4 feet wide with square edge [for supports 400 mm 16 inches o.c. with or without corner bracing of framing] [or] [for supports 600 mm 24 inches o.c. with corner bracing of framing]; 600 mm 2 feet wide with V-tongue and groove (T&G) edge for supports [400] [or] [600] mm [16] [or] [24] inches o.c. with corner bracing of framing.

2.5.4 Foil-Faced Insulative Sheathing

Wood fiber core, chemically treated for water resistance, with aluminum foil laminated under pressure to both sides with water-resistant adhesive; 1200 mm 48 inches or 48 3/4 inches wide; 2 mm 0.078 inch thick when used with corner bracing, 2.9 mm 0.115 inch thick with studs up to 400 mm 16 inches o.c. without corner bracing, or 3.5 mm 0.137 inch thick with studs up to 600 mm 24 inches o.c. without corner bracing. The sheathing and installation must have been accepted by ICC as conforming to ICC IBC. The sheathing alone must have a thermal resistance value (R value) of not less than 0.20.

2.5.5 Cellulose Honeycomb Panels

****

NOTE: Cellulose panels are EPA designated products for recycled content. Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition (including verification of bracketed percentages included in this guide specification) before specifying product recycled content requirements. A resource that can be used to identify products with recycle content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. Other products with recycled content are also acceptable when meeting all requirements of this specification.

Research shows products are available from US national manufacturers with the minimum recycled content of the first bracket. Based on research, select or insert desired minimum percentages

****

ASTM C208. Panels must be made of [kraft paper] [fire retardant paper] [and must be impregnated with phenolic resins for moisture resistance].[Panels must contain a minimum of [100][_____] percent post-consumer recycled content. Provide data identifying percentage of recycled content for cellulose honeycomb panels.]

2.5.6 Building Paper

FS UU-B-790, Type I, Grade D, Style 1.

2.5.7 Trussed Rafters

Metal plate connected trusses designed in accordance with TPI 1 and TPI HIB and fabricated in accordance with TPI 1.

2.5.8 Trussed Joists

Metal plate connected parallel chord wood trusses designed and fabricated in accordance with TPI 1.

2.5.9 Roof Decking

****
NOTE: If a specific species is required for architectural purpose, the paragraph or drawings should reflect such a requirement. Roof decking is permitted on Army projects only.
****

[Roof decking must be [commercial][select] grade with minimum design value of [0.9] [7.6] MPa [130] [1100] psi in bending. Decking must be [50 mm 2 inches thick with single tongue and groove][100 mm 4 inches thick with double tongue and groove]; V-jointed, matched and dressed. As an option, fabricated laminated lumber decking with interlocking tongue and groove joints may be provided.

]2.5.10 Miscellaneous Wood Members

2.5.10.1 Nonstress Graded Members

Members must include bridging, corner bracing, furring, grounds, and nailing strips. Members must be in accordance with TABLE I for the species used. Sizes must be as follows unless otherwise shown:

Member	Size mm inch
Bridging	25 x 75 1 x 3 or 25 x 100 1 x 4 for use between members 50 x 300 2 x 12 and smaller; 50 x 100 2 x 4 for use between members larger than 50 x 300 2 x 12.
Corner bracing	25 x 100 1 x 4.
Furring	25 x [50] [75] 1 x [2] [3]
Grounds	Plaster thickness by 38.
Nailing strips	25 x 75 1 x 3 or 25 x 100 1 x 4 when used as shingle base or interior finish, otherwise 50 mm 2 inch stock.

2.5.10.2 Wood Bumpers

AREMA Eng Man, Industrial grade cross ties

2.5.10.3 Sill Plates

Sill plates must be standard or number 2 grade.

2.5.10.4 Blocking

Blocking must be standard or number 2 grade.

2.5.10.5 Rough Bucks and Frames

Rough bucks and frames must be straight standard or number 2 grade.

2.5.11 Adhesives

****

NOTE: If a project design includes use of adhesive products on the building interior (inside the weatherproofing system), include the last bracketed sentences requiring products with indoor air quality certifications or validations as defined in Part 1 of this specification.

****

Comply with applicable regulations regarding toxic and hazardous materials and as specified.[Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).]

2.6 ROUGH HARDWARE

****

NOTE: Any ferrous metal hardware used in humid locations or project locations with Environmental Severity Classification (ESC) of C3 thru C5 must be hot-dip galvanized. For extreme exposed locations, consider stainless steel as a more appropriate material. Humid locations are those in ASHRAE climate zones 0A, 1A, 2A, 3A, 3C, 4C and 5C (as identified in ASHRAE 90.1). See UFC 1-200-01 for determination of ESC for project locations.

****

Unless otherwise indicated or specified, rough hardware must be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials must be as recommended by the product manufacturer unless otherwise indicated or specified. Rough hardware exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs must be hot-dip zinc-coated in accordance with ASTM A153/A153M.[Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather must be copper alloy or hot-dipped galvanized fasteners as recommended by the treated wood manufacturer.]

2.6.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

2.6.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

2.6.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices must be 10 mm 3/8 inch.

2.6.4 Lag Screws and Lag Bolts

ASME B18.2.1.

2.6.5 Wood Screws

ASME B18.6.1.

2.6.6 Nails [and Staples]

****
NOTE: Staples are permitted for Army projects only.
****

ASTM F547, size and type best suited for purpose[; staples must be as recommended by the manufacturer of the materials to be joined]. For sheathing and subflooring, length of nails must be sufficient to extend 25 mm 1 inch into supports. In general, 8-penny or larger nails must be used for nailing through 25 mm 1 inch thick lumber and for toe nailing 50 mm 2 inch thick lumber; 16-penny or larger nails must be used for nailing through 50 mm 2 inch thick lumber. Nails used with treated lumber and sheathing must be hot-dipped galvanized in accordance with ASTM A153/A153M. Nailing must be in accordance with the recommended nailing schedule contained in AWC WFCM. Where detailed nailing requirements are not specified, nail size and spacing must be sufficient to develop an adequate strength for the connection. The connection's strength must be verified against the nail capacity tables in AWC NDS. Reasonable judgment backed by experience must ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector must be used.

2.6.7 Wire Nails

ASTM F1667/F1667M.

2.6.8 Timber Connectors

Unless otherwise specified, timber connectors must be in accordance with TPI 1, APA EWS T300 or AITC TCM.

2.6.9 Clip Angles

Steel, 5 mm 3/16 inch thick, size [as indicated][best suited for intended use]; or zinc-coated steel or iron commercial clips designed for connecting wood members.

2.6.10 Joist Hangers

Steel or iron, zinc coated, sized to fit the supported member, of sufficient strength to develop the full strength of the supported member in accordance with ICC IBC, and furnished complete with any special nails required.

2.6.11 Tie Straps

For joists supported by the lower flange of steel beams, provide 3 by 40 mm 1/8 by 1-1/2 inch steel strap, 600 mm 2 feet long [, except as indicated otherwise].

2.6.12 Joist Anchors

For joists supported by masonry walls, provide anchors 5 by 40 mm 3/16 by 1 1/2 inch steel tee or strap, bent and of length to provide 100 mm 4 inches embedment into wall and 300 mm 12 inches along joist [except as indicated otherwise]. For joists parallel to masonry or concrete walls, provide anchors 6 by 30 mm 1/4 by 1-1/4 inch minimum cross-sectional area, steel strap, length as necessary to extend over top of first three joists and into wall [100] [200] mm [4] [8] inches, and with wall end of bend or pin type [, except as indicated otherwise].

2.6.13 Door Buck Anchors

Metal anchors, 3 by 30 mm 1/8 by 1-1/4 inch steel, 300 mm 12 inches long, with ends bent 50 mm 2 inches [, except as indicated otherwise]. Anchors must be screwed to the backs of bucks and built into masonry or concrete. Locate 200 mm 8 inches above sills and below heads and not more than 600 mm 24 inches intermediately between.[Anchorage of bucks to steel framing must be [as indicated][as necessary to suit the conditions].]

2.6.14 Metal Bridging

[Where not indicated or specified otherwise,] No. 16 U.S. Standard gage, cadmium-plated or zinc-coated.

2.6.15 Toothed Rings and Shear Plates

AWC NDS.

2.6.16 Beam Anchors

Steel U-shaped strap anchors 6 mm 1/4 inch thick by 40 mm 1-1/2 inches wide [, except as indicated otherwise].

2.6.17 Metal Framing Anchors

Construct anchors to the configuration shown using hot dip zinc-coated steel conforming to ASTM A653/A653M, Z275 G90.[Except where otherwise shown,] Steel must be not lighter than 18 gage. Special nails supplied by the manufacturer must be used for all nailing.

2.6.18 Panel Edge Clips

Extruded aluminum or galvanized steel, H-shaped clips to prevent differential deflection of roof sheathing.

2.7 AIR INFILTRATION BARRIER

****

NOTE: The drawings will indicate the location and extent of air infiltration barrier. Coordinate this paragraph or remove this paragraph if you have a separate air barrier specification.

****

Air infiltration barrier must be building paper meeting the requirements of ASTM C1136, Type IV, style optional or a tear and puncture resistant olefin building wrap (polyethylene or polypropylene) with a moisture vapor transmission rate of [125] [_____] g per square meter per 24 hours [125] [_____] g per square meter per 24 hours in accordance with ASTM E96/E96M, Desiccant Method at [23] [_____] degrees C or with a moisture vapor transmission rate of [670] [_____] g per square meter per 24 hours [670] [_____] g per square meter per 24 hours in accordance with ASTM E96/E96M, Water Method at [23] [_____] degrees C.

PART 3 EXECUTION

3.1 INSTALLATION

****

NOTE: NAHB guidelines were written for residential construction, but include techniques that can be used for wood framing in other types of construction as well. OVE uses engineering principles to minimize material usage while meeting model building code structural performance requirements. Using OVE techniques results in lower material and labor costs and improved energy performance for the building. While the system can be applied as a whole package, many of its components can be used independently, depending upon the specific needs of the project.

****

Do not install building construction materials that show visual evidence of biological growth.

Conform to AWC WFCM and install in accordance with the National Association of Home Builders (NAHB) Advanced Framing Techniques: Optimum Value Engineering, unless otherwise indicated or specified. Select lumber sizes to minimize waste. Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. Space plastic lumber boards as necessary to allow for lengthwise expansion and contraction. Do not splice framing members between bearing points. Set joists, rafters, and purlins with their crown edge up. Frame members for the passage of pipes, conduits, and ducts. Provide adequate support as appropriate to the application, climate, and modulus of elasticity of the product. Do not cut or bore structural members for the passage of ducts or pipes without approval. Reinforce all members damaged by such cutting or boring by means of specially formed and approved sheet metal or bar steel shapes, or remove and provide new, as approved. Provide as necessary for the proper completion of the work all framing members not indicated or specified. Spiking and nailing not indicated or specified otherwise must be in accordance with the Nailing Schedule contained in ICC IBC; perform bolting in an approved manner. Spikes, nails, and bolts must be drawn up tight. Install plastic lumber with screws or bolts; if nails are used, use ring shank or spiral shank nails. [Timber connections and fastenings must conform to AWC NDS.][Provide 50 mm 2 inch minimum clearance between chimneys and wood framing; provide 100 mm 4 inch minimum clearance at fireplaces. Fill the spaces with strips of approved noncombustible material.] Use slate or steel shims when leveling joists, beams, and girders on masonry or concrete. Do not use shimming on wood or metal bearings. When joists, beams, and

girders are placed on masonry or concrete, a wood base plate must be positioned and leveled with grout. The joist, beam, or girder must then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket must be formed into the wall. The joist, beam, or girder must then be placed into the pocket and leveled with a steel shim.

3.1.1 Sills

Set sills level and square and wedge with steel or slate shims; point or grout with non-shrinking cement mortar to provide continuous and solid bearing. Anchor sills to the foundations as indicated.[Where sizes and spacing of anchor bolts are not indicated, provide not less than 16 mm 5/8 inch diameter bolts at all corners and splices and space at a maximum of 1800 mm 6 feet o.c. between corner bolts. Provide at least two bolts for each sill member. Lap and splice sills at corners and bolt through the laps or butt the ends and through-bolt not more than 150 mm 6 inches from the ends.] Provide bolts with plate washers and nuts. Bolts in exterior walls must be zinc-coated.

3.1.1.1 Anchors in Masonry

[Except where indicated otherwise,] Embed anchor bolts not less than 400 mm 15 inches in masonry unit walls and provide each with a nut and a 50 mm 2 inch diameter washer at bottom end. Fully grout bolts with mortar.

3.1.1.2 Anchors in Concrete

[Except where indicated otherwise,] Embed anchor bolts not less than 200 mm 8 inches in poured concrete walls and provide each with a nut and a 50 mm 2 inch diameter washer at bottom end. A bent end may be substituted for the nut and washer; bend must be not less than 90 degrees. Powder-actuated fasteners spaced 900 mm 3 feet o.c. may be provided in lieu of bolts for single thickness plates on concrete.

3.1.2 Beams and Girders

Set beams and girders level and in alignment and anchor to bearing walls, piers, or supports with U-shaped steel strap anchors. Embed anchors in concrete or masonry at each bearing and through-bolt to the beams or girders with not less than two bolts. Provide bolts not less than 12 mm 1/2 inch in diameter and with plate washers under heads and nuts. Install beams and girders [not indicated otherwise] with 200 mm 8 inch minimum end bearing on walls or supports. Install beams and girders into walls with [12 mm 1/2 inch clearance at the top, end, and sides] [or] [standard steel wall-bearing boxes]. Provide joints and splices over bearings only and bolt or spike together.

3.1.3 Roof Framing or Rafters

Tops of supports or rafters must form a true plane. Valley, ridge, and hip members must be of depth equal to cut on rafters where practicable, but in no case less than depth of rafters and nominally 50 mm 2 inches thick. Rafters must [be notched and] have full and solid bearing on plates. Valleys, hips, and ridges must be straight and true intersections of roof planes. Necessary crickets and watersheds must be formed. Rafters, except hip and valley rafters, must be [spiked to wall plate and to ceiling joists with no less than three 8-penny nails] [bolted by angles]. Rafters must be toe-nailed to ridge, valley, or hip members with

at least three 8-penny nails. Rafters must be braced to prevent movement until permanent bracing, decking or sheathing is installed. Hip and valley rafters must be secured to wall plates by clip angles. Openings in roof must be framed with headers and trimmers. Unless otherwise indicated, headers carrying more than two rafters and trimmers supporting headers carrying more than one rafter must be double. Hip rafters longer than the available lumber must be butt jointed and scabbed. Valley rafters longer than the available lumber must be double, with pieces lapped not less than 1200 mm 4 feet and well spiked together. Install trussed rafters in accordance with TPI HIB. Install engineered wood joists in accordance with distributor's instructions.

3.1.4 Joists

Provide joists of the sizes and spacing indicated, accurately and in alignment, and of uniform width. Joists must have full bearing on sills, [plates,] [beams,] [girders,] [and] [trusses]; provide laps over bearing only and spike. Where joists are of insufficient length to produce a 300 mm 12 inch lap, butt joists over bearing and provide wood scabs 2 nominal inches thick by depth of joists by 600 mm 24 inches long or metal straps 6 by 40 mm 1/4 by 1 1/2 inch by not less than 450 mm 18 inches long nailed to each joist with not less than four 10-penny nails, or approved sheet metal connectors installed in accordance with the manufacturer's recommendations. Provide joists built into masonry with [a beveled fire cut so that the top of the joist does not enter the wall more than 25 mm one inch] [or] [standard steel wall bearing boxes]. Provide metal hangers for joists framing into the side of headers, beams, or girders.[When a portion of the joist extends above the top flange of a steel beam or girder, provide a 10 mm 3/8 inch space between the top flange and the extended portion of the joists to allow for shrinkage of joists.] The minimum joist end bearing must be 100 mm 4 inches, and joists built into concrete or masonry must have a 12 mm 1/2 inch minimum clearance at the top, end, and sides. For joists approved to be bored for the passage of pipes or conduits, bore through the neutral axis of the joist.[Provide steel joist hangers of proper size and type to receive the ends of all framed joists.]

[3.1.4.1 Floor (Ceiling) Framing

Except where otherwise indicated joists must have bearings not less than 100 mm 4 inches on concrete or masonry and 40 mm 1-1/2 inches on wood or metal. Joists, trimmers, headers, and beams framing into carrying members at the same relative levels must be carried on joist hangers. Joists must be lapped and spiked together at bearings or butted end-to-end with scab ties at joint and spiked to plates. Openings in floors must be framed with headers and trimmers. Headers carrying more than two tail joists and trimmers supporting headers carrying more than one tail joist must be doubled, unless otherwise indicated. Joists built into masonry must be provided with [a beveled fire cut so that the top of the joist does not enter the wall more than 25 mm 1 inch] [or] [standard steel wall bearing boxes]. Install engineered wood joists in accordance with distributor's instructions.

]3.1.4.2 Doubled Joists

Provide under bearing walls and partitions running parallel with the floor joists[, around [stairways,] [chimneys,] [fireplaces,]] and at other openings where joists are cut and framed. Double, space for clearance, block apart 1200 mm 4 feet on center, rigidly frame, and spike together

joists under partitions that are to receive ducts, pipes, and conduits.

3.1.4.3 Tie Straps

For joists supported by the lower flange of steel beams, provide straps at every fourth joist and the corresponding fourth joist on the opposite side. Tie joists across the top of the steel beam with a steel strap. Form straps to lie flat across the top of the beam and twist at the ends to provide flat contact with the side of each joist. Nail each strap at each end with three 10-penny nails spaced 50 mm 2 inches o.c.

3.1.4.4 Joist Anchors

Provide anchors for each fourth joist supported by a masonry wall. Build wall end of anchors into the wall. Nail anchor to the joist with three 10-penny nails spaced 50 mm 2 inches o.c. Anchor the first three joists parallel to concrete or masonry walls at bridging points, but not less than 2400 mm 8 feet o.c. from end walls. Let anchors into the tops of each joist and spike to the top of joist with one 10-penny nail. Extend anchors at least [100] [200] mm [4] [8] inches into the wall.

3.1.5 Bridging

Provide bridging for floor and ceiling joists and for roof rafters having slopes of less than 1/3. Locate bridging as indicated and as specified herein. Provide bridging for spans greater than 1800 mm 6 feet, but do not exceed 2400 mm 8 feet maximum spacing between rows of bridging. Install rows of bridging uniformly. Provide metal or wood cross-bridging, except where solid bridging is indicated. Do not nail the bottom end of cross-bridging until the subfloor has been laid.

3.1.5.1 Wood Cross-Bridging

Provide wood cross-bridging not less than [1 by 3] [2 by 3] [2 by 4] nominal size. Nail wood cross-bridging at each end with [two 8-penny nails for one by thick material] [and] [three 8-penny nails for 2 by thick material.]

3.1.5.2 Metal Cross-Bridging

Must be the manufacturer's standard product, not less than 16 gage before forming and coating. Metal bridging must be the compression type, lodged into or nailed to the wide faces of opposite joists at points diagonally across from each other near the bottoms and tops of joists.

3.1.6 Subflooring

3.1.6.1 Plywood, Structural-Use, and OSB Panels

****

NOTE: Edges must be supported with blocking for square-edged wood finish flooring, unless a separate underlayment layer is installed.

****

Apply best side up with the grain of outer plies or the long dimension at right angles to joists. Stagger end joints and locate over the centerline of joists.[Support panel edges by nominal 2 by 4 members framed between joists so the edge joints of subfloor occur over the centerline of

blocking.] Allow 3 mm 1/8 inch spacing at panel ends and 6 mm 1/4 inch at panel edges. Panels must be continuous over two or more spans. Nail panels 150 mm 6 inches o.c. at supported edges and 250 mm 10 inches o.c. over intermediate bearing. Nails must be 8-penny common or 6-penny threaded. Provide at least 12 mm 1/2 inch clearance between subflooring and masonry or concrete walls. Subflooring may be installed with adhesive conforming to ASTM D3498 and nails spaced at 300 mm 12 inches on center unless otherwise shown.

3.1.6.2 Combination Subfloor-Underlayment

****
NOTE: Edges must be supported with blocking for square-edged wood finish flooring, unless a separate underlayment layer is installed.
****

Apply with the grain of the face plies or the long dimension at right angles to joists. Panels ust be continuous over two or more spans. Stagger end joints of adjacent panels. Panel edges must be T&G or supported by 2 by 4 members framed between joists so the edge joints of subfloor-underlayment occur over the centerline of blocking. Provide end joints of panels over the centerline of joists. Allow 3 mm 1/8 inch spacing between panel edge and end joints. Nail panels 150 mm 6 inches o.c. at ends and edges and 250 mm 10 inches o.c. along intermediate bearings unless they are glue-nailed in accordance with APA E30. Nails must be 8-penny coated common or 6-penny threaded. Provide at least 12 mm 1/2 inch clearance between subfloor-underlayment and masonry or concrete walls.[Lightly sand all joints to receive [resilient flooring][_____].]

3.1.6.3 Wood

Subflooring must be applied diagonally with end joints made over supports. Each board must bear on at least three supports and must be nailed at each support using two nails for boards 150 mm 6 inches and less in width and three nails for boards more than 150 mm 6 inches in width.

3.1.6.4 Depressed Subfloors

Provide depressed subfloors to receive [ceramic] [and] [quarry] tile floors. Nail cleats or ledgers of one by four material to the sides of joists to support the flooring material. Place the cleats at a depth below the top of the joists sufficient to allow the installation of the subflooring below the tops of joists. Snugly fit subflooring as specified herein between joists.

3.1.7 Underlayment

Install underlayment over subfloor just prior to laying of [resilient flooring] [_____] and protect from water and physical damage. Stagger end joints of underlayment with respect to each other, and stagger all joints with respect to paralleling panel joints in subfloor. Space panels 2 mm 1/16 inch apart at ends and 3 mm 1/8 inch apart at edges and at least 12 mm 1/2 inch from concrete or masonry walls. Nail panels 150 mm 6 inches o.c. along edges and 150 mm 6 inches o.c. each way throughout panel, but not closer than 10 mm 3/8 inch to panel edges. Nails must be 4-penny annular ring or screw type and must be countersunk 2 mm 1/16 inch.[Lightly sand all joints to receive [resilient flooring][_____].]

3.1.8 Columns and Posts

Set columns and posts, plumb, in alignment, and with full and uniform bearing. Do not embed the bottom and bearing surfaces of [posts] [columns] in concrete or set in direct contact with concrete slabs on grade. [Provide post and beam construction with [wood bolsters] [steel post caps] in such a manner that the post above will tier directly over the one below; fabricate the assembly in a rigid and substantial manner using bolts or lag screws.]

3.1.9 Wall Framing

3.1.9.1 Studs

Select studs for straightness and set plumb, true, and in alignment. In walls and partitions more than 2400 mm 8 feet tall, provide horizontal bridging at not more than 2400 mm 8 feet o.c. using nominal 50 mm 2 inch material of the same width as the studs; install the bridging flat. Sizes and spacing of studs must be [_____] [as indicated]. Double studs at jambs and heads of openings and triple at corners to form corner posts. Frame corner posts to receive sheathing, lath, and interior finish. Truss over openings exceeding 1200 mm 4 feet in width or use a header of sufficient depth. Toe-nail studs to sills or sole plates with four 8-penny nails or fasten with metal nailing clips or connectors. Anchor studs abutting concrete or masonry walls thereto near the top and bottom and at midheight of each story using expansion bolts or powder-actuated drive studs.

3.1.9.2 Plates

Use plates for walls and partitions of the same width as the studs to form continuous horizontal ties. Splice single plates; stagger the ends of double plates. Double top plates in walls and bearing partitions, built up of two nominal 50 mm 2 inch thick members. Top plates for nonbearing partitions must be single or double plates of the same size as the studs. Nail lower members of double top plates and single top plates to each stud and corner post with two 16-penny nails. Nail the upper members of double plates to the lower members with 10-penny nails, two near each end, and stagger 400 mm 16 inches o.c. intermediately between. Nail sole plates on wood construction through the subfloor to each joist and header; stagger nails. Anchor sole plates on concrete with expansion bolts, one near each end and at not more than 1800 mm 6 feet o.c., or with powder-actuated fasteners, one near each end and at not more than 900 mm 3 feet o.c. Provide plates cut for the passage of pipes or ducts with a steel angle as a tie for the plate and bearing for joist.

3.1.9.3 Firestops

Provide firestops for wood framed walls and partitions and for furred spaces of concrete or masonry walls at each floor level and at the ceiling line in the top story. Where firestops are not automatically provided by the framing system used, they must be formed of closely fitted wood blocks of nominal 50 mm 2 inch thick material of the same width as the [studs] [and] [joists].[Lightweight concrete units may be used at the first-floor level to serve jointly as firestopping and ratproofing.]

3.1.9.4 Diagonal Bracing

Provide diagonal bracing at all external corners and internal angles and

at maximum 12000 mm 40 foot centers in stud walls, except that bracing may be omitted where diagonally applied wood sheathing, plywood or structural-use panel sheathing, 1200 by 2400 mm 4 by 8 foot fiberboard sheathing, or gypsum board sheathing is used. Bracing must be of 1 by 6 material, let into the exterior face of studs. Extend bracing from top plates to sill at an angle of approximately 45 degrees and double nail at each stud. When openings occur near corners, provide diagonal knee braces extending from the corner post above headers to top plates and from below window sills to the main sill. Nail bracing at each bearing with two 8-penny nails.

3.1.10 Wall Sheathing

3.1.10.1 Plywood, Structural-Use, and OSB Panel Wall Sheathing

Apply horizontally or vertically. Extend sheathing over and nail to sill and top plate. Abut sheathing edges over centerlines of supports. Allow 3 mm 1/8 inch spacing between panels and 3 mm 1/8 inch at windows and doors. If sheathing is applied horizontally, stagger vertical end joints. Nail panels with 6-penny nails spaced 150 mm 6 inches o.c. along edges of the panel and 300 mm 12 inches o.c. over intermediate supports. Keep nails 10 mm 3/8 inches away from panel ledges. Provide 2 by 4 blocking for horizontal edges not otherwise supported.

3.1.10.2 Fiberboard Wall Sheathing

Apply fiberboard wall sheathing allowing a 3 mm 1/8 inch joint at edges to permit expansion, except at frames and openings where sheathing must be fitted snugly. Pre-expand sheathing before application, allowing sheathing to condition for humidity as recommended by the sheathing manufacturer. Provide 2 by 4 blocking for horizontal edges not otherwise supported.

a. Fiberboard wall sheathing used with diagonal-braced framing must be either 600 or 1200 mm 2 or 4 feet wide. Sheathing 600 mm 2 feet wide must have T&G or shiplapped edges and must be applied horizontally with vertical joints staggered. Apply sheathing with tongued edge up and nail at edges and intermediate bearings with 45 mm 1-3/4 inch long, zinc-coated steel roofing nails spaced on maximum 115 mm 4-1/2 inch centers. Apply sheathing 1200 mm 4 feet wide either horizontally or vertically. Nail sheathing with 45 mm 1-3/4 inch long, zinc-coated steel roofing nails spaced 100 mm 4 inches maximum o.c. at edges and 200 mm 8 inches maximum o.c. at intermediate bearings.

b. Fiberboard wall sheathing used with unbraced framing must be 1200 mm 4 feet wide. Apply sheathing vertically. Extend sheathing over and nail to sill and top plates. Locate joints over centerlines of supports. Nail sheathing with 40 mm 1-1/2 inch long, zinc-coated steel roofing nails with 9.5 mm 3/8 inch diameter heads. Space nails 75 mm 3 inches o.c. at edges and ends and 150 mm 6 inches o.c. at intermediate bearings.

3.1.10.3 Gypsum Sheathing Board

Apply gypsum sheathing board either horizontally or vertically. Butt joints and locate over the centerlines of supports. Horizontally applied sheathing must be T&G, applied with tongued edge up. Stagger vertical joints and abut sheet closely to frames of openings. Nail sheathing with 11 gage, 9.5 mm 3/8 inch head, zinc-coated nails 40 mm 1-1/2 inches long

for 12.7 mm 1/2 inch sheathing and 45 mm 1-3/4 inches long for 16 mm 5/8 inch sheathing, spaced 10 mm 3/8 inch minimum from edges. Provide 2 by 4 blocking for horizontal edges of 1200 mm 4 foot wide panels not otherwise supported.

a. Gypsum Sheathing Board Used with Diagonal-Braced Framing: Sheathing must be either 600 or 1200 mm 2 or 4 feet wide. Apply sheathing 600 mm 2 feet wide horizontally. Nail 100 mm 4 inches maximum o.c. at edges and over intermediate bearings. Apply sheathing 1200 mm 4 feet wide either horizontally or vertically. Nail 150 mm 4 inches maximum o.c. at edges and 200 mm 8 inches maximum o.c. at intermediate bearings.

b. Gypsum Sheathing Board Used with Unbraced Frames: Sheathing must be 1200 mm 4 feet wide and applied vertically. Extend sheathing over and nail to both sill and top plates. Nail 100 mm 4 inches maximum o.c. at edges and 200 mm 8 inches maximum o.c. at intermediate bearings.

3.1.10.4 Foil-Faced Insulative Sheathing

Apply sheathing vertically. Butt or overlap joints and locate over centerline of supports. Attach sheathing to framing with 30 mm 1-1/4 inch, large, flat-head, 11 gage, galvanized roofing nails or 16 gage, 11 mm 7/16 inch minimum crown, galvanized staples with 30 mm 1-1/4 inch legs. For nonstructural application (with corner bracing), space fasteners 150 mm 6 inches o.c. on all panel edges and 300 mm 12 inches o.c. on intermediate supports, regardless of sheathing thickness, for studs not more than 600 mm 24 inches o.c. For structural application (without corner bracing), for studs not more than 400 mm 16 inches o.c., space fasteners 75 mm 3 inches o.c. on all edges and 150 mm 6 inches o.c. on intermediate members using minimum 2.9 mm 0.115 inch thickness; for studs up to 600 mm 24 inches o.c., space fasteners 75 mm 3 inches o.c. on all edges and 75 mm 3 inches o.c. on intermediate supports using minimum 3.5 mm 0.137 inch thickness.

3.1.10.5 Particleboard

Install according to manufacturer's instructions and accepted industry standards.

3.1.10.6 Cellulose Honeycomb Panels

Install according to manufacturer's instructions and accepted industry standards.

3.1.11 Wood Sheathing

Sheathing end joints must be made over framing members and so alternated that there will be at least two boards between joints on the same support. Each board must bear on at least three supports. Boards must be nailed at each support using two nails for boards 150 mm 6 inches and less in width and three nails for boards more than 150 mm 6 inches in width. Roof sheathing must not be installed where roof decking is installed.

3.1.12 Building Paper

Provide building paper [where indicated] [on wood board sheathing for all types of exterior siding]. Apply paper shingle fashion, horizontally, beginning at the bottom of the wall. Lap edges 100 mm 4 inches, and nail with 25 mm one inch, zinc-coated roofing nails, spaced 300 mm 12 inches o.c. and driven through tin discs.

3.1.13 Ceiling Joists

Size as indicated and set accurately and in alignment. Toe-nail joists to all plates with not less than three 10-penny nails. Frame openings in ceilings with headers and trimmers.

3.1.14 Metal Framing Anchors

Provide framing anchors at every [other] [rafter] [or] [trussed rafter] to fasten [rafter] [or] [trussed rafter] to plates and studs against uplift movement and forces as indicated. Anchors must be punched and formed for nailing so that nails will be stressed in shear only. Nails must be zinc-coated; drive a nail in each nail hole provided in the anchor.

3.1.15 Trusses

Metal plate connected wood trusses must be handled, erected, and braced in accordance with TPI HIB and as indicated.

3.1.16 Structural Glued Laminated Timber Members

Brace members before erection. Align members and complete all connections before removal of bracing. Unwrap individually wrapped members only after adequate protection by a roof or other cover has been provided. Treat scratches and abrasions of factory applied sealer with two brush coats of the same sealer used at the factory.

3.1.17 Plywood and Structural-Use Panel Roof Sheathing

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NOTE: The following requirements for size, type, and spacing of nails represent the minimum recommended by APA for roof sheathing. Modify these requirements to agree with UL or FM requirements for wind-tested roof assemblies.

****

Install with the grain of the outer plies or long dimension at right angles to supports. Stagger end joints and locate over the centerlines of supports. Allow 3 mm 1/8 inch spacing at panel ends and 6 mm 1/4 inch at panel edges. Nail panels with 8-penny common nails or 6-penny annular rings or screw-type nails spaced 150 mm 6 inches o.c. at supported edges and 300 mm 12 inches o.c. at intermediate bearings. Do not use staples in roof sheathing. Where the support spacing exceeds the maximum span for an unsupported edge, provide adequate blocking, tongue-and-groove edges, or panel edge clips, in accordance with APA E30.

3.1.18 Stair Framing

Cut carriages to exact shape required to receive treads and risers, with risers of uniform height and treads of uniform width. Provide trimmers, nailers, and blocking as required to support finish materials.

3.1.19 Plastic Lumber

In conjunction with above requirements, follow manufacturer's recommendations for plastic lumber installation, including requirements for structural support, thermal movement, working, fastening, and

finishing. Use standard woodworking tools, including carbide tips, coarse saw blades, and routers with aggressive cutters. Follow manufacturer's recommendations for repair by melting.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Nailers, Edge Strips, Crickets, Curbs, and Cants

Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

3.2.1.1 Roof Nailing Strips

Provide roof nailing strips for roof decks as [indicated] [and] [specified herein]. Apply nailing strips in straight parallel rows in the direction and spacing[indicated][specified in [_____]]. Strips must be[surface applied][embedded in concrete].

a. Surface-Applied Nailers: Must be 75 mm 3 inches wide and of thickness to finish flush with the top of the insulation. Anchor strips securely to the roof deck with powder actuated fastening devices or expansion shields and bolts, spaced not more than 600 mm 24 inches o.c.[On decks with slopes of 25 mm one inch or more, provide surface applied wood nailers for securing insulation[and for nailing of roofing felts].]

b. Embedded Nailers: Must be nominal 50 by 75 with 20 mm 2 by 3 with 2 inch sides beveled. Set and anchor nailers to finish flush with the roof deck surface.

3.2.1.2 Roof Edge Strips and Nailers

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NOTE: For NAVFAC SE, indicate the anchorage type and spacing for all nailer attachments on the project drawings.
****

Provide at perimeter of roof, around openings through roof, and where roofs abut walls, curbs, and other vertical surfaces. Except where indicated otherwise, nailers must be 150 mm 6 inches wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. Anchor perimeter nailers in accordance with FM 4435.[Strips must be grooved [as indicated] for edge venting; install at walls, curbs, and other vertical surfaces with a 6 to 12 mm 1/4 to 1/2 inch air space.]

3.2.1.3 Crickets, Cants, and Curbs

Provide wood saddles or crickets, cant strips, [curbs for scuttles and ventilators,] [and wood nailers bolted to tops of concrete or masonry curbs] [and at expansion joints,] as indicated, specified, or necessary and of [lumber] [or [_____] mm inch thick exterior plywood].

3.2.2 Rough Wood Bucks

[Size as indicated] [50 mm 2 inch nominal thickness]. Set wood bucks true and plumb. Anchor bucks to concrete or masonry with steel straps extending into the wall 200 mm 8 inches minimum. Place anchors near the

top and bottom of the buck and space uniformly at 600 mm 2 foot maximum intervals.

3.2.3 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.

3.2.4 Wood Grounds

Provide for fastening wood trim, finish materials, and other items to plastered walls and ceilings. Install grounds in proper alignment and true with an 2400 mm 8 foot straightedge.

3.2.5 Wood Furring

Provide where shown and as necessary for facing materials specified. Except as shown otherwise, furring strips must be nominal one by 3, continuous, and spaced 400 mm 16 inches o.c. Erect furring vertically or horizontally as necessary. Nail furring strips to masonry. Do not use wood plugs. Provide furring strips around openings, behind bases, and at angles and corners. Furring must be plumb, rigid, and level and must be shimmed as necessary to provide a true, even plane with surfaces suitable to receive the finish required. Form furring for [cornices,] offsets and breaks in walls or ceilings on 1 by 4 wood strips spaced 400 mm 16 inches o.c.

3.2.6 Wood Bumpers

Dress to the sizes indicated, and bevel edges. Bore, countersink, and bolt bumpers in place.

3.2.7 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

3.2.8 Temporary Centering, Bracing, and Shoring

Provide for the support and protection of masonry work during construction as specified in Section [_____]. Forms and centering for cast-in-place concrete work are specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.2.9 Wood Sleepers

Run wood sleepers in lengths as long as practicable and stagger end joints in adjacent rows.[Sleepers for gymnasium floors are specified in Section 09 64 66 WOOD ATHLETIC FLOORING.]

3.2.10 Diaphragms

****

NOTE: Select laying pattern, nail size, and spacing based on Chapter 23 of the ICC IBC. Also refer to APA E30.

****

Install plywood, structural-use, or OSB panels with the long dimension [parallel] [perpendicular] to supports. End joints must be [continuous] [staggered] and located over the centerline of supports. Longitudinal joints must be [continuous] [staggered] [and provided with blocking]. Nail panels with [6] [8] [10]-penny nails spaced not more than [_____] mm inches on centers around the diaphragm boundaries [and along continuous panel edges] and [_____] mm inches on centers at all other supported edges and 300 mm 12 inches o.c. over intermediate bearings.

3.2.11 Shear Walls

****

NOTE: Select nail size and spacing based on Chapter 23 of ICC IBC. Also refer to APA E30.

****

Install plywood or structural-use panels with long dimension parallel or perpendicular to supports. Provide blocking behind edges not located over supports. Nail panels with [6] [8] [10]-penny nails spaced not more than [_____] mm inches on centers along panel edges and 150 mm 6 inches o.c. over intermediate bearings.

3.2.12 Bridging

Wood bridging must have ends accurately bevel-cut to afford firm contact and must be nailed at each end with two nails. Indall metal bridging as recommended by the manufacturer. The lower ends of bridging must be driven up tight and secured after subflooring or roof sheathing has been laid and partition framing installed.

3.2.13 Corner Bracing

Indatall corner bracing when required by type of sheathing used or when siding, other than panel siding, is applied directly to studs. Corner bracing must be let into the exterior surfaces of the studs at an angle of approximately 45 degrees, must extend completely over wall plates, and must be secured at each bearing with two nails.

3.2.14 Sill Plates

Sill plates must be set level and square and anchor bolted at not more than 1800 mm 6 feet on centers and not more than 300 mm 12 inches from end of each piece. A minimum of two anchors must be used for each piece.

3.3 INSTALLATION OF TIMBER CONNECTORS

Install timber connectors in conformance with requirements of AWC NDS.

3.4 ERECTION TOLERANCES

a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, must be within the following limits:

(1) Layout of walls and partitions: 6 mm 1/4 inch from intended position;

(2) Plates and runners: 6 mm in 2400 mm 1/4 inch in 8 feet from a straight line;

(3) Studs: 6 mm in 2400 mm 1/4 inch in 8 feet out of plumb, not cumulative; and

(4) Face of framing members: 6 mm in 2400 mm 1/4 inch in 8 feet from a true plane.

b. Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive must be within the following limits:

(1) Layout of walls and partitions: 6 mm 1/4 inch from intended position;

(2) Plates and runners: 3 mm in 2400 mm 1/8 inch in 8 feet from a straight line;

(3) Studs: 3 mm in 2400 mm 1/8 inch in 8 feet out of plumb, not cumulative; and

(4) Face of framing members: 3 mm in 2400 mm 1/8 in 8 feet from a true plane.

[3.5 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS

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NOTE: Include this paragraph only when special inspection and testing for seismic-resisting systems is required by FEMA P-750,"NEHRP Recommended Seismic Provisions".

This paragraph will be applicable to both new buildings designed and to existing building seismic rehabilitation designs done according to UFC 1-200-01, "General Building Requirements" and UFC 3-301-01, "Structural Engineering".

The designer must indicate on the drawings all locations and all features for which special inspection and testing is required in accordance with FEMA P-750. This includes indicating the locations of all structural components and connections requiring inspection.

Add any additional requirements as necessary.

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NOTE: Use this paragraph regarding special inspection and testing for Army projects only.

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Special inspections and testing for seismic-resisting systems and components must be done in accordance with Section 01 45 35 SPECIAL INSPECTIONS.

]3.6 WASTE MANAGEMENT OF WOOD PRODUCTS

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NOTE: Take-back programs refer to programs in which the product manufacturer "takes-back" scrap material and/or packaging associated with its product. Diverting waste from the landfill contributes maximizing sustainability on all projects. Coordinate with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Designer must verify that items are able to be disposed of as specified.
****

In accordance with the Waste Management Plan and as specified.[Separate and reuse scrap sheet materials larger than [0.2 square meters] [2 square feet] [_____], framing members larger than [406 mm] [16 inches] [_____], and multiple offcuts of any size larger than [305 mm] [12 inches] [_____].] Clearly separate damaged wood and other scrap lumber for acceptable alternative uses on site, including bracing, blocking, cripples, ties, and shims.

[Separate composite wood from other wood types and recycle or reuse.] [Coordinate with manufacturer for take-back program and submit manufacturer's policy statement on program.] [Set aside scrap [plastic lumber] and return to manufacturer for recycling into new product. When such a service is not available, local recyclers must be sought after to reclaim the materials.][Fold up metal banding, flatten, and recycle.]

Separate treated, stained, painted, and contaminated wood and place in designated area for hazardous materials. Dispose of according to local regulations.[Do not leave any wood, shavings, sawdust, or other wood waste buried in fill or on the ground[, unless for planned future use].][Prevent sawdust and wood shavings from entering the storm drainage system.] [Compost sawdust.]Do not burn scrap lumber that has been pressure treated, or lumber that is less than one year old.

3.7 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurements. Typical conversion is as shown:

PRODUCTS	INCH-POUND Nominal	METRIC Conversion
Sawn lumber	2 by 4	38 by 89 mm
	1 by	19 mm by
Stud spacing	16 inches	400 mm
	If not 48 inches panel	406 mm
Plywood	48 by 96 inches	1200 mm by 2400 mm

-- End of Section --