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USACE / NAVFAC / AFCEA UFGS-06100A (February 2004)  
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Preparing Activity: USACE Superseding  
UFGS-06100A (February 2002)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

Latest change indicated by CHG tags

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SECTION TABLE OF CONTENTS

DIVISION 06 - WOOD AND PLASTICS

SECTION 06100A

ROUGH CARPENTRY

02/04

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY AND STORAGE
- 1.4 Qualifications

PART 2 PRODUCTS

- 2.1 LUMBER AND SHEATHING
  - 2.1.1 Grading and Marking
    - 2.1.1.1 Lumber Products
    - 2.1.1.2 Fabricated Structural Members
    - 2.1.1.3 Plywood and Other Sheathing Products
  - 2.1.2 Sizes
  - 2.1.3 Treatment
    - 2.1.3.1 Lumber and Timbers
    - 2.1.3.2 Plywood
  - 2.1.4 Moisture Content
  - 2.1.5 Fire-Retardant Treatment
  - 2.1.6 Structural Wood Members
    - 2.1.6.1 Trussed Rafters
    - 2.1.6.2 Structural Glued Laminated Members
    - 2.1.6.3 Engineered Wood Joists and Rafters
  - 2.1.7 Sheathing
    - 2.1.7.1 Fiberboard
    - 2.1.7.2 Gypsum Sheathing Board
    - 2.1.7.3 Plywood
    - 2.1.7.4 Wood Structural Panels
    - 2.1.7.5 Wood
  - 2.1.8 Subflooring
    - 2.1.8.1 Plywood
    - 2.1.8.2 Wood Structural Panels
    - 2.1.8.3 Wood

- 2.1.9 Underlayment
  - 2.1.9.1 Hardboard
  - 2.1.9.2 Particleboard
  - 2.1.9.3 Plywood
- 2.1.10 Shear Wall Panels
- 2.1.11 Roof Decking
- 2.1.12 Miscellaneous Wood Members
  - 2.1.12.1 Nonstress Graded Members
  - 2.1.12.2 Wood Bumpers
  - 2.1.12.3 Sill Plates
  - 2.1.12.4 Blocking
  - 2.1.12.5 Rough Bucks and Frames
- 2.2 ACCESSORIES AND NAILS
  - 2.2.1 Anchor Bolts
  - 2.2.2 Bolts: Lag, Toggle, and Miscellaneous Bolts and Screws
  - 2.2.3 Clip Angles
  - 2.2.4 Expansion Shields
  - 2.2.5 Joist Hangers
  - 2.2.6 Metal Bridging
  - 2.2.7 Nails and Staples
  - 2.2.8 Timber Connectors
- 2.3 INSULATION
  - 2.3.1 Batt or Blanket
    - 2.3.1.1 Glass Fiber Batts and Rolls
    - 2.3.1.2 Mineral Fiber Batt
    - 2.3.1.3 Mineral Fiber Blanket
  - 2.3.2 Loose Fill or Granular Fill
    - 2.3.2.1 Vermiculite
    - 2.3.2.2 Perlite
    - 2.3.2.3 Mineral Fiber
    - 2.3.2.4 Cellulosic or Wood Fiber
  - 2.3.3 Sill Sealer
  - 2.3.4 Rigid Insulation
    - 2.3.4.1 Polystyrene Board
    - 2.3.4.2 Polyurethane or Polyisocyanurate Board
    - 2.3.4.3 Glass Fiber or Insulation Board
    - 2.3.4.4 Mineral Fiber Block and Board
    - 2.3.4.5 Cellular Glass
- 2.4 VAPOR RETARDER
- 2.5 AIR INFILTRATION BARRIER

## PART 3 EXECUTION

- 3.1 INSTALLATION OF FRAMING
  - 3.1.1 General
  - 3.1.2 Structural Members
  - 3.1.3 Partition and Wall Framing
  - 3.1.4 Floor (Ceiling) Framing
  - 3.1.5 Roof Framing or Rafters
  - 3.1.6 Stair Framing
- 3.2 INSTALLATION OF SHEATHING
  - 3.2.1 Fiberboard
  - 3.2.2 Gypsum Board
  - 3.2.3 Plywood and Wood Structural Panels
  - 3.2.4 Wood
- 3.3 INSTALLATION OF SUBFLOORING
  - 3.3.1 Plywood and Wood Structural Panel
  - 3.3.2 Wood
- 3.4 INSTALLATION OF UNDERLAYMENT

- 3.4.1 Hardboard
- 3.4.2 Particleboard
- 3.4.3 Plywood
- 3.5 INSTALLATION OF SHEAR WALLS
- 3.6 INSTALLATION OF MISCELLANEOUS WOOD MEMBERS
  - 3.6.1 Bridging
  - 3.6.2 Corner Bracing
  - 3.6.3 Blocking
  - 3.6.4 Nailers and Nailing Strips
  - 3.6.5 Wood Grounds
  - 3.6.6 Furring Strips
  - 3.6.7 Rough Bucks and Frames
  - 3.6.8 Wood Bumpers
  - 3.6.9 Sill Plates
- 3.7 INSTALLATION OF TIMBER CONNECTORS
- 3.8 INSTALLATION OF INSULATION
- 3.9 INSTALLATION OF VAPOR RETARDER
- 3.10 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS
- 3.11 INSTALLATION OF AIR INFILTRATION BARRIER
- 3.12 TABLES

-- End of Section Table of Contents --

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SECTION 06100A

ROUGH CARPENTRY  
02/04

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NOTE: This guide specification covers the requirements for rough carpentry.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

This guide specification includes tailoring options for fire-retardant treatment, structural wood, sheathing, subflooring, underlayment, shear wall panels, roof decking, and insulation. Selection or deselection of a tailoring option will include or exclude that option in the section, but editing the resulting section to fit the project is still required.

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PART 1 GENERAL

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NOTE: Designer should require (besides insulation) materials, products, and innovative construction methods and techniques which are environmentally sensitive, take advantage of recycling and conserve natural resources.

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## 1.1 REFERENCES

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NOTE: Issue (date) of references included in  
project specifications need not be more current than  
provided by the latest guide specification. Use of  
SpecsIntact automated reference checking is  
recommended for projects based on older guide  
specifications.  
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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 & PAPER ASSOCIATION (AF&PA)

|            |   |
|------------|---|
| AF&PA T10  | (2001) Wood Frame Construction Manual for One- and Two-Family Dwellings |
| AF&PA T101 | (2001) National Design Specification (NDS) for Wood Construction        |

### AMERICAN HARDBOARD ASSOCIATION (AHA)

|            |                               |
|------------|-------------------------------|
| AHA A135.4 | (1995) Basic Hardboard        |
| AHA A194.1 | (1985) Cellulosic Fiber Board |

### AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

|             |  |
|-------------|--|
| AITC 109    | (1998) Standard for Preservative Treatment of Structural Glued Laminated Timber                                      |
| AITC 111    | (1979) Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection |
| AITC A190.1 | (2002) Structural Glued Laminated Timber   |
| AITC OT-01  | (1994) Timber Construction Manual  |

### AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

|             |                      |
|-------------|----------------------|
| ANSI A208.1 | (1999) Particleboard |
|-------------|----------------------|

### AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

|          |   |
|----------|---|
| AWPA C2  | (2001) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes |
| AWPA C20 | (1999) Structural Lumber Fire-Retardant Treatment by Pressure Processes                         |
| AWPA C27 | (1999) Plywood - Fire-Retardant Treatment by Pressure Processes                                 |
| AWPA C9  | (2000) Plywood - Preservative Treatment by  |

#### Pressure Processes

|         |   |
|---------|---|
| AWPA M4 | (2001) Standard for the Care of<br>Preservative-Treated Wood Products |
| AWPA P5 | (2002) Standard for Waterborne<br>Preservatives                       |

#### APA - THE ENGINEERED WOOD ASSOCIATION (APA)

|               |   |
|---------------|---|
| APA E445S     | (2001; R 2002) Performance Standards and<br>Policies for Structural-Use Panels (APA<br>PRP-108) |
| APA EWS R540C | (1995; R 1996) Builder Tips Proper Storage<br>and Handling of Glulam Beams                      |
| APA EWS T300E | (2002) Technical Note: Glulam Connection<br>Details   |

#### ASTM INTERNATIONAL (ASTM)

|                     |   |
|---------------------|---|
| ASTM A 307          | (2002) Carbon Steel Bolts and Studs, 60<br>000 PSI Tensile Strength                                   |
| ASTM C 1136         | (2003) Flexible, Low Permeance Vapor<br>Retarders for Thermal Insulation                              |
| ASTM C 1177/C 1177M | (2001) Glass Mat Gypsum Substrate for Use<br>as Sheathing   |
| ASTM C 1289         | (2002) Faced Rigid Cellular<br>Polyisocyanurate Thermal Insulation Board                              |
| ASTM C 208          | (1995; R 2001) Cellulosic Fiber Insulating<br>Board   |
| ASTM C 516          | (2002) Vermiculite Loose Fill Thermal<br>Insulation   |
| ASTM C 518          | (2002e1) Steady-State Thermal Transmission<br>Properties by Means of the Heat Flow Meter<br>Apparatus |
| ASTM C 549          | (2002) Perlite Loose Fill Insulation  |
| ASTM C 552          | (2000e1) Cellular Glass Thermal Insulation  |
| ASTM C 553          | (2002) Mineral Fiber Blanket Thermal<br>Insulation for Commercial and Industrial<br>Applications      |
| ASTM C 578          | (2003a) Rigid, Cellular Polystyrene<br>Thermal Insulation   |
| ASTM C 591          | (2001) Unfaced Preformed Rigid Cellular<br>Polyisocyanurate Thermal Insulation                        |
| ASTM C 612          | (2000a) Mineral Fiber Block and Board   |

Thermal Insulation

|                 |  |
|-----------------|--|
| ASTM C 665      | (2001e1) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing    |
| ASTM C 726      | (2000a) Mineral Fiber Roof Insulation Board  |
| ASTM C 739      | (2003e1) Cellulosic Fiber Loose-Fill Thermal Insulation  |
| ASTM C 764      | (2002) Mineral Fiber Loose-Fill Thermal Insulation   |
| ASTM C 79/C 79M | (2003) Treated Core and Nontreated Core Gypsum Sheathing Board   |
| ASTM D 2898     | (1994; R 1999) Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing                      |
| ASTM D 3498     | (2003) Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems                              |
| ASTM E 154      | (1999) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover |
| ASTM E 84       | (2003) Surface Burning Characteristics of Building Materials   |
| ASTM E 96       | (2000e1) Water Vapor Transmission of Materials   |
| ASTM F 547      | (2001) Nails for Use with Wood and Wood-Base Materials   |

FM GLOBAL (FM)

|            |                           |
|------------|---------------------------|
| FM DS 1-49 | (2000) Perimeter Flashing |
|------------|---------------------------|

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

|            |   |
|------------|---|
| NHLA Rules | (2003) Rules for the Measurement & Inspection of Hardwood & Cypress |
|------------|---|

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

|                     |   |
|---------------------|---|
| NELMA Grading Rules | (2003) Standard Grading Rules for Northeastern Lumber |
|---------------------|---|

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

|               |                                       |
|---------------|---------------------------------------|
| RIS Grade Use | (1998) Redwood Lumber Grades and Uses |
|---------------|---------------------------------------|

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 (2002) Standard Grading Rules for Southern  
Pine Lumber

TRUSS PLATE INSTITUTE (TPI)

TPI 1 (2002) National Design Standard for Metal  
Plate Connected Wood Truss Construction;  
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)

PS1 (1995) Construction and Industrial Plywood  
(APA V995)

PS2 (1992) Wood-Based Structural-Use Panels  
(APA 5350)

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

16 CFR 1209 Interim Safety Standard for Cellulose  
Insulation

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17 (2000) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5 (1998) Western Lumber Grading Rules

1.2 SUBMITTALS

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**NOTE:** Submittals must be limited to those necessary  
for adequate quality control. The importance of an  
item in the project should be one of the primary  
factors in determining if a submittal for the item  
should be required.

A "G" following a submittal item indicates that the  
submittal requires Government approval. Some  
submittals are already marked with a "G". Only  
delete an existing "G" if the submittal item is not  
complex and can be reviewed through the Contractor's  
Quality Control system. Only add a "G" if the  
submittal is sufficiently important or complex in  
context of the project.

For submittals requiring Government approval on Army  
projects, a code of up to three characters within



the submittal tags may be used following the "G" designation 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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Structural Wood Members[; G][; G, [\_\_\_\_]]  
Installation of Framing[; G][; 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][; 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

Structural Wood Members[; G][; G, [\_\_\_\_]]

Design analysis and calculations of structural laminated members, fabricated wood trusses, and other fabricated structural members showing design criteria used to accomplish the applicable analysis.

#### Qualifications

List of successful installations as specified.

#### SD-07 Certificates

##### Grading and Marking

Manufacturer's certificates (approved by an American Lumber

Standards approved agency) attesting that lumber and material not normally grade marked meet the specified requirements. Certificate of Inspection for grade marked material by an American Lumber Standards Committee (ALSC) recognized inspection agency prior to shipment.

#### Insulation

Certificate attesting that the cellulose, perlite, glass and mineral fiber, glass mat gypsum roof board, polyurethane, or polyisocyanurate insulation furnished for the project contains recovered material, and showing an estimated percent of such recovered material.

### 1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity. Laminated timber shall be handled and stored in accordance with AITC 111 or APA EWS R540C.

### 1.4 Qualifications

The Contractor shall submit a list containing name and location of successful installations of similar type of fabricated structural members specified herein.

## PART 2 PRODUCTS

### 2.1 LUMBER AND SHEATHING

#### 2.1.1 Grading and Marking

##### 2.1.1.1 Lumber Products

Solid sawn and finger-jointed lumber shall bear an authorized gradestamp or grademark recognized by ALSC, or an ALSC recognized certification stamp, mark, or hammerbrand. Surfaces that are to be exposed to view shall 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.

##### 2.1.1.2 Fabricated Structural Members

Wood trusses shall be fabricated in accordance with TPI 1. Laminated timbers shall be marked with a quality mark indicating conformance to AITC A190.1. Engineered wood joists and rafters shall be fabricated using an approved quality control system to meet specified requirements.

##### 2.1.1.3 Plywood and Other Sheathing Products

Materials shall bear the grademark or other identifying marks indicating grades of material and rules or standards under which produced, including requirements for qualifications and authority of the inspection organization. Except for plywood and wood structural panels, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to be exposed to view shall not bear grademarks or other types of identifying marks.

#### 2.1.2 Sizes

Lumber and material sizes shall conform to requirements of the rules or standards under which produced. Unless otherwise specified, lumber shall be surfaced on four sides. Unless otherwise specified, sizes indicated are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

#### 2.1.3 Treatment

Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPA M4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil. Except as specified for all-heart material of the previously mentioned species, the following items shall be treated:

- a. Wood members in contact with or within 455 mm 18 inches of soil.
- b. Wood members in contact with water.
- c. Wood members exposed to the weather and those used in roofing systems or as nailing strips or nailers over fiberboard or gypsum-board wall sheathing as a base for wood siding.
- d. Wood members set into concrete regardless of location, including flush-with-deck wood nailers for roofs.
- e. Wood members in contact with concrete that is in contact with soil or water or that is exposed to weather.

##### 2.1.3.1 Lumber and Timbers

Lumber and timbers shall be treated in accordance with AWPA C2 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

- a. 4 kg/cubic meter 0.25 pcf intended for above ground use.
- b. 6.4 kg/cubic meter 0.40 pcf intended for ground contact and fresh water use.

##### 2.1.3.2 Plywood

Plywood shall be treated in accordance with AWPA C9 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

- a. 4 kg/cubic meter 0.25 pcf intended for above ground use.
- b. 6.4 kg/cubic meter 0.40 pcf intended for ground contact and fresh water use.

#### 2.1.4 Moisture Content

At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

- a. Treated and Untreated Lumber Except Roof Planking: 100 mm 4 inches or less, nominal thickness, 19 percent maximum. 125 mm 5 inches or more, nominal thickness, 23 percent maximum in a 75 mm 3 inch perimeter

of the timber cross-section.

b. Roof Planking: 15 percent maximum.

c. Materials Other Than Lumber: In accordance with standard under which product is produced.

#### 2.1.5 Fire-Retardant Treatment

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NOTE: List items to be treated. Fire-retardant treatment will be specified for exposed plywood and exposed wood structural members when a flame spread rating of 25 or less is required. In addition, exterior grade fire-retardant treatment will be required for exposed wood structural members located where the relative humidity may be 80 percent or more.

Fire-retardant treated plywood will be used only for nonstructural applications which are not subject to elevated temperature or high humidity. Fire-retardant treated plywood will not be used in any part of the roof or roofing system.

Consult AWPA C20 and AWPA C27 for material selection and use.

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Fire-retardant treated wood shall be pressure treated in accordance with AWPA C20 for lumber and AWPA C27 for plywood. Material use shall be defined in AWPA C20 and AWPA C27 for Interior Type [A] [and] [B] and Exterior Type. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting shall be subjected to an accelerated weathering technique in accordance with ASTM D 2898 prior to being tested for compliance with AWPA C20 or AWPA C27. Items to be treated include: [\_\_\_\_\_].

#### 2.1.6 Structural Wood Members

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NOTE: Show stress diagrams for framing system and minimum stress values on contract drawings. Design values for structural lumber used in fabrication of bolted trusses and other fabricated structural members for engineered uses, except laminated members, will be computed in accordance with AF&PA T101. Allowable unit stresses will be specified and will not be less than 7.2 MPa (1050 psi) in bending for single member use; 8.3 MPa (1200 psi) in bending for repetitive member use; 4.8 MPa (700 psi) in tension; 2.1 MPa (300 psi) in compression perpendicular to the grain; 2.1 MPa (300 psi) in compression parallel to the grain; and 0.4 MPa (60 psi) in horizontal shear with modulus of elasticity of 8275 MPa (1,200,000 psi).

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Species and grades shall be as listed in AF&PA T101. Structural lumber used in fabrication of bolted trusses and other fabricated structural members for engineered uses, except laminated members, shall have allowable design values of [ ] MPa psi in bending; [ ] MPa psi in tension parallel to the grain; [ ] MPa psi in compression perpendicular to the grain; [ ] MPa psi in compression parallel to the grain; [ ] MPa psi in horizontal shear; and a modulus of elasticity of [ ] MPa psi. Joists, rafters including trussed type, decking, and headers shall have design values of [ ] MPa psi in bending for repetitive member uses. Design of members and fastenings shall conform to AITC OT-01. Other stress graded or dimensioned items such as blocking, carriages, and studs shall be standard or No. 2 grade except that studs may be Stud grade.

#### 2.1.6.1 Trussed Rafters

As an option to standard rafters, trussed rafters may be provided. The design shall be as indicated. Connections shall be made with light-metal plate-connectors. Light-metal-plate-connected wood trusses shall be designed and fabricated in conformance with TPI 1. When new plate configuration is proposed, load testing of trusses is required and shall conform to Appendix D of TPI 1.

#### 2.1.6.2 Structural Glued Laminated Members

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**NOTE: Species and appearance grade of lumber in glued laminated members will be specified when required by aesthetic considerations. Insert stress requirements necessary. Individual wrapping will be specified when protection during erection is necessary in accordance with AITC 111 or APA EWS R540C. Preservative treatment in lieu of sealing will be specified for exposure conditions named in AITC 109 or APA EWS S580.**

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Members shall conform to AITC A190.1 with allowable design values of [ ] MPa psi in bending; [ ] MPa psi in tension parallel to grain; [ ] MPa psi in compression parallel to grain; [ ] MPa psi in compression perpendicular to grain (top); [ ] MPa psi in compression perpendicular to grain (bottom); [ ] MPa psi in horizontal shear; and [ ] MPa psi in modulus of elasticity, based on dry condition. Adhesives used in fabrication shall meet the requirements of dry use service. Members shall be [industrial appearance grade] [architectural appearance grade], [sealed with a penetrating sealer] [treated with preservative], and [individually wrapped] [bundle wrapped]. Preservative treatment shall be [ ] and the retention shall be [ ] kg/cubic meter pcf in accordance with AITC 109. Members shall be complete with hardware for joining laminated members and for their connection to other construction.

#### 2.1.6.3 Engineered Wood Joists and Rafters

As an option to standard rafters, engineered wood joists and rafters may be provided. Engineered wood rafters shall be wood I-joists manufactured in accordance with a nationally recognized code and installed in accordance with the manufacturer's recommendations.

#### 2.1.7 Sheathing

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**NOTE: Design of plywood and wood structural panel diaphragms will be in accordance with APA L350 Design/Construction Guide, Diaphragms and Shearwalls (1997).**

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Sheathing shall be fiberboard, gypsum board, plywood, wood structural panels, or wood for wall sheathing; and plywood, wood structural panels, or wood for roof sheathing.

##### 2.1.7.1 Fiberboard

Fiberboard shall conform to ASTM C 208, Type IV, Grade 2, Structural Grade, or AHA A194.1, Type IV, Grade 2 asphalt impregnated or asphalt coated to be water-resistant but vapor permeable.

##### 2.1.7.2 Gypsum Sheathing Board

Glass mat gypsum sheathing shall conform to ASTM C 79/C 79M and ASTM C 1177/C 1177M. Gypsum board shall conform to ASTM C 79/C 79M, 13 mm 1/2 inch thick, 1200 mm 4 feet wide with straight edges for supports 400 mm 16 inches on center without corner bracing of framing or for supports 600 mm 24 inches on center with corner bracing of framing; 600 mm 2 feet wide with V-tongue and groove edges for supports 400 or 600 mm 16 or 24 inches on center with corner bracing of framing.

##### 2.1.7.3 Plywood

Plywood shall conform to PS1, APA E445S or PS2, Grade C-D or sheathing grade with exterior glue. Sheathing for roof and walls without corner bracing of framing shall have a span rating of 16/0 or greater for supports 400 mm 16 inches on center and a span rating of 24/0 or greater for supports 600 mm 24 inches on center.

##### 2.1.7.4 Wood Structural Panels

Panels shall meet the qualification requirements of APA E445S or PS2 for rated sheathing, Exposure 1 or Structural I rated sheathing, Exposure 1. Sheathing for roofs or walls without corner bracing of framing shall have a span rating of 16/0 or greater for supports 400 mm 16 inches on center and shall have a span rating of 24/0 or greater for supports 600 mm 24 inches on center.

##### 2.1.7.5 Wood

Species and grade shall be in accordance with TABLE I at the end of this section. Wall sheathing shall be 25 mm 1 inch thick for supports 400 or 600 mm 16 or 24 inches on center without corner bracing of framing, provided sheathing is applied diagonally. Roof sheathing shall be 25 mm 1 inch thick for supports 400 or 600 mm 16 or 24 inches on center.

## 2.1.8 Subflooring

### 2.1.8.1 Plywood

Plywood shall conform to PS1, APA E445S or PS2; Grade C-D or Sheathing grade with exterior glue for uses not otherwise specified; Grade C-D or sheathing grade with exterior glue for reception of underlayment or wood flooring; underlayment grade with exterior glue, or C-C (plugged) exterior grade for use as a combination subfloor-underlayment under resilient flooring. Minimum span rating for subflooring shall be 24/16 for supports 400 mm 16 inches on center, and 48/24 for supports 600 mm 24 inches on center. Minimum span rating for combination subfloor-underlayment shall be 16/0 for supports 400 mm 16 inches on center and 24/0 for supports at 600 mm 24 inches on center.

### 2.1.8.2 Wood Structural Panels

Rated wood structural panels shall be qualified for subflooring or combination subfloor-underlayment under APA E445S or PS2. Subflooring shall be rated sheathing with a span rating of 24/16 or greater for supports 400 mm 16 inches on center and shall have span rating of 48/24 or greater for supports 600 mm 24 inches on center. Combination subfloor-underlayment shall have a span rating of 16/0 or greater for supports 400 mm 16 inches on center and shall have span rating for 24/0 or greater for supports 600 mm 24 inches on center.

### 2.1.8.3 Wood

Species and grade shall be in accordance with TABLE I at the end of this section, 25 mm 1 inch thick, center-matched, shiplapped, or square edge.

## 2.1.9 Underlayment

\*\*\*\*\*  
**NOTE: Underlayment will be limited to plywood in  
areas of high moisture or occasional wetting of the  
finished floor.**  
\*\*\*\*\*

Underlayment shall conform to one of the following:

### 2.1.9.1 Hardboard

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

### 2.1.9.2 Particleboard

ANSI A208.1, Grade 1-M-1, 6 mm 1/4 inch thick, 1200 x 1200 mm 4 x 4 feet.

### 2.1.9.3 Plywood

Plywood shall conform to PS1, underlayment grade with exterior glue, or C-C (Plugged) exterior grade 9 mm 11/32 inch thick, 1200 mm 4 feet wide.

## 2.1.10 Shear Wall Panels

Panels used in shear wall construction shall be of the span rating and thickness shown and shall be plywood conforming to PS1 or PS2, [Grade C-D

with exterior glue] [Grade C-D, Structural I]; or wood structural panels conforming to APA E445S or PS2, [rated sheathing, Exposure I] [Structural I rated sheathing, Exposure 1].

#### 2.1.11 Roof Decking

\*\*\*\*\*  
**NOTE: Delete this paragraph if the design does not include exposed decking. Commercial grade decking with minimum design value of 7.6 MPa (1100 psi) in bending will normally be used unless higher strength is required. If a specific species is required for architectural purpose, the paragraph or drawings should reflect such a requirement.**  
 \*\*\*\*\*

Roof decking shall be [commercial] [select] grade with minimum design value of [0.9] [7.6] MPa [130] [1100] psi in bending. Decking shall 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.

#### 2.1.12 Miscellaneous Wood Members

##### 2.1.12.1 Nonstress Graded Members

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

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

| Member         | Size (inch)  |
|----------------|--|
| Bridging       | 1 x 3 or 1 x 4 for use between members<br>2 x 12 and smaller; 2 x 4 for use<br>between members larger than 2 x 12. |
| Corner bracing | 1 x 4.   |



| Member         | Size (inch)  |
|----------------|--|
| Furring        | 1 x [2] [3].   |
| Grounds        | Plaster thickness by 1-1/2.  |
| Nailing strips | 1 x 3 or 1 x 4 when used as shingle base or interior finish, otherwise 2 inch stock. |

#### 2.1.12.2 Wood Bumpers

Bumpers shall be of the species and grade in accordance with TABLE II at the end of this section, size as shown.

#### 2.1.12.3 Sill Plates

Sill plates shall be standard or number 2 grade.

#### 2.1.12.4 Blocking

Blocking shall be standard or number 2 grade.

#### 2.1.12.5 Rough Bucks and Frames

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

### 2.2 ACCESSORIES AND NAILS

Markings shall identify both the strength grade and the manufacturer. Accessories and nails shall conform to the following:

#### 2.2.1 Anchor Bolts

ASTM A 307, size as indicated, complete with nuts and washers.

#### 2.2.2 Bolts: Lag, Toggle, and Miscellaneous Bolts and Screws

Type, size, and finish best suited for intended use. Finish options include zinc compounds, cadmium, and aluminum paint impregnated finishes.

#### 2.2.3 Clip Angles

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

#### 2.2.4 Expansion Shields

Type and size best suited for intended use.

#### 2.2.5 Joist Hangers

Steel or iron, zinc-coated, size to fit members where used, sufficient strength to develop the full strength of supported member, complete with any special nails required.

#### 2.2.6 Metal Bridging

Optional to wood bridging; zinc-coated steel, size and design to provide rigidity equivalent to specified wood bridging.

#### 2.2.7 Nails and Staples

ASTM F 547, size and type best suited for purpose; staples shall be as recommended by the manufacturer of the materials to be joined. For sheathing and subflooring, length of nails shall be sufficient to extend 25 mm 1 inch into supports. In general, 8-penny or larger nails shall 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 shall be used for nailing through 50 mm 2 inch thick lumber. Nails used with treated lumber and sheathing shall be galvanized. Nailing shall be in accordance with the recommended nailing schedule contained in AF&PA T10. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail capacity tables in AF&PA T101. Reasonable judgement backed by experience shall 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 shall be used.

#### 2.2.8 Timber Connectors

Unless otherwise specified, timber connectors shall be in accordance with TPI 1, APA EWS T300E or AITC OT-01.

### 2.3 INSULATION

\*\*\*\*\*  
**NOTE: Show R-value on the drawings. R-values will  
be the R-values used in the Energy Budget Analysis.**  
\*\*\*\*\*

Thermal resistance of insulation shall be not less than the R-values shown. R-values shall be determined at 24 degrees C 75 degrees F in accordance with ASTM C 518. Contractor shall comply with EPA requirements in conformance with Section 01670 RECYCLED / RECOVERED MATERIALS. Insulation shall be the standard product of a manufacturer and factory marked or identified with manufacturer's name or trademark and R-value. Identification shall be on individual pieces or individual packages. Materials containing more than one percent asbestos will not be allowed.

#### 2.3.1 Batt or Blanket

\*\*\*\*\*  
**NOTE: See MIL-HDBK-1008 and local building code for  
fire retardant classifications required, and for  
flame spread and smoke developed ratings.**  
\*\*\*\*\*

##### 2.3.1.1 Glass Fiber Batts and Rolls

Glass fiber batts and rolls shall conform to ASTM C 665, [Type I unfaced insulation] [Type II kraft faced insulation] [Type III foil faced insulation, Class [A] [B], having a UL rating of [25] [50] [and a smoke developed rating of 150 or less when tested in accordance with ASTM E 84]].

Insulation shall have a 0.25 mm 10 mil thick, white, puncture resistant woven-glass cloth with vinyl facing on one side. Width and length shall suit construction conditions.

#### 2.3.1.2 Mineral Fiber Batt

Mineral fiber batt shall conform to ASTM C 665, [Type I unfaced insulation] [Type II kraft faced insulation, Class C] [Type III foil faced insulation Class C].

#### 2.3.1.3 Mineral Fiber Blanket

Mineral fiber blanket shall conform to ASTM C 553, Type I, Class 6. Blankets shall be sized to suit construction conditions, resilient type for use below and above ambient temperature to 195 degrees C 350 degrees F. Blankets shall have a factory applied vapor-barrier facing on one side with 50 mm 2 inch nailing tabs on both edges. Vapor barriers shall be fire retardant, high vapor transmission, and aluminum foil laminated to crepe paper type conforming to ASTM C 1136, Type II. Nominal density shall be 12 kg/cubic meter 0.75 pcf.

#### 2.3.2 Loose Fill or Granular Fill

##### 2.3.2.1 Vermiculite

Vermiculite shall conform to ASTM C 516, Type II.

##### 2.3.2.2 Perlite

\*\*\*\*\*

NOTE: Detailed information concerning EPA requirements on recycled/recovered materials is available at the following URL's:  
<http://www.epa.gov/cpg/products/> and then click on the appropriate item from the list (building.htm for building insulation, for example).  
<http://www.epa.gov/cpg/products.htm> (similar results).  
<http://www.epa.gov/cpg/pdf/back.pdf> which opens up EPA530-R-98-003 (dated July, 1998, titled BACKGROUND DOCUMENT FOR PROPOSED CPG III AND DRAFT RMAN III).

Using data from listed locations, fill in blank space for required percentage of recycled or recovered material in the following paragraphs dealing with insulation. This is in accordance with the requirements of 40 CFR 247 and Section 01670 which should be included in all projects.

\*\*\*\*\*

Perlite shall conform to ASTM C 549, Type II with minimum recovered material content of [\_\_\_\_\_] percent by weight of core material.

##### 2.3.2.3 Mineral Fiber

\*\*\*\*\*

NOTE: Blown-in insulation is recommended for use in attics or floors directly over ceilings, in wall spaces where mineral fiber flexible blankets cannot

be used.

\*\*\*\*\*

Mineral fiber shall conform to ASTM C 764, Type [I] [II]. Blown-in mineral fiber insulation shall conform to ASTM C 764, Type I, [Category 1, one percent or less loss on ignition] [Category 2, 12 percent or less loss on ignition].

#### 2.3.2.4 Cellulosic or Wood Fiber

Cellulosic or wood fiber shall conform to ASTM C 739 or 16 CFR 1209 with minimum recovered material content of [\_\_\_\_\_] percent by weight of core material.

#### 2.3.3 Sill Sealer

Mineral wool, 25 mm 1 inch thick and compressible to 0.8 mm 1/32 inch, width of sill, designed to perform as an air, dirt, and insect seal in conformance with ASTM C 665, Type I.

#### 2.3.4 Rigid Insulation

##### 2.3.4.1 Polystyrene Board

Polystyrene board shall be extruded and conform to ASTM C 578, Type IV.

##### 2.3.4.2 Polyurethane or Polyisocyanurate Board

Polyurethane or polyisocyanurate board shall have a minimum recovered material content of [\_\_\_\_\_] percent by weight of core material in the polyurethane or polyisocyanurate portion. Unfaced preformed polyurethane shall conform to ASTM C 591. Faced polyisocyanurate shall conform to ASTM C 1289.

##### 2.3.4.3 Glass Fiber or Insulation Board

Glass mat gypsum roof board shall conform to ASTM C 1177/C 1177M, flame spread 0, smoke developed 0, psi 500, water resistant. Glass fiber or insulation board shall conform to ASTM C 612, Type 1A with a minimum recovered material content of [\_\_\_\_\_] percent by weight of glass fiber core material.

##### 2.3.4.4 Mineral Fiber Block and Board

Mineral fiber block and board shall conform to ASTM C 612 or ASTM C 726 with a minimum recovered material content of [\_\_\_\_\_] percent by weight of mineral fiber core material.

##### 2.3.4.5 Cellular Glass

Cellular glass shall conform to ASTM C 552.

#### 2.4 VAPOR RETARDER

\*\*\*\*\*

**NOTE: The drawings will indicate the location and extent of vapor retarder.**

\*\*\*\*\*

Vapor retarder shall be polyethylene sheeting conforming to ASTM E 154 or other equivalent material. Vapor retarder shall have a maximum vapor permeance rating of 29 ng per Pa per second per square meter 0.5 perms as determined in accordance with ASTM E 96, unless otherwise specified.

## 2.5 AIR INFILTRATION BARRIER

\*\*\*\*\*  
**NOTE: The drawings will indicate the location and  
extent of air infiltration barrier.**  
\*\*\*\*\*

Air infiltration barrier shall be building paper meeting the requirements of ASTM C 1136, 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 E 96, 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 E 96, Water Method at [23] [\_\_\_\_\_] degrees C.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF FRAMING

#### 3.1.1 General

General framing shall be in accordance with AF&PA T10. Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Members shall be framed for passage of ducts. Members shall be cut, notched, or bored in accordance with applicable requirements of AF&PA T101 for the passage of pipes, wires, or conduits. Rafters, purlins, and joists shall be set with crown edge up. Framing shall be kept at least 50 mm 2 inches away from chimneys and 100 mm 4 inches away from fireplace backwalls. When joists, beams, and girders are placed on masonry or concrete, a wood base plate shall be positioned and leveled with grout. The joist, beam, or girder shall then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket shall be formed into the wall. The joist, beam, or girder shall then be placed into the pocket and leveled with a steel shim.

#### 3.1.2 Structural Members

Members shall be adequately braced before erection. Members shall be aligned and all connections completed before removal of bracing. Individually wrapped members shall be unwrapped only after adequate protection by a roof or other cover has been provided. Scratches and abrasions of factory-applied sealer shall be treated with two brush coats of the same sealer used at the factory.

#### 3.1.3 Partition and Wall Framing

Unless otherwise shown, studs shall be spaced [400] [600] mm [16] [24] inches on centers. Studs shall be doubled at openings. Unless otherwise indicated, headers for openings shall be made of two pieces of stud material set on edge or solid lumber of equivalent size, and corners shall be constructed of not less than three full members. End studs of partitions abutting concrete or masonry shall be anchored thereto with

expansion bolts, one near each end of each stud and at intermediate intervals of not more than 1200 mm 4 feet. Plates of partitions resting on concrete floors shall be anchored in place with expansion bolts, one near each end of each piece and at intermediate intervals of not more than 1800 mm 6 feet between bolts. In lieu of expansion bolts, anchoring into concrete may be accomplished with powder-driven threaded studs of suitable type and size and spaced at 900 mm 3 feet on center. Walls and load bearing partitions shall be provided with double top plates with members lapped at least [600] [1200] mm [2] [4] feet and well spiked together.

#### 3.1.4 Floor (Ceiling) Framing

Except where otherwise indicated joists shall 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 shall be carried on joist hangers. Joists shall be lapped and spiked together at bearings or butted end-to-end with scab ties at joint and spiked to plates. Openings in floors shall be framed with headers and trimmers. Headers carrying more than two tail joists and trimmers supporting headers carrying more than one tail joist shall be doubled, unless otherwise indicated. Joists shall be doubled under partitions parallel with floor joists. Joists built into masonry shall 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]. Engineered wood joists shall be installed in accordance with distributor's instructions.

#### 3.1.5 Roof Framing or Rafters

Tops of supports or rafters shall form a true plane. Valley, ridge, and hip members shall be of depth equal to cut on rafters where practicable, but in no case less than depth of rafters. Valleys, hips, and ridges shall be straight and true intersections of roof planes. Necessary crickets and watersheds shall be formed. Rafters, except hip and valley rafters, shall be [spiked to wall plate and to ceiling joists with no less than three 8-penny nails] [through-bolted to supporting angles]. Rafters shall be toe-nailed to ridge, valley, or hip members with at least three 8-penny nails. Rafters shall be braced to prevent movement until permanent bracing, decking or sheathing is installed. Hip and valley rafters shall be secured to wall plates by clip angles. Openings in roof shall be framed with headers and trimmers. Unless otherwise indicated, headers carrying more than two rafters and trimmers supporting headers carrying more than one rafter shall be double. Hip rafters longer than the available lumber shall be butt jointed and scabbed. Valley rafters longer than the available lumber shall be double, with pieces lapped not less than 1200 mm 4 feet and well spiked together. Trussed rafters shall be installed in accordance with TPI HIB. Engineered wood joists shall be installed in accordance with distributor's instructions.

#### 3.1.6 Stair Framing

\*\*\*\*\*  
**NOTE: Normally a minimum of three rough carriages will be required. However, design conditions will govern, and the number of carriages required will be shown on the drawings.**  
\*\*\*\*\*

Stair framing members shall be well spiked together. Rough carriages shall

be cut to exact shape required to receive finish treads and risers. Risers shall be of uniform height, and treads shall be of uniform width except as otherwise shown. Trimmers, blocking, and other framing necessary for support of finish treads, risers, newels, and railing shall be provided.

### 3.2 INSTALLATION OF SHEATHING

#### 3.2.1 Fiberboard

Sheathing shall be applied with edges 3 mm 1/8 inch apart at joints, fitted snugly at abutting frames of openings, and nailed or stapled in accordance with the manufacturer's approved instructions. Sheets shall be applied vertically, extended over top and bottom plates, and with all vertical and horizontal joints over supports.

#### 3.2.2 Gypsum Board

Sheathing shall be applied with edges in light contact at joints and nailed in accordance with the manufacturer's approved instructions. Sheets 600 mm 2 feet wide shall be applied horizontally with tongued edge up, with vertical joints over supports, and with vertical joints staggered. Sheets 1200 mm 4 feet wide shall be applied vertically, extended over top and bottom plates, and with all vertical and horizontal joints over supports.

#### 3.2.3 Plywood and Wood Structural Panels

Sheathing shall be applied with edges 3 mm 1/8 inch apart at side and end joints, and nailed at supported edges at 150 mm 6 inches on center and at intermediate supports 300 mm 12 inches on center unless otherwise shown. Nailing of edges shall be 10 mm 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates, and if applied horizontally the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles are to be applied shall be applied horizontally. Roof sheathing shall be applied with long dimension at right angles to supports, end joints made over supports, and end joints staggered.

#### 3.2.4 Wood

Sheathing end joints shall be made over framing members and so alternated that there will be at least two boards between joints on the same support. Each board shall bear on at least three supports. Boards shall 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 shall not be installed where roof decking is installed.

### 3.3 INSTALLATION OF SUBFLOORING

#### 3.3.1 Plywood and Wood Structural Panel

Subflooring shall be applied with long dimension at right angles to the supports, with edges 3 mm 1/8 inch apart at side and end joints, and nailed at supported edges 150 mm 6 inches on center and at intermediate supports 300 mm 12 inches on center unless otherwise shown. Subflooring may be installed with adhesive conforming to ASTM D 3498 and nails spaced at 300 mm 12 inches on center unless otherwise shown. Each panel shall have end joints made over supports and end joints staggered. Where finish flooring of different thicknesses is used in adjoining areas, wood strips of the thickness required to bring the finish flooring surfaces into the same plane shall be used under the plywood subfloor.

### 3.3.2 Wood

Subflooring shall be applied diagonally with end joints made over supports.

Each board shall bear on at least three supports and shall 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.

## 3.4 INSTALLATION OF UNDERLAYMENT

### 3.4.1 Hardboard

Underlayment shall be applied with edges 0.8 mm 1/32 inch apart at joints and nailed at edges 150 mm 6 inches on center and at 150 mm 6 inches on center throughout remainder of panel. Nailing at edges shall be 10 mm 3/8 inch from edges. A clearance of 6 mm 1/4 inch shall be provided at walls. Joints of underlayment shall not be located directly over parallel joints of subflooring. Power-driven wire staples of lengths recommended by the underlayment manufacturer may be used in lieu of nails. Any surface roughness at nail heads or joints shall be lightly sanded to blend with the undisturbed surface.

### 3.4.2 Particleboard

Underlayment shall be applied with edges 0.8 mm 1/32 inch apart at joints and nailed at edges 150 mm 6 inches on center and at 250 mm 10 inches on center throughout remainder of panel. Nailing at edges shall be 10 mm 3/8 inch from edges. A clearance of 6 mm 1/4 inch shall be provided at walls. Joints of underlayment shall not be located directly over parallel joints of subflooring. Power-driven wire staples of lengths recommended by the underlayment manufacturer may be used in lieu of nails. Any surface roughness at nail heads or joints shall be lightly sanded to blend with the undisturbed surface.

### 3.4.3 Plywood

Underlayment shall be applied with edges 0.8 mm 1/32 inch apart at joints and nailed at edges 150 mm 6 inches on center and at 200 mm 8 inches on center throughout remainder of panel for panels 9 mm 11/32 inch and thicker. Thinner panels shall be nailed at edges 75 mm 3 inches on center and at 150 mm 6 inches on center throughout remainder of panel. Nailing at edges shall be 10 mm 3/8 inch from edges. A clearance of 6 mm 1/4 inch shall be provided at walls. Joints of underlayment shall not be located directly over parallel joints of subflooring. Power-driven wire staples of lengths recommended by the underlayment manufacturer may be used in lieu of nails. When plywood combination subfloor-underlayment is used in lieu of separate layers, it shall be installed as specified for plywood subfloor, except all joints shall be made over supports with edge and joints spaced 3 mm 1/8 inch apart. When plywood combination subfloor-underlayment is tongued and grooved, only end joints shall require support. Tongued and grooved combination subfloor-underlayment shall be applied with joints spaced 3 mm 1/8 inch apart. Any surface roughness at nail heads or joints shall be lightly sanded to blend with the undisturbed surface. For floors receiving a vinyl finish flooring, a separate layer of fully-sanded underlayment shall be installed as provided for above over combination subfloor-underlayment panels.



### 3.5 INSTALLATION OF SHEAR WALLS

Plywood or wood structural panels shall be installed with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports. Shear wall construction, nailing, and top and bottom anchorage shall be as shown.

### 3.6 INSTALLATION OF MISCELLANEOUS WOOD MEMBERS

#### 3.6.1 Bridging

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

#### 3.6.2 Corner Bracing

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

#### 3.6.3 Blocking

Blocking shall be provided as necessary for application of siding, sheathing, subflooring, wallboard, and other materials or building items, and to provide firestopping. Blocking for firestopping shall ensure a maximum dimension of 2400 mm 8 feet for any concealed space. Blocking shall be cut to fit between framing members and rigidly nailed thereto.

#### 3.6.4 Nailers and Nailing Strips

Nailers and nailing strips shall be provided as necessary for the attachment of finish materials. Nailers used in conjunction with roof deck installation shall be installed flush with the roof deck system. Stacked nailers shall be assembled with spikes or nails spaced not more than 450 mm 18 inches on center and staggered. Beginning and ending nails shall not be more than 150 mm 6 inches for nailer end. Ends of stacked nailers shall be offset approximately 300 mm 12 inches in long runs and alternated at corners. Anchors shall extend through the entire thickness of the nailer. Strips shall be run in lengths as long as practicable, butt jointed, cut into wood framing members when necessary, and rigidly secured in place. Nailers and nailer installation for Factory Mutual wind uplift rated roof systems specified in other Sections of these specifications shall conform to the recommendations contained in FM DS 1-49.

#### 3.6.5 Wood Grounds

Wood grounds shall be provided as necessary for attachment of trim, finish, and other work to plaster. Grounds shall be run in lengths as long as practicable, butt jointed, and rigidly secured in place.

#### 3.6.6 Furring Strips

Furring strips shall be provided at the locations shown. Furring strips shall be installed at 400 mm 16 inches on center unless otherwise shown,

run in lengths as long as practicable, butt jointed and rigidly secured in place.

#### 3.6.7 Rough Bucks and Frames

Rough bucks shall be set straight, true, and plumb, and secured with anchors near top and bottom of each wood member and at intermediate intervals of not more than 900 mm 3 feet. Anchors for concrete shall be expansion bolts, and anchors for masonry shall be 5 x 32 mm 3/16 x 1-1/4 inch steel straps extending not less than 200 mm 8 inches into the masonry and turned down 50 mm 2 inches into the masonry.

#### 3.6.8 Wood Bumpers

Wood bumpers shall be bored, countersunk and securely bolted in place.

#### 3.6.9 Sill Plates

Sill plates shall 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 shall be used for each piece.

#### 3.7 INSTALLATION OF TIMBER CONNECTORS

Installation of timber connectors shall conform to applicable requirements of AF&PA T101.

#### 3.8 INSTALLATION OF INSULATION

Insulation shall be installed after construction has advanced to a point that the installed insulation will not be damaged by remaining work. For thermal insulation the actual installed thickness shall provide the thermal resistance R-values shown. For acoustical insulation the installed thickness shall be as shown. Insulation shall be installed on the weather side of such items as electrical boxes and water lines. Unless otherwise specified, installation shall be in accordance with the manufacturer's recommendation.

#### 3.9 INSTALLATION OF VAPOR RETARDER

Vapor retarder shall be applied to provide a continuous barrier at window and door frames, and at all penetrations such as electrical outlets and switches, plumbing connections, and utility service penetrations. Joints in the vapor retarder shall be lapped and sealed according to the manufacturer's recommendations.

#### 3.10 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS

\*\*\*\*\*

**NOTE: Include this paragraph only when special inspection and testing for seismic-resisting systems is required by paragraph 3.2 of FEMA 302, NEHRP RECOMMENDED PROVISIONS FOR SEISMIC REGULATIONS FOR NEW BUILDINGS AND OTHER STRUCTURES.**

**This paragraph will be applicable to both new buildings designed according to TI 809-04, SEISMIC DESIGN FOR BUILDINGS, and to existing building seismic rehabilitation designs done according to TI**

809-05, SEISMIC EVALUATION AND REHABILITATION FOR  
BUILDINGS.

The designer must indicate on the drawings all locations and all features for which special inspection and testing is required in accordance with Chapter 3 of FEMA 302. This includes indicating the locations of all structural components and connections requiring inspection.

Add any additional requirements as necessary.

\*\*\*\*\*

Special inspections and testing for seismic-resisting systems and components shall be done in accordance with Section 01452 SPECIAL INSPECTION FOR SEISMIC-RESISTING SYSTEMS.

3.11 INSTALLATION OF AIR INFILTRATION BARRIER

Air infiltration barrier shall be installed in accordance with the manufacturer's recommendations.

## 3.12 TABLES

TABLE I. SPECIES AND GRADE

Subflooring, Roof Sheathing, Wall Sheathing, Furring

| Grading Rules       | Species                  | Const Standard | No. 2 Comm | No. 2 Board Comm | No. 3 Comm |
|---------------------|--------------------------|----------------|------------|------------------|------------|
| NHLA Rules          | Cypress                  |                |            | X                |            |
| NELMA Grading Rules | Northern White Cedar     |                |            |                  | X          |
|                     | Eastern White Pine       | X              |            |                  |            |
|                     | Northern Pine            | X              |            |                  |            |
|                     | Balsam Fir               |                |            |                  | X          |
|                     | Eastern Hemlock-Tamarack |                |            |                  | X          |
| RIS Grade Use       | Redwood                  |                | X          |                  |            |
| SCMA Spec           | Cypress                  |                |            | X                |            |
| SPIB 1003           | Southern Pine            |                | X          |                  |            |
| WCLIB 17            | Douglas Fir-Larch        | X              |            |                  |            |
|                     | Hem-Fir                  | X              |            |                  |            |
|                     | Sitka Spruce             | X              |            |                  |            |
|                     | Mountain Hemlock         | X              |            |                  |            |
|                     | Western Cedar            | X              |            |                  |            |
| WWPA G-5            | Douglas Fir-Larch        | X              |            |                  |            |
|                     | Hem-Fir                  | X              |            |                  |            |
|                     | Idaho White Pine         | X              |            |                  |            |
|                     | Lodgepole Pine           |                |            | X                |            |
|                     | Ponderosa Pine           |                |            | X                |            |
|                     | Sugar Pine               |                |            | X                |            |
|                     | Englemann Spruce         |                |            | X                |            |
|                     | Douglas Fir South        |                |            | X                |            |
|                     | Mountain Hemlock         |                |            | X                |            |
|                     | Subalpine Fir            |                |            | X                |            |
|                     | Western Cedar            |                |            | X                |            |

TABLE II. SPECIES AND GRADE

Wood Bumpers

| Grading Rules | Species | No. 1 | No. 2 |
|---------------|---------|-------|-------|
| NHLA Rules    |         |       |       |

TABLE II. SPECIES AND GRADE

| Wood Bumpers        |                              |       |       |
|---------------------|------------------------------|-------|-------|
| Grading Rules       | Species                      | No. 1 | No. 2 |
|                     | Red Oak                      | X     |       |
| NELMA Grading Rules | Northern Pine                |       | X     |
|                     | Eastern Hemlock-<br>Tamarack |       | X     |
| SPIB 1003           | Southern Pine                | X     |       |
| WCLIB 17            | Douglas Fir-Larch            |       | X     |
|                     | Hem-Fir                      |       | X     |
| WWPA G-5            | Douglas Fir-Larch            |       | X     |
|                     | Hem-Fir                      |       | X     |
|                     | Douglas Fir-South            |       | X     |

-- End of Section --