

SECTION 06 10 00

ROUGH CARPENTRY

**04/06**

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

AITC 111 (2005) 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 (2004) Timber Construction Manual

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A208.1 (1999) Mat-Formed Wood Particle Board

ANSI B18.2.1 (1996; Errata 2003) Square and Hex Bolts and Screws Inch Series

ANSI B18.5.2.1M (1981; R 1995) Metric Round Head Short Square Neck Bolts

ANSI B18.6.1 (1981; R 2004) Wood Screws

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C1 (2003) All Timber Products - Preservative Treatment by Pressure Processes

AWPA C2 (2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes

AWPA C20 (2003) Structural Lumber Fire-Retardant Treatment by Pressure Processes

AWPA C27 (2002) Plywood - Fire-Retardant Treatment by Pressure Processes

AWPA C28 (2003) Standard for Preservative Treatment of Structural Glued Laminated Members and Lamination Before Gluing of Southern Pine, Coastal Douglas Fir, Hemfir and Western Hemlock by Pressure Processes

AWPA C9 (2003) Plywood - Preservative Treatment by Pressure Processes

AWPA M2 (2001) Standard for Inspection of Treated Wood Products

AWPA M6 (1996) Brands Used on Forest Products

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA E30 (2005) Engineered Wood Construction Guide

APA E445S (2001; R 2002) Performance Standards and Qualification Policy for Structural-Use Panels (APA PRP-108)

APA EWS R540C (1995; R 1996) Builder Tips Proper Storage and Handling of Glulam Beams

APA EWS T300E (2005) Technical Note: Glulam Connection Details

APA F405L (1999) Performance Rated Panels

ASME INTERNATIONAL (ASME)

ASME B18.2.2 (1987; R 2005) Square and Hex Nuts

ASME B18.5.2.2M (1982; R 2000) Metric Round Head Square Neck Bolts

ASTM INTERNATIONAL (ASTM)

ASTM A 307 (2004) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 653/A 653M (2004a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 687 (1993) High-Strength Nonheaded Steel Bolts

and Studs

ASTM C 1136 (2003a) Flexible, Low Permeance Vapor Retarders for Thermal Insulation

ASTM C 208 (1995; R 2001) Cellulosic Fiber Insulating Board

ASTM C 79/C 79M (2004a) Treated Core and Nontreated Core Gypsum Sheathing Board

ASTM D 2898 (1994; R 2004) 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 96 (2005) Water Vapor Transmission of Materials

ASTM F 1667 (2003) Driven Fasteners: Nails, Spikes, and Staples

ASTM F 547 (2001) Nails for Use with Wood and Wood-Base Materials

FM GLOBAL (FM)

FM DS 1-49 (2000) Perimeter Flashing

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2003) International Building Code

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)

PS-56 (1973) Structural Glued Laminated Timber

PS-58 (1974) Basic Hardboard

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

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

PS20 (1999) American Softwood Lumber Standard

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923 (Rev A; Notice 1) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)

CID A-A-1924 (Rev A; Notice 1) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors)

CID A-A-1925 (Rev A; Notice 1) Shield Expansion (Nail Anchors)

FS FF-B-588 (Rev E) Bolt, Toggle: and Expansion Sleeve, Screw

FS FF-T-1813 (Basic) Tack

FS MM-T-371 (Rev E) Ties, Railroad, Wood (Cross and Switch)

FS UU-B-790 (Rev A) Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant)

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17 (2000) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. 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 01 33 00 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Trussed rafters; G, RO

Fabricated structural members; G, RO

Modifications of structural members; G, RO

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, RO

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-05 Design Data

Modifications of structural members; G, RO

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

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.

## 1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. 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. Remove defective and damaged materials and provide new materials.

#### 1.4 GRADING AND MARKING

##### 1.4.1 Lumber

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 shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. 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.

##### 1.4.2 OMITTED

##### 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 shall identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with PS1. Surfaces that are to be exposed to view shall 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 shall indicate end use, span rating, and exposure durability classification.

##### 1.4.5 Preservative-Treated Lumber and Plywood

The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor shall 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 OMITTED

##### 1.4.7 OMITTED

#### 1.5 SIZES AND SURFACING

PS20 for dressed sizes of yard and structural lumber. Lumber shall be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall 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 shall be as follows at the time of delivery to the job site:

- a. Framing lumber and boards - 19 percent maximum
- b. Timbers 5 inches and thicker - 25 percent maximum
- c. Materials other than lumber - Moisture content shall be in accordance with standard under which the product is produced

#### 1.7 PRESERVATIVE TREATMENT

Treat lumber and timber in accordance with AWPA C1 and AWPA C2, and plywood in accordance with AWPA C1 and AWPA C9. Treat structural glued laminated timber in accordance with AWPA C1 and AWPA C28.

- a. 0.25 pcf intended for above ground use.
- b. 0.40 pcf intended for ground contact and fresh water use. All wood shall be air or kiln dried after treatment. Specific treatments shall 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. 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 shall be preservative treated. The following items shall be preservative treated:
  1. Wood members that are in contact with water.
  2. Exterior wood steps, platforms, and railings; and all wood framing of open, roofed structures.
  3. Wood sills, soles, plates, furring, and sleepers that are less than 24 inches from the ground, furring and nailers that are set into or in contact with concrete or masonry.
  4. Nailers, edge strips, crickets, curbs, and cants for roof decks.

#### 1.8 OMITTED

#### 1.9 QUALITY ASSURANCE

##### 1.9.1 Drawing Requirements

For fabricated structural members, trusses, 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 Certificates of Grade

Submit certificates attesting that products meet the grade requirements specified in lieu of grade markings where appearance is important and grade marks will deface material.

## PART 2 PRODUCTS

### 2.1 LUMBER

#### 2.1.1 Structural Lumber

Any of the species and grades listed in AF&PA T101 that have allowable unit stresses in pounds per square inch (psi) not less than 1200 Fb, 700 Ft, 780 Fc, with 1200000 E. Use for joists, rafters, headers, trusses, beams (except collar beams), columns, posts, stair stringers, girders, and all other members indicated to be stress rated. 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.

#### 2.1.2 Framing Lumber

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 shall be one of the species listed in the table below. Minimum grade of species shall 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 PS-56.

Table of Grades for Framing and Board Lumber

<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
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	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common

Table of Grades for Framing and Board Lumber

<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
	Ponderosa Pine -Lodgepole Pine Subalpine Fir White Woods Western Woods Western Cedars Western Hemlock		
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, 10 feet and shorter)	All Species: Standard
SPIB 1003 standard grading rules	Southern Pine	Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 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, 10 feet and shorter)	All Species: No. 3 Common except Stan- dard 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, 10 feet and shorter)	Construction Heart
NHLA Rules rules for the measurement and inspection of hardwood and cypress	Cypress	No. 2 Dimension	No. 2 Common

Table of Grades for Framing and Board Lumber

<u>Grading Rules</u> lumber	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
2.1.3	OMITTED		
2.2	PLYWOOD, STRUCTURAL-USE, AND ORIENTED STRAND BOARD (OSB) PANELS		
	PS1, PS2, APA E445S, and APA F405L respectively.		
2.2.1	OMITTED		
2.2.1.1	Plywood		
	C-D Grade, Exposure 1 durability classification, Span rating of 24/16 or greater.		
2.2.1.2	OMITTED		
2.2.2	OMITTED		
2.2.2.1	OMITTED		
2.2.2.2	OMITTED		
2.2.3	Wall Sheathing		
2.2.3.1	Plywood		
	C-D Grade, Exposure 1, and a minimum thickness of 3/4 inch .		
2.2.3.2	OMITTED		
2.2.4	Roof Sheathing		
2.2.4.1	Plywood		
	C-D Grade, Exterior Exposure, with an Identification Index of not less than 24/0.		
2.2.4.2	OMITTED		
2.2.5	Diaphragms		
2.2.5.1	Plywood		
	C-D grade, Exterior Exposure, and a minimum thickness of 3/4 inch.		
2.2.5.2	OMITTED		
2.2.6	OMITTED		
2.2.6.1	OMITTED		

2.2.6.2 OMITTED

2.2.7 OMITTED

2.3 OMITTED

2.3.1 OMITTED

2.3.2 OMITTED

2.3.3 Plywood

Plywood shall conform to PS1, underlayment grade with exterior glue, or C-C (Plugged) exterior grade 3/4 inch thick, 4 feet wide.

2.3.4 OMITTED

2.4 OMITTED

2.4.1 OMITTED

2.4.2 OMITTED

2.4.3 OMITTED

2.4.4 OMITTED

2.4.5 Building Paper

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

2.4.6 Trussed Rafters

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

2.4.7 Trussed Joists

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

2.4.8 OMITTED

2.4.9 Miscellaneous Wood Members

2.4.9.1 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:

<u>Member</u>	<u>Size (inch)</u>
Bridging	1 x 3 or 1 x 4 for use between members 2 x 12 and smaller; 2 x 4 for use

Member	Size (inch)
	between members larger than 2 x 12.
Corner bracing	1 x 4.
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.

2.4.9.2 OMITTED

2.4.9.3 Sill Plates

Sill plates shall be standard or number 2 grade.

2.4.9.4 Blocking

Blocking shall be standard or number 2 grade.

2.4.9.5 OMITTED

2.5 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware shall be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials shall 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 shall be zinc-coated.

2.5.1 Bolts, Nuts, Studs, and Rivets

ANSI B18.2.1, ANSI B18.5.2.1M, ASME B18.5.2.2M, ASME B18.2.2, and ASTM A 687.

2.5.2 Anchor Bolts

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

2.5.3 Expansion Shields

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

2.5.4 Lag Screws and Lag Bolts

ANSI B18.2.1.

2.5.5 Toggle Bolts

FS FF-B-588.

#### 2.5.6 Wood Screws

ANSI B18.6.1.

#### 2.5.7 Nails

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 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 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 judgment 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.

#### 2.5.8 Wire Nails

ASTM F 1667.

#### 2.5.9 Tacks

FS FF-T-1813.

#### 2.5.10 OMITTED

#### 2.5.11 Clip Angles

Steel, 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.

#### 2.5.12 OMITTED

#### 2.5.13 Tie Straps

For joists supported by the lower flange of steel beams, provide 1/8 by 1 1/2 inch steel strap, 2 feet long.

#### 2.5.14 Joist Anchors

For joists supported by masonry walls, provide anchors 3/16 by 1 1/2 inch steel tee or strap, bent and of length to provide 4 inches embedment into wall and 12 inches along joist except as indicated otherwise. For joists parallel to masonry or concrete walls, provide anchors 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 4 inches, and with wall end of bend or pin type, except as indicated otherwise.

#### 2.5.15 Door Buck Anchors

Metal anchors, 1/8 by 1 1/4 inch steel, 12 inches long, with ends bent 2 inches. Anchors shall be screwed to the backs of bucks and built into masonry or concrete. Locate 8 inches above sills and below heads and not more than 24 inches intermediately between. Anchorage of bucks to steel framing shall be as necessary to suit the conditions.

#### 2.5.16 OMITTED

#### 2.5.17 OMITTED

#### 2.5.18 Beam Anchors

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

#### 2.5.19 OMITTED

#### 2.5.20 Panel Edge Clips

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

### 2.6 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 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 in accordance with ASTM E 96, Water Method at 23 degrees C.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Conform to AF&PA T10 unless otherwise indicated or specified. Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. 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. 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 shall be in accordance with the Nailing Schedule contained in ICC IBC; perform bolting in an approved manner. Spikes, nails, and bolts shall be drawn up tight. 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 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.

### 3.1.1 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 5/8 inch diameter bolts at all corners and splices and space at a maximum of 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 6 inches from the ends. Provide bolts with plate washers and nuts. Bolts in exterior walls shall be zinc-coated.

#### 3.1.1.1 Anchors in Masonry

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

#### 3.1.1.2 OMITTED

#### 3.1.2 OMITTED

#### 3.1.3 OMITTED

#### 3.1.4 OMITTED

#### 3.1.5 OMITTED

#### 3.1.6 OMITTED

#### 3.1.7 OMITTED

#### 3.1.8 OMITTED

### 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 eight feet tall, provide horizontal bridging at not more than 8 feet o.c. using nominal 2 inch material of the same width as the studs; install the bridging flat. Sizes and spacing of studs shall be 16 inches. 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 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 2 inch thick members. Top plates for nonbearing partitions shall 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 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 6 feet o.c., or with powder-actuated fasteners, one near each end and at not more than 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 OMITTED

3.1.9.4 Diagonal Bracing

Provide diagonal bracing at all external corners and internal angles and at maximum 40 foot centers in stud walls, except that bracing may be omitted where diagonally applied wood sheathing, plywood or structural-use panel sheathing, 4 by 8 foot fiberboard sheathing, or gypsum board sheathing is used. Bracing shall 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, Sheathing

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

3.1.10.2 OMITTED

3.1.10.3 OMITTED

3.1.10.4 OMITTED

3.1.11 Wood Sheathing

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 6 inches and less in width and three nails for boards more than 6 inches in width. Roof sheathing shall not be installed where roof decking is installed.

### 3.1.12 Building Paper

Provide building paper where indicated. Apply paper shingle fashion, horizontally, beginning at the bottom of the wall. Lap edges 4 inches, and nail with one inch, zinc-coated roofing nails, spaced 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 rafter or trussed rafter to fasten rafter] or trussed rafter to plates and studs against uplift movement and forces as indicated. Anchors shall be punched and formed for nailing so that nails will be stressed in shear only. Nails shall be zinc-coated; drive a nail in each nail hole provided in the anchor.

### 3.1.15 Trusses

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

### 3.1.16 OMITTED

### 3.1.17 Plywood and Structural-Use Panel Roof Sheathing

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 1/8 inch spacing at panel ends and 1/4 inch at panel edges. Nail panels with 8-penny common nails or 6-penny annular rings or screw-type nails spaced 6 inches o.c. at supported edges and 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 OMITTED

## 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 OMITTED

#### 3.2.1.2 Roof Edge Strips and Nailers

Provide at perimeter of roof, around openings through roof, and where roofs abut walls, curbs, and other vertical surfaces. Except where indicated otherwise, nailers shall be 6 inches wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. Anchor

perimeter nailers in accordance with FM DS 1-49.

#### 3.2.1.3 Crickets, Cants, and Curbs

Provide wood saddles or crickets, as indicated, specified, or necessary and of lumber or 3/4 inch thick exterior plywood.

#### 3.2.2 OMITTED

#### 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 8 foot straightedge.

#### 3.2.5 OMITTED

#### 3.2.6 OMITTED

#### 3.2.7 OMITTED

#### 3.2.8 Temporary Centering, Bracing, and Shoring

Provide for the support and protection of masonry work during construction as specified in Section 04200. Forms and centering for cast-in-place concrete work are specified in Section 03 30 00.00 20 CAST-IN-PLACE CONCRETE.

#### 3.2.9 OMITTED

#### 3.2.10 Diaphragms

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

#### 3.2.11 OMITTED

#### 3.2.12 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.

#### 3.2.13 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.

#### 3.2.14 Sill Plates

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

#### 3.3 OMITTED

#### 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, shall be within the following limits:

- (1) Layout of walls and partitions: 1/4 inch from intended position;
- (2) Plates and runners: 1/4 inch in 8 feet from a straight line;
- (3) Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
- (4) Face of framing members: 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 shall be within the following limits:

- (1) Layout of walls and partitions: 1/4 inch from intended position;
- (2) Plates and runners: 1/8 inch in 8 feet from a straight line;
- (3) Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and
- (4) Face of framing members: 1/8 in 8 feet from a true plane.

#### 3.5 OMITTED

-- End of Section --