
NAVFAC IGS-06100 (MAY 2002)

Preparing Activity: LANTNAVFACENGCOM Use in lieu of UFGS-06100N

ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

SECTION 06100

ROUGH CARPENTRY

05/02

NOTE: This guide specification is issued by the Atlantic Division, Naval Facilities Engineering Command for regional use in Italy.

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

NOTE: The following information should be shown on the project drawings:

1. Sizes and spacing of all wood framing members
2. Location, size, type, and thickness of all materials
3. Size and spacing of anchor bolts
4. Details of all connections and anchorage where special conditions exist such as high wind, hurricane, and earthquake areas
5. Design loads
6. Design unit stresses for structural lumber

NOTE: Wood should be utilized in designs sparingly. Availability of wood products in Italy is very limited. The only area of Italy in which wood is utilized to any degree is in extreme northern Italy.

Because the population of this area is primarily of germanic descent, normatives involving wood and timber structural properties are primarily in the form of German DIN standards and therefor not utilized in this guide specification.

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

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.

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 in the text by the basic designation only.

ITALIAN NATIONAL ASSOCIATION FOR UNIFICATION OF STANDARDS (UNI)

NOTE: A UNI Norm is a technical normative recognized as Italian Law, submitted by a private organization "Ente Nazionale Italiano di Unificazione" for Italy and is available only in the Italian language. It is the National Standard.

SS UNI U24.04.893.0	(1995) Fasteners - hexagon nuts with flange - Grade A
UNI 699	(1980) Wood screws - Thread and ends
UNI 3152	(1951) Wood screws for railroads - Summary of standard types
UNI 3253	(1952) Wood Tests - Conditioning
UNI 3517/7	(1954) Names and dimensions of wood

varieties of national production

UNI 3682 (1983) Paperfelt for the manufacture of roofing felts - Requirements and tests

UNI 3740/10/FA 1 (1982/94) Steel fasteners - Technical specifications - Surface discontinuities on bolts, screws and studs

UNI 5371 (1984) Gypsum rock for manufacture of binders - Classification, requirements and tests

UNI 7536 (1976) Elastomers: Raw materials and compounding ingredients - Non oil-extended, solution polymerized isoprene rubber (IR) - Mixing and vulcanizing in standard test compounds

UNI 9447 (1989) Adhesives - Determination of rolling ball tack

ITALIAN/EUROPEAN HARMONIZATION STANDARDS (UNI EN)(UNI ENV)(CEI EN)
(UNI EN ISO)(UNI ISO)

NOTE: A UNI EN, UNI ENV, CEI EN, UNI EN ISO or UNI ISO is a European Standard with a coincident Italian National Standard or International Standard. The two standards are identical, with most (but not all) EN's available in the English language and the UNI available only in the Italian language.

UNI EN 300 (1998) Oriented Strand Boards (OSB) - Definitions, classification and specifications

UNI EN 302-1 (1993) Adhesives for load-bearing timber structures - Test methods - Part 1: Determination of bond strength in longitudinal tensile shear

UNI EN 310 (1994) Wood-based panels - Determination of modulus of elasticity in bending and of bending strength

UNI EN 313-1 (1997) Plywood - Classification and terminology - Part 1: Classification

UNI EN 315 (1994) Plywood - Tolerances for dimensions

UNI EN 330 (1994) Wood preservatives - Field test method for determining the relative

	protective effectiveness of a wood preservative for use under a coating and exposed out of ground contact: L-joint method
UNI EN 335-3	(1998) Durability of wood and wood-based products - Definition of hazard classes of biological attack - Application to wood-based panels
UNI EN 386	(1997) Glued laminated timber - Performance requirements and minimum production requirements
UNI EN 622-2	(1998) Fibreboards - Specifications - Part 2: Requirements for hardboards
UNI EN 622-5	(1998) Fibreboards - Specifications - Part 5: Requirements for dry process boards (MDF)
UNI EN 635-3	(1996) Plywood - Classification by surface appearance - Part 3: Softwood
UNI EN 636-2	(1997) Plywood - Specifications - Part 2: Requirements for plywood for use in humid conditions
UNI EN 636-3	(1997) Plywood - Specifications - Part 3: Requirements for plywood for use in exterior conditions
UNI EN 912	(2000) Timber fasteners - Specifications for connectors for timber
UNI EN 975-1/A1	(1999/00) Sawn timber - Appearance grading of hardwoods - Part 1: Oak and beech
UNI ENV 1099	(1999) Plywood - Biological durability - guidance for the assessment of plywood for use in different hazard classes
UNI EN 1313-1	(1999) Round and sawn timber - Permitted deviations and preferred sizes - Part 1: Softwood sawn timber
UNI EN 1611-1	(2001) Sawn timber - Appearance grading of softwoods - Part 1: European spruces, firs, pines and Douglas firs
UNI ISO 3131	(1985) Wood - Determination of density for physical and mechanical tests
UNI ISO 4018	(1992) Hexagon head screws - Product grade

C

UNI ISO 4032	(1993) Hexagon nuts, style 1 - Product grades A and B
UNI EN 10142/A1	(1992/1997) Continuously hot-dip zinc coated low carbon steel sheet and strip for cold forming - Technical delivery conditions
UNI EN ISO 12777-1	(1997) Methods of test for pallet joints - Part 1: Determination of bending resistance of pallet nails, other fowel-type fasteners and staples

1.2 SUBMITTALS

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 is 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. Recommended codes for Army projects are "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval. 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.

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

[Structural glued laminated members; G]

[Fabricated structural members; G]

Modifications of structural members; G

SD-05 Design Data

Modifications of structural members; G

SD-06 Test Reports

Preservative-treated lumber and plywood

Structural lumber allowable unit stresses

[SD-07 Certificates

Certificates of grade]

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

NOTE: The Federlegno-Arredo (National Association of Finish Carpentry) provides an overview of standardized practices for both rough carpentry and finish carpentry.

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 Federlegno-Arredo, to grade the species used.

1.4.2 Structural Glued Laminated Timber

Mark each member with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of structural glued laminated timber products. The marking shall indicate compliance with UNI EN 386 and UNI EN 302-1 and shall include all identification information required by UNI EN 386 and UNI EN 302-1. [Structurally end-jointed lumber shall also be certified and grade marked.]

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 and nominal thickness, exposure durability classification, and grade.

1.4.4 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 and span rating. Mark panels with exposure durability classification in accordance with UNI EN 335-3.

1.4.5 Preservative-Treated Lumber and Plywood

UNI EN 330. The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected by an approved independent testing company and permanently marked or branded, by the producer to indicate treatment class provided. The Contractor shall provide Contracting Officer's Representative (COR) with the inspection report of the approved independent inspection agency that offered preservative treated products.

1.4.6 Fire-Retardant Treated Lumber

NOTE: Do not use fire-retardant treated plywood.

Each piece of lumber shall be marked with the label of a nationally recognized testing laboratory, except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber shall be distinguished by a permanent penetrating blue stain.

1.4.7 Hardboard[, Gypsum Board, and Fiberboard]

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

1.5 SIZES AND SURFACING

UNI EN 1313-1 for dressed sizes of softwood sawn 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.

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 - 20 percent maximum

- b. Timbers 125 mm 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

NOTE: Water-borne preservative treatment should be used in accordance with The Federlegno-Arredo authorization for the appropriate product. Water-borne preservatives are leach resistant, paintable, and easily worked. Whenever certain exposed uses require minimized swelling, shrinking, or splitting, then require that a water repellent be added to the treatment. Requirement of an independent inspection agency report verifies that the product was prepared and treated in accordance with The Federlegno-Arredo requirements. Consult the EFD applied biologist for further guidance regarding specific treatments listed or additional treatments that may be required for special use items.

UNI EN 330, UNI EN 335-3, and UNI ENV 1099. Treat lumber and plywood with preservatives as required to achieve a rating of 0 or 1 as tested in accordance with UNI EN 330. All wood shall be air or kiln dried after treatment. Specific treatments shall be verified by the report of an approved independent inspection agency. [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. [All lumber and woodwork shall be preservative treated.] The following items shall be preservative treated:

NOTE: Edit the following locations. Most conditions are not common in Italy.

- a. Wood framing, woodwork, and plywood up to and including the subflooring at the first-floor level of structures having crawl spaces when the bottoms of such items are 600 mm or less from the earth underneath.
- b. Exterior wood steps, platforms, and railings; and all wood framing of open, roofed structures.
- c. Wood sills, soles, plates, furring, and sleepers that are less than 600 mm from the ground, furring and nailers that are set into or in contact with concrete or masonry.
- d. Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.8 FIRE-RETARDANT TREATMENT

NOTE: Items to be treated should be listed in this paragraph. Fire-retardant treatment should be specified when necessary to provide required fire resistance for the structure. Where wood will be exposed to heat or high humidity, as well as where wood is exposed on the exterior of buildings, specify exterior fire retardant treatment.

The following items shall receive fire-retardant treatment. Items that will not be inside a building, and that will be exposed to heat or high humidity, shall receive exterior fire-retardant treatment.

a. [_____].

1.9 QUALITY ASSURANCE

1.9.1 Drawing Requirements

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

1.9.2 Data Required

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

[1.9.3 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

All lumber and wood items to be furnished and installed shall conform to the UNI 3517/7, UNI 3253, and UNI ISO 3131, and shall conform to the type and grade described hereinafter. Wood showing signs of warp, grain deviation, shakes, cracks, mold, stain, rot, insect damage, or other injurious defects will be rejected.

2.1.1 Structural Lumber

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

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

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

[Except where a specific grade is indicated or specified,] Any of the species and grades that have allowable unit stresses in kPa not less than [_____] Fb, [_____] Ft, [_____] Fc, with [_____] E [allowable unit stresses indicated]. Use for joists, rafters, headers, beams (except collar beams), columns, posts, stair stringers, girders, and all other members indicated to be stress rated. Structural lumber exposed to view in [_____] shall be appearance grade of [Oak] [Cherry] [Red Spruce] [Larch] [Beech] species meeting the allowable unit stresses [specified] [indicated]. Provide test data to confirm conformance with the stresses specified. Provide appearance grade minimum of F-D1 (Beech or similar grade for other woods) in accordance with UNI EN 975-1/A1.

2.1.2 Framing Lumber

Framing lumber such as studs, plates, caps, collar beams, cant strips, bucks, sleepers, nailing strips, and nailers shall be common type Fir or Poplar wood which is suitable for general utility and construction purposes. Lumber in permanent construction shall be of the first grade, common type, which is sound, tight knotted, watertight, straight, if it is not required to have fine finishing qualities. Lumber for temporary construction shall be common lumber of low quality allowing some defects and coarse uneven texture. [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.] Provide lumber for permanent construction from Table below, with a unit stress (bending) of not less than 40 Kg/sq. cm and a modulus of elasticity (E) of not less than 98,000 Kg/sq. cm.

FRAMING WOOD TABLE

<u>Botanical Name</u>	<u>Common Name</u>	<u>Appearance Grading Minimum</u> <u>(UNI EN 1611-1)</u>
Populus	Yellow Poplar	G2/G4-2
Populus alba	White Poplar	G2/G4-2
Abies pectinata	White Fir	G2/G4-2

FRAMING WOOD TABLE

<u>Botanical Name</u>	<u>Common Name</u>	<u>Appearance Grading Minimum</u> (UNI EN 1611-1)
Pseudotsuga douglas	Douglas Fir	G2/24-2
Picea exceisa	Red Spruce	G2/G4-2
Pinus sylvestris	Sylvestre Pine	G2/G4-2
Larix decidua	Larch	G2/G4-2
Linus Laricio	Larch Pine	G2/G4-2

Framing lumber in contact with masonry or concrete or used in connection with faascias, roofing, or exterior trim shall be preservative treated to a minimum of Hazard Class 3 in accordance with UNI EN 335-3.

2.1.3 Structural Glued Laminated Timber

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

UNI EN 302-1 and UNI EN 386, allowable working stress values for loads of normal duration in kPa not less than the following:

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

Fabricated with phenolic and aminoplastic adhesives. Members shall be [Structural] [Architectural] Appearance Grade, sealed with a penetrating sealer, and [individually wrapped] [bundle wrapped] as standard with the manufacturer and approved. Members shall be complete with hardware for joining laminated members and for their connection to other construction.

2.2 PLYWOOD AND ORIENTED STRAND BOARD (OSB) PANELS

2.2.9 Plywood

NOTE: Appearance classes III and IV are also available that allow larger number of defects.

Designer shall provide additional reference information as required for strength characteristics and stability requirements if needed. If different uses and locations are required, list such following the paragraph.

UNI EN 310, UNI EN 313-1, UNI EN 315, UNI EN 636-2, and UNI EN 636-3. Plywood shall be veneer core material constructed of an odd number of veneer plies with face and back veneers or overlays adhered to the core ply. Plywood for interior use may be either of the moisture - resistant type. Face veneer shall be of soft wood and a minimum of 3 plies; thicknesses as indicated. Provide UNI EN 635-3 appearance [class E for high quality surfaces without imperfections or defects] [and] [class I for good quality with only slight irregularities] [and] [class II for utility quality with knots and surface voids filled].

2.2.10 Oriented Strand Board (OSB)

NOTE: Designer shall provide additional reference information as required for strength characteristics and stability requirements if needed. If different uses and locations are required, list such following the paragraph.

UNI EN 310. Multi-layered board made from strands of wood of a predetermined shape and thickness combined with a binder for form construction panels. Provide UNI EN 300 Class [OSB/1 general purpose board for interior use] [and] [OSB/2 load-bearing boards for use in dry conditions] [and] [OSB/3 load-bearing boards for use in humid conditions][OSB/4 heavy duty load-bearing boards for use in humid condntions].

2.3 OTHER MATERIALS

2.3.1 Hardboard Underlayment

NOTE: If used, Designer shall provide additional reference information as required for strength characteristics and stability requirements if needed. If different uses and locations are required, list such following the paragraph.

UNI EN 622-2 [type HB general purpose for use in dry conditions] [and] [type HB.H general purpose for use in humid conditions] [and] [type HB.E for general purpose use in exterior conditions] [and] [type HB.LA load-bearing for use in dry conditions] [and] [type HB.HLA1 load-bearing for use in humid conditions] [and] [type HB.HLA2 heavy-duty load-bearing for use in humid conditions], sanded on one side, 6 mm thick 1200 mm wide.

[2.3.2 Fiberboard Wall Sheathing

NOTE: Include fiberboard wall sheathing only for wood framed buildings - not typically used in Italy.
If used, Designer shall provide additional reference information as required for strength characteristics and stability requirements if needed. If different uses and locations are required, list such following the paragraph.

UNI EN 622-5 [type MDF general purpose for use in dry conditions] [and] [type MDF.H general purpose boards for use in humid conditions] [and] [type MDF.LA load-bearing for use in dry conditions] [and] [type MDF.HLS load-bearing for use in humid condtions], 600 mm wide by [12.5 mm thick for supports 400 mm (o.c.)] [18 mm thick for supports 600 mm o.c.] or 1200 mm wide by [12.5 mm thick for supports 400 mm o.c.] [18 mm thick for supports 600 mm o.c.], except only 1200 mm wide by 12.5 mm thick sheathing over supports at 400 mm o.c. may be applied without corner bracing of framing. Sheathing shall be asphalt impregnated or asphalt coated to render the sheathing water resistant but vapor permeable.

] [2.3.3 Gypsum Wall Sheathing

NOTE: Include gypsum wall sheathing only for wood framed buildings, and only if Section 09250 is not used - not typically used in Italy.

UNI 5371, Class I, 12.5 mm thick [fire retardant, 15 mm thick]; 1200 mm wide with square edge [for supports 400 mm o.c. with or without corner bracing of framing] [or] [for supports 600 mm o.c. with corner bracing of framing]; 600 mm wide with V-tongue and groove (T&G) edge for supports [400] [or] [600] mm o.c. with corner bracing of framing.

] [2.3.4 Foil-Faced Insulative Sheathing

NOTE: Include foil faced insulative sheathing only for wood framed buildings - not typically used in Italy, otherwise delete.

Wood fiber core, chemically treated for water resistance, with aluminum foil laminated under pressure to both sides with water-resistant adhesive; 1200 mm wide; 2 mm thick when used with corner bracing, 2.9 mm thick with studs up to 400 mm o.c. without corner bracing, or 3.5 mm thick with studs up to 600 mm o.c. without corner bracing. The sheathing and installation shall have been accepted by Insulative Sheathing Manufacturer. The sheathing alone shall have a thermal resistance value (R value) of not less than 0.20.

]2.3.5 Building Paper

**NOTE: Include building paper only for wood framed
buildings - not typically used in Italy, otherwise
delete.**

UNI 3682.

]2.4 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. [Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather shall be copper alloy.]

2.4.1 Bolts, Nuts, Studs, and Rivets

UNI 3740/10/FA 1, SS UNI U24.04.893.0, UNI 7536, UNI ISO 4018, and UNI ISO 4032.

2.4.2 Expansion Shields

Expansion shields shall be lag shield, self drilling tubular expansion shell and nail anchors. Except as shown otherwise, maximum size of devices shall be 10 mm.

2.4.3 Lag Screws and Lag Bolts

UNI 3740/10/FA 1.

2.4.4 Toggle Bolts

UNI 3152.

2.4.5 Wood Screws

UNI 699.

2.4.6 Wire Nails

UNI EN ISO 12777-1.

2.4.7 Tacks

UNI 9447.

2.4.8 Joist Hangers

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

2.4.9 Tie Straps

For joists supported by the lower flange of steel beams, provide 3 by 40 mm steel strap, 600 mm long [, except as indicated otherwise].

2.4.10 Joist Anchors

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

2.4.11 Door Buck Anchors

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

2.4.12 Metal Bridging

[Where not indicated or specified otherwise,] 1.6 mm thick, cadmium-plated or zinc-coated.

2.4.13 Toothed Rings and Shear Plates

UNI EN 912.

2.4.14 Beam Anchors

Steel U-shaped strap anchors 6 mm thick by 40 mm wide [, except as indicated otherwise].

2.4.15 Metal Framing Anchors

Construct anchors to the configuration shown using hot dip zinc-coated steel conforming to UNI EN 10142/A1. [Except where otherwise shown,] Steel shall be not lighter than 1.32 mm thick. Special nails supplied by the manufacturer shall be used for all nailing.

2.4.16 Panel Edge Clips

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

PART 3 EXECUTION

3.1 INSTALLATION

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. Spikes, nails, and bolts shall be drawn up tight. [Timber connections and fastenings shall conform to approved shop drawings.] [Provide 50 mm minimum clearance between chimneys and wood framing; provide 100 mm minimum clearance at fireplaces. Fill the spaces with strips of approved noncombustible material.] Use slate or steel shims when leveling joists, beams, and girders on masonry or concrete. Do not use shimming on wood or metal bearings.

3.1.1 Sills

Set sills level and square and wedge with steel or slate shims; point or grout with non-shrinking cement mortar to provide continuous and solid bearing. Anchor sills to the foundations as indicated. [Where sizes and spacing of anchor bolts are not indicated, provide not less than 16 mm diameter bolts at all corners and splices and space at a maximum of 1800 mm o.c. between corner bolts. Provide at least two bolts for each sill member. Lap and splice sills at corners and bolt through the laps or butt the ends and through-bolt not more than 150 mm 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 400 mm in masonry unit walls and provide each with a nut and a 50 mm diameter washer at bottom end. Fully grout bolts with mortar.

3.1.1.2 Anchors in Concrete

[Except where indicated otherwise,] Embed anchor bolts not less than 200 mm in poured concrete walls and provide each with a nut and a 50 mm diameter washer at bottom end. A bent end may be substituted for the nut and washer; bend shall be not less than 1.57 rad. Powder-actuated fasteners spaced 900 mm o.c. may be provided in lieu of bolts for single thickness plates on concrete.

3.1.2 Beams and Girders

Set beams and girders level and in alignment and anchor to bearing walls, piers, or supports with U-shaped steel strap anchors. Embed anchors in

concrete or masonry at each bearing and through-bolt to the beams or girders with not less than two bolts. Provide bolts not less than 12 mm in diameter and with plate washers under heads and nuts. Install beams and girders [not indicated otherwise] with 200 mm minimum end bearing on walls or supports. Install beams and girders into walls with [12 mm clearance at the top, end, and sides] [or] [standard steel wall-bearing boxes]. Provide joints and splices over bearings only and bolt or spike together.

3.1.3 Joists

Provide joists of the sizes and spacing indicated, accurately and in alignment, and of uniform width. Joists shall have full bearing on sills, [plates,] [beams,] [girders,] [and] [trusses]; provide laps over bearing only and spike. Where joists are of insufficient length to produce a 300 mm lap, butt joists over bearing and provide wood scabs 2 nominal inches thick by depth of joists by 600 mm long or metal straps 6 by 40 mm by not less than 450 mm long nailed to each joist with not less than four nails of 2.9 mm dia. by 76 mm size, or approved sheet metal connectors installed in accordance with the manufacturer's recommendations. Provide joists built into masonry with [a beveled fire cut so that the top of the joist does not enter the wall more than 25 mm] [or] [standard steel wall bearing boxes]. Provide metal hangers for joists framing into the side of headers, beams, or girders. [When a portion of the joist extends above the top flange of a steel beam or girder, provide a 10 mm space between the top flange and the extended portion of the joists to allow for shrinkage of joists.] The minimum joist end bearing shall be 100 mm, and joists built into concrete or masonry shall have a 12 mm minimum clearance at the top, end, and sides.

For joists approved to be bored for the passage of pipes or conduits, bore through the neutral axis of the joist. [Provide steel joist hangers of proper size and type to receive the ends of all framed joists.]

3.1.3.1 Doubled Joists

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

3.1.3.2 Tie Straps

For joists supported by the lower flange of steel beams, provide straps at every fourth joist and the corresponding fourth joist on the opposite side. Tie joists across the top of the steel beam with a steel strap. Form straps to lie flat across the top of the beam and twist at the ends to provide flat contact with the side of each joist. Nail each strap at each end with three nails of 2.9 mm dia. by 76 mm size, spaced 50 mm o.c.

3.1.3.3 Joist Anchors

Provide anchors for each fourth joist supported by a masonry wall. Build wall end of anchors into the wall. Nail anchor to the joist with three nails of 2.9 mm dia. by 76 mm size, spaced 50 mm o.c. Anchor the first three joists parallel to concrete or masonry walls at bridging points, but

not less than 2400 mm o.c. from end walls. Let anchors into the tops of each joist and spike to the top of joist with one nail of 2.9 mm dia. by 76 mm size,. Extend anchors at least [100] [200] mm into the wall.

3.1.4 Bridging

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

3.1.4.1 Wood Cross-Bridging

Provide wood cross-bridging not less than [25 mm by 75 mm] [50 mm by 75 mm] [50 mm by 100 mm] nominal size. Nail wood cross-bridging at each end with [two nails of 2.6 mm dia. by 70 mm size, for one by thick material] [and] [three nails of 2.6 mm dia. by 70 mm size, for 50 by thick material.]

3.1.4.2 Metal Cross-Bridging

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

3.1.7 Columns and Posts

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

3.1.8 Wall Framing

3.1.8.1 Studs

Select studs for straightness and set plumb, true, and in alignment. In walls and partitions more than 2400 mm tall, provide horizontal bridging at not more than 2400 mm o.c. using nominal 50 mm material of the same width as the studs; install the bridging flat. Sizes and spacing of studs shall be [_____] [as indicated]. Double studs at jambs and heads of openings and triple at corners to form corner posts. Frame corner posts to receive sheathing, lath, and interior finish. Truss over openings exceeding 1200 mm in width or use a header of sufficient depth. Toe-nail studs to sills or sole plates with four nails of 2.6 mm dia. by 70 mm size, or fasten with metal nailing clips or connectors. Anchor studs abutting concrete or masonry walls thereto near the top and bottom and at mid height of each story using expansion bolts or powder-actuated drive studs.

3.1.8.2 Plates

Use plates for walls and partitions of the same width as the studs to form continuous horizontal ties. Splice single plates; stagger the ends of double plates. Double top plates in walls and bearing partitions, built up of two nominal 50 mm 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 nails of 3.3 mm dia. by 90 mm size. Nail the upper members of double plates to the lower members with nails of 2.9 mm dia. by 76 mm size,, two near each end, and stagger 400 mm o.c. intermediately between. Nail sole plates on wood construction through the subfloor to each joist and header; stagger nails. Anchor sole plates on concrete with expansion bolts, one near each end and at not more than 1800 mm o.c., or with powder-actuated fasteners, one near each end and at not more than 900 mm 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.

3.1.8.3 Firestops

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

3.1.8.4 Diagonal Bracing

Provide diagonal bracing at all external corners and internal angles and at maximum 12000 mm centers in stud walls, except that bracing may be omitted where diagonally applied wood sheathing, plywood sheathing[, 1200 by 2400 mm fiberboard sheathing,][or gypsum board sheathing] is used. Bracing shall be of 25 mm by 150 mm material, let into the exterior face of studs. Extend bracing from top plates to sill at an angle of approximately 0.785 rad. 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 nails of 2.6 mm dia. by 70 mm size.

3.1.9 Wall Sheathing

3.1.9.1 Plywood OSB Panel Wall Sheathing

Apply horizontally or vertically. Extend sheathing over and nail to sill and top plate. Abut sheathing edges over centerlines of supports. Allow 3 mm spacing between panels and 3 mm at windows and doors. If sheathing is applied horizontally, stagger vertical end joints. Nail panels with nails of 2.3 mm dia. by 50 mm size, spaced 150 mm o.c. along edges of the panel and 300 mm o.c. over intermediate supports. Keep nails 10 mm away from panel ledges. Provide 50 mm by 100 mm blocking for horizontal edges not otherwise supported.

[3.1.9.2 Fiberboard Wall Sheathing

NOTE: Include fiberboard wall sheathing only for wood framed buildings.

Apply fiberboard wall sheathing allowing a 3 mm joint at edges to permit expansion, except at frames and openings where sheathing shall be fitted snugly. Pre-expand sheathing before application, allowing sheathing to condition for humidity as recommended by the sheathing manufacturer. Provide 50 mm by 100 mm blocking for horizontal edges not otherwise supported.

- a. Fiberboard wall sheathing used with diagonal-braced framing shall be either 60 or 1200 mm wide. Sheathing 600 mm wide shall have T&G or shiplapped edges and shall be applied horizontally with vertical joints staggered. Apply sheathing with tongued edge up and nail at edges and intermediate bearings with 45 mm long, zinc-coated steel roofing nails spaced on maximum 115 mm centers. Apply sheathing 1200 mm wide either horizontally or vertically. Nail sheathing with 45 mm long, zinc-coated steel roofing nails spaced 100 mm maximum o.c. at edges and 200 mm maximum o.c. at intermediate bearings.
- b. Fiberboard wall sheathing used with unbraced framing shall be 1200 mm wide. Apply sheathing vertically. Extend sheathing over and nail to sill and top plates. Locate joints over centerlines of supports. Nail sheathing with 40 mm long, zinc-coated steel roofing nails with 9.5 mm diameter heads. Space nails 75 mm o.c. at edges and ends and 150 mm o.c. at intermediate bearings.

] [3.1.9.3 Gypsum Sheathing Board

NOTE: Include gypsum wall sheathing only for wood framed buildings, and only if Section 09250 is not used.

Apply gypsum sheathing board either horizontally or vertically. Butt joints and locate over the centerlines of supports. Horizontally applied sheathing shall be T&G, applied with tongued edge up. Stagger vertical joints and abut sheet closely to frames of openings. Nail sheathing with 11 gage, 9.5 mm head, zinc-coated nails 40 mm long for 12.7 mm sheathing and 45 mm long for 16 mm sheathing, spaced 10 mm minimum from edges. Provide 50 mm by 100 mm blocking for horizontal edges of 1200 mm wide panels not otherwise supported.

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

200 mm maximum o.c. at intermediate bearings.

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

] [3.1.9.4 Foil-Faced Insulative Sheathing

NOTE: Include foil-faced insulative wall sheathing only for wood framed buildings.

Apply sheathing vertically. Butt or overlap joints and locate over centerline of supports. Attach sheathing to framing with 30 mm, large, flat-head, 2.3 mm dia., galvanized roofing nails. For nonstructural application (with corner bracing), space fasteners 150 mm o.c. on all panel edges and 300 mm o.c. on intermediate supports, regardless of sheathing thickness, for studs not more than 600 mm o.c. For structural application (without corner bracing), for studs not more than 400 mm o.c., space fasteners 75 mm o.c. on all edges and 150 mm o.c. on intermediate members using minimum 2.9 mm thickness; for studs up to 600 mm o.c., space fasteners 75 mm o.c. on all edges and 75 mm o.c. on intermediate supports using minimum 3.5 mm thickness.

] [3.1.10 Building Paper

NOTE: Include building paper only for wood framed buildings.

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

] 3.1.11 Ceiling Joists

Size as indicated and set accurately and in alignment. Toe-nail joists to all plates with not less than three nails of 2.9 mm dia. by 76 mm size. Frame openings in ceilings with headers and trimmers.

3.1.12 Rafters

Size as indicated, set accurately, and form a true plane. [Ridge] [hip] [and] [valley] members shall be of ample depth to receive beveled ends of rafters and shall be nominally 50 mm thick. Rafters shall [be notched and] have full and solid bearing on plates. Toe-nail rafters to plates and [ridge] [valley] [hip] member with at least three nails of 2.9 mm dia. by 76 mm size, and nail to adjoining ceiling joists with at least four nails of 2.9 mm dia. by 76 mm size. Adequately frame openings in roofs with headers and trimmers. Double headers and trimmers carrying or supporting

two or more rafters.

3.1.13 Metal Framing Anchors

Provide framing anchors at every [other] rafter to fasten 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 Structural Glued Laminated Timber Members

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

3.1.16 Plywood Roof Sheathing

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

Install with the grain of the outer plies or long dimension at right angles to supports. Stagger end joints and locate over the centerlines of supports. Allow 3 mm spacing at panel ends and 6 mm 1/4 inch at panel edges. Nail panels with common nails of 2.6 mm dia. by 70 mm size, or 2.3 mm dia. annular rings or screw-type nails spaced 150 mm o.c. at supported edges and 300 mm 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.

3.1.17 Stair Framing

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

3.2 MISCELLANEOUS

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

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

3.2.1.1 Roof Nailing Strips

Provide roof nailing strips for roof decks as [indicated] [and] [specified]

herein]. Apply nailing strips in straight parallel rows in the direction and spacing [indicated] [specified in Section _____, "_____."] Strips shall be [surface applied] [embedded in concrete].

- a. Surface-Applied Nailers: Shall be 75 mm wide and of thickness to finish flush with the top of the insulation. Anchor strips securely to the roof deck with powder actuated fastening devices or expansion shields and bolts, spaced not more than 600 mm o.c. [On decks with slopes of 25 mm or more, provide surface applied wood nailers for securing insulation [and for nailing of roofing felts].]
- b. Embedded Nailers: Shall be nominal 50 mm by 75 mm with the 50 mm sides beveled. Set and anchor nailers to finish flush with the roof deck surface.

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 150 mm wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. [Strips shall be grooved [as indicated] for edge venting; install at walls, curbs, and other vertical surfaces with a 6 to 12 mm air space.]

3.2.1.3 Crickets, Cants, and Curbs

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

3.2.2 Rough Wood Bucks

[Size as indicated] [50 mm nominal thickness]. Set wood bucks true and plumb. Anchor bucks to concrete or masonry with steel straps extending into the wall 200 mm minimum. Place anchors near the top and bottom of the buck and space uniformly at 600 mm maximum intervals.

3.2.3 Wood Blocking

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

3.2.4 Wood Grounds

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

3.2.5 Wood Furring

Provide where shown and as necessary for facing materials specified. Except

as shown otherwise, furring strips shall be nominal one by 3, continuous, and spaced 400 mm o.c. Erect furring vertically or horizontally as necessary. Nail furring strips to masonry. Do not use wood plugs. Provide furring strips around openings, behind bases, and at angles and corners. Furring shall be plumb, rigid, and level and shall be shimmed as necessary to provide a true, even plane with surfaces suitable to receive the finish required. Form furring for [cornices,] offsets and breaks in walls or ceilings on 25 mm by 200 mm wood strips spaced 400 mm o.c.

3.2.7 Temporary Closures

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

3.2.8 Temporary Centering, Bracing, and Shoring

Provide for the support and protection of masonry work during construction as specified in Section [_____, "_____."] Forms and centering for cast-in-place concrete work are specified in Section 03300, "Cast-In-Place Concrete."

3.2.9 Wood Sleepers

Run wood sleepers in lengths as long as practicable and stagger end joints in adjacent rows. [Sleepers for gymnasium floors are specified in Section 09641, "Wood Athletic Flooring."]

3.3 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: 6 mm from intended position;
 - (2) Plates and runners: 6 mm in 2400 mm from a straight line;
 - (3) Studs: 6 mm in 2400 mm out of plumb, not cumulative; and
 - (4) Face of framing members: 6 mm in 2400 mm 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: 6 mm from intended position;
 - (2) Plates and runners: 3 mm in 2400 mm from a straight line;
 - (3) Studs: 3 mm in 2400 mm out of plumb, not cumulative; and

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

-- End of Section --