SECTION 14

TIMBER CONSTRUCTION

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1401 GENERAL

Timber members used for structural purposes shall be designed by methods admitting of rational analysis according to established principles of mechanics.

1402 STANDARDS

(a) Standards of construction shall be at least equal to standards in the latest edition of CUBiC Part 2 Section 8 - Structural Timber; or the American Institute of Timber Construction - AITC 100; or BS 5268 - Structural Use of Timber; or other Standard approved by the Authority for environmental conditions in the OECS.

(b) CUBiC Part 2 Section 8, is hereby adopted as being part of this Code and supplements, but does not supersede the specific requirements set forth herein.

1403 QUALITY OF TIMBER PRODUCTS

1403.1 Preservative Treated or Durable Species Timber

(a) Wood used for structural purposes shall be pressure treated or have natural resistance to termites. The approval of the Director is required for the use of any timber for structural purposes that has not been pressure treated.

(b) Approved wood having natural resistance to termites include greenheart, redwood, or red cedar*.

(c) The standard of the American Wood Pressures Bureau and/or the American Wood Pressure Association shall be deemed as approved in respect of pressure treated wood.

(d) The soil should be treated against termites, as a protection against the termite infestation in the area in which the building is being constructed. This treatment should be carried out by experienced contractors using methods and materials approved by the Director.

Note: The developer should confirm the natural resistance of the timber to be used by providing test certificates or other relevant information for the approval of the Director.

1403.2 Use of Lumber, Plywood, Hardboard, and other Timber Products.

a) All lumber, including end-jointed lumber, used for load supporting purposes shall be identified by Grade Mark of a Lumber Grading or Inspection Bureau or Agency approved by the Authority.

b) Structural glued laminated timber shall be manufactured in accordance with AITC 117 "Standard Specification for Structural Glued Laminated Timbers of Softwood Species, Manufacture and Design or BS 5268 Part 2, "Structural Use of Timber".

c) All plywood when used structurally (including among others, used for siding, roof and wall sheathing, sub flooring, diaphragms and built-up members), shall conform to the performance standards for its type as determined by the American Plywood Design Specifications for Plywood-Lumber Components or other Standard approved by the Authority.

d) Plywood components shall be designed and fabricated in accordance with the applicable standards and identified by the trademarks of a testing and inspection agency approved by the Authority, and indicating conformance with the applicable standard. In addition, all plywood when permanently exposed in outdoor applications, shall be of exterior type.

e) Wood Shingles and/or shakes shall be identified by the grade mark of a grading or inspection bureau or agency recognized by the Authority as being competent.

f) Fibreboard for its various uses shall conform to "Voluntary Product Standard, Cellulose Fibre Insulating Authority PS-57". Fibreboard sheathing when used structurally shall be so identified by an approved agency conforming to the Product Standard. Fibreboard should not be used for exterior structural purposes without specific approval of the Director.

g) Hardboard shall conform to the applicable Product Standard, "PS-58 Basic Hardboard", "PS-59 Pre-finished Hardboard Panelling" or, "PS-60 Hardboard Siding", and shall be identified as to classification. Hardboard siding when used structurally shall be identified by an agency approved by the Authority as conforming to the Product Standard.

h) Particle board shall conform to American National Standard for Mat-Formed Wood Particleboard - ANSI A208.1. Particleboard shall be identified by the grade mark or Certificate of Inspection issued by an agency approved by the Authority.

i) Particle board sub floor or combination subfloor-underlayment shall conform to one of the Grades in Table 14-4.

j) Particle board should be used with caution. Particleboard used for sub flooring or roof decking or for wall sheathing should be moisture and termite resistant.

k) All lumber and plywood required to be treated shall bear an approved AWPB Quality Mark or that of an inspection agency approved by the Authority, that maintains continuing control, testing and inspection over the quality of the products.

l) Wood flooring of the various types shall be manufactured and identified as required in an appropriate standard such as:

- Laminated Hardwood Block Flooring - Interim Industry Standard HPMA-LF 1971.
- Flooring Grading Rules (Oak, Pecan Beech, Birch, Hard Maple) - National Oak Flooring Manufacturers Association.
- Hard Maple Flooring Standard Specification (Hard Maple, Beech and Birch) - Maple Flooring Manufacturers Association.

m) It is recommended that where rainwater is collected from a shingled roof a filter be installed at the inlet pipe to the storage tank.

1404 SIZES

(a) All timber structural members shall be of sufficient size to carry the dead and required live loads without exceeding the allowable deflections or working stresses specified. Adequate bracing and bridging to resist wind and other forces shall be provided.

(b) Sizes of timber members referred to by this Code are nominal sizes. The minimum acceptable net sizes conforming to normal sizes shall be within 2 percent of the minimum net sizes specified in AITC 100 at 19 percent moisture content. Computations to determine the required sizes of members shall be based on the net sizes contained in the standard.

1405 ALLOWABLE UNIT STRESSES

1405.1 General

(a) Timber joists and rafters shall be designed using the allowable unit stresses in AITC 100.

(b) Timber members supporting plastered ceilings shall be so proportioned that their deflection under full live load shall not exceed 1/360 of the span; and timber members, not supporting plastered ceilings, shall be so proportioned that their deflection under full live load shall not exceed 1/240 of the span.

(c) The span of roof rafters shall be measured horizontally from bearing to bearing.

(d) Where there is an accessible space having a clear vertical height of 30" or more, ceiling joists shall be designed as having usable attic space.

1405.2 Plywood Stresses

(a) Working stresses of plywood other than those covered by the American Plywood Association Standard shall be determined according to the (APA) species.

(b) All plywood permanently exposed in outdoor locations shall be of exterior type, and where used for roof or exterior wall sheathing shall meet the performance standards for exterior type plywood in the APA standard

(c) Walls or roofs sheathed with plywood may be considered as diaphragms to distribute horizontal forces, based on structural analysis and/or tests; and where so used plywood shall be bonded with approved exterior adhesive.

(d) All plywood used structurally shall bear the identification of an approved agency as to type and grade, species of veneer used and conformance with the appropriate standard.

1405.3 Glued Laminated Members

(a) The Authority may require tests to determine the strength, permanence, effect of moisture and insect-resistance of adhesives; and only approved adhesives may be used.

(b) The Authority may limit or otherwise regulate the use of glued-laminated members after consideration of the manufacture, location and service.

1405.4 Timber Trusses

(a) Trusses shall be designed by methods admitting of rational analysis.

(b) Where metal is used for connecting wood members such metal shall be not less than 18 gauge and shall be galvanised.

(c) The allowable deflection under live load, for trusses shall be 1/360 of the span for plastered ceilings, 1/240 for unplastered finished ceilings, and 1/180 for trusses without a ceiling.

(d) The design of metal plate connected wood trusses shall comply with the "Design Specifications for Light Metal Plate Connected Wood Roof Trusses" - Truss Plate Institute, 2400 East Devon, Des Plaines, Illinois 60018, or other Standard approved by the Authority.

(e) Where trusses are to support mechanical or other equipment, the trusses shall be designed for such additional load.

1406 CONSTRUCTION DETAILS

1406.1 Roof Joists and Rafters

(a) Maximum spans for roof joists and rafters shall be in accordance with "Span Tables for Joists and Rafters", as published by the National Forest Products Association, or other acceptable design method.

(b) Joists shall be supported laterally at the ends by solid blocks or diagonal struts. Such bridging may be omitted where ends of joists are nailed to a header, band joist or to an adjoining stud.

(c) Notches on the ends of joists shall not exceed one-fourth (1/4) the depth. Holes bored for pipes or cable shall be on the neutral axis and at least two (2) inches from the top or bottom of the joist. The diameter of any such hole shall not exceed one-third (1/3) the depth of the joist. Holes shall not be less than three diameters apart. Notches for pipes in the top or bottom of joists shall not exceed one-sixth (1/6) the depth and shall not be located in the middle one-third (1/3) of the span.

1406.2 Roof Sheathing

(a) All rafters and roof joists shall be covered with sheathing such as:

1. **Lumber**

Solid sheathing - Wood boards of three quarter (3/4) inch (net) minimum thickness

2. **Plywood**

Applied in accordance with the provisions of Table 14-1(b).

3. **Insulating Roof Deck**

Fibreboard insulating roof deck not less than one (1) inch nominal thickness.

(b) Joints in lumber sheathing shall occur over supports unless end-notched lumber or approved clips are used, in which case each piece shall bear on at least two rafters.

1406.3 Floor Joists

a) Maximum spans for floor joists shall be in accordance with the "Span Tables for joists and Rafters", as provided by the National Forest Products Association; or may be designed in accordance with other standard criteria.

b) Spans for field-glued plywood lumber floor systems using adhesives shall be as set forth in "APA Glued System", as published by the America Plywood Association. Adhesives for the APA Glued Floor System shall be those meeting the requirements of AFG-01, "Adhesives for Field Gluing Plywood to Wood Framing", as published by the American Plywood Association.

c) Except where supported on a one by four inch (1" x 4") ribbon strip and nailed to the adjoining stud, the ends of each joist shall have not less than one and one-half (1-1/2) inches of bearing on wood or metal nor less than three (3) inches of masonry.

d) Floor joists having a depth to thickness ratio exceeding six and the design live load is in excess of forty (40)pounds per square foot, shall be supported laterally by bridging or blocking installed at intervals not exceeding eight (8) feet.

e) Joists shall be supported laterally at the ends by solid blocks or diagonal struts except where the ends of joists are nailed to a beam (wood or steel with an attached nailer) header, band joists or to an adjoining stud.

f) Notches on the ends of joists shall not exceed one-fourth (1/4) the depth. Holes bored for pipes or cables shall not be within two (2) inches of the top or bottom of the joist and the diameter of any such hole shall not exceed one-third (1/3) the depth

of the joist. Notches for pipes in the top or bottom of joists shall not exceed one-sixth (1/6) the depth and shall not be located in the middle one-third (1/3) of the span.

g) Joists framing from opposite sides of a beam, girder or partition shall be lapped at least four inches and fastened, or the opposing joists shall be tied together in an approved manner.

h) Joists framing into the side of a wood girder shall be supported by framing anchors, on ledger strips not less than two (2) by two (2) inches, or by other approved methods.

Table 14-1 (a)

Spans of Plywood Sub-floor
Continuous over Two or More Supports

Panel Identification Index	Maximum Span (in)
32/16,36/16	16
42/20	20
48/24	24

Table 14-1(b)

Allowable Spans for Plywood Roof Sheathing Continuous over Two or More Supports (in.)

Panel Identification Index	Maximum span if block or other edge support (in.)	Maximum span without edge support (in.)
24/0 (1/2" only)	24	20
30/12	30	26
32/16	30	28
36/16	32	30
42/20	36	32
48/24	42	36

Notes:

(1) These values apply for Structural 1 and 11, C-D Sheathing and C-C grades only. Spans shall be limited to values shown because of possible effect of concentrated loads.

Edges may be blocked with lumber or other approved type of edge support.

(2) Identification Index appears on all panels in the construction grades listed in footnote (1).

(3) For roof live load of 40 psf, decrease span by 13 percent or use panel with next greater identification index.

(4) Plywood edges shall have approved tongue and groove joints or shall be supported with blocking, unless one-fourth (1/4) inch minimum thickness underlayment is installed, or finished floor is 25/32" wood strip. Allowable uniform load based on deflection of 1/360 of span is 165 psf.

(5) For joists spaced 24" on plywood sheathing with Identification Index numbers 42/20 or greater can be used for subfloors when supporting 1-1/2" lightweight concrete.

Table 14-2

Allowable Spans for Plywood
Combination Subfloor-Underlayment

Plywood Continuous over Two or More Spans and Face Grain Perpendicular to Supports - Thickness in inches			
Species Groups	**Maximum Spacing of Joists (inches)**		
	16	**20**	**24**
1	1/2	5/8	3/4
2,3	5/8	3/4	7/8
4	3/4	7/8	1

Notes:

(1) Applicable to Underlayment grade, C-C (Plugged) and all grades of sanded exterior type plywood. Spans limited to values shown because of possible effect of concentrated loads. Allowable uniform load based on deflection of 1/360 of span is 125 psf. Plywood edges shall have approved tongue and groove joints or shall be supported with blocking, unless one-fourth (1/4) inch minimum thickness underlayment is installed, or finish floor is 25/32" wood strip.

(2) If wood strips are perpendicular to supports, thickness shown for 16" and 20" spans may be used on 24" spans. Except for 1/2 inch,

(3) Underlayment Grade and C-C (plugged) panels may be of nominal thickness 1/32 inch less than the nominal thickness shown when marked with the reduced thickness.

Table 14-3
Minimum Thickness of Lumber Sub-flooring

Joist spacing (in.)*	Minimum net thickness for lumber placed (in.)	
	Perpendicular to joists	Diagonally to joists
24	1-1/16	3/4
16	5/8	5/8
12	5/8	5/8

Note: *Joists in sub-flooring shall occur over supports unless end-matched lumber is used, in which case each piece shall bear on at least two (2) joists.

1406.4 Sub-flooring

a) All floor joists shall be covered with sub-flooring such as lumber, plywood or particle board. Sub-flooring may be omitted when tongue and groove boards are used as per 1406.4 (d)

b) The minimum thickness of lumber used as sub-flooring shall be in accordance with Table 14-3.

(c) Plywood shall be applied in accordance with the provisions of Table 14-2.

(d) Sub-flooring may be omitted when joist spacing does not exceed sixteen (16) inches and nominal one (1) inch tongue and grooved wood strip flooring is applied perpendicular to the joists.

(e) When resilient flooring is applied directly to plywood subfloor, it shall be applied in accordance with the provisions of Table 14-3 and fastened in accordance with a standard fastening system.

(f) Particleboard should be applied in accordance with the provisions of an acceptable fastening system in accordance with NPA - 1969 "How to Install Particleboard Underlayment." When resilient flooring is applied directly to the particle board sub-floor, it shall be applied in accordance with the provisions of Table 14-4 and fastened in accordance with a standard fastening system.

Table 14-4

Allowable Spans for Particleboard Subfloor and Combined Subfloor-underlayment (1), (4)

Grade	Thickness (in.)	Maximum spacing of supports (2), (3)	
		Subfloor (in.)	Combined subfloor underlayment (in.)
2-M-W	5/8	16	16
2-M-W	21/32 3/4	16 19	16 19
2-M-F	3/4	19	19
2-M-F	3/4	19	19

(1) All panels continuous over two (2) or more supports and the tongue-and-groove panels are installed with the long dimension perpendicular to supports.

(2) Uniform deflection limitation: 1/360th of the span under 100 psf minimum load.

(3) Edges shall have tongue-and-groove joints or shall be supported with blocking unless 1/4" minimum thickness underlayment is installed, or finish floor is 25/32" wood strip.

(4) Floor sheathing conforming with this Table shall be deemed to meet the design criteria of 1406.4

1406.5 Post and Beam Framing

a) Where post and beam framing is used in lieu of stud and joist construction, the posts shall be located to support the beams above and shall be designed in accordance with sound engineering principles.

b) Intermediate framing shall be attached to the posts and braced so that the frame is capable of accepting lateral loads in addition to loads transferred by the sheeting.

1406.6 Stair Framing

a) Stair framing shall be supported adequately on floor framing or on walls or partitions.

b) Except in public stairs where the number and size of stringers shall be determined by engineering analysis, two (2) rough stringers shall be provided for each set of stairs, cut to receive finish treads and risers of uniform width and height.

c) Unless stringers are supported on partitions, and except for open staircases, the minimum effective depth at each notch shall be not less than three and one-half (3-1/2) inches.

1406.7 Joists Supporting Partitions

Bearing partitions parallel to joists shall be supported on beams, girders, walls, or other bearing partitions. Bearing partitions perpendicular to joists shall not be offset from supporting girders, wall or partitions more than the joist depth, unless such joists are of sufficient size carry the additional load.

1406.8 Exterior Wall Framing

Stud size and spacing of studs in one-and-two storey buildings shall be not less than two (2) by four (4) inches with the wide face perpendicular to wall. In three-storey buildings, studs in the first storey shall be not less than three (3) by four (4) inches or two (2) by six (6) inches. Studs shall be spaced not more than as shown in Table 14-5. However, the walls shall be designed to resist the dead and live loads as per Section 12.

Table 14-5

Maximum Spacing of Studs (inches)

Stud size (in.)	Supporting roof and ceiling only	Supporting 1 floor, roof and ceiling	Supporting 2 floors, roof and ceiling
2 x 4	24	16	16
3 x 4	24	24	16
4 x 4	24	24	16
2 x 6	24	24	16

1406.9 Bracing of Exterior Stud Walls

a) Not less than three (3) studs shall be installed at every corner of an exterior wall, except that a third stud may be omitted through the use of continuous wood spacer or backup cleat of 3/8 inch thick plywood, 1 inch thick lumber or other approved devices which will serve as an adequate backing for the attachment of facing materials.

b) Stud walls shall be braced by one of the following methods:

1. Nominal one (1) inch by four (4) inch continuous diagonal strips set into the face of the studs and top and bottom plates at each corner of building.

2. Wood boards of five-eighths (5/8) inch (net) minimum thickness, applied diagonally.

3. Wood sheathing panels two (2) by eight (8) feet of five-eighths (5/8) inch minimum thickness applied horizontally.

4. Plywood sheathing panels not less than forty-eight (48) inches wide and ninety six (96) inches long applied vertically or horizontally.

c) Sheathing shall be applied on the exterior walls of all Type 5 buildings (Table 3-2), more than one (1) storey in height except when back plastered stucco construction is used. However, where sheathing is not being used the method of applying the waterproof wall finish shall be carried out to the approval of the Director.

d) Sheathing, where required for exterior walls, shall be applied solidly over the wall surface and shall be one or more of the following materials and shall be installed in accordance with the manufacturers' recommendations:

1 Wood and sheathing panels five eighths (5/8) inch minimum thickness.

2. Plywood complying with Table 14-5 shall be not less than five-sixteenths (5/16) inch thick for sixteen (16) inch stud spacing or not less than three-eighths (3/8) inch for twenty-four (24) inch stud spacing. Plywood of exterior type complying with 1406.8, may also serve as siding.

Table 14-6

Allowable Spans for Plywood Wall Sheathing

Panel identification	Maximum stud spacing and construction (in) Exterior covering nailed to:	
	Stud	Sheathing
5/16	16	16
3/8 and 1/2	24	16
3 ply	24	24
1/2 (4 and 5 ply)	24	24

Notes: a) When plywood sheathing is used, building paper and diagonal wall bracing can be omitted.

b) When siding such as shingles is nailed only to the plywood sheathing, apply plywood with face grain across studs.

1406.10 Interior Bearing Partitions

a) Studs in one (1) two (2) storey buildings shall be not less than two (2) x four (4) inches with the wide face perpendicular to the partitions. In three (3) storey buildings, studs in the first storey shall not be less than three (3) by four (4) inch or two (2) by six (6) inches.

b) Studs shall be spaced not more than shown in Table 14-5.

c) Headers shall be provided over each opening in interior bearing partitions.

d) Studs shall be capped with double top plates installed to provide overlapping at corners and at intersections with exterior walls. End joints in double top plates shall be offset at least twenty four (24) inches. For platform frame construction, studs shall rest on a single bottom plate.

Exception: A single top plate may be installed but must be designed so as to provide continuity of the capping.

1406.11 Exterior Wall Coverings

Exterior wall coverings of other than the following shall be of material approved for exterior use and shall be applied in accordance with the manufacturers' recommendations when not otherwise covered in this Code. Exterior wall coverings shall provide weather protection for the building at the walls.

(a) **Weather-boarding.** Wood siding patterns known as rustic drop siding or shiplap shall have an average thickness in place of not less than nineteen-thirty seconds (19/32) inches and shall have a minimum thickness of not less than three-eighths (3/8) inches. Bevel siding shall have a minimum thickness measured at the butt section of not less than seven-sixteenths (7/16) inches and a tip thickness of not less than three-sixteenths (3/16) inches. Siding of lesser dimensions may be used provided such wall covering is placed over sheathing which conforms to the provisions of 1406.9.

(b) **Wood Shingles or Shakes.** Wood shingles or shakes attached to sheathing other than wood or plywood shall be secured with approved mechanically-bonding nails or by corrosive resisting common nails on shingle nailing boards securely nailed to each stud with two 8d nails. Wood shingles or shakes may be applied over fibreboard shingle backer and fibreboard sheathing with approved non-corrosion annular grooved nails or may

be nailed directly to fibreboard sheathing with non-corrosion annular grooved nails. The minimum thickness of wood shingles or shakes between nailing boards shall be not less than three-eighths (3/8) inches.

(c) **Plywood.** Plywood shall be of the exterior type and shall have a minimum thickness of three-eighths (3/8) inches. All plywood joints shall be backed solidly with nailing pieces not less than two (2) inches in width, unless wood or plywood sheathing is used, or joints are lapped horizontally, or otherwise made waterproof.

(d) **Stucco.** Stucco or exterior plaster shall conform to requirements of Section 15.

(e) **Metal.** Exterior wall coverings may be of formed metal not less in thickness than 18 gauge. For aluminum siding, the instructions of the manufacturers are to followed.

(f) **Flashing** shall be provided as necessary to prevent the entrance of water at openings in, or projections through exterior walls; at intersections of exterior wall coverings of different materials, unless such materials are provided with self-flashing joints; at other points subject to the entrance of water. Caulking shall be provided where such flashing is determined by the Director to be impractical.

1406.12 Roof Covering

(a) Any roof covering permitted in this Code may be applied to dwellings. Whenever composition roofing is used, solid sheathing shall be applied.

(b) Flashings shall be placed around openings and extensions of mechanical appliances or equipment through the roof and otherwise as necessary to provide adequate drainage.

(c) All roof coverings shall be installed in accordance with standard approved practices and in accordance with manufacturer's instructions.

(d) The fire resistive rating of the roof covering shall be approved by the Director for the specific application desired.

1407 VENTILATION

(a) The space between ceiling joists and roof rafters shall be effectively ventilated. Openings shall be located to provide effective cross-ventilation, and such openings shall be covered with a corrosion-resistant mesh.

(b) The space between the bottom of wood-floor joists and the ground of any building, except such space as is occupied by a basement or cellar, shall have ventilating openings through foundation walls, and such openings shall be covered with a corrosion-resistant wire mesh. Where practicable, ventilating openings shall be arranged on three sides. The minimum total area of ventilating openings shall be 2 sq.ft. for each 15'0" of exterior wall. Such openings need not be placed in the front of the building.

(c) Where wood-floor joists are used, there shall be not less than 18" distance between the bottom of such floor joists and the ground beneath.