SBOC

Suburban Building Officials Conference

Building Code

Revised 1997

1996 Edition
Rules and Regulation for the Construction, Alteration, Repair, and Conversion of Buildings for Residential Purposes

Revised June 18, 1997

Specifically ------

for single family residence, not over 2 stories and an attic in height;

for duplex houses (two units side by side) , two flats, not over 2 stories in height;

for buildings customarily accessory to the forgoing; and

for any residential portions of office, store and other business buildings, not higher than the second floor, subject to such additional requirements as may apply to such buildings.

These rules and regulations set forth requirements which are considered reasonable and are held in every instance to be the minimum for the promotion of the public health, safety and general welfare.

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DEFINITIONS

(a). Unless otherwise expressly stated, the following terms shall, for the purpose of this code, have the meanings indicated in this section.

(b). Words used in the present tense include the future; the singular number includes the plural and the plural the singular.

(c). Where terms are not defined in this section, they shall have their ordinarily accepted meanings or such as the context may imply.

Apartment, means one or more rooms arranged for the use of one or more individuals living together as a single housekeeping unit, with cooking, living, sanitary and sleeping facilities.

Approved, as to materials and types of construction, refers to approval by the Building Officials as the result of the investigation and tests conducted by him, or by reason of accepted principles or tests by national authorities, technical or scientific organizations.

Approved agency, is an established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the Building Official.

Building Officials, shall mean the officer or other designated authority charged with the administration and enforcement of this code, or his duty authorized representative.

Dead Load, shall mean the weight of all permanent construction including walls, floors, partitions, stairways and fixed service equipment.

Fire Resistance Rating, shall means the time in hours that the material or construction will withstand the standard fire exposure as determined by a fire test made in conformation with the "Standard Methods of Fire Tests of Building Construction and Materials." see NFPA 1976.

200. LIGHT, VENTILATION AND SAFETY

A. General

1. Install windows in outside walls to provide natural light and ventilation in all habitable rooms.

2. Windows in habitable rooms, whose areas provide the light and ventilation necessary to comply with the following requirements are considered to be required windows. All windows in addition to these, and also windows in rooms other than habitable rooms, are considered non-required windows.

3. The area of glazed portions of doors located in exterior walls may be included when necessary in determining compliance with the above requirements.

4. Where window or drain openings are provided below grade, protect with metal gratings, covers or equivalent methods acceptable to the Code Official.

B. Habitable Rooms

Rooms designed to be used for sleeping, eating, or cooking, including basement areas with the finished floor 3'-6" or less below grade.

1. Required light and ventilation in each habitable room include windows, sliding glass doors and other exterior doors with glass area.

2. Total glass area: Not less than 8% of floor area of the room.

3. Ventilating area: Not less than 4% of floor area of the room.

C. Borrowed Light and Ventilation Between Rooms

1. Unless separately lighted and ventilated by windows which provide the required areas, the floor area of two habitable rooms may be combined in computing required light and ventilation area.

2. The common wall between such rooms shall contain an opening or openings which shall provide enough light and ventilation to meet the requirements for habitable rooms.

D. Bathrooms and Water Closet Compartments

Provide ventilation by one of the following means:

1. Window or skylight:
Operable windows or skylights located in exterior walls or roofs with the light and vent area, not less than 3 square feet.

2. Vents in or near ceilings with continuous duct connection to outside air in an approved method, with mechanical exhaust, 1 cfm per square foot of floor area.

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E. Basements

Basements with the finished floor greater than 3'-6" below grade.

1. Provide light and ventilation by windows or doors, in exterior walls with both glazed and ventilating area not less than 1% of the floor area.

F. Crawl Spaces

1. All crawl spaces under houses not open to basements, and other unexcavated spaces under porches, breezeways and patios or other appendages shall be ventilated by openings in the foundation walls. A minimum of 1 square foot of vent opening per 150 square feet of crawl space floor shall be provided. The vents shall be located so as to provide cross ventilation, and shall be separated no less than ½ the distance of the longest diagonal of the crawl space.

G. Attic and Other Enclosed Spaces

1. To eliminate the problem of moisture condensation on roof framing in cold weather and to permit the escape of heat in hot weather, ventilation of all spaces is required.

2. For gable roofs, where screened louvers are provided, the net area of the opening shall be 1 square foot of vent per 150 square feet of area of the area of the ceiling below.

3. Hip roofs shall be provided with soffit vents and shall have either roof vents near the peak, or shall have a ridge vent if the ridge is long enough to provide the required ventilation. The net area of ventilation shall be 1 square foot of vent per 300 square feet; distributed equally between the soffits and the ridge.

4. For flat roofs or cathedral ceilings, blocking and bridging shall be arranged to prevent interference with movement of air. Such roofs may be ventilated along overhanging eaves on the basis of net area of opening equal to 1 square foot per 200 square feet of the area of the ceiling below.

5. In all cases where soffit or eave vents are installed, approved deflectors shall be used to ensure that insulation does not cover or reduce the effectiveness of the soffit vents.

H. Furnace Rooms

Heater Room, enclosed room or area where the central heat and water heating devices are located.

1. All fuel fired heating units shall be installed in strict compliance with the manufacturer's specifications or installation requirements. Installation of gas units shall comply with NFPA No. 54 and the installation of oil burning units shall comply with NFPA No. 31. Manufacturer installation manuals shall be available on sites at time of inspection.

2. Combustion air in unconfined spaces may be provided by normal infiltration if the volume of the space is no less than 50 cubic feet per 1,000 Btu/h of the total input rating of all appliances.

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3. Combustion air in confined spaces may be provided by openings to adjacent areas as long as the adjacent areas meet the requirements of unconfined spaces. At least two openings shall be provided and shall be located within 12" of the top and 12" of the bottom of the space. Each opening must provide a minimum of 1 square inch per 1,000 Btu/h of the total input rating of all appliances, and shall be no less than 100 square inches in area.

I. Fire Protection

1. Every dwelling unit shall be equipped with at least one approved smoke detector in an operating condition within 15' of every room used for sleeping purposes. The detector shall be installed on the ceiling and at least 6" from any wall, or on a wall located between 4" and 6" from the ceiling.

2. In all new construction the smoke detectors must be powered by the building electrical service panel. The detectors must have a visible light that indicates there is a battery backup.

3. Every single family residence shall have at least one approved smoke detector installed on every story of the dwelling unit, including basements but not including unoccupied attics. In dwelling units with split levels, a smoke detector installed on the upper level shall suffice for the adjacent lower level if the lower level is less than one full story below the upper level; however, if there is an intervening door between the adjacent levels, a smoke detector shall be installed on each level.

4. If more than one smoke detector is installed within a dwelling unit, they shall be tied together in series on the same electrical circuit so that if one detector goes into alarm, they all respond.

J. Safety Glazing

Safety glazing shall be provided for glass located in the following areas:

1. Swinging or sliding ingress and egress doors (including storm doors).

2. Fixed or operable panels located within 2'-0" of a door and whose bottom panel is located less than 5'-0" above the floor.

3. Fixed or operable windows or panels located 3'-0" horizontally from a walking surface, with a surface area larger than 9 square feet, with a bottom edge less than 1'-6" above the floor and a top edge greater than 3'-0" above the floor.

4. Doors and enclosures for bathtubs, showers, hot tubs, whirlpools, saunas or steam rooms. This shall include exterior windows within these compartments where the bottom edge of the window is located less than 5'-0" above the drain inlet.

Exceptions to Safety Glazing:

Leaded, faceted or decorative glass panels.

Panels in doors or adjacent panels through which a 3" sphere is unable to pass. Louvered windows or jalousies no thinner than 3/16", and no longer than 4'-0".

201. SPACE REQUIREMENTS

A. Minimum Room Sizes

Except as otherwise provided by ordinance, rooms for the following uses shall meet the standards specified below:

1. Living, Dining, Cooking

a. Living, dining and cooking when all in one room minimum gross area 220 square feet.

b. Living, dining when in one room minimum gross area 180 square feet.

c. Living only in one room when dining space is provided in a kitchen or a separate room. Minimum gross area 160 square feet.

d. Kitchen, cooking only (including area occupied by equipment) minimum gross area 70 square feet. Provide at least 30 square feet additional area, usable for dining purposes when dining space included in the kitchen.

e. Dining only, minimum gross area 100 square feet.

2. Sleeping:

a. Major bedroom, Minimum gross area 100 square feet.

b. When no bedroom exists and bed is located in the living room shall be increased 30 square feet over the minimum area required in 1-c.

3. Additional habitable rooms minimum floor area 80 square feet.

4. Bedroom Closets:

a. Depth: 24 inches minimum.

b. Floor area minimum 5 square feet.

c. Height 6' minimum.

d. All closets over 5 square feet in area will be required to have a light installed.

5. Space for heating units:

a. Other than a habitable room provide space within the building for the heating unit or system.

b. Provide at least 3 feet working space in front of the unit for maintenance or repair.

c. All equipment must be installed in strict compliance with manufacture's installation requirements and applicable NFPA standards.

6. Minimum hallway width 3' feet.

202. HABITABLE BASEMENT ROOMS

A. Comply with requirements for habitable rooms with respect to privacy, light, ventilation, floor area and ceiling height.

B. Finish floor Maximum 3'-6" below the adjoining outside finish grade.

203. INGRESS AND EGRESS

A. Access

1. Living units. Each living unit shall be provided with two means of access, as remote as possible from each other without passing through any other living unit. Sliding doors may be accepted as a required access.

2. Attics. Provide access to attics having a clear height of over 2'-6" by means of scuttles, minimum 1'-10" x 2'-0", disappearing or built-in stairways.

Required scuttles shall not be permitted in any closet ceiling.

3. Crawl Spaces. Provide access of not less than 2'-0" x 2'-0".

4. Basements. Provide direct access to outside by a door, or a window having an openable area at least 2'-0" wide and 2'-6" high, sill not more than 3'-6" above the floor. Where a basement is within 5' of an exterior entrance door, this will constitute direct access.

5. Bedrooms or sleeping areas. Provide at least one escape window with minimum openable area of 5.7 sq. ft. minimum openable clear height of 2'-0", and a minimum clear width of 1'-8". Required windows shall not be located more than 40" above the finished floor.

B. Privacy

1. Bedrooms:

a. Each bedroom to have access to a bathroom without passing through another bedroom.

b. Each habitable room to have access to each other habitable room without passing through a bedroom.

2. Nonacceptable bathroom arrangements:

a. Sole bathroom door, opening directly into a kitchen.

b. Bathroom providing sole access to any other room.

c. Bathrooms in the basement as the only one serving a living unit.

204. CEILING HEIGHTS

A. Minimum Ceiling Heights

1. Basements: 7'-6" clear under joists.

2. Habitable basements: 7'-0" clear under finished ceiling.

3. Main floors of any living unit: 8'-0" clear for at least 75% of the total floor area.

4. Areas other than main living areas 7'-6" clear: under sloping roofs,. 7'-6" for not less than 50% of area having 5'-0" or more headroom. Kneewalls shall have a minimum height of 4'-0".

205. DOORS

A. Exterior Doors

1. Minimum sizes:

a. Main entrance doors: 3'-0" wide x 6'-8" in height.

b. Service entrance doors: 2'-8" wide x 6'-8" in height

B. Interior Doors

1. Provide a door for each opening to a bedroom, bathroom, and toilet compartment.

2. Minimum sizes:

a. All habitable rooms: 2'-6" wide x 6'-8" high

b. Bathrooms: 2'-4" wide x 6'-8" high

c. Powder rooms: 2'-0" wide x 6'-8" high

C. Doors to Attached Garages

1. Minimum size of a door: 2'-8" x 6'-8"; 1-3/8" thick solid core wood door or a "B" label steel door.

206. STAIRWAYS

See 307-K for construction requirements.

A. Design and Location:

1. Headroom: Continuous clear headroom measured vertically from front nosing of tread to a line parallel with a stair run, minimum 6'-8".

2. Width: Minimum 3'-0" wide.

3. Treads: Minimum width, 9 ½", clear of nosing above.

4. Rise: 8" maximum. All riser heights to be uniform to within 1/4" in anyone stairway.

5. Winders: Shall have a tread width of not less then 91/2" not more than 15" from the side where the tread is narrower and the minimum tread width shall not be less than 6".

6. Landings:

a. Width equal to that of stair.

b. Minimum size of 4' x 4' at egress doors, and no lower than 8" below the threshold.

c. Minimum size of 3' x 3' on interior stairways where a door swings over the stairway.

7. Handrails: Install a continuous handrail on at least one side of each run of all stairways; extending at grasp level on lower floor or landing, to grasp level on upper floor or landing. No interruption by any means shall be allowed necessitating a change of the handhold within a stairway run. The grasp level shall remain a constant

height paralleling the stair run, and shall be a height between 2'-6" to 3'-2" above the tread nosing. Maximum width and depth of handrails shall be 2 ½", unless shaped to provide a secure handhold, minimum 1 1/2inch in diameter.

8. Guardrails: Provide guardrails around all stairways of more than 2 risers. Porches, balconies or raised floor surfaces located more than 1'-4" above the floor or grade below shall have guard rails not less than 3'-0" in height. Handrails and guardrails on open sides of stairways shall intermediate rails or ornamental closures which will not allow passage of an object 4" or more in diameter.

207. DWELLING UNIT SEPARATION

Provide a one-hour fire-resistive wall and/or ceiling without openings between living units of duplexes and over and under units. Row houses and single family attached dwellings shall provide two-hour fire separation to the under side of the roof deck. When the attached dwellings exceed 4 units or 4800 square feet, a four-hour fire separation shall be provided through the roof to a height of no less than 30" above the lowest roof. Structural integrity of individual units shall be independent of other units.

208. MINIMUM WIDTH

The width of any row or duplex dwelling measured between the interior finished surfaces of party walls or end walls shall be not less than 25'.

300. GENERAL

A. Construction Materials and Methods

These requirements specify minimum acceptable construction materials and methods. Other materials and methods not specified herein may be approved for use by the Building Official upon submission of evidence satisfactory to him that their performance in use will be at least equivalent to that of the materials and methods specified herein. It shall be required that such evidence include adequate reports and test data from a recognized testing laboratory, or proved and authoritative service records, or analysis of performance made in accordance with well-established principles of mechanics.

B. Loads

1. All parts of dwellings and accessory buildings and structures shall be designed, constructed and maintained to safely support their own weight and all other loads and forces to which they may be subjected. When special conditions exist or arise during construction, which necessitate additional precautions, the Building Official may require work in excess of these requirements.

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2. Assumed minimum live loads (uniformly distributed) for design purposes.

a. Floor joists: Design deflection - L/360. Design to support at least a 40 lb. live load and a 10 lb. dead load. See table in appendix B.

b. Ceiling or attic floor joists: Design deflection - L/240. When the roof pitch is steeper than 3 in 12, and the clear height in the attic is greater than 30"; the ceiling joists must be designed to support at least a 20 lb. live load and a 10 lb. dead load. If clear height is under 30", no storage is permitted and the ceiling joists may be designed to support at least a 10 lb. live load and a 5 lb. dead load. See table in appendix B

c. Roof rafters: Design deflection - L/180, cathedral ceilings design deflection L/240. Design to support at least a 30 lb. live load and a 7 lb. dead load when not supporting a ceiling load. When supporting a ceiling load (cathedral), design for at least a 30 lb. live load and a 15 lb. dead load. Roofs that are subject to snow drift loads shall require more stringent design values. See appendix B.

3. Wind loads

a. On vertical faces: 20 lbs. per square foot horizontally, any direction.

b. Roof or parts of roofs with slopes greater than 30 degrees: 20 lbs. per square foot design wind load.

c. Lifting force: 20 lbs. per square foot. To prevent sliding or overturning, anchor roofs to walls and columns, and walls and columns to foundations.

C. Vapor Barriers

1. General

a. Definition: A material having a vapor transmission rate of 1.0 perms or less. Outside of the wall to have a vapor transmission rate of 5.0 perms or more. Generally acceptable are:

(1) 15 lb. tar-paper.
(2) Foil backed drywall
(3) Foil faced insulation
(4) Approved laminated papers
(5) Insulation paper (treated)
(6) An insulating gypsum wallboard
(7) Polyethylene films 6 mil minimum

2. Ceilings: Where unheated spaces are located above, install independent vapor barrier or one integral with insulating material immediately above ceiling interior finish.

3. Sidewalls: Install a vapor barrier immediately back of interior wall finish.

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4. Crawl Space: Where unheated spaces below, install independent vapor barrier or one integral with insulating material immediately below subflooring.

5. Vapor barriers to be applied tightly against any electrical outlets, registers or framed openings.

D. Insulation Requirements:

1. Exterior Requirements:

a. Air Infiltration Barrier: Air infiltration barrier to be continuous, unbroken and undamaged material covering all sheathing products of vertical residential frame exterior walls. Material to be applied from sealed mudsill joints at the top of concrete foundation; material to be pulled inside all exterior wall openings and secured to the framing for inspection during rough framing. Vapor transmission rate to be 5.0 perms or more. Water resistance to be not less than 41.8 cms., Hydrostatic pressure test; AATCCF method 127. (Note: This is the water resistance of 15 lb. felt.)

b. Caulking and Sealants: Exterior joints around windows and door frames, between wall cavities and window or door frames, between wall and foundation, between wall and roof, between wall panels and penetrations or utility services through walls, floors and roofs, and all other openings in the exterior envelope shall be caulked, gasketed, weatherstripped or otherwise sealed.

2. Ceilings: Cathedral ceilings shall be insulated with material with an R value of not less than 19. Flat ceilings shall be insulated with material with an R value of not less than 25.

3. Walls: Walls shall be insulated with a material having an R value of not less than 11.

a. Warm air supply plenums or pipes will only be allowed in the outside walls if insulation providing an R value of 11 is installed between the exterior sheeting and pipes or fixtures.

b. Plumbing fixtures and electrical fixtures not exceeding 2" in diameter will be permitted in the outside walls. Insulation to be installed between exterior sheeting and pipes or fixtures.

c. All box joists shall be insulated the same as the wall.

4. Insulation for exterior perimeters of concrete floor slabs on grade, and walls of heated crawl spaces:
a. At least 2" thickness at edges.

b. Extend insulation down along face of foundation wall for a distance of at least 2-0'".

c. Insulation material requirements shall be rigid, inorganic, waterproof, and non-capillary; or rigid, organic, termite and fungi resistant and saturated with asphalt to be waterproof.

4. Exterior Doors:

a. All exterior doors shall have an R value not less than 3.33.

b. Frames, jambs, and thresholds, if other than wood, shall have a thermal barrier.

c. All wood doors must be fully weatherstripped.

5. Service Door (Between Garage and Occupied Area):

a. All service doors shall have an R value not less than 3.33, and must be fully weatherstripped.

6. Patio Doors (Sliding):

a. Air infiltration not to exceed .50 CFM per square foot of opening.

b. Glass shall be insulated.

c. Frames, jambs and thresholds, if other than wood, shall have a thermal barrier.

7. Glass: All glass in habitable area shall be double glazed or insulated. (Single glazed with storm windows will be accepted in place of the double glazed glass.)

8. Unheated Spaces

a. Hot and cold water lines shall be insulated with a material having an R value not less than 7. All heating and cooling pipes and plenums (supply and/or return) shall be insulated with a material having an R value not less than 7.

b. The framed floor above all unheated spaces shall be insulated with a material having an R value not less than 19.

E. Heating Requirements

1. Provide a heating unit capable of heating dwelling from minus 10 degrees to 72 degrees Fahrenheit at 15 mph outside wind with heat loss calculated in accord with American Society of Heating & Ventilating Engineers standards.

2. Heating units shall be constructed and installed in strict accordance with the applicable current published standards, requirements and recommendations of the National Fire Protection Association, American Standards Association, and the American Society of Mechanical Engineers. Labeling and listing by the following shall be accepted as conforming with equipment design standards: Underwriters Laboratories, Inc., American Gas Association, or

American Society of Mechanical Engineers.

3. Clearance shall be provided for all heating equipment for access, repair and maintenance in accordance with manufacturer' recommendations.

301. FOUNDATIONS

A. Walls

1. Extend bottom of footing to undisturbed, inorganic earth or place footings on a controlled, engineered fill. If deemed necessary by the Building Official, an independent testing laboratory shall provide the specifications-cations and testings.

2. Bottom of Footing. Not less than 3'-6" below finished grade, except where placed on solid bedrock that extends below frost level.

3. Protect against freezing. No concrete shall be placed on frozen ground.

B. Dampproofing

1. Dampproof basement walls, cellar walls, or below-grade crawl-space walls. Apply on exterior from outside edge of footing to finish grade.

a. Masonry unit walls: Apply ½" thick Portland cement plaster coat forming a cove at the footing, over which apply at least one heavy coat of undiluted hot tar, asphalt or compound acceptable to Building Official.

b. Concrete walls: Apply at least one heavy coat of undiluted hot tar, asphalt or compound acceptable to Building Official.

C. Piers

1. Acceptable only for open porches and wood decks, unless designed by an architect or engineer and approved by the Building Official.

2. Concrete poured in place. (Support post will not be embedded in concrete)

3. Minimum diameter - 10".

4. Minimum height above grade 6".

5. Anchor bolts, dowels, approved brackets, or equivalent to be installed for post support.

D. Crawl Spaces

1. Ground level at least 2'-0" below bottom of floor joists and girders. Ground under dwelling to be approximately level.

2. Remove all debris, sod, trees, stumps and other organic matter within area occupied by dwelling.

3. Cover with a minimum of 2" screed coat of concrete. Over 6 mil vapor barrier.

E. Footing Drain Tile

See ASTM C 4-62 (re-approved 1986)

1. Required outside of basement and crawl space footings. Inside location only upon approval of the Building Official. A minimum diameter - 4".

2. Cover tile with a minimum 10" of gravel or crushed stone, 95% passing 3/4" mesh, less than 5% passing 3/8" mesh.

3. Provide drains in all below grade stair landings and window wells. Connect drains to footing drain tile with an approved "T" fitting

4. Connect with a tight-joint glazed tile or approved equal to storm sewer, sump pump, dry well or other approved outlet.

302. GRADING, DRAINAGE, DOWN-SPOUT AND SUMP PUMP DIS-CHARGE

A. General

1. All finished grades shall conform to the subdivision grading plans. Storm water foundation water shall drain away from the building on all sides and be accomplished in such a manner so as to prevent the discharge or overflow of storm water onto adjoining property or upon any street or public-way unless approved by the Village Engineer in conformance with State Drainage Law.

2. Construction such as walks, driveways and retaining walls shall be installed so that they will not interfere with drainage.

3. All sidewalks, driveways, patios and other flatwork shall have the top of the finished surface 4" minimum below the top of the foundation wall and be pitched 1/4"per foot away from the building.

4. Gutter downspouts must discharge away from the building in accordance with the approved grading plans. Discharge shall not cause undue damage to neighboring properties.

5. Sump pumps must discharge a minimum of 3'-0" from the foundation walls. Discharge must conform to the approved grading plan and in no case shall be extended to closer than 5'-0" from the rear or side property lines. Discharge shall not cause undue damage to neighboring properties. Sump pumps may not discharge to the front yard or exterior side yard unless specifically approved by the Village Engineer.

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303. MASONRY MATERIALS

Masonry materials described below apply to all masonry and concrete work.

A. Cement

1. Portland cement. See

Appendix B and C

2. Prepared masonry cement for mortar. See Appendix B and C.

3. Pozzolanic materials, such as fly ash, will not be substituted for any portion of cement without the knowledge and consent of the Building Official. When used as a replacement for cement, manufacturer's recommendations will be followed and subjected to testing by an approved agency.

4. Portland cement, Air entraining. See ASTM C 173-78.

B. Aggregate

1. Sand: Clean, hard, and sharp, free from harmful materials, graded according to intended use.

a. Concrete Aggregate. See Appendix B and C.

b. Masonry Mortar Aggregate. See Appendix B and C.

2. Coarse Aggregate (crushed stone or gravel): Hard, strong crystalline rock, properly graded, clean and free from shale or other soft material. See Appendix B and C.

C. Water

Clean and free of deleterious amounts of acids, alkalines, or organic materials.

D. Lime

1. Hydrated lime. See Appendix C.

2. Quick lime, slake thoroughly. See Appendix C.

E. Mortar

See Appendix C.

F. Brick

1. Face brick.
See Appendix C.

2. Common brick.
See Appendix C.

a. Selected hard-burned, common brick may be used for facing of exterior and interior walls.

b. Salmon or soft brick may be used in interior walls when not exposed, and for back up work.

3. Fire brick.
See Appendix C.

4. Concrete brick.
See Appendix C.

5. Secondhand materials. Masonry units may be reused when thoroughly clean, whole and conforming to other provisions of this standard, except that the maximum allowable wall heights shall be limited to 50% of that permitted for walls of new masonry materials.

G. Concrete Masonry Unit

See Appendix C.

H. Stone

1. Rubble and cut stone: good quality building stone.

2. Cast stone.

I. Flue Lining

Glazed fire clay and vitrified tile, free from cracks or other defects. All joints must be flush with the surface of flue lining.

304. CONCRETE WORK

A. General

All concrete shall be designed to meet the Building Code Requirements. For reinforced concrete see (ACI 318-90 and ACI 318R-89).

1. Materials: See 303.

2. Maximum slump: 6".

3. Calcium chloride may be used as an accelerator, and shall be introduced in solution as part of the mixing water. Calcium chloride shall not exceed 1% mixed at the plant per ASTM D98-87.

4. All concrete shall be air-entrained, 6% (+ or - 1%). Air entraining admixtures shall conform to ASTM C 260-86.

B. Quality of Concrete

1. Job mix: minimum cement proportions, by volume. One part Portland cement, 2 ½ parts sand, 3 parts coarse aggregate (3/4" to 1" maximum size).

2. Commercial Ready-mix. See Appendix C.

a. Minimum Portland cement content: 6 bags/cubic yard, for 3/4" to 1" max. size aggregate.

b. Mixing period shall not extend beyond 1 ½ hours per batch.

3. Exposed concrete (driveways, sidewalks, curbs and gutters, patios, stoops, etc.)

a. Minimum Portland cement content: 6 bags/cubic yard, for 3/4" to 1" maximum size aggregate.

b. Maximum slump: 4".

c. Maximum water content, including moisture in the aggregate: 6 gallons per bag of cement.

304

C. Forms

1. Double forms required for all basement concrete foundation walls.

2. Side forms required for footings where soil conditions prevent sharp-cut trenches.

3. Build tight, straight, plumb, and brace rigidly.

4. Forms to be oiled prior to placement.

5. Stepped foundations - forms shall not cantilever more than 6" beyond the excavation below to allow for proper bearing.

6. Wood footing forms and braces shall be removed prior to backfill.

D. Placing

1. Place continuously unless otherwise allowed by Building Official.

2. When not placed continuously; provide a bulkhead with keyway and re-bar. Clean, score and wet the top surface of the concrete before continuing.

3. Spade, rod, or vibrate thoroughly. Concrete shall not be pulled with a vibrator.

4. Concrete shall not be placed on standing water, frozen ground or snow. Bottom of footing shall be cleaned of all soft soils and organic materials.

E. Curing and Protection

Concrete shall be protected from drying or freezing and shall be cured in accordance with ASTM C 309-89.

F. Footings

1. General. All footings should be designed to be a minimum of twice the width of the foundation wall, and shall be at least as thick as the wall they support.

a. Design for proper distribution of superimposed loads.

b. Material: cast-in-place concrete.

c. Provide a minimum of 3"-6" frost protection.

d. Reinforce with steel bars where footings cross or bear on filled trenches or other unstable soil.

e. Footing dimensions listed below are based upon soils of average bearing capacity (3,000 lbs. per square foot). For soils of lesser bearing capacity or where unusual loading conditions exist, larger footings and reinforcement may be required. Design must be provided by a licensed architect or engineer.

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f. Footing must be keyed a minimum of 2" into undisturbed soil, or shall be interlocked to the soil by other approved methods.

2. Wall Footings

a. Minimum dimensions for spread footings shall be 8" deep by 18" wide, except that masonry veneer on frame and solid masonry walls shall be 10" deep by 20" wide.

b. Provide 2" x 2" keyway in the top of the footing underneath the centerline of the wall.

c. Trench walls shall be a minimum of 8" wide, belled twice the width of the wall and be allowed only for single-story frame buildings.

3. Pier, Post and Column Footings

Dwellings: Minimum pier area 2"-6" x 2"-6" x 1'. In all cases, piers must be designed to support all live and dead loads. Isolated piers and columns not permitted under exterior walls.

4. Chimney Footings:

a. Dwellings: Minimum thickness, 1'-0" minimum projection each side, 6".

b. Pour integral with wall footing when a chimney occurs in out-side wall or interior bearing wall.

c. Must start at level of lowest adjacent wall footing.

G. Walls Cast in Place

1. General: Top of foundation shall be at least 6" above approved adjacent grade.

2. Minimum thickness:

a. Wall supporting wood frame construction shall be a minimum of 8" thick.

b. Walls supporting masonry veneer shall be a minimum of 10" thick.

c. Walls shall be not less than the width of the wall supported.

3. Beam and girder pockets:

a. Provide a minimum 4" end bearing on supporting wall.

b. Steel beams must be cemented in place.

c. Provide 1" air space on sides of wood beams supported on foundation walls.

4. Sill anchor bolts:

a. Diameter, ½" minimum.

b. Minimum length, 10".

c. Provide a washer under nuts on bolts.

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d. Spacing, not more than 6' on center; and within 12" of each corner minimum 2 bolts in each separate sill plate.

5. Anchorage for intersecting walls and slabs. Provide dowel bar anchorage for porch and terrace slabs, concrete or masonry steps and area walls, which adjoin foundation walls. For basementless portions and attached garages, embed four ½" round, 4' long hooked bars halfway into main wall, 2 near top and 2 near bottom of attached wall. Epoxy into place if holes are oversized.

6. Dampproofing and Waterproofing. See 301-B.

H. Concrete Floor Slabs

No floor slab to be placed in water or on soft wet subgrade. Basements must be pumped dry.

1. Construction:

a. Sub-base: Gravel, sand, screenings, or crushed rock. Minimum thickness 4" compacted. Remove all organic material before placing sub-base, level and compact before placing fill.

b. Wire mesh reinforcing may be required when soil conditions warrant to enhance stability.

c. Bottom of slab shall be no lower than top of footing. Provide at least 4" bearing on footing.

2. Cement floor finish:

a. Finish basement slabs with a steel trowel.

b. Basement floors shall be pitched toward floor drains or sump pit.

3. Slabs on ground used as a base for floors or as a finish floor in habitable rooms.

a. Minimum thickness 4".

b. Provide membrane waterproofing directly under slab, at least 6 mil polyethylene film, lapped 4".

c. Refer to 300-D-4 for insulation requirements.

4. Basement floor slabs: Minimum thickness, 4".

5. Garage floor slabs:
Shall be a minimum of 5" concrete on 4" of compacted stone. On attached garages where overdig exists for foundation footings, excavation must be backfilled with:

a. Clean stone.

b. Inorganic soil compacted in 8" lifts.

6. Stoops and steps shall be supported on wing walls, 8" (mini mum) foundations, piers or similar design features.

a. Minimum slab thickness 4".

b. Install metal flashing between slabs and all wood construction. See 311-F.

7. Slabs on ground used to support interior bearing walls or partitions:

a. Thicken to at least 10" for a width of 20".

b. Not permitted when used for separation between garage and living spaces.

8. Unvented crawl spaces or crawl spaces vented to the interior of the building shall have a minimum of 2" concrete over 6 mil vapor barrier.

305. MASONRY WORK

A. General

1. Construction Methods and Materials. See 303.

2. Mortar

a. All mortar must conform to the requirements of ASTM C270-89.

b. All grout must conform to the requirements of ASTM C476-83.

c. Retempering mortar: Mortar that has stiffened on the mortar board due to evaporation should be retempered to restore its workability by thorough remixing and by the addition of water as required. All mortar shall be used within 2 hours after initial mixing.

3. Joints

a. Maximum thickness 5/8". Joints for decorative stone work may be increased by 1/4".

b. Solid masonry units: Fill joints solid.

c. Hollow masonry units: No through mortar joints.

d. Fill all joints solid on both sides of wall.

4. Bonding

a. Walls of solid masonry units. Solid masonry bearing and non-bearing walls shall be bonded in accordance with one of the following methods:

(1) Bonding with headers. The facing and backing shall be bonded with a header course consisting of alternate through header and stretcher every seventh course, or one through header in every 240 square inches, uniformly placed throughout wall.

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(2) Bonding with metal ties. The facing and backing shall be bonded with corrosion-resistant metal tie. There shall be one metal tie for not more than each 4 ½ square feet of wall area. Ties in alternate courses shall be staggered. The maximum vertical distance between ties shall not exceed 16", and the horizontal distance shall not exceed 2'-8". Walls so bonded shall conform to the thickness (excluding cavity), height, and mortar requirements for cavity walls.

b. Masonry walls of Hollow Units. Where 2 or more hollow units are used to make up the thickness of a wall, bonding shall be in accordance with the recommendations of ACI 530-88/ASCE 588.

c. Stone Walls

(1) Ashlar Masonry. Ashlar masonry, bond stones uniformly distributed shall be provided to the extent of not less than 10% of exposed faces.

(2) Rubble Stone Masonry. Rubble stone masonry 2'-0" or less in thickness shall have bond stones with a maximum spacing of 3'-0" vertically and 3'-0" horizontally, and if the masonry is of greater thickness than 2'-0", shall have one bond stone for each 6 square feet of wall surface on both sides.

d. Intersecting concrete and masonry walls shall be anchored and bonded together in an approved manner.

(3). Closed cell hollow units: Use for rough openings, corners, and wall intersections. Filling exposed ends of cells shall not be an acceptable means of finishing.

(4). Protection. Provide frost protection acceptable to Building Official when temperature falls below freezing, except that no masonry work shall be done in temperatures below 20° F. (Protection as outlined by ACI 530.1-88/ASCE 6-88 for hot or cold weather shall be considered acceptable practice.)

(5). Loading. Allow sufficient time for strength of mortar to develop before subjecting to loads.

(6). Wetting Clay Masonry Units. All clay brick having absorption rates (determined in accordance with ASTM Specifications C67-73) in excess of 0.025 oz. per square inch per minimum shall be wetted sufficiently so that the rate of absorption does not exceed this amount.

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B. Masonry Unit Foundation Walls (For cast-in-place concrete foundation walls, see 304-G)

1. General

a. Materials. See 303.

b. Walls supporting wood frame construction: extend not less than 6" above adjoining outside finish grade.

c. Walls supporting masonry veneer or wood frame: Extend foundation so that wood portion of wall is not less than 6" above outside finish grade.

d. Walls of hollow masonry units: Cap with minimum of 4" of solid masonry or concrete. Hollow units filled with concrete not acceptable.

e. Concentrated loads under ends of girders bearing on hollow masonry unit foundation walls: Support must be designed for the bearing load and shall be a minimum of 4" of solid masonry or concrete.

2. Minimum Thickness of Masonry Unit Foundation Walls:

a. Foundation walls shall be of sufficient strength and thickness to resist lateral pressures from adjacent earth and to support their vertical loads. Foundation walls or foundation footings shall extend to a depth below grade of no less than 3'-6". Foundation footings shall be no less than 10" thick.

b. Solid foundation walls of solid masonry units that do not extend more than 5'-0" below the adjacent finished ground level may be 8" in thickness. The combined height of the 8" foundation wall and the wall supported shall not exceed 30'.

3. Beam or girder pockets: See 304G.3.

4. Sill anchor bolts to be installed.

a. Diameter: ½" minimum.

b. Minimum length: 1'-3". Grout in solid.

c. Provide washer under nuts on bolts.

d. Spacing: not more than 8' on center, minimum 2 bolts in each piece.

5. Provide anchorage for intersecting walls and slabs: Provide anchorage for porch and terrace slabs, concrete or masonry steps and area walls which adjoin foundation walls.

6. Chimney foundations: Start at a level of lowest adjacent foundation wall footings. Or 3'-6"" which ever is greater

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C. Masonry Chimneys

1. Construction:

a. Chimneys shall be designed, anchored, supported and reinforced as required within this section. Chimneys shall not support any other structural load unless specifically designed and constructed for that purpose.

b. Masonry chimney walls shall be constructed of solid masonry units no less than 4" thick.

2. Flues:

a. Separate flue required for each fireplace or solid-fuel burning appliance.

b. Combination flues only allowed for appliances listed as suitable for combination flues, and when the flue is sized to accommodate the appliances attached.

3. Effective flue area:

a. Minimum diameter for house heating flue, 8". For fire-places, effective area not less than 1/10 of fireplace opening.

b. Exceptions in flue sizes and combination of flues are allowed for listed appliances installed in accordance with manufacturer's specifications.

4. Chimney linings and wythes:

a. Glazed fire clay flue lining required in all chimneys for liquid and solid fuels. When gas is used as fuel, provide flue lining of metal or composition acceptable to the Building Official; or glazed fire-clay lining or vitrified tile lining, bell and spigot type, bell end up, all with joints made with acid-resisting mortar. Provide drain to dispose of condensation.

b. Two or more flues may be grouped together provided that they are individually separated by a masonry wythe of at least 3-3/4" thickness.

5. Chimney clearance: Provide a minimum of 2" to combustibles from
the outside face of the chimney.

6. Corbeling:

a. Maximum projection, 6".

b. Minimum thickness of wall - 12" unless corbeling projects equally on each side of wall.

c. Maximum displacement of each course, 1".

7. Height of chimney: Chimneys shall extend at least 3' above roof line at the ridge, and 2' above the highest ridge or portion of the building located within 10'. In no case shall the chimney extend less than 14' above the floor of the fireplace.

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8. Cap chimney to form wash from flue to outside edge, minimum thick-ness, 2". Chimney cap must project at least ½" past chimney walls.

9. Metal thimbles and clean-out doors to be built in at the time chimney is constructed.

D. Masonry Fireplaces
Appendix A and C

1. Smoke chamber and damper required in all fireplaces.

2. Minimum wall thickness: 8" in addition to the lining.

3. Ash dump: When provided, empty into concrete or masonry chamber provided with metal clean-out door.

4. Lining: 2" fire brick or other material acceptable to Building Official.

5. Hearth:

a. Support independently on masonry or concrete.

b. Depth: Fireplace openings smaller than 6 square feet shall have a hearth that projects a minimum of 16". Fireplace openings 6 square feet or greater shall have a hearth that projects a minimum of 20".

c. Width: Fireplace openings smaller than 6 square feet shall have a hearth that extends a minimum of 8" to either side of the opening. Fireplace openings 6 square feet or greater shall have a hearth that extends minimum of 12" to either side of the opening.

d. Material, noncombustible.

e. Combined minimum thickness of hearth and support; 6".

6. Fireplace opening lintel: use brick arch, concrete, stone, steel or reinforced clay masonry.

7. Fireplace clearances:

a. Framing members can be no closer than 2" from the outside wall of the fireplace.

b. Combustible trim can be installed no closer than 6" from the fireplace opening.

c. Combustible trim located within 12" of the fireplace opening shall not project more than 1/8" for each inch of clearance from the opening.

E. Prefabricated Fireplaces and Chimneys

1. The fireplace must be listed by a recognized testing agency as acceptable for the fuel specified.

2. The fireplace must be installed in accordance with the manufacturer's specifications and

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instructions and in accordance with the methods by which it was tested by the listed testing agency.

3. The chimney must be installed according to the height requirements for masonry chimneys and manufacturer's specifications.

306. STRUCTURAL STEEL AND IRON

A. Structural Steel Construction

1. The design, fabrication, and erection of structural steel for building shall conform to the requirements of the Specification for the Design, Fabrication and Erection of Structural Steel for Buildings of American Institute of Steel Construction adopted April 17, 1989.

2. Bearing:
Concrete walls, minimum bearing 4".

3. Bearing Plates:

a. Design to distribute load, minimum thickness, 5/16"

b. Bed in non-shrink mortar.

c. Plates may be omitted under wide-flange type steel beams if width of flange provides sufficient bearing area so that allowable compressive stress of supporting materials is not exceeded.

4. Columns:

a. Fill solid with concrete.

b. Metal shims to be encased in concrete at the bottom of the column. Maximum height of shims - ½".

c. Flange bolts shall be provided with nuts finger-tightened.

B. Light Gage Cold-Formed Steel Construction

1. The design of light gage cold-formed steel construction shall conform to the Specification for the Design of Light Gage Cold-Formed Steel Structural Members of American Iron and Steel Institute, 1962 Edition.

C. Open Web Steel Joist Construction

1. The design, fabrication and erection of open web steel joist construction shall conform to the Load Tables and Weight Tables for Steel Joists and Joist Girders adopted by the Steel Construction and Steel Joist Institute, 1988 edition.

D. Welding

1. Details of welding technique, inspection of welding and qualification of welding operators shall conform to the recommendations of the Standard Code for Arc and Gas Welding in Building Construction of the

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American Welding Society, AWS D1.1. All structural welding to be performed by a Certified Welder.

307. WOOD CONSTRUCTION

A. Lumber

1. Stress-Grade Lumber: Except as otherwise specifically provided in this code, National Design Specifications for Wood Construction NFPA 1991 Edition shall be accepted as good engineering practice covering design and use of stress-grade lumber, of manufactured lumber and of their fastenings.

2. All plywood used structurally shall bear the identification of an approved testing agency as to type and grade of plywood, and species of lumber.

3. Lumber dimensions:

a. Wood structural members shall be of sufficient sizes to carry the dead and live loads without exceeding the allowable working stresses hereinafter specified.

b. Computations to determine the required sizes of lumber members shall be based on the actual size of the lumber. Where manufactured lumber is used, follow the design criteria of the manufacturer for load computations.

c. Where minimum sizes of lumber members are required by this code, they shall be construed as meaning nominal sizes. For sawn lumber, the dressed sizes established in American Lumber Standards shall be accepted as the minimum net sizes conforming to such nominal sizes. For manufactured lumber, the net sizes established in the National Design Specification shall be accepted as the minimum sizes conforming to such nominal sizes.

d. The Building Official may require the sizes, the allowable unit stress, or the species and the grade of lumber used for structural design purposes to be shown on the plans or given in a statement filed therewith.

B. Framing - General

Except as specifically provided for herein, compliance with Wood Construction Data Series NFPA shall be acceptable as good engineering practice.

1. Structural framing members:

a. Splicing between bearing points not permitted.

b. When structural strength is impaired by cutting, drilling, or by inherent defects, replace or reinforce members in manner acceptable to Building Official.

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2. Framing at chimneys.

a. Bearing of framing members on chimney masonry not acceptable. When pier support for girders or beams are required adjacent to chimneys, combustible framing must be at least 2" away from chimney masonry.

b. Framing members: Not closer than 2" to chimney masonry.

3. Fire stopping:

a. Fire stop all furring, partitions and outside stud walls at level of each floor or ceiling, and at juncture of roof rafters and wall.

b. Fire stop all balloon framing at intervals not to exceed 8' in height.

c. Wood or masonry, tightly fitted, or other methods acceptable to Building Official may be used.

C. Floor Framing

1. Spans (see design load requirements in 300-B-2-a also see span table in appendix B)

2. Columns and Posts:

a. Structural steel or iron. See 306.

b. Wood posts: Must be designed to carry the loads imposed. Support below must carry through to adequate foundation bearing. When wood posts are used in basement or crawl space, bear on concrete base resting on footing, top of base 3" above finished floor; securely fasten top and bottom of post.

3. Girders:

a. Material: Laminated beams, solid wood, or built-up wood. Must be designed to carry the loads imposed.

b. Spans for wood girders: Determine in accordance with sound engineering practice and subject to approval of the Building Official.

c. Joints of solid and built-up wood girders to be made over pier or column supports only, unless specifically engineered and approved.

d. Provide at least ½" air space on all sides of wood girders framed into masonry.

4. Sills:

a. Must be treated if located within 6" of surrounding grade.

b. Minimum size - 2"x 6" nominal. May be reduced to 2"x 4" nominal when brick or stone veneer is applied.

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c. Level and grout with Portland cement mortar. Organic or compressible shims are not allowed for permanent usage. All temporary shims must be removed prior to grouting.

5. Maximum spans for wood joists: Except for stress-grade lumber of an assured quality, designed in accordance with the National Design Specifications, NFPA, all wood joists shall be limited as follows:

a. Lumber must be properly identified as to species and grade by an approved by the American Lumber Standards Committee, and shall be limited to the spans given in the AFPA 1993 publication Span Tables for Joists and Rafters, and as regulated by the design standards set forth in the NFPA 1991 publication Design Values for Wood Construction.

b. Wood floor trusses: Allowable spans for wood floor trusses shall be designed in accordance with accepted engineering practices, and shall conform to the manufacturer's specifications.

c. Framing into headers or side of wood girders. Use steel joist hangers. Joists must have full bearing on support.

d. Framing into side of steel girders. Supply architectural detail for design. Allow ½" minimum clearance top of top flange. Secure to girder or to opposite joists, or bridge joists firmly at girder ends if other ends are fixed. Notch for bearing not more than 1/4 of joist depth.

e. Framing into masonry:

(1) Minimum bearing, 3".

(2) Fire cut or bevel top 2".

(3) Second story floor joists parallel with masonry. Tie to masonry with metal straps extending over and secured to at least one joist and not more than 8'-0" on center.

f. Butt or lap joists over girders and bearing partitions.

(1) Butting: center and tie with metal straps or 1" thick wood ties at least 2'-0" long.

(2) Lapping: at least 4"; spike together; maximum projection beyond bearing, 1'.

g. Double joists:

(1) Under all bearing partitions and under plaster finished non-bearing partitions when parallel to floor joists.

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(2) Double joists which are separated to permit the installation of piping or vents shall be solid blocked spaced a maximum of 4'-0" on center.

(3) Double floor Joist framing each side of floor opening for plenum of furnace. Spike joists together.

(4) Double floor joists supporting water heaters wash machines, bath tubs, whirl-pool bathtubs or special loading conditions.

(5) Double joists on both sides of unsupported stairway openings.

(6) Loading conditions may require more support than doubling of joists.

h. Headers and trimmers:

(1) Where more than one joist is cut for an opening, double headers and trimmers must be installed.

(2) Where headers span 6'-0" or more, headers must be supported by joist hangers, or by a ledger board not less than 2" x 2", nominal.

I. Cutting of floor joists: See appendix A

(1) Notching top or bottom for piping and duct work is permitted to not more than 1/6 minimum required joist depth except no notching in middle third of span; otherwise install header.

(2) Holes may be bored through joists, maximum diameter 2 ½"; edges not nearer than 2" to top and bottom of joists.

j. Cross-bridging:

(1) Maximum spacing, 8'-0" minimum size, 1" x 3" double nail at each end; bridging split by nailing not acceptable. Solid blocking, full depth, 2" nominal acceptable.

(2) Rigid metal bridging may be used when acceptable to Building Official.

k. Cantilevered construc tion: submit detailed drawing.

l. Subflooring

a. Plywood:

(1) Apply with face grain perpendicular to supports and panels continuous over 2 or more spans.

(2) Thickness of plywood subflooring shall be based on the Panel Identification Index for the joist spacing supporting it.

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(3) Install solid blocking under all edges at right angles to floor joists, or tongue-and-groove plywood approved by the Building Official may be used.

(4) Nailing: Nail securely to joists and blocking with nails 6" o.c. on edges and 10" o.c. at inter mediate framing members. Use 6d common nails for ½" plywood, 8d for 5/8" and 3/4" and 10d common or 8d ring shank for 1 1/8" thick plywood.

(5) As underlayment, when used for leveling purposes over subflooring, Minimum thickness 1/8" 3-ply.

b. Wood boards:

(1)The minimum thickness of floor sheathing shall be 3/4" with a maximum joist spacing of 24" o.c..

(2) No two adjoining boards shall break joints over the same joist space.

(3) Other spacings may be used when sub-flooring is designed according to loads to be imposed.

c. Clearance: Provide ½" clearance between all subflooring and all masonry walls, chimneys & partitions.

d. Floors finished with any material other than hardwood see 314-C.

e. Combination subfloor-underlayment: Combination subfloor-underlayment shall be installed in accordance with the following table:

Look for table in appendix B
Combined Subfloor-Underlayment

D. Ceiling Framing

1. Span

a. Maximum spans for wood joists: Except for stress-grade lumber of an assured quality, designed in accordance with the National Design Specifications, AFPA, all wood joists shall be as limited as follows and see 307-C-5.

See design load requirements in section 300-B-2-b, also look for table in appendix B

b. Use ceiling joists as ties for rafters whenever possible.

c. Bridging: Solid, 2" thick full depth of joists, staggered for end nailing. Joists 8" and over, 1' x 3" cross bridging or rigid metal bridging may be used; when acceptable to Building Official; maximum spacing, 8'-0" on center.

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d. Splicing of framing of ceiling joists over girders and bearing partitions shall follow the requirements for floor joists.

2. False ceilings:

a. Minimum size 2" x 4" on edge supported by wood or metal hangers, not more than 6'-0" on center.

b. Ceiling joists bridging not required.

E. Roof Framing

1. Spans (See design load requirements in 300-B-2-c.) See table in appendix B

a. Truss roofs: Provide temporary bracing during erection, and permanent lateral and cross bracing as specified by manufacturer.

b. Manufactured rafters: Follow manufacturer's specifications for installation.

c. Nominal lumber: For species of lumber not listed in tables, refer to the Span Tables for Joists and Rafters published by the National Forest Products Association.

2. Pitched roof construction

a. Rafter seat cuts: Cut for level bearing no more than 1/4 depth of rafter at inside intersection. Toe-nail rafter into top plate. (For anchorage of top plate on masonry walls see 305-B-4.)

b. Collar ties: Minimum size - 1" x 6" or 2" x 4". Maximum spacing - 4' on center. Vertical height - 1/3 down from ridge beam or rafter intersection.

c. Ridge beams: Not required for simple gable roofs with attic space. When installed, ridge board must be 2" thick, nominal, and have a depth not less than the cut end of the rafters.

d. Hip rafters: Must be 2" thick, nominal, and have a depth not less than the cut end of the jack rafters.

e. Valley rafters:

(1) Must be 2" thick, nominal, and have a depth not less than the cut end of the jack rafter.

(2) Maximum unsupported length of single valley rafters - 8'. Maximum unsupported ported length of double valley rafters 12'-0".

f. Roof openings: Provide double headers and trimmers when more than one rafter is cut, and when dormer windows are installed without additional support.

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g. Chimney saddles: Required at upper side of all chimneys whose upper side is not in contact with the ridge.

3. Flat roof construction

a. Provide cross bridging at maximum spacing of 8'-0" on center. Minimum size of bridging 1" x 3".

b. Splicing of framing of roof joists over girders and bearing walls shall follow the requirements for floor joists.

F. Exterior Wall and Bearing Partition Framing

1. Studs:

a. Continuous length without splicing.

b. Minimum size, 2" x 4". (Nominal)

c. Size, height and spacing. The size, height and spacing of studs shall be in accordance with the following table.

Look for table in appendix B

d. Maximum length for balloon frame, 20'; notch studs at second floor to receive 1" x 4" ribbon. Nail joists to studs.

e. Provide fireblocking at 8'-0" on center when height of wall exceed 8'. All floor levels and not to exceed 8'-0".

1. Corner posts: Not less than three 2" x 4s" set to receive interior finish.

2. Corner Bracing:

a. Braces at external corners: Install full sheet plywood or structural rated sheathing at both sides of all external corners.

(1) Exception: Except for kneewall construction other approved lateral braces may be installed.

3. Window and Door Openings:

a. Cripple stud on jambs: Extend in one piece from header to bearing and nail to outer stud.

b. One story building where header carries roof load only assuming 1200 F and double top plate.

Spans less than 4'-0" two 2"x4" on edge
Spans 4'-0" two 2"x6" on edge
Spans 6' to 8'- two 2"x8" on edge
Spans 8' to 10'- two 2"x10" on edge
Spans 10' to 12'- two 2"x12" on edge

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Two story or bi-level where header carries one floor and roof loads assuming 1200 F and double top plate.

Spans less than 4'- two 2"x6" on edge
Spans 4' to 6' - two 2"x8" on edge
Spans 6' x 8' - two 2"x10" on edge
Spans 8' x 10' - two 2"x12" on edge

c. Where headers support concentrated loads or are subjected to other unusual loading conditions, the header shall be specially designed.

6. Plates:

a. Top plates, two 2 x 4's. Lap at corners and intersecting partitions. When plates are cut for piping or duct work, provide doubled studs at both sides of opening and tie top plates together with a metal strap. Splices of bottom plates must be made over stud.

b. Sill plates, minimum thickness, 2"; exterior wall studs may bear on the foundation sill plate or on a sill plate placed on top of subfloor.

7. When bearing partitions connect to masonry walls, anchor wall to masonry with bolts or other approved fasteners.

8. Any wood in contact with concrete without a vapor barrier will be pressure treated.

G. Non-Bearing Partition Framing

1. Studs:

a. Use continuous lengths without splicing.

b. Minimum size - 2" x 4", 16"o.c.

c. Masonry walls may be furred out with 2" x 2" nominal lumber as a minimum.

2. Plates:

a. Minimum thickness, 2".

b. Splices must be made at midpoint of stud.

H. Wall Sheathing

1. Plywood

a. May be used under any exterior finish material.

b. Plywood wall sheathing shall be installed in accordance with the following table:
Look for table in appendix B

c. Types of finish which affect the minimum thickness of plywood used:

(1) Under wood shingles: If 5/16" plywood is used, apply shingles over 1" x 2" nailing strips using copper or galvanized nails for attaching shingles. Nailing strips may be omitted if annular ringed nails are used for attaching the shingles.

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(2) Under
asbestos cement shingles and siding, if 5/16" thick plywood is used apply siding or single material with annular ringed nails. Do not apply wood nailing strips.

2. Fiberboard: Structural. See FS-LLL-I-535.

a. Under wood shingle siding: Apply 1" x 2" nailing strips. Wood shingles may also be applied over fiberboard shingle backer and fiberboard sheathing with annular grooved nails at least 2" length.

b. Asbestos-cement siding or asbestos-cement shingles shall be attached with special metal fastening devices.

c. Maximum Spans:

Thickness	Stud Spacing
½"	16"
3/4"	24"

d. Wood shingles and asbestos-cement shingles may be applied over fiberboard nail-base sheathing with annular grooved nails with minimum length of 1 3/4" for wood shingles and 1 3/8" for asbestos-cement shingles.

I. Sheathing Paper

1. Material

a. Water-resistant building paper.

b. Asphalt saturated felt.

c. Vapor resistance shall be less than that of vapor barrier provided on inside of wall.

2. Application

a. Use over all types of sheathing except as noted in #3 below.

b. Apply shingle fashion, 4" lap. Lap 4" over paper strips around openings.

c. Use 6" wide strips behind exterior trim of all exterior openings.

d. Install tape on all overlaps.

3. Paper not required over fiberboard, factory treated to be moisture resistant, (except when used behind masonry veneer and stucco) provided:

a. Necessary corner and opening cuts are caulked with elastic waterproof caulking material. Corner joints may be protected with 18" widths of sheathing paper applied shingle fashion.

b. At heads of openings, bottom edge of board is located to permit head flashing to be extended under and turned up behind sheathing, and joint between head flashing and board is caulked.

J. Roof Sheathing

1. Exterior grade plywood:

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a. May be used under any roofing material.

b. Apply with face grain perpendicular to supports and panels continuous over 2 or more supports.

c. Plywood sheathing shall be installed in accordance with the Fasting Schedule.

Look for table in Appendix B

d. Edges of 3/8" thick plywood shall be blocked or ply clips used.

e. Flat roofs used for walking traffic shall be designed as floors.

f. Nailing: Nail securely to rafters with 6d nails for ½" thickness and less, 8d nails for 5/8" thickness and greater. Space at 6" o.c. at edges and 12" o.c. at intermediate supports.

g. Protect exposed edges of sheathing along eaves and rake of roof with moldings or sheet-metal flashing. Flashing along eaves may be integral with gutters. If gutters are not installed, form the flashing to provide a drip.

2. Wood boards:

a. May be used under any roofing material.

b. The allowable span for board type roof sheathing shall not exceed 24" and shall be 5/8" minimum net thickness for solid sheathing and 3/4" net thickness for spaced sheathing.

c. Break joints over center of rafters unless end-matched (tongue and groove) boards are used; no two adjoining end-matched boards to break joints over same rafter space and each board to bear on at least 2 rafters.

d. Application: Lay closed under all roof material except wood shingles. Under wood shingles, use 1" x 4" shingle lath spaced according to shingle exposure.

K. Stair Stringers
(Also see 206)

1. Provide solid bearing at top and bottom, and full support at landings.

2. Effective depth of wood stringers, minimum, 3 ½".

3. Third stringer: Install if treads are less than 1 1/8" thick and stair is more than 2'-6" wide. Wider stairs require design approval.

L. Caulking.

1. Caulk around exterior openings in masonry or masonry veneer walls.

2. Caulk at intersections of

wood and masonry except when flashed. This does apply to tops of foundations.

3. Caulking shall remain elastic non-hardening and firmly adherent. With no voids

309. EXTERIOR WALL FINISH

A. General

Exterior covering shall be installed in accordance with Tables in Appendix B.

B. Exterior Lath

All lath and lath attachments shall be of corrosion-resistant materials and shall conform to Tables in Appendix B Where lath on vertical surfaces extends between rafters, or other similar protecting members, solid backing shall be installed to provide support for lath and attachments. Backing for vertical surfaces shall consist of sheathing of not less than No. 18 U.S. gauge steel wire; stretched taut horizontally and spaced not more than 6" apart vertically. Gypsum lath shall not be used, except that on horizontal supports of ceilings or roof soffits, it may be used as backing for metal lath or wire lath and Portland cement plaster. Backing is not required under metal lath or paperbacked wire lath.

Table in Appendix B MAXIMUM SPACING OF SUPPORTS FOR LATH

Table in Appendix B MAXIMUM SPACING OF FASTENERS FOR SUPPORTS OF LATH

Table in Appendix B THICKNESS OF PLASTER

Table in Appendix B GYPSUM PLASTER PROPORTIONS

Table in Appendix B PORTLAND CEMENT PLASTER

Table in Appendix B APPLICATION OF GYPSUM WALLBOARD

C. Exterior Plaster

Plastering with Portland cement plaster shall be not less than 3 coats when applied over metal lath or wire lath and shall be not less 2 coats when applied over masonry, concrete, or gypsum backing. If plaster surface is completely covered by veneer or other need only be 2 coats provided the total thickness is as set forth in Table in Appendix B. On wood frame construction with an on-grade concrete floor slab system, exterior plaster shall be applied in such a manner as to cover, but not extend below, lath, paper and screed. Only approved plasticity agents and approved amounts thereof may be added to Portland cement. When plastic cement is used, no additional lime or plasticizers shall be added. Hydrated lime or the equivalent amount of lime putty used as a

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plasticizer, may be added to standard Portland cement in an amount not to exceed 20% by weight of the Portland cement. The proportion of aggregate to cementitious materials shall be as set forth in Appendix B.

D. Masonry Veneer

General. All masonry veneer shall be installed in accordance with this Chapter, and Figure in Appendix C . Exterior masonry veneer shall not be attached to wood at any point more than 25' above the adjacent ground elevation in Seismic Zones No. 2 and No. 3 nor more than 35' in Seismic Zones No. 0 and No. 1.

1. Masonry veneer shall not support any vertical load other than the dead load of the veneer above. Veneer above openings shall be supported upon lintels of noncombustible material and the allowable span shall not exceed the values set forth in Table No. 5-H. The lintels shall have a length of bearing of not less than 4".

Table in Appendix B ALLOWABLE SPANS FOR LINTELS SUPPORTING MASONRY VENEER

2. Masonry veneer shall be attach-ed to the supporting wall with corrosion-resistant metal ties. Veneer ties, if strand wire, shall be not less in thickness than No. 6 U.S. gauge wire and shall have a hook embedded in the mortar joint, or if sheet metal, not less than No. 22 U.S. gauge corrugated. Each tie shall be spaced not more than 2'-8" on center horizontally and 1'-4" vertical.
Exception: In Seismic Zone No. 2 or No. 3 and in wind areas of more than 30 lbs. per square foot, each tie shall support not more than 2 square feet of wall area. In lieu of such wire ties, an approved method of grouting the veneer to a paperbacked reinforcement attached directly to the studs may be used.

E. Weather Protection

Exterior walls shall be covered with a weather-resistant siding and/or membrane.

F. Weather-Resistant Siding

The weather-resistant covering shall be attached in accordance with manufactures specifications and where required the cellular spaces shall be ventilated so as not to make ineffective the fire stopping at floor, attic and roof levels. In addition, where cellular spaces are provided with interior noncorrodible vapor type barriers, other means shall be used to avoid condensation and leakage of moisture.

G. Weather-Resistant Membrane

Asphalt-saturated felt free from holes and breaks and weighing not less than 14 lbs. per 100 square feet or other approved weather-resistant membrane shall be applied over studs or sheathing of all exterior walls as required by the manufactures

specifications. Such felt or membrane shall be applied weather-board fashion, lapped not less than 2" at horizontal joints and not less than 6" at vertical joints. Such felt or membrane may be omitted in the following cases:

1. Under weather-resistant siding.

2. In accessory buildings.

3. Over water-repellent panel sheathing.

4. Under approved paperbacked metal or wire fabric lath.

5. Under metal lath, wire lath, or wire fabric lath on noncombustible construction.

H. Flashing

Approved corrosion-resistive flashing shall be provided at top and sides of all exterior windows and door openings in such manner as to be leakproof. Similar flashings shall be installed at the intersection of chimneys or other masonry con struction with frame or stucco walls, with projecting lips on both sides under stucco copings; under and at the ends of masonry, wood or metal copings and sills; continuously above all projecting wood trim; at wall and roof intersections; under built-in gutters; at junction of chimneys and roofs; in all roof valleys and around all roof openings.

I. Plywood Application

Exterior plywood joints shall occur over framing members, unless wood or plywood sheathing is used or joints are lapped horizontally a minimum of 1.5" or otherwise made waterproof to the satisfaction of the Building Official.

310. ROOF COVERINGS

A. General

1. Roof Slope:

a. Shingle and tile roof, 4 in 12 minimum.

b. Shingle roofs less than 4 in 12 but not less than 2 ½ in 12 shall be applied in strict accordance with specification Index B-1-a, of the Asphalt Roofing Industry Bureau. In lieu of cementing the individual tabs, Self Sealing Shingles listed by the Underwriters' Laboratories as carrying their Wind Resistant label may be used.

c. Built-up Roofs (gravel or slag surface), 2 in 12 maximum.

d. Built-up Roofs with mineral surfaced cap sheet, 3 in 12 maximum.

e. When materials and method of application provide precautions in excess of these minimum requirements to assure a

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weather-tight roof, the roof slopes may be altered subject to acceptance by Building Official. Application and materials as outlined by "Manufacturers Selection and Application of Asphalt Roofing and Siding Products" published by A.R.I.B. shall be considered as acceptable good practice.

2. Either a 9" wide or wider strip of Mineral Surfaced Roll Roofing or a row of inverted shingles may be used as a starter course.

3. Nails for attaching roof covering, copper or hot-dipped galvanized nails. Staples permitted.

B. Asphalt & Fiberglass Shingles

1. Fire Underwriters Class C Label on each bundle.

2. Approximate shipping weights per square:

a. Square butt strip, 235 lbs.

b. Hexagon strip, 200 lbs.

c. Irregular shaped shingles manufactured in conformance with the Underwriters' Laboratories minimum weight requirements.

3. Exposure as required for Underwriters' Class C label.

4. Headlap as recommended by manufacturers; minimum 2".

5. Underlay:

a. Asphalt saturated felt; weight approximately 15 lbs. per 100 square feet.

b. No underlay required on roof slopes of 7 in 12" or more; or when triple thickness is obtained at all points on roof slopes of 4 in 12" or more.

c. One layer of 15 lb. asphalt saturated felt shall be required under all double thickness shingles on roof slopes between 4 in 12 and 7 in 12.

d. On roof slopes less than 4 in 12 but not less than 2 in 12, install 15 lb. asphalt saturated felt. A 19" width strip shall be laid along the eaves followed by a 36" sheet completely overlapping the first 19" sheet. Each successive 36" sheet shall overlap the preceding sheet by 19". A continuous layer of plastic roof cement shall be applied between the 2 layers of asphalt felt on the roof area. Application shall start from the eaves to a point on the roof 24" inside the inside wall line of the building. The cement shall be applied with a comb trowel and the overlying sheet shall be pressed firmly into the cement over the entire cemented area.

6. Reroofing. No more than two layers without architect's written approval.

C. Wooden Shingles

1. Edge-grain, tapered shingles (No. 1 grade).

2. Minimum size:

Length (Inches)	Thickness
16	5 Butts in 2"
18	5 Butts in 2 1/4"
24	4 Butts in 2"

3. Maximum exposure:

Slope of Roof Exposure For Shingle Length (Inches)

Rise	Run	16	18	24
3 to 7	12	4	4-1/2	6
7 to 18	12	5	5-1/2	7-1/2

4. Underlay not permitted.

D. Tile Roofing

1. Quality: Hard-burned roofing tile.

2. Underlay: One layer asphalt saturated felt approximately 30 lbs. per 100 square feet.

3. Shingle tile, American Method.

Length of Shingle	Max. Exposure
16"	7"
15"	6-1/2"
14"	6"
12"	5"

4. Interlocking tile and curved tile: Lay in accordance with manufacturer's recommendations.

E. Slate shingles:

1. Quality: Free from knots or knurls and of reasonable smooth cleavage. See FS-SS-S-451

2. Underlay: Asphalt saturated felt approximately 30 lbs. per 100 square feet.

3. Laid American Method:

a. Minimum thickness, 3/16".

b. Maximum Exposure

Shingle Length	Max.Exposure
18"	7-1/2"
16"	6-1/2"
14"	5-1/2"
12"	4-1/2"
10"	3-1/2"

F. Built-Up Roofs

1. Asphalt or tar and gravel coverings, including flashing: Comply with requirements of Underwriters' Laboratories, Inc., Built- up roof coverings, minimum 3-ply.

2. Apply according to manufacturer's directions.

3. Each ply of felt: Minimum weight, 15 lbs. per 100 square feet.

4. Surface with:

a. Roofing gravel or crushed stone: Approximately 400 lbs. per 100 square feet; or

b. Crushed slag: Approximately 300 lbs. per 100 square feet.

c. Other material approved as to quality and weight by Building Official.

5. Top ply of felt and crushed stone or slag surfacing may be replaced with one layer of mineral surfaced cap sheet, minimum weight 85 lbs. per square.

G. Metal Roofs

1. Materials.

a. Galvanized sheet metal; 26-gauge sheets, 1.25-oz. (total weight both sides) zinc coating per square foot.

b. Copper: 16-oz. soft (roofing temper).

c. Roofing tin: 40-lb. coating.

d. Lead: Sheet lead, 2-1/2 lbs. per square foot.

2. Nails:

a. Hard copper or copper alloy, for copper roofs.

b. Hot-dipped galvanized, for galvanized, sheet metal roofs.

3. Seams, flat or standing; flat seams, locked and soldered.

4. Provide for expansion.

H. Other Types of Roof Coverings

Roof covering such as metal singles, canvas or roll roofing may be used when the type and weight of material, and method of application are acceptable to the Building Official.

311. FLASHING

Flashings, a lap joint or a turned up flange, usually of metal to make a water-tight connection between two different materials.

A. Material

1. Copper: 16-oz. soft (roofing temper).

2. Galvanized sheet metal: 26-gauge, 1.25-oz. (total weight both sides) zinc coating per square foot.

3. Lead: Hard lead, 2 lbs.; soft lead, 4 lbs.

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4. Tin: 40-lb. coating, painted both sides.

5. Membrane waterproofing material acceptable to Building Official.

6. Copper and zinc flashings, gutters and downspouts not to be used in conjunction with each other.

7. Aluminum of suitable weight to Building Official.

B. Openings Not Protected by Overhang

1. Heads of openings, wood frame walls:

a. Sheet metal extended behind finish siding material and turned down over outside edge of head trim unless drip cap extends behind and above bottom of finished material; or

b. Three-ounce copper-coated building paper may be used provided flashing is not exposed to weather more than 2". Extend behind siding. Blind tack at outside edge of drip cap, 1" center.

2. Heads and sills of openings, masonry-veneered wood frame walls. See Drawing Appendix A

a. Material: Sheet metal or membrane waterproofing material acceptable to Building Official.

b. Head flashing: Extend from front edge of lintel, up and over top of lintel and up on sheathing under building paper.

c. Sill flashing: Extend under masonry sill, up on sheathing and under wood sill.

3. Heads and sills of openings, masonry walls.

a. Material: Sheet metal or membrane waterproofing material acceptable to Building Official.

b. Head flashing: Extend from front edge of lintel, up and over top of lintel, through wall and turn up 1" on inside surface.

c. Sill flashing: Extend under and behind masonry sill.

4. Heads of openings, stuccoed wood frame walls:

a. Material: Sheet metal.

b. Drip: Form drip on front edge of drip cap and extend flashing up behind paper underneath stucco.

C. Intersections

1. Provide sheet metal flashing for all horizontal and vertical intersections of stucco with other materials.

2. All flashing in connection with masonry walls shall have flashing or counter-flashing built into masonry not less than one.

D. Valleys

1. Rigid shingle roof covering:

a. Flash with sheet metal.

b. Flashing on:

(1) Roof slopes less than 7 in 12, width 18".

(2) Roof slopes 7 in 12 or more, width 12".

2. Asphalt shingle roof covering:

a. Flash with sheet metal;

b. Two thicknesses of mineral surfaced roll-roofing material cut from rolls weighing not less than 85 lbs. per square. Bottom strip, 1'-6" wide, top strip at least 3'-0" wide, lapped 12".

E. Roof and Wall Intersections

1. Sloping roof: Sheet metal flashings.

2. Flat roof: Sheet metal or same material as roof covering. When sheet metal is not used, install 45 degree cant strip at roof and wall intersection.

F. Terrace or Porch Slabs

Suspended (reinforced) type or bearing on the ground, which abut wood construction at exterior wall.

1. Flashing material: Sheet metal.

2. Extend flashing at finish floors of terrace or porch from 1/4" outside exterior face of finish, turn up 4" behind exterior finish, thence turn down and extend 4" below top of outside of foundation.

G. Chimneys

1. All chimney and roof intersections, sheet metal flashing.

2. Cricket or saddle covering: Sheet metal.

312. GUTTERS AND DOWNSPOUTS

All structures with basements or crawl spaces shall be provided with gutters and downspouts unless omission is specifically permitted by the Building Official.

A. Materials

1. Copper, 16-oz., hard (cornice temper).

2. Galvanized sheet metal: 26-gauge sheets, 1.25-oz. (total weight both sides) zinc coating per square foot.

3. Solid wood gutters: Paint inside with 2 coats pitch or 3 coats lead and oil after installation.

4. Aluminum of suitable weight acceptable to Building Official.

5. Stainless steel.

6. Vinyl.

B. Roof Water Disposal:

Provide outlet(s) located so as to provide drainage away from the building in accordance with the approved grading.

313. INTERIOR WALL AND CEILING FINISH

A. Lath and Plaster

1. Wood Lath:

a. Maximum stud or furring spacing, 16" on center.

b. Lath, No. 1, 5/16" thick.

c. Space lath 1/4 to 3/8" apart. Break joints every seventh lath, nail at each bearing.

2. Expanded metal lath:

a. Painted or galvanized lath.

b. Minimum weights; maximum spacing of supports.

Use	Lbs. per Yard	Stud Spacing (Inches)
Walls:		
All dwellings	2.5	16
One Story Dwellings	x3.4	20
	x4.0	24
	xx3.0	24
		Joist Spacing (Inches)
Ceilings	x2.75	16
	3.4	16
	xx3.4	24

xFlat rib
xxHigh rib

3. Insulating fiberboard lath:

a. Minimum thickness, 1/2".

b. Lath size, 1'-6" x 4'-0". Lath 24" x 48" may be used provided all joints at right angles to the framing members are covered

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with continuous strips of metal lath and ends of lath are nailed to solid bearing (framing mem-bers) at approximately 4" on center including intermediate supports.

c. Maximum stud or joists spacing, 16" on center.

d. Apply in accordance with manufacturer's direction.

4. Gypsum lath:

a. Minimum Thickness, 3/8".

b. Size 16" by 48".

c. Maximum stud or joist spacing, 16" on center.

d. Apply in accordance with manufacturer's directions.

5. Lathing:

a. Heads of openings: Install lath so vertical joints of first course of lath above head will not occur on jamb studs.

b. Corner beads: Galvanized metal, for all external corners.

c. Corner and joint reinforcing: Metal lath 2 ½" lap on each surface.

d. Over solid wood surfaces: install metal lath on strips or use furring nails. Lap metal lath on adjoining lath surfaces.

6. Plaster.

a. Mix all plaster (lime and prepared) according to manufacturer's recommendations.

b. Quick lime, slake thoroughly

c. Minimum thickness, 1/2" over lath base. Finish all ceilings level and walls and corners, plumb and straight.

7. Drying period: Allow sufficient time for plaster to dry thoroughly before application of trim.

B. Ceramic Tile

Waterproof all surfaces prior to the application of the setting coat of adhesive.

C. Bath-Shower Walls

1. Surface materials: Dense, smooth and water-repellent. Walls of showers and bath enclosures with shower heads shall be so surfaced to a height not less than 6'-0" above shower bases and not less than 4'-0" above lip of tubs.

2. Backing materials: Backing materials shall be suitable for application of tile or other approved surfaces.

3. Installation: Installation of backing materials, and required waterproofing shall be in accordance with manufacturer's recommendations. All joints and other openings shall be caulked or otherwise protected from infiltration of water.

D. Dry Wall Finish

1. Minimum thickness: Actual Inches

Type of Wall Finish	Spacing of Studs or Furring (ActualInches)		
	16	20	24
Wood boards	3/8	1/2	1/2
Plywood	1/4	3/8	3/8
Gypsum board	3/8	1/2	1/2
Fiberboard	1/2	3/4	3/4

2. Other types of boards, including compressed dense composition board less than ½" thick, may be used when acceptable to the Building Official. Maximum stud spacing 16" on center.

3. There shall be 3/8" drywall backer board behind all wood paneling less than 25/32" thick. Fastening shall be : 8"o.c. on the edges12"o.c. thru field of board.

314. FINISH FLOORS.

A. Wood Floors

1. Materials.

a. Flooring: Kiln-dried materials.

b. Strip flooring, hardwood or softwood, minimum thickness 25/32", maximum width 2 1/4" for hardwood, 3 1/4" for softwood. 3/8" thickness may be used where laid directly on a subfloor. Wider widths (plank flooring) and parquet flooring may be used when precautions are taken to prevent warping or cupping.

c. Nails: Maximum spacing, 16" on center.

d. Building paper or deadening felt: Apply under all finish flooring unless floor is insulated.

2. Installation.

a. Finish flooring over subflooring: Apply at right angles to subflooring except when subflooring is laid diagonally.

b. Finish flooring on strips; wood strips, minimum size, 1" x 2"; maximum spacing, 16" on center. Apply strips over building paper or deadening felt on top of subflooring.

c. Strip flooring on concrete: Apply on not less than 2" x 2" sleepers embedded in concrete.

d. Wood block flooring on concrete: Set blocks in mastic and install in accordance with flooring manufac-turer's directions.

B. Ceramic Tile

See 307-C-5-f.

1. Materials. See ASTM C 126-52T.

2. Grade: Not less than Standard grade.

3. Setting bed.

a. Mix one part Portland cement, 4 parts sand; or one part Portland cement, 2 parts sand, and 4 parts pea-size aggregate.

b. Minimum thickness: 1 1/4", if re-enforced with wire mesh; 3" when installed below top of chamfered joists with finish tile surface at least 1 1/2" above tops of joists.

4. When applied over wood sub-floor: Install asphalt saturated felt over sub-floor underneath the wire mesh.

C. Rubber Tile, Asphalt Tile, Linoleum and Wall to Wall Carpeting

1. Hardboard, plywood or similar underlayment leveler having a nominal thickness of 1/4" shall be used over wood subfloors to provide a smooth, flat surface for the finish floor covering (including wall to wall carpeting). Apply in accordance with manufacturer's recommendations.

2. Adhesive for flooring to be waterproof; type as recommended by manufacturer of the floor covering.

315. GARAGES

A. Attached and Built-In Garages

1. Construction same as required for the dwelling.

2. If door opening occurs between garage and dwelling provide 6" curb at the service door, or construct garage floor 6" lower than adjoining floor.

3. Installation of house heating unit or other fuel burning appliance in garage space not permitted. Install one-hour fire-rated partition between space containing house-heating unit and garage space. Doors are not permitted common to heater room and/or garage.

4. There shall be no openings from a private garage directly into a room used for sleeping purposes. Other openings between the garage and residence shall be equipped with solid wood core doors not less than 1 3/8"in thickness or equivalent. The garage shall be completely separated

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from the residence and its attic area by means of 5/8" type "x" gypsum board or equivalent applied on the garage side. Garage floor surfaces shall be of approved noncombustible materials.

5. Hot air heat duct opening shall be a minimum of 4'-0" over floor of garage with a fusible link fire damper. Cold air returns are not permitted.

B. One-story Frame Detached Garages and Accessory Buildings

1. Comply with construction requirements for one-story dwellings with the following exceptions:

a. Foundation walls and footing may not be less than 18" below finish grade, 6" minimum thickness at the top and may be flared to not less than 12" at the bottom.

b. Grade beam construction permitted consisting of a 4" concrete floor on a minimum 4" of Compacted crushed stone, sand and gravel poured monolithically with a minimum 10" thickened outer edge a width of 20" around perimeter of building, said 20" grade beam to be of equal depth and on undisturbed soil.

c. Studs, maximum spacing 24" o.c. Doubling of studs not required on jambs of opening less than 3'-5" wide.

d. Wall sheathing and build-ing paper may be omitted if corner bracing is used. Each corner is to be braced from top outward in two directions to a minimum of 6'-0" from corner at sill plate, and may be applied on the inside surface of studs, minimun 1" x 4".

e. Corner post may be two 2" x 4" or one 4" x 4".

f. Top plate may be single, provided rafters occur directly over studs and plate at corners is lapped to provide tie.

g. Rafter ties at eaves not less than 2" x 4", maximum spacing 6' o.c.

h. Concrete floor, minimum 4" of concrete on minimum 4" of crushed stone, sand or gravel.

C. One Story Solid Masonry or Masonry Veneer Detached Garages and Accessory Buildings

1. Comply with construction requirements for one-story dwellings with the following exceptions:

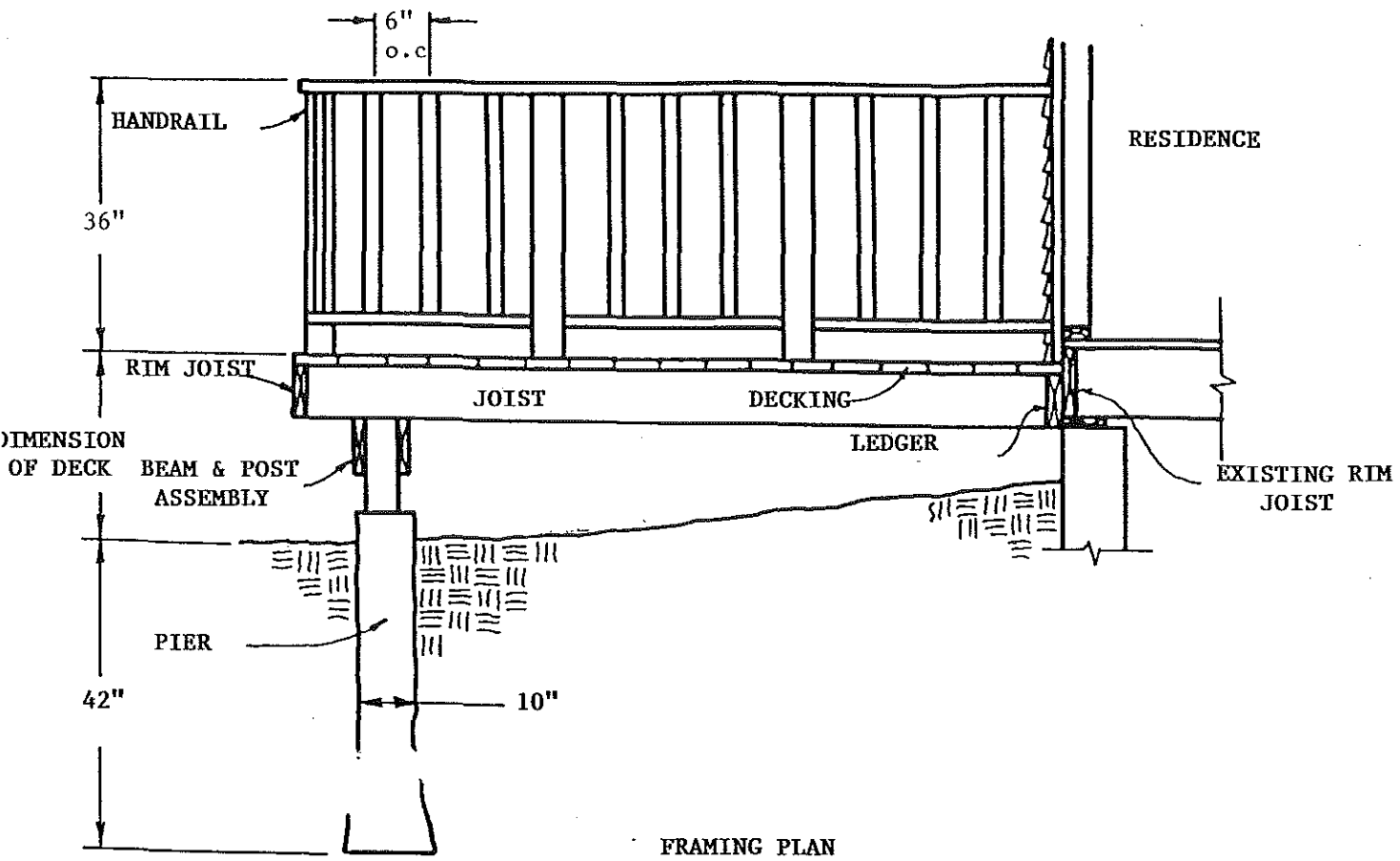
a. Combined foundation wall and footing is allowed provided it goes down 3'-6" below grade and the bottom is flared to 1'-4". Wall width shall be wide enough to support wall above but in no event less than 8" minimum width.

b. Brick veneer framing may comply with 315-B.

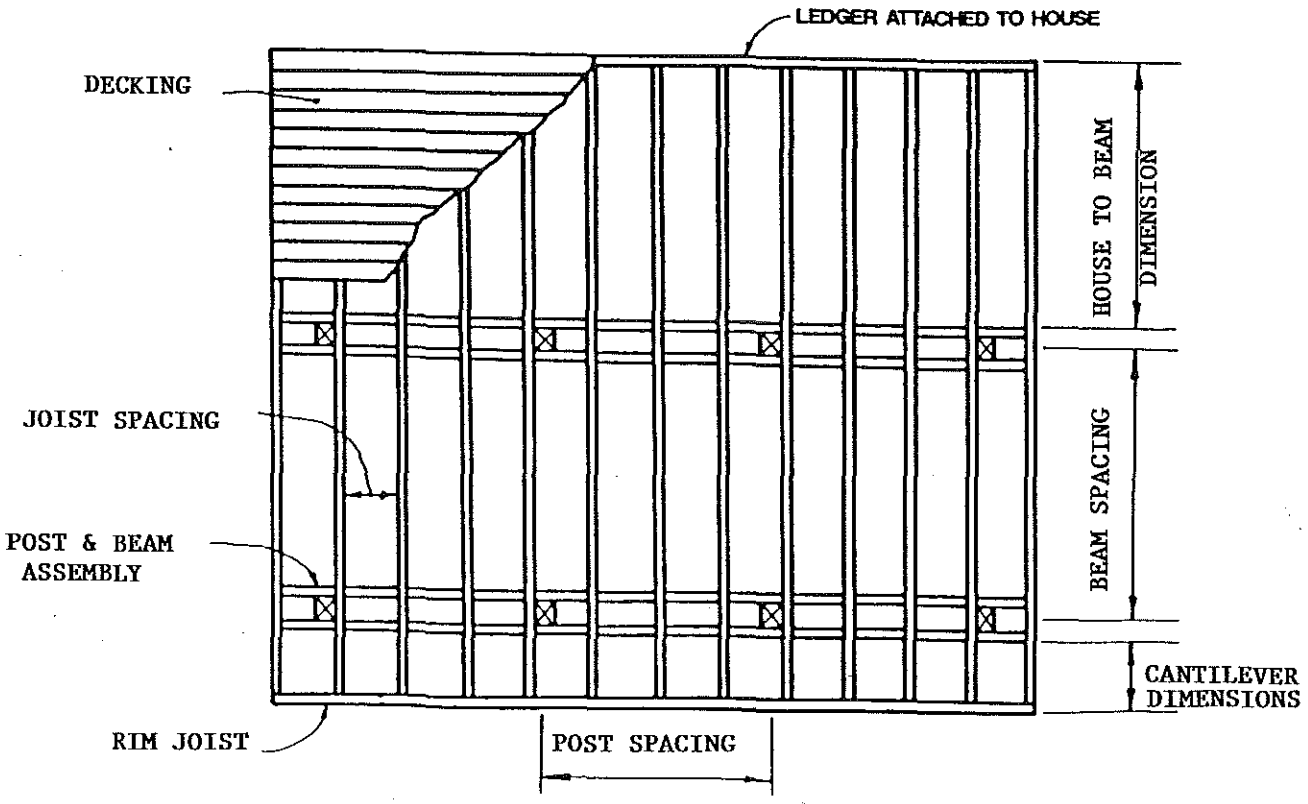
APPENDIX A

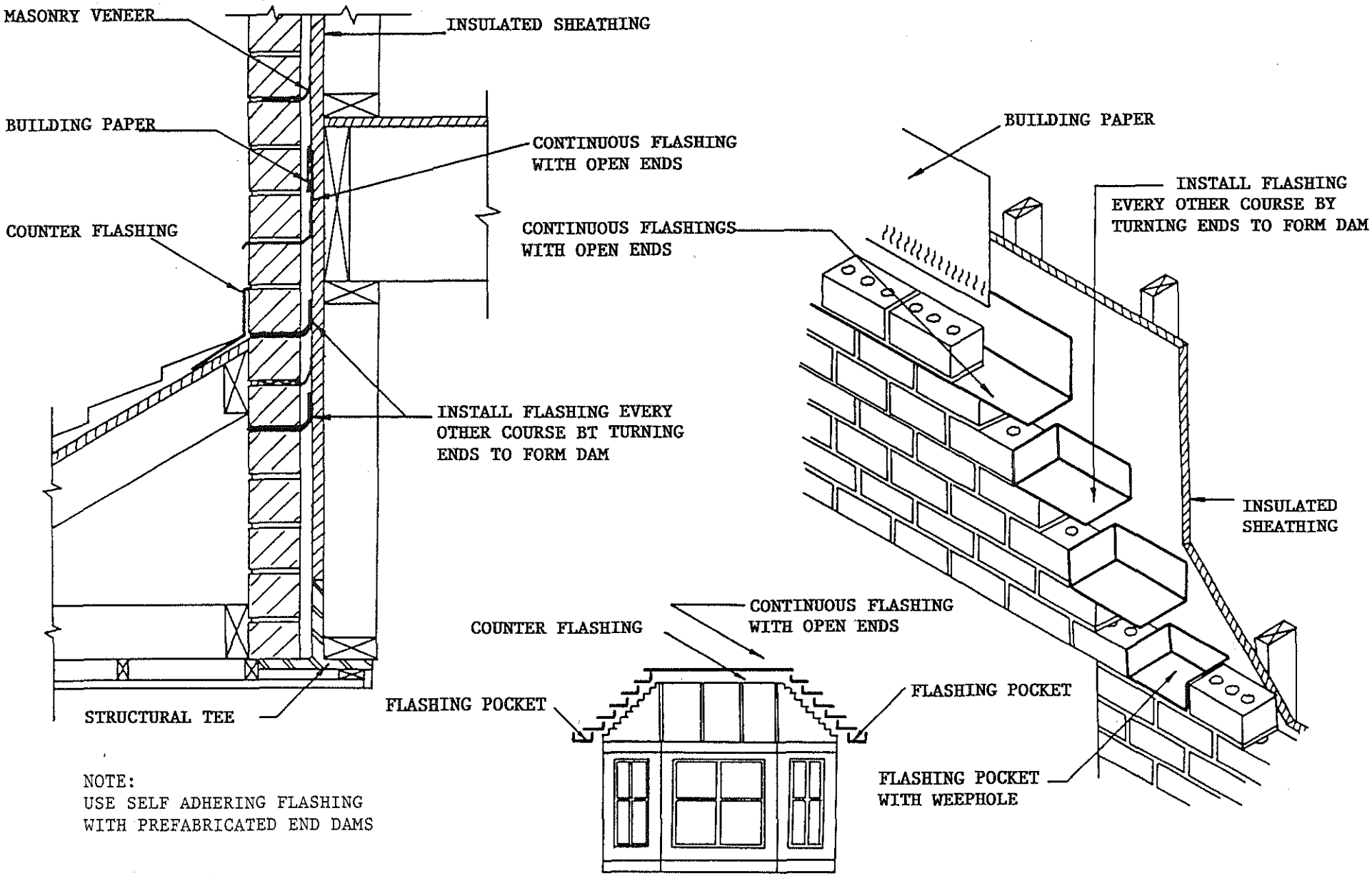
ILLUSTRATIONS

CROSS SECTION

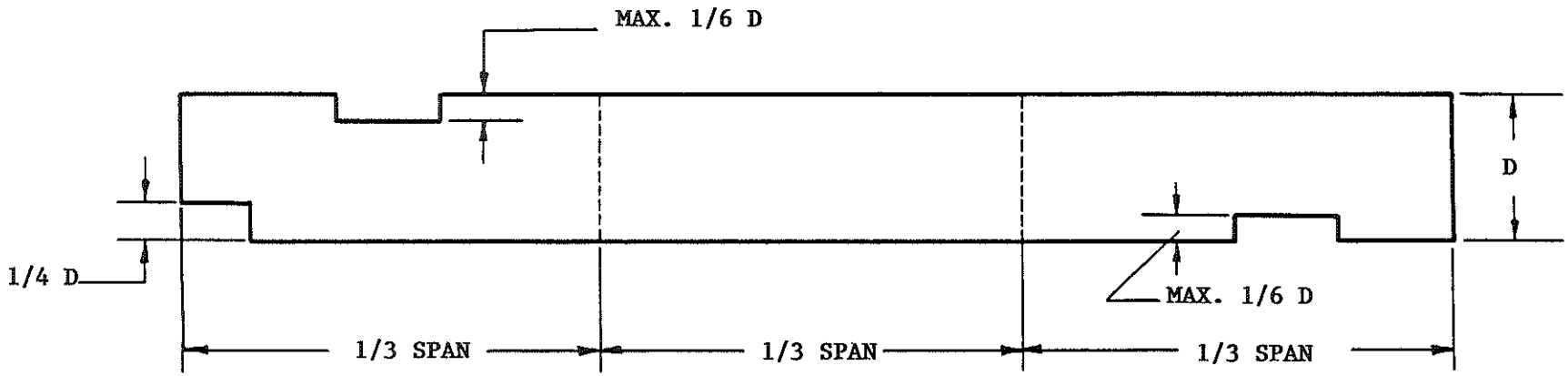


FRAMING PLAN





NOTE:
USE SELF ADHERING FLASHING
WITH PREFABRICATED END DAMS


MAX. 1/6 D
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1/4 D
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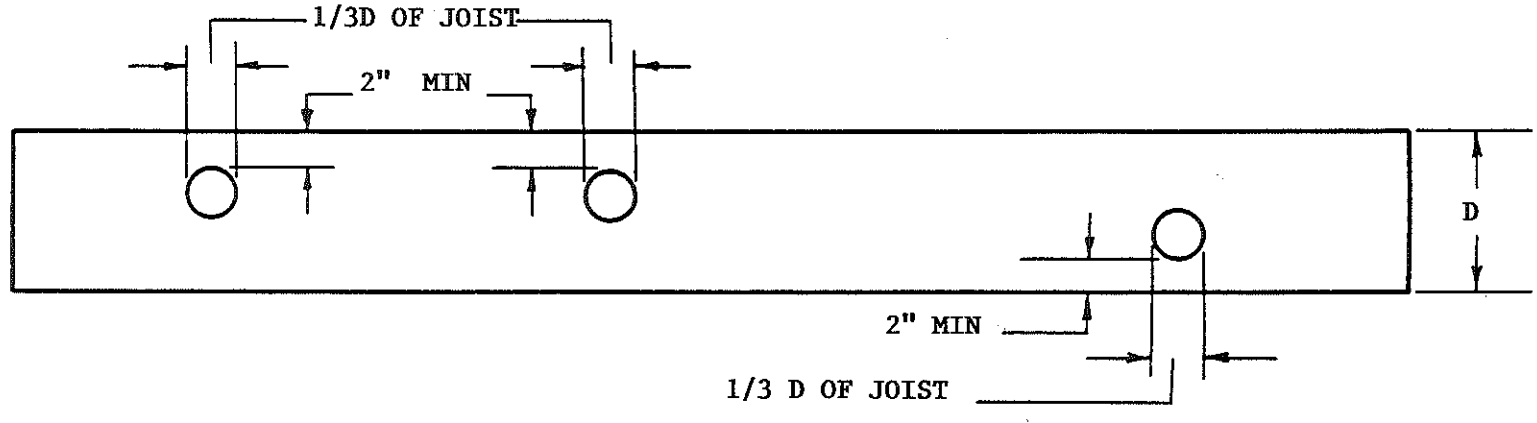
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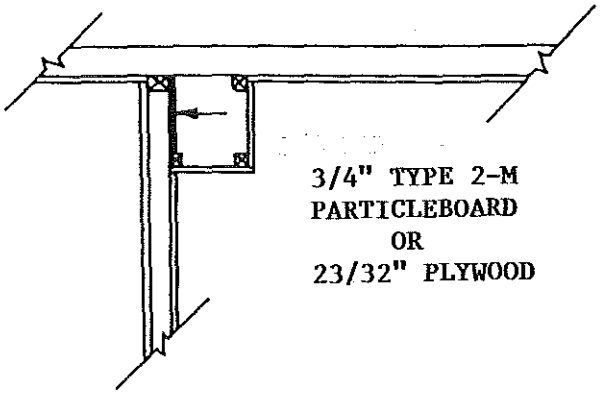
2" MIN
1/3 D OF JOIST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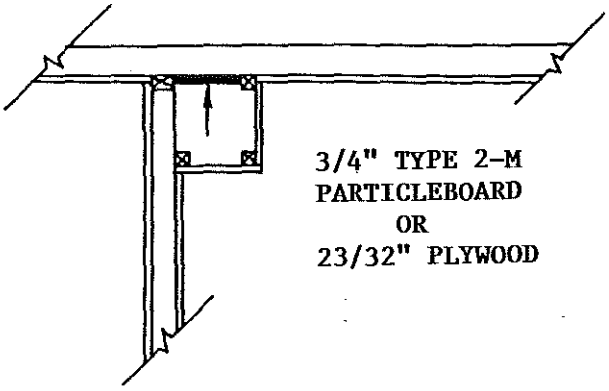
PARTICLEBOARD
OR
23/32" PLYWOOD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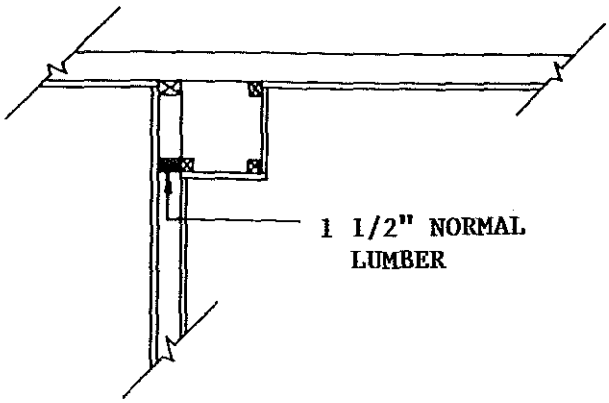
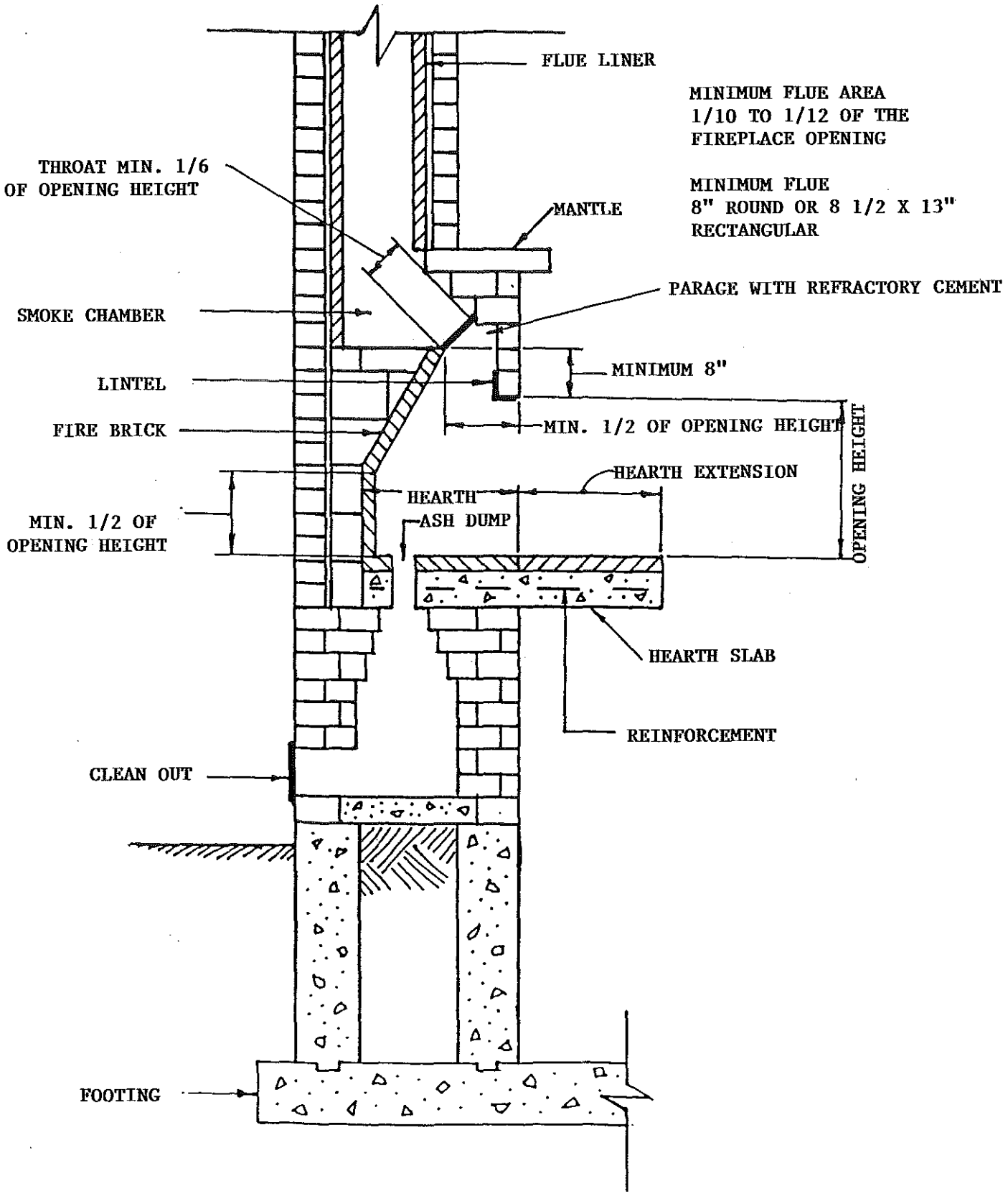
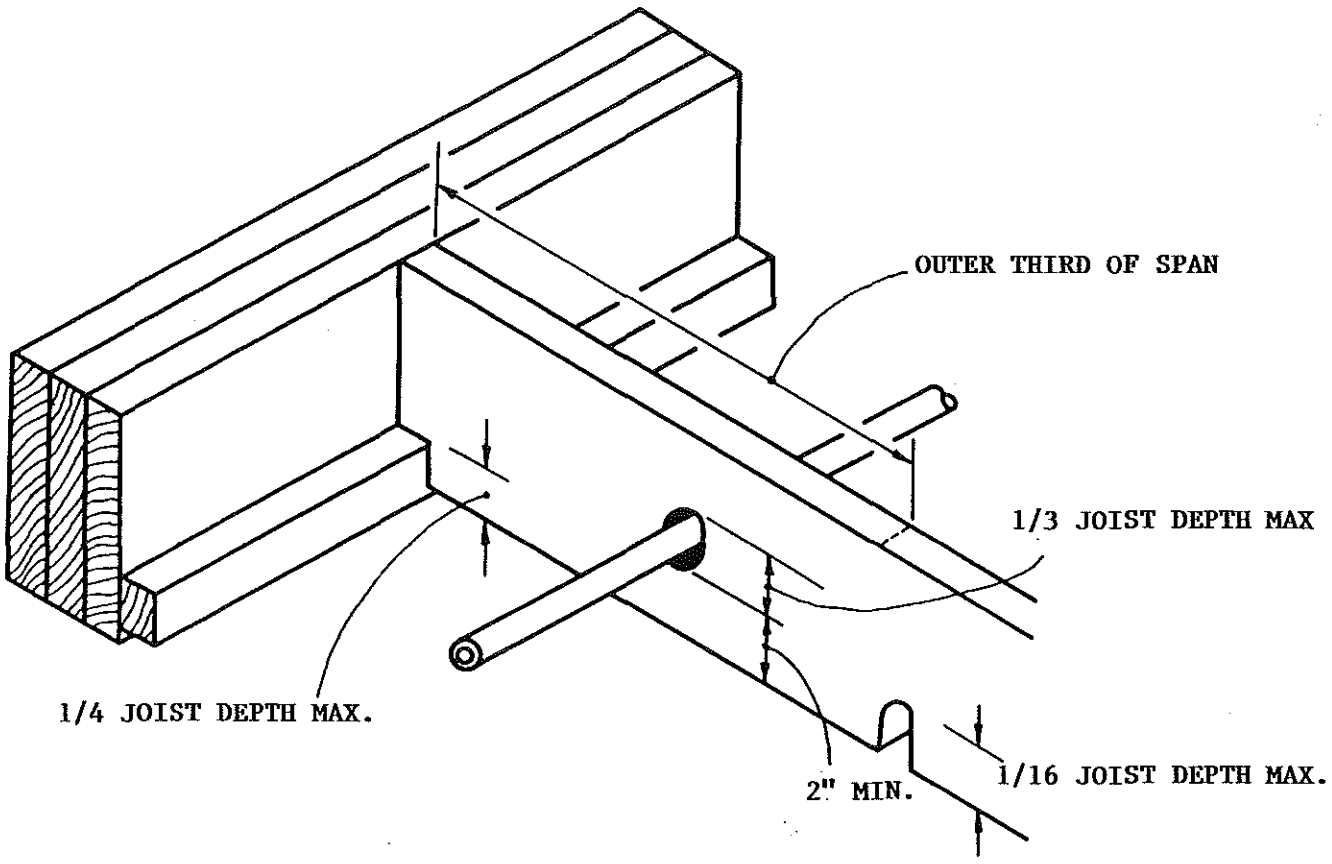
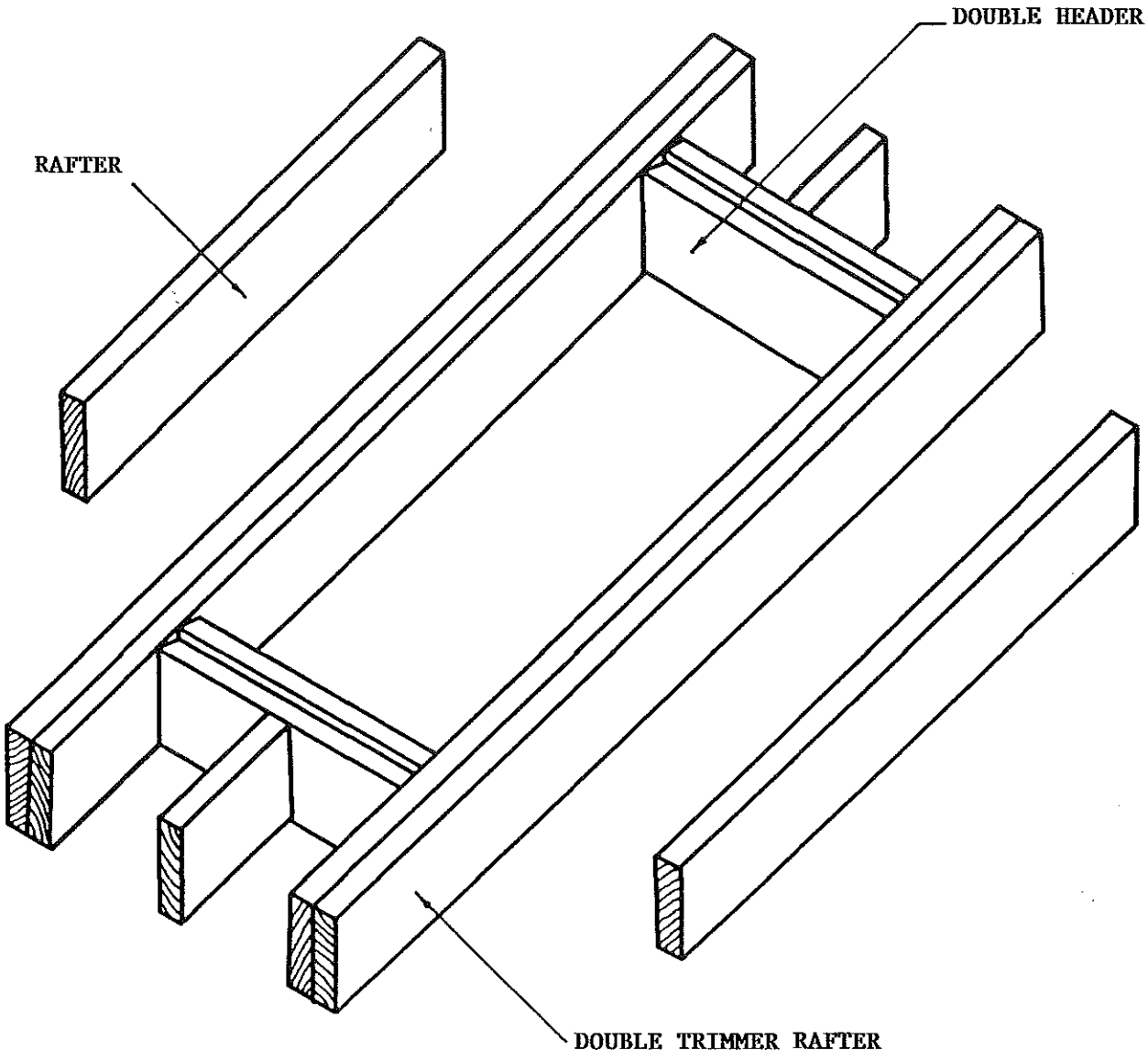
PARTICLEBOARD
OR
23/32" PLYWOOD


1 1/2" NORMAL
LUMBER


FLUE LINER
MINIMUM FLUE AREA
1/10 TO 1/12 OF THE
FIREPLACE OPENING
MINIMUM FLUE
8" ROUND OR 8 1/2 X 13"
RECTANGULAR
THROAT MIN. 1/6
OF OPENING HEIGHT
MANTLE
PARAGE WITH REFRACTORY CEMENT
SMOKE CHAMBER
MINIMUM 8"
LINTEL
MIN. 1/2 OF OPENING HEIGHT
FIRE BRICK
OPENING HEIGHT
HEARTH EXTENSION
HEARTH
ASH DUMP
MIN. 1/2 OF
OPENING HEIGHT
HEARTH SLAB
REINFORCEMENT
CLEAN OUT
FOOTING


OUTER THIRD OF SPAN
1/3 JOIST DEPTH MAX
1/4 JOIST DEPTH MAX.
2" MIN.
1/16 JOIST DEPTH MAX.


DOUBLE HEADER
RAFTER
DOUBLE TRIMMER RAFTER

APPENDIX B
TABLES

FLOOR JOISTS **30# LIVE LOAD, 10# DEAD LOAD, /360**

Span (feet and inches)

		2 x 6			2 x 8			2 x 10			2 x 12		
Species or Group	Grade	12" oc	16" oc	24"oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Doug-Fir Larch (Western)	Sel. Struc.	12-6	11-4	9-11	16-6	15-0	13-1	21-0	19-1	16-8	25-7	23-3	20-3
	No.1 & Btr.	12-3	11-2	9-9	16-2	14-8	12-8	20-8	18-9	16-1	25-1	22-10	18-8
	No. 1	12-0	10-11	9-7	15-10	14-5	12-4	20-3	18-5	15-0	24-8	21-4	17-5
	No. 2	11-10	10-9	9-1	15-7	14-1	11-6	19-10	17-2	14-1	23-0	19-11	16-3
	No. 3	9-8	8-5	6-10	12-4	10-8	8-8	15-0	13-0	10-7	17-5	15-1	12-4
Doug-Fir South (Western)	Sel. Struc.	11-3	10-3	11-10	14-11	13-6	11-10	19-0	17-3	15-1	23-1	21-0	18-4
	No. 1	11-0	10-0	8-9	14-6	13-2	11-6	18-6	16-10	14-3	22-6	20-3	16-6
	No. 2	10-9	9-9	8-6	14-2	12-10	11-2	18-0	16-5	13-8	21-11	19-4	15-10
	No.3	9-6	8-2	6-8	12-0	10-5	8-6	14-8	12-8	10-4	17-0	14-8	12-0
Hem-Fir (Western)	Sel. Struc.	11-10	10-9	9-4	15-7	14-2	12-4	19-10	18-0	15-9	24-2	21-11	19-2
	No. 1 & Btr.	11-7	10-6	9-2	15-3	13-10	12-1	19-5	17-8	15-5	23-7	21-6	17-10
	No. 1	11-7	10-6	9-2	15-3	13-10	12-0	19-5	17-8	14-8	23-7	20-9	17-0
	No.2	11-0	10-0	8-9	14-6	13-2	11-4	18-6	16-10	13-10	22-6	19-8	16-1
	No.3	9-8	8-5	6-10	12-4	10-8	8-8	15-0	13-0	10-7	17-5	15-1	12-4
Spruce-Pine-fir (South)	Sel. Struc.	11-0	10-0	8-9	14-6	13-2	11-6	18-6	16-10	14-8	22-6	20-6	17-11
	No.1 & Btr.	10-9	9-9	8-6	14-2	12-10	11-3	18-0	16-5	13-10	21-11	19-8	16-1
	No. 1	10-5	9-6	8-3	13-9	12-6	10-8	17-6	15-11	13-0	21-4	18-6	15-1
	No. 2	8-11	7-9	6-4	11-4	9-10	8-0	13-10	12-0	9-9	16-1	13-11	11-4
	No. 3												
Doug Fir Larch North (Canada)	Sle. Struc.	12-6	11-4	9-11	16-6	15-0	8-10	21-0	19-1	16-8	25-7	23-3	19-10
	No. 1	11-10	10-9	8-10	15-7	13-8	11-2	19-3	16-8	13-8	22-4	19-4	15-10
	No. 2	11-10	10-9	8-10	15-7	13-8	11-2	19-3	16-8	13-8	22-4	19-4	15-10
	No. 3	9-6	8-2	6-8	12-0	10-5	8-6	14-8	12-8	10-4	17-0	14-8	12-0
Hem-Fir North (Canada)	Sle. Struc.	12-0	10-11	9-7	15-10	14-5	12-7	20-3	18-5	16-1	24-8	22-5	19-7
	No. 1	11-10	10-9	9-4	15-7	14-2	12-4	19-10	18-0	15-0	24-2	21-4	17-5
	No. 2	11-10	10-9	9-4	15-7	14-2	12-4	19-10	18-0	15-0	24-2	21-4	17-5
	No. 3	10-5	9-0	7-4	13-2	11-5	9-4	16-1	13-11	11-5	18-8	16-2	13-2
Spruce, Pine, Fir (Canada)	Sle. Struc.	11-7	10-6	9-2	15-3	13-10	12-1	19-5	17-8	15-5	23-7	21-6	18-9
	No. 1	11-3	10-3	8-11	14-11	13-6	11-6	19-0	17-8	14-1	23-0	19-11	16-3
	No. 2	11-3	10-3	8-11	14-11	13-6	11-6	19-0	17-8	14-1	23-0	19-11	16-3
	No. 3	9-8	8-5	6-10	12-4	10-8	8-8	15-0	13-0	10-7	17-5	15-1	12-4

FLOOR JOISTS **40# LIVE LOAD, 10# DEAD LOAD, *l*/360**

Span (feet and inches)

		2 x 6			2 x 8			2 x 10			2 x 12		
Species or Group	Grade	12" oc	16" oc	24"oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Doug-Fir Larch (Western)	Sel. Struc.	11-4	10-4	9-0	15-0	13-7	11-11	19-1	17-4	15-2	23-3	21-1	18-5
	No.1 & Btr.	11-2	10-2	8-10	14-8	13-4	11-8	18-9	17-0	14-5	22-10	20-5	16-8
	No. 1	10-11	9-11	8-8	14-5	13-1	11-0	18-5	16-5	13-5	22-0	19-1	15-7
	No. 2	10-9	9-9	8-1	14-2	12-7	10-3	17-9	15-5	12-7	20-7	17-10	14-7
	No. 3	8-8	7-6	6-2	11-0	9-6	7-9	13-5	11-8	9-6	15-7	13-6	11-0
Doug-Fir South (Western)	Sel. Struc.	10-3	9-4	8-2	13-6	12-3	10-9	17-3	15-8	13-8	21-0	19-1	16-8
	No. 1	10-0	9-1	7-1	13-2	12-0	10-5	16-10	15-3	12-9	20-6	18-1	14-9
	No. 2	9-9	8-10	7-9	12-10	11-8	10-0	16-5	14-11	12-2	15-2	13-2	10-9
	No. 3	8-6	7-4	6-0	10-9	9-3	7-7	13-1	11-4	9-3	15-2	13-2	10-9
Hem-Fir (Western)	Sel. Struc.	10-9	9-9	8-6	14-2	12-10	11-3	18-0	16-5	14-4	21-11	19-11	17-5
	No. 1 & Btr.	10-6	9-6	8-4	13-10	12-7	11-0	17-8	16-0	13-9	21-6	19-6	16-0
	No. 1	10-6	9-6	8-4	13-10	12-7	10-9	17-8	16-0	13-9	21-6	18-7	15-2
	No. 2	10-0	9-1	7-11	13-2	12-0	10-2	16-10	15-2	12-5	20-4	17-7	14-4
	No. 3	8-8	7-6	6-2	11-0	9-6	7-9	13-5	11-8	9-6	15-7	13-6	11-0
Spruce-Pine-Fir (South)	Sel. Struc.	10-0	9-9	8-6	13-2	12-0	10-6	16-10	15-3	13-4	20-6	18-7	16-3
	No. 1	9-9	8-10	7-9	12-10	11-8	10-2	16-5	14-11	12-5	19-11	17-7	14-4
	No. 2	9-6	8-7	7-6	12-6	11-4	9-6	15-11	14-3	11-8	19-1	16-6	13-6
	No. 3	8-0	6-11	5-8	10-2	8-9	7-2	12-5	10-9	8-9	14-4	12-5	10-2
Doug Fir Larch North (Canada)	Sle. Struc.	11-4	10-4	9-0	15-0	13-7	11-11	19-1	17-4	15-2	23-3	21-1	17-9
	No. 1	10-9	9-8	7-11	14-1	12-3	10-0	17-3	14-11	12-2	20-0	17-4	14-2
	No. 2	10-9	9-8	7-11	14-1	12-3	10-0	17-3	14-11	12-2	20-0	17-4	14-2
	No. 3	8-6	7-4	6-0	10-9	9-3	7-7	13-1	11-4	9-3	15-2	13-2	10-9
Hem-Fir North (Canada)	Sle. Struc.	10-11	9-11	8-8	14-5	13-1	11-5	18-5	16-9	14-7	22-5	20-4	17-9
	No. 1	10-9	9-9	8-6	14-2	12-10	11-0	18-0	16-5	13-5	21-11	19-1	15-7
	No. 2	10-9	9-9	8-6	14-2	12-10	11-0	18-0	16-5	13-5	21-11	19-1	15-7
	No. 3	9-4	8-1	6-7	11-9	10-3	8-4	14-5	12-6	10-2	16-8	14-6	11-10
Spruce, Pine, Fir (Canada)	Sle. Struc.	10-6	9-6	8-4	13-10	12-7	11-0	17-8	16-0	14-0	21-6	20-7	15-7
	No. 1	10-3	9-4	8-1	13-6	12-3	10-3	17-3	15-5	12-7	19-6	17-10	17-0
	No. 2	10-3	9-4	8-1	13-6	12-3	10-3	17-3	15-5	12-7	19-6	17-10	17-0
	No. 3	8-8	7-6	6-2	11-0	9-6	7-9	13-5	11-8	9-6	15-7	13-6	11-0

FASTENING SCHEDULE

BUILDING ELEMENT	NAIL OR STAPLE SIZE AND TYPE	NUMBER AND LOCATION
FLOOR CONSTRUCTION		
Built-up girders and beams	20d common	32" o.c. direct
Bridging to joists	8d common	2 each direct end
Floor joists to studs (No ceiling joists)	10d common	5 direct
Floor joists to studs (with ceiling joists)	10d common	2 direct
Floor joists to sill or girder	8d common	3 toe nail
Ledger strip	16d common	3 each direct joist
1" subflooring (6" or less)	8d common	2 each direct joist
1" subflooring (8" or more)	8d common	3 each direct joist
2" subflooring	16d common	2 each direct joist
Particle board underlayment (1/4"-3/4")	6d annular threaded	6" o.c. direct edges and 12" o.c. intermediate
Particle board subflooring (5/8" or greater)	8d common	6" o.c. direct edges and 12" o.c. intermediate
Wood structural panel subflooring (½" or less)	6d common or 6d annular or spiral thread	6" o.c. direct edges and 12" o.c. intermediate
Wood structural panel subflooring (19/32" - 3/4")	8d common or 6d annular or spiral thread	6" o.c. direct edges and 12" o.c. intermediate

Wood structural panel subflooring (7/8" - 1-1/8")	10d common or 8d ring shank or 8d annular or spiral thread	6" o.c. intermediate
Wood structural panel subflooring (½" or less)	16 gage galvanized wire staples	4" o.c. edges and 7" o.c. intermediate
Wood structural panel subflooring (19/32", 5/8")	3/8" min. crown 1-5/8" length	2-1/2" o.c. edges and 4" o.c. intermediate

CEILING JOISTS **10# LIVE LOAD, 5# DEAD LOAD, l/240**

Use these loading conditions for the following:
No attic storage. Ceiling where the roof slope is not steeper than 3 in 12. Drywall ceilings.

Span (feet and inches)

		2 x 4			2 x 6			2 x 8			2 x 10		
Species or Group	**Grade**	**12" oc**	**16" oc**	**24"oc**	**12" oc**	**16" oc**	**24" oc**	**12" oc**	**16" oc**	**24" oc**	**12" oc**	**16" oc**	**24" oc**
Doug-Fir Larch (Western)	Sel. Struc.	13-2	11-11	10-5	20-8	18-9	16-4	27-2	24-8	21-7	34-8	31-6	27-6
	No.1 & Btr.	12-11	11-9	10-3	20-3	18-5	16-1	26-9	24-3	21-2	34-1	31-0	26-4
	No. 1	12-8	11-6	10-0	19-11	18-1	15-8	26-2	23-10	20-1	33-5	30-0	24-6
	No. 2	12-5	11-3	9-10	19-6	17-8	14-10	25-8	23-0	18-9	32-5	28-1	22-11
	No. 3	10-10	9-5	7-8	15-10	13-9	11-2	20-1	17-5	14-2	24-6	21-3	17-4
Doug-Fir South (Western)	Sel. Struc.	11-10	10-9	9-5	18-8	16-11	14-9	24-7	22-4	19-6	31-4	28-6	24-10
	No. 1	11-7	10-6	9-2	18-2	16-6	14-5	24-0	21-9	19-0	30-7	27-9	23-3
	No. 2	11-3	10-3	8-11	17-8	16-1	14-1	23-4	21-2	18-3	29-9	27-1	22-3
	No. 3	10-7	9-2	7-6	15-5	13-5	10-11	19-7	16-11	13-10	23-11	20-8	16-11
Hem-Fir (Western)	Sel. Struc.	12-5	11-3	9-10	19-6	17-8	15-6	25-8	23-4	20-5	32-9	29-9	26-0
	No. 1 & Btr.	12-2	11-0	9-8	19-1	17-4	15-2	25-2	22-10	19-11	32-1	29-2	25-2
	No. 1	12-2	11-0	9-8	19-1	17-4	15-2	25-2	22-10	19-7	32-1	29-2	23-11
	No. 2	11-7	10-6	9-2	18-2	16-6	14-5	24-0	21-9	18-6	30-7	27-8	22-7
	No. 3	10-10	9-5	7-8	15-10	13-9	11-2	20-1	17-5	14-2	24-6	21-3	17-4
Spruce-Pine-Fir (South)	Sel. Struc.	11-7	10-6	9-2	18-2	16-6	14-5	24-0	21-9	19-0	30-7	27-9	24-3
	No. 1	11-3	10-3	8-11	17-8	16-1	14-1	23-4	21-2	18-6	29-9	27-1	22-7
	No. 2	10-11	9-11	8-8	17-2	15-7	13-8	22-8	20-7	17-5	28-11	26-0	21-3
	No. 3	10-0	8-8	7-1	14-7	12-8	10-4	18-6	16-0	13-1	22-7	19-7	16-0
Doug Fir Larch North (Canada)	Sle. Struc.	13-2	11-11	10-5	20-8	18-9	16-4	27-2	24-8	21-7	34-8	31-6	27-6
	No. 1	12-5	11-3	9-10	19-6	17-8	14-5	25-8	22-4	18-3	31-6	27-3	22-3
	No. 2	12-5	11-3	9-10	19-6	17-8	14-5	25-5	22-4	18-3	31-6	27-3	22-3
	No. 3	10-7	9-2	7-7	15-5	13-5	10-11	19-7	16-11	13-10	23-11	20-8	16-11
Hem-Fir North (Canada)	Sle. Struc.	12-8	11-6	10-0	19-11	18-1	15-9	26-2	23-10	20-10	33-5	30-5	26-6
	No. 1	12-5	11-3	9-10	19-6	17-8	15-6	25-8	23-4	20-1	32-9	29-9	24-6
	No. 2	12-5	11-3	9-10	19-6	17-8	15-6	25-8	23-4	20-1	32-9	29-9	24-6
	No. 3	11-7	10-1	8-3	17-0	14-9	12-0	21-6	18-8	15-3	26-4	22-9	18-7
Spruce, Pine, Fir (Canada)	Sle. Struc.	12-2	11-0	9-8	19-1	17-4	15-2	25-2	22-10	19-11	32-1	29-2	25-5
	No. 1	11-10	10-9	9-5	18-8	16-11	14-9	24-7	22-4	18-9	31-4	28-1	22-11
	No. 2	11-10	10-9	9-5	18-8	16-11	14-9	24-7	22-4	18-9	31-4	28-1	22-11
	No. 3	10-10	9-5	7-8	15-10	13-9	11-2	20-1	17-5	14-2	24-6	21-3	17-4

CEILING JOISTS **20# LIVE LOAD, 10# DEAD LOAD, *l*/240**

Use these loading conditions for the following:
Limited attic storage where development of future rooms is not possible. Ceilings where the roof pitch is steeper than 3 in 12.
Where the clear height in the attic is greater than 30 inches. Drywall ceiling.

Span (feet and inches)

		2 x 4			2 x 6			2 x 8			2 x 10		
Species or Group	Grade	12" oc	16" oc	24"oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Doug-Fir Larch (Western)	Sel. Struc.	10-5	9-6	8-3	16-4	14-11	13-0	21-7	19-7	17-1	27-6	25-0	20-11
	No.1 & Btr.	10-3	9-4	8-1	16-1	14-7	12-0	21-2	18-8	15-3	26-4	22-9	18-7
	No. 1	10-0	9-1	7-8	15-9	13-9	11-2	20-1	17-5	14-2	24-6	21-3	17-4
	No. 2	9-10	8-9	7-2	14-10	12-10	10-6	18-9	16-3	13-3	22-11	19-10	16-3
	No. 3	7-8	6-8	5-5	11-2	9-8	7-11	14-2	12-4	10-0	17-4	15-0	12-3
Doug-Fir South (Western)	Sel. Struc.	9-5	8-7	7-6	14-9	13-5	11-9	19-6	17-9	15-6	24-10	22-7	19-9
	No. 1	9-2	8-4	7-3	14-5	13-0	10-8	19-0	16-6	13-6	23-3	20-2	16-5
	No. 2	8-11	8-1	7-0	14-1	12-6	10-2	18-3	15-9	12-11	22-3	19-3	15-9
	No. 3	7-6	6-6	5-3	10-11	9-6	7-9	13-10	12-0	9-9	16-11	14-8	11-11
Hem-Fir (Western)	Sel. Struc.	9-10	8-11	7-10	15-6	14-1	12-3	20-5	18-6	16-2	26-0	23-8	20-6
	No. 1 & Btr.	9-8	8-9	7-8	15-2	13-9	11-6	19-11	17-10	14-7	25-2	21-9	17-9
	No. 1	9-8	8-9	7-6	15-2	13-5	10-11	19-7	16-11	13-10	23-11	20-8	16-11
	No. 2	9-2	8-4	7-1	14-5	12-8	10-4	18-6	16-0	13-1	22-7	19-7	16-0
	No. 3	7-8	6-8	5-5	11-2	9-8	7-11	14-2	12-4	10-0	17-4	15-0	12-3
Spruce-Pine-Fir (South)	Sel. Struc.	9-2	8-4	7-3	14-5	13-1	11-5	19-0	17-3	15-1	24-3	22-1	19-3
	No. 1	8-11	8-1	7-1	14-1	12-8	10-4	18-6	16-0	13-1	22-7	19-7	16-0
	No. 2	8-8	7-11	6-8	13-8	11-11	9-8	17-5	15-1	12-4	21-3	18-5	15-0
	No. 3	7-1	6-1	5-0	10-4	8-11	7-4	13-1	11-4	9-3	16-0	13-10	11-4
Doug Fir Larch North (Canada)	Sle. Struc.	10-5	9-6	8-3	16-4	14-11	12-9	21-7	19-7	16-2	27-6	24-3	19-9
	No. 1	9-10	8-6	7-0	14-5	12-6	10-2	18-3	15-9	12-11	22-3	19-3	15-9
	No. 2	9-10	8-6	7-0	14-5	12-6	10-2	18-3	15-9	12-11	22-3	19-3	15-9
	No. 3	7-6	6-6	5-3	10-11	9-6	7-9	13-10	12-0	9-9	16-11	14-8	11-11
Hem-Fir North (Canada)	Sle. Struc.	10-0	9-1	8-0	15-9	14-4	12-6	20-10	18-11	16-2	26-6	24-1	21-3
	No. 1	9-10	8-11	7-8	15-6	13-9	11-2	20-1	17-5	14-2	24-6	21-2	17-4
	No. 2	9-10	8-11	7-8	15-6	13-9	11-2	20-1	17-5	14-2	24-6	21-2	17-4
	No. 3	8-3	7-1	5-10	12-0	10-5	8-6	15-3	13-2	10-9	18-7	16-1	13-2
Spruce, Pine, Fir (Canada)	Sle. Struc.	9-8	8-9	7-8	15-2	13-9	12-0	19-11	18-2	15-10	25-5	23-2	19-5
	No. 1	9-5	8-7	7-2	14-9	12-10	10-6	18-9	16-3	13-3	22-11	19-10	16-3
	No. 2	9-5	8-7	7-2	14-9	12-10	10-6	18-9	16-3	13-3	22-11	19-10	16-3
	No. 3	7-8	6-8	5-5	11-2	9-8	7-11	14-2	12-4	10-0	17-4	15-0	12-3

ROOF RAFTERS
Flat roof or cathedral ceiling
with drywall finish.
Light roof covering

30# SNOW LOAD, 15# DEAD LOAD, *l*/240

Span (feet and inches)

		2 x 6			2 x 8			2 x 10			2 x 12		
Species or Group	Grade	12" oc	16" oc	24"oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Doug-Fir Larch (Western)	Sel. Struc.	14-4	13-0	11-4	18-10	17-2	15-0	24-1	21-10	18-3	29-3	26-0	21-2
	No.1 & Btr.	14-1	12-9	10-6	18-6	16-4	13-4	23-0	19-11	16-3	26-8	23-1	18-11
	No. 1	13-9	12-0	9-10	17-7	15-3	12-5	21-6	18-7	15-2	24-11	21-7	17-7
	No. 2	13-0	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-2	23-3	20-2	16-6
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5
Doug-Fir South (Western)	Sel. Struc.	12-11	11-9	10-3	17-0	15-6	13-6	21-9	19-9	17-3	26-5	24-0	20-1
	No. 1	12-7	11-5	9-4	16-7	14-5	11-9	20-4	17-8	14-5	23-7	20-5	16-8
	No. 2	12-3	10-11	8-11	16-0	13-10	11-3	19-6	16-11	13-9	22-7	19-7	16-0
	No. 3	9-7	8-3	6-9	12-1	10-6	8-7	14-10	12-10	10-6	17-2	14-10	12-2
Hem-Fir (Western)	Sel. Struc.	13-6	12-3	10-9	17-10	16-2	14-2	22-9	20-8	18-0	27-8	25-1	20-10
	No. 1 & Btr.	13-3	12-0	10-1	17-5	15-7	12-9	22-0	19-1	15-7	25-6	22-1	18-0
	No. 1	13-3	11-9	9-7	17-2	14-10	12-1	20-11	18-1	14-10	24-3	21-0	17-2
	No. 2	12-7	11-1	9-1	16-2	14-0	11-6	19-10	17-2	14-0	22-11	19-11	16-3
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5
Spruce-Pine-Fir (South)	Sel. Struc.	12-7	11-5	10-0	16-7	15-1	13-2	21-2	19-3	16-10	25-9	23-5	20-1
	No. 1	12-3	11-1	9-1	16-2	14-0	11-6	19-10	17-2	14-0	22-11	19-11	16-3
	No. 2	11-11	10-5	8-6	15-3	13-2	10-9	18-7	16-1	13-2	21-7	18-8	15-3
	No. 3	9-1	7-10	6-5	11-6	9-11	8-1	14-0	12-1	9-11	16-3	14-1	11-6
Doug Fir Larch North (Canada)	Sle. Struc.	14-4	13-0	11-2	18-10	17-2	14-2	24-1	21-2	17-4	28-5	24-7	20-1
	No. 1	12-7	10-11	8-11	16-0	13-10	11-3	19-6	16-11	13-9	22-7	19-7	16-0
	No. 2	12-7	10-11	8-11	16-0	13-10	11-3	19-6	16-11	13-9	22-7	19-7	16-0
	No. 3	9-7	8-3	6-9	12-1	10-6	8-7	14-10	12-10	10-6	17-2	14-10	12-2
Hem-Fir North (Canada)	Sle. Struc.	13-9	12-6	10-11	18-2	16-6	14-2	23-2	21-1	17-4	28-2	24-7	20-1
	No. 1	13-6	12-0	9-10	17-7	15-3	12-5	21-6	18-7	15-2	24-11	21-7	17-7
	No. 2	13-6	12-0	9-10	17-7	15-3	12-5	21-6	18-7	15-2	24-11	21-7	17-7
	No. 3	10-6	9-1	7-5	13-4	11-7	9-5	16-3	14-1	11-6	18-11	16-4	13-4
Spruce, Pine, Fir (Canada)	Sle. Struc.	13-3	12-0	10-6	17-5	15-10	13-10	22-3	20-2	17-0	27-1	24-1	19-8
	No. 1	12-11	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-2	23-3	20-2	16-6
	No. 2	12-11	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-2	23-3	20-2	16-6
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5

ROOF RAFTERS **30# SNOW LOAD, 15# DEAD LOAD, l /180**

Roof slope greater than 3 in 12
No ceiling finish

Span (feet and inches)

		2 x 6			2 x 8			2 x 10			2 x 12		
Species or Group	Grade	12" oc	16" oc	24"oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Doug-Fir Larch (Western)	Sel. Struc.	15-9	14-4	11-10	20-9	18-4	15-0	25-10	22-5	18-3	30-0	26-0	21-2
	No.1 & Btr.	14-11	12-11	10-6	18-10	16-4	13-4	23-0	19-11	16-3	26-8	23-1	18-11
	No. 1	13-11	12-0	9-10	17-7	15-3	12-5	21-6	18-7	15-2	24-11	21-7	17-7
	No. 2	13-0	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-2	23-3	20-2	16-6
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5
Doug-Fir South (Western)	Sel. Struc.	14-3	12-11	11-2	18-9	17-0	14-2	23-11	21-2	17-4	28-5	24-7	20-1
	No. 1	13-2	11-5	9-4	16-8	14-5	11-9	20-4	17-8	14-5	23-7	20-5	16-8
	No. 2	12-7	10-11	8-11	16-0	13-10	11-3	19-6	16-11	13-9	22-7	19-7	16-0
	No. 3	9-7	8-3	6-9	12-1	10-6	8-7	14-10	12-10	10-6	17-2	14-10	12-2
Hem-Fir (Western)	Sel. Struc.	14-10	13-6	11-7	19-7	17-10	14-8	25-0	22-0	18-0	29-6	25-6	20-10
	No. 1 &	14-3	12-4	10-1	18-0	15-7	12-9	22-0	19-1	15-7	25-6	22-1	18-0
	Btr.	13-6	11-9	9-7	17-2	14-10	12-1	20-11	18-1	14-10	24-3	21-0	17-2
	No. 1	12-10	11-1	9-1	16-2	14-0	11-6	19-10	17-2	14-0	22-11	19-11	16-3
	No. 2	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5
	No. 3												
Spruce-Pine-Fir (South)	Sel. Struc.	13-10	12-7	11-0	18-3	16-7	14-2	23-4	21-2	17-4	28-5	24-7	20-1
	No. 1	12-10	11-1	9-1	16-2	14-0	11-6	19-10	17-2	14-0	22-11	19-11	16-3
	No. 2	12-0	10-5	8-6	15-3	13-2	10-9	18-7	16-1	13-2	21-7	18-8	15-3
	No. 3	9-1	7-10	6-5	11-6	9-11	8-1	14-0	12-1	9-11	16-3	14-1	11-6
Doug Fir Larch North (Canada)	Sle. Struc.	15-9	13-8	11-2	20-0	17-4	14-2	24-6	21-2	17-4			
	No. 1	12-7	10-11	8-11	16-0	13-10	11-3	19-6	16-11	13-9			
	No. 2	12-7	10-11	8-11	16-0	13-10	11-3	19-6	16-11	13-9			
	No. 3	9-7	8-3	6-9	12-1	10-6	8-7	14-10	12-10	10-6			
Hem-Fir North (Canada)	Sle. Struc.	15-2	13-8	11-2	20-0	17-4	14-2	24-6	21-2	17-4			
	No. 1	13-11	12-0	9-10	17-7	15-3	12-5	21-6	18-7	15-2			
	No. 2	13-11	12-0	9-10	17-7	15-3	12-5	21-6	18-7	15-2			
	No. 3	10-6	9-1	7-5	13-4	11-7	9-5	16-3	14-1	11-6			
Spruce, Pine, Fir (Canada)	Sle. Struc.	14-7	13-3	11-0	19-2	17-0	13-11	24-0	20-9	17-0			
	No. 1	13-0	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-2			
	No. 2	13-0	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-4			
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9			

FASTENING SCHEDULE

BUILDING ELEMENT	NAIL OR STAPLE SIZE AND TYPE	NUMBER AND LOCATION
Roof and ceiling CONSTRUCTION		
Ceiling joists to plate	16d common	3 toe nail
Ceiling joists (laps over partition)	10d common	3 direct nail
Ceiling joists (parallel to rafter)	10d common	3 direct nail
Collar beam	10d common	3 direct
Roof rafter to plate	8d common	3 toe nail
Roof rafter to ridge	16d common	2 toe nail or direct nail
Jack rafter to hip	10d common or 16d common	3 toe nail or 2 direct nail
1" roof decking (6" or less in width)	8d common	2 each direct rafter
1" roof decking (over 6" in width)	8d common	3 each direct rafter

FASTENING SCHEDULE

BUILDING ELEMENT	NAIL OR STAPLE SIZE AND TYPE	NUMBER AND LOCATION
ROOF COVERINGS		
MATERIAL	FASTENER STYLE 2	SPACING SPECIFICATIONS 4
Base ply and roofing plies	12 ga. roofing nail 6 16 ga. staple	Nails or staples driven through tin discs, spaced maximum 12" o.c.
Asphalt shingles	12 ga. 3/8"HD roofing nail 16 ga. staple	4 nails or staples per each 36"-40" section of shingle
Asphalt hip and ridge shingles	12 ga. 3/8" HD roofing nail 16 ga. staple	2 nails or staples are required for each hip and ridge shingle
Wood shingles 3	.076 shingle nail .080 T-nail 16 ga. staple	16" and 18" shingle 2 fasteners per shingle
Wood shingle 3	.080 shingle nail .080 T-nail 16 ga. staple	24" shingle 2 fasteners per shingle
Wood shakes 3	.0915 shingle nail .0915 to .099 T-nail 16 ga staple	2 nails or staples per shake
Particle board roof and wall sheathing (½" or less)	6d common	6" o.c. direct edges and 12" o.c. intermediate
5/8" or greater	8d common	6" o.c. direct edges and 12" o.c. intermediate
Wood structural panel roof and wall sheathing (½" or less)	6d common	6" o.c. direct edges and 12" intermediate
(19/32" or greater)	8d common	6" o.c. direct edges and 12" o.c. intermediate

(½" or less)	16 ga. galvanized wire staples, 3/8" minimum crown Length of 1" plus panel thickness	4" o.c. edges and 8" o.c. intermediate
(19/32" , 5/8")	Same as immediately above	2-1/2" o.c. edges and 5" o.c. intermediate
Shingles wood (a)	No. 14 B & S gage corrosion resistant	2 each bearing
Weatherboarding	8d corrosion resistant	2 each bearing

1. Shingles and shakes attached to roof sheathing having the underside of the sheathing exposed to visual view may be attached in these locations with nails or staples having shorter lengths than specified so as not to penetrate the exposed side of the sheathing.

2. All nails and staples shall be corrosion resistant.

3. Nails may have T-heads, clipped round heads or standard heads.

4. Roof coverings shall be fastened in an approved manner.

5. Nails or staples shall be long enough to penetrate into the sheathing 3/4 inch or through the thickness of the sheathing, whichever is less.

6. Annularly threaded nails with minimum 1-inch diameter heads shall be used for plywood decks.

a. Shingle nails shall penetrate not less than 3/4 inch into nailing strips, sheathing or supporting construction except as otherwise provided for in section 1507.0.

FASTENING SCHEDULE

BUILDING ELEMENT	NAIL OR STAPLE SIZE AND TYPE	NUMBER AND LOCATION
Wall and Roof Sheathing		
1" wall sheathing (8" or less in width)	8d common	2 each direct stud
1" wall sheathing (over 8" in width)	8d common	3 each direct stud
Diagonal wall sheathing (seismic bracing)	See Table 2306.4.5	
½" fiberboard sheathing	1-1/2" galvanized roofing nail or 6d common nail or 16 ga. staple, 1-1/8" long with minimum crown of 7/16"	3" o.c. exterior edge 6" o.c. intermediate
25/32" fiberboard sheathing	1-3/4" galvanized roofing nail or 8d common nail or 16 ga. staple, 1-1/2" long with minimum crown of 7/16"	3" o.c. exterior edge 6" o.c. intermediate
Gypsum sheathing	12 ga. 1-1/4" large head, corrosion resistant	4" o.c. on edge 8" o.c. intermediate
Gypsum sheathing (seismic bracing	11 ga. 1-3/4" long 7/16" head, diamond point, galvanized	4" o.c. all bearing points

FASTENING SCHEDULE

BUILDING ELEMENT	NAIL OR STAPLE SIZE AND TYPE	NUMBER AND LOCATION
WALL CONSTRUCTION		
Stud to sole plate	8d common	4 toe nail or 2 direct nail
Stud to cap plate	16d common	2 toe nail or 2 direct nail
Double studs	10d common	12" o.c. direct
Corner studs	16d common	24" o.c. direct
sole plate to joist or blocking	16d common	16" o.c.
Interior-braced wall sole plate to parallel joist	16d common	12" o.c.
Double cap plate	10d common	16" o.c. direct nail
Cap plate laps	10d common	2 direct nail
Ribbon strip 6" or less	10d common	2 each direct bearing
Ribbon strip 6" or more	10d common	3 each direct bearing
Diagonal brace (to stud and plate)	8d common	2 each direct bearing
Interior-braced wall top plate to joist or blocking	10d common	12" o.c.
Tall beams to headers (where nailing is permitted)	20d common	1 each end 4sq. ft. floor area
Header beams to trimmers (where nailing is permitted)	20d common	1 each end 8sq. ft. floor area
Continuous header to stud	8d common	4 toe nail
Continuous header two pieces	16d common	16" o.c. direct

OTHER GYPSUM INSTALLATIONS (NAILS)

Thickness of gypsum wallboard inches	Plane of framing surface	Long dimension of gypsum wallboard sheets in relation to direction of framing members	Maximum spacing of framing members center to center in inches	Maximum spacing of fasteners center to center in inches NAILS	Nails(a) to wood
½"	Horizontal	either direction	16	7	No. 13 ga., 1-3/8" long, 19/64" head .098" diameter, 1-1/4" long, annular ringed 5d cooler nail
	Horizontal	perpendicular	24	7	
	Vertical	either direction	24	8	
5/8"	Horizontal	either direction	16	7	No. 13 ga., 1-5/8" long, 19/64" head, .098" diameter, 1-3/8" long, annular ringed, 6d cooler nail
	Horizontal	perpendicular	24	7	
	Vertical	either direction	24	8	
½" or 5/8" with adhesive	Horizontal	either direction	16	16	As required for ½" and 5/8" Gypsum wallboard, see above
	Horizontal	perpendicular	24	12	
	Vertical	either direction	24	16	

2 layers each 3/8" (3/4" total	Horizon-tal Vertical	perpen-dicular either direction	24 24	16 24	Base ply nailed as required for ½" Gypsum wallboard and face ply placed with adhesive

a. Where the metal farming has a clinching design formed to receive the nails by two edges of metal, the nails shall not be less than 5/8" longer than the wallboard thickness, and shall have ringed shanks. Where the metal framing has a nailing groove formed to receive the nails, the nails shall have barbed shanks or be 5d cooler nails (No.13-1/2 ga., 1-5/8" long, 15/16" head). For ½" Gypsum wallboard; 6d cooler (No. 13 ga., 1-7/8" long, 15/64" head) for 5/8" Gypsum wallboard.

b. Two nails at 2" to 2-1/2" apart are permitted to be used if the pairs are spaced 12" center-to-center except around perimeters.

c. For fire-resistance rated construction assemblies, see the pertinent fire test information.

d. One inch equals 25.4 mm.

OTHER GYPSUM INSTALLATIONS (SCREWS)

Thickness of gypsum wallboard inches	Plane of framing surface	Long dimension of gypsum wallboard sheets in relation to direction of framing members	Maximum spacing of framing members center to center in inches	Maximum spacing of fasteners center to center in inches SCREWS	Nails(a) to wood
½"	Horizontal	either direction	16	12	No. 13 ga., 1-3/8" long, 19/64" head .098" diameter, 1-1/4" long, annular ringed 5d cooler nail
	Horizontal	perpendicular	24	12	
	Vertical	either direction	24	12	
5/8"	Horizontal	either direction	16	12	No. 13 ga., 1-5/8" long, 19/64" head, .098" diameter, 1-3/8" long, annular ringed, 6d cooler nail
	Horizontal	perpendicular	24	12	
	Vertical	either direction	24	12	
½" or 5/8" with adhesive	Horizontal	either direction	16	16	As required for ½" and 5/8" Gypsum wallboard, see above
	Horizontal	perpendicular	24	16	
	Vertical	either direction	24	24	

2 layers each 3/8" (3/4" total	Horizon-tal Vertical	perpen-dicular either direction	24 24	16 24	Base ply nailed as required for ½" Gypsum wallboard and face ply placed with adhesive

a. Screws shall be No. 6 with tapered head and long enough to penetrate into wood framing not less than 5/8" and metal framing not less than 1/4"

b. For fire-resistance rated construction assemblies, see the pertinent fire test information.

c. One inch equals 25.4 mm.

THICKNESS OF PLASTER

FINISHED THICKNESS OF PLASTER FROM FACE OF LATH, MASONRY, CONCRETE

PLASTER BASE	GYPSUM PLASTER	PORTLAND CEMENT MORTAR
Expanded metal lath	**5/8" minimum (1)**	**5/8" minimum (1)**
Wire lath	**5/8" minimum (1)**	**3/4" minimum (interior) (2)** **7/8" minimum (exterior) (2)**
Gypsum lath	**1/2" minimum**	
Masonry walls (3)	**1/2" minimum**	**1/2" minimum**
Monolithic concrete walls (3,4)	**5/8" maximum**	**7/8" maximum**
Monolithic concrete ceilings (3,4)	**3/8" maximum (5)**	**1/2" maximum**
Gypsum veneer base (6)	**1/16" minimum**	

For SI: 1 inch - 25.4 mm.

(1) When measured from back plane of expanded metal lath, exclusive of ribs, or self-furring lath, plaster thickness shall be 3/4" minimum.

(2) When measured from face of support or backing.

(3) Because masonry and concrete surfaces may vary in plane, thickness of plaster need not be uniform.

(4) When applied over liquid bonding agent, finish coat may be applied directly to concrete surface.

(5) Approved acoustical plaster may be applied directly to concrete or over base coat plaster, beyond the maximum plaster thickness shown.

(6) Attachment shall be in accordance with table **(APPLICATION AND MINIMUM THICKNESS OF GYPSUM WALLBOARD).**

GYPSUM PLASTER PROPORTIONS (1)

NUMBER	COAT	PLASTER BASE OR LATH	MAXIMUM VOLUME AGGREGATE PER 100 POUNDS MEAT PLASTER (2) DAMP LOOSE SAND	MAXIMUM VOLUME AGGREGATE PER 100 POUNDS MEAT PLASTER (2) PERLITE OR VERMICULITE
Two-coat work	Base coat	Gypsum lath	2 ½	2
Two-coat work	Base coat	Masonry	3	3
Three-coat work	First coat	Lath	2 (4)	5
Three-coat work	**Second coat**	**lath**	**3 (4)**	**2 (5)**
Three-coat work	**First and Second coats**	**Masonry**	**3**	**3**

For SI: 1 inch + 25.4 mm. 1 cubic foot + 0.0283 m to the third power, 1 pound + 0.454 kg.

(1). Wood-fibered gypsum plaster may be mixed in the portions of 100 pounds of gypsum to not more than 1 cubic foot of sand where applied on masonry or concrete.
(2). When determining the amount of aggregate in set plaster, a tolerance of 10 percent shall be allowed.
(3). Combinations of sand and lightweight aggregate may be used, provided the volume and weight relationship of the combined aggregate to the gypsum plaster is maintained.
(4) If used for both first and second coats, the volume of aggregate may be 2 ½ cubic feet.
(5) Where plaster is 1 inch or more in total thickness, the proportion for the second coat may be increased to 3 cubic feet.

Siding

TYPE OF SUPPORTS FOR SIDING MATERIAL AND FASTENERS

Siding Material	Nominal Thickness (Inches)	Plywood/ Particle board	Fiberboard	Fiberboard
Horizontal Aluminum siding Without insulation	.019	.120 nail- 1-1/2"	.120 nail- 2"	.120 nail- 2"
	.024	.120 nail- 1-1/2"	.120 nail- 2"	.120 nail- 2"
With insulation	.019	.120 nail- 1-1/2"	.120 nail- 2-1/2"	.120 nail- 2-1/2"

MORTAR PROPORTIONS

PROPORTIONS BY VOLUME (Cementitious Materials)							
Mortar	Type	Portland Cement or Bleached Cement	Masonry Cement			Hydrated Lime or Lime Putty	Aggregate Ratio Measured in Damp, Loose Condition
			M	S	N		
Cement-Lime	M	1	___	___	___	1/4	Not less than 2 1/4 and not more than 3 times the sum of separate volumes of lime, if used, and cement
	S	1	___	___	___	Over 1/4to1/2	
	N	1	___	___	___	Over ½ to 1 1/4	
	O	1	___	___	___	Over 1 1/4 to 2 ½	
Masonry Cement	M	1	___	___	1		Not less than 2 1/4 and not more than 3 times the sum of separate volumes of lime, if used, and cement
	M	___	1	___	___		
	S	1\2"	___	___	1		
	S	___	___	1	___		
	N	___	___	___	1		
	O	___	___	___	1		

For **SI:** 1 cubic foot = 0.0283 m to the third power, 1 pound = 0.454kg

1.For the purpose of these specifications, the weight of 1 cubic foot of the respective materials shall be considered to be as follows:
Portland Cement94 lb.
Masonry CementWeight printed on the bag
Hydrated Lime40 lb.
Lime Putty (Quicklime)80 lb.
Sand, damp and loose80 lb.

2.Two air-entraining materials shall not be combined in mortar

GROUT PROPORTIONS BY VOLUME FOR MASONRY CONSTRUCTION

AGGREGATE MEASURED IN A DAMP, LOOSE CONDITION

Type	Portland Cement or Blended Concrete Slag Cement	Hydrate Lime or Lime Putty	Fine	Coarse
Fine	1	0 to 1/10	2 1/4 to 3 times the sum of the volume of the cementitious materials	___
Coarse	1	0 to 1/10	2 1/4 to 3 times the sum of the volume of the cementitious materials	**1 to 2 times the sum of the Volum of the cementitious materials**

Siding

TYPE OF SUPPORTS FOR SIDING MATERIAL AND FASTENERS

Siding Material	Nominal Thickness (Inches)	Plywood/ Particle board	Fiberboard	Gypsum
Horizontal Aluminum siding Without insulation	.019 .024	.120 nail-1-1/2" .120 nail-1-1/2"	.120 nail-2" .120 nail-2"	.120 nail-2" .120 nail-2"
With insulation	.019	.120 nail-1-1/2"	.120 nail-2-1/2"	.120 nail-2-1/2"

GYPSUM PLASTER PROPORTIONS (1)

NUMBER	COAT	PLASTER BASE OR LATH	MAXIMUM VOLUME AGGREGATE PER 100 POUNDS MEAT PLASTER (2) DAMP LOOSE SAND	PERLITE OR VERMICULITE
Two-coat work	Base coat	Gypsum lath	2 ½	2
Two-coat work	Base coat	Masonry	3	3
Three-coat work	First coat	Lath	2 (4)	5
Three-coat work	**Second coat**	**lath**	**3 (4)**	**2 (5)**
Three-coat work	**First and Second coats**	**Masonry**	**3**	**3**

For SI: 1 inch + 25.4 mm. 1 cubic foot + 0.0283 m to the third power, 1 pound + 0.454 kg.

(1). Wood-fibered gypsum plaster may be mixed in the portions of 100 pounds of gypsum to not more than 1 cubic foot of sand where applied on masonry or concrete.

(2). When determining the amount of aggregate in set plaster, a tolerance of 10 percent shall be allowed.

(3). Combinations of sand and lightweight aggregate may be used, provided the volume and weight relationship of the combined aggregate to the gypsum plaster is maintained.

(4) If used for both first and second coats, the volume of aggregate may be 2 ½ cubic feet.

(5) Where plaster is 1 inch or more in total thickness, the proportion for the second coat may be increased to 3 cubic feet.

APPENDIX C

DURABILITY TEST STANDARDS

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APPENDIX C

DURABILITY TEST STANDARDS

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Concrete, Aggregate Method of Tests for Voids in	ASTM C 30-70
Concrete, Air Content of Freshly Mixed, by the Pressure Method of the Teat for	ASTM C 231-74
Concrete, Weight per Cubic Foot, Yield and Air Content of-Method of Test for	ASTM C 138-74
Organic Impurities in Sand for Concrete-Method of Test for	ASTM C 40-73

MASONRY AND MASONRY PRODUCTS

Ceramic Glazed Structural Clay Facing Tile, Facing Brick and Solid Masonry Units Specifications for (Autoclave Test)	ASTM C 126-71
Freezing and Thawing Tests (see specifications for materials)	
Bricks-Methods of Sampling and Testing	ASTM C 67-73
Drain Tile-Specifications for	ASTM C 4-70

PLASTICS

Water Absorption of Plastic-Methods of Test for	ASTM D 570-72

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Asphalt Roll Roofing, Cap Sheets, and Shingle Methods of Testing	ASTM D 228-69
Bituminous Materials, Accelerated Test of Weathering Recommended Practice for	ASTM D 529-73
Felted and Woven Fabrics Saturated with Bituminous Substance for Use in Waterproofing and Roofing Methods of Sampling and Testing	ASTM D 146-72

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Fiber Building Boards-Method of Accelerated Aging	ASTM D1037-72
Gypsum and Gypsum Products, Chemical Analysis of Standard Methods for	ASTM C 471-72
Gypsum Board Products and Gypsum Partitions Tile or Block Physical Testing of-Standard Methods of	ASTM C 473-74
Gypsum Plasters and Gypsum Concrete, Physical Testing of Standard Methods for	ASTM C 472-73

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Coarse Aggregates, Resistance to Abrasion of Small Size, By use of the Los Angeles Abrasion Machine-test for	ASTM C 131-69
Fine and Coarse Aggregate, Sieve or Screen Analysis of Test for (A 37.8-1973)	ASTM C 136-71
Concrete, Obtaining and Testing Drilled Cores and Sawed Beams of	ASTM C 42-68
Concrete Test Specimens in the Laboratory-Making and Curing	ASTM C 192-69
Concrete, Molded Cylinder-Test for Compressive Strength of	ASTM C 39-72
Lightweight Insulating Concrete, Compressive Strength-Test for	ASTM C 495-69
Concrete Masonry Units-Sampling and Testing (A 84.1-1972)	ASTM C 140-70
Concrete Masonry Units, Hollow Load Baring Specifications for	ASTM C 90-70
Concrete Masonry Units, Solid Load Baring Specifications for (A 81.1-1972	ASTM C 145-71
Concrete, Hardened Portland Cement-Test for Cement Content of (A 1.22-1967	ASTM C 85-66
Concrete, Ready Mixed-Specification for (A 37.69-1970)	ASTM C 94-74a
Sands for Concrete-Test for Organic Impurities in	ASTM C 40-73

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Gypsum and Gypsum Products, Chemical Analysis of Standard Methods for	ASTM C 471-72
Gypsum Board Products and Gypsum Partition Tile or Block, Physical Testing of-Standard Methods for	ASTM C 473-74
Gypsum Concrete-Specifications for	ASTM C 317-70
Gypsum Form board-Specifications for	ASTM C 318-67
Gypsum Lath-Specifications for	ASTM C 37-69
Gypsum Plasters-Specifications for	ASTM C 28-68
Gypsum Plasters and Gypsum Concrete, Physical Testing of Standards Methods for	ASTM C 472-73
Gypsum Wallboard-Specifications for	ASTM C 36-73
Gypsum Sheathing Board-Specifications for	ASTM C 79-67
Insulating Board (Made from Cellulosic Fiber), Methods of Testing	ASTM C 209-72
Specifications for	ASTM C 208-72
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Aggregate for Masonry Mortar-Specifications for	ASTM C 144-70
Brick, Concrete Building-Specifications for	ASTM C 55-71
Brick-Methods of Testing and Sampling	ASTM C 67-73
Cement, Masonry-Specifications for	ASTM C 91-71
Ceramic Tile (Veneers)	(See Interior Finishes)
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Concrete Masonry Units	(See Concrete)
Glazed Units-Ceramic Glazed Structural Clay Facing Tile, Facing Bricks, and Solid Masonry Units-Specifications for	ASTM C 126-71
Lime and Limestone Products-Methods of Sampling, Inspection, Packing and Marking of	ASTM C 50-68
Lime, Hydrated and Quick-Methods of Physical Testing of	ASTM C 110-71
Lime, Hydraulic hydrate for structural Purposes Specifications for	ASTM C 141-67
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Mortars, Hydraulic Cement-Method of test for Tensile Strength of	ASTM C 109-72
Stone, Natural Building-Methods of Test for Absorption and Bulk Specific Gravity of	ASTM C 97-70
Stone, Natural Building-Method of Test for Compressive Strength of	ASTM C 170-70
Stone, Natural Building-Methods of Test for Modules of Ruptures of	ASTM C 99-70

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Tile, Clay Drain-Specification for	ASTM C 4-70

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Timber, Small Clear Specimens-Method of Testing	ASTM D 143-72
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-of Piles by Pressure Process-Standards for	AWPA C 3-74
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-With Creosote or Creosote Coal Tar Solution (for Above Ground Use)	AWPB LP 5-71
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-With Heavy Petroleum Solvent-Penta Solutions (For Above Ground Use)	AWPB LP 7-71
-With Heavy Petroleum Solvent-Penta Solution (For Ground Contact)	AWPB LP- 77-71
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-With Light Petroleum Solvent-Penta Solution (For Ground Contact)	AWPB LP- 33-71
-With Volatile Petroleum Solvent (LPG)-Penta Solution (For Above Ground Use)	AWPB LP- 4-71
-With Volatile Petroleum Solvent (LPG)-Penta Solution (For Ground Contact)	AWPB LP- 44-71
-With Water-Borne Preservatives (for Above) Ground Use)	AWPB LP- 2-71
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Felt-Methods of Testing	ASTM D 461-72
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Form board, Gypsum-Specifications for	ASTM C 318-67
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Nails, Brads, Staples and Spikes: Wire, Cut and Wrought-Federal Specifications for, with Amendment 2-1972	FF-N-105B-1971
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Mortar and Grout for Reinforced Masonry Specifications for	ASTM C 476-71
Mortar for Unit Masonry-Specifications for	ASTM C 270-73
Portland Cement-Lime Mortar for Brick Masonry Standard Specification for	BIA M 1-72
Portland Cement-Specifications for	(See Concrete)

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Alloy Steel Bolts, Quenched and Tempered, for Structural Steel Joints-Standard Specifications for	ASTM A 490-74
Alloy Steel Sheets and Strip, Regular Quality Hot-Rolled and Cold-Rolled Specifications for	ASTM A 506-73
Aluminum-Alloy Bars, Rods and Wire Standard Specifications for	ASTM B 211-74
Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubs Standard Specifications for	ASTM B 221-74
Aluminum-Alloy Die and Hand Forgings Standard Specifications for	ASTM B 247-74
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Asphalt Shingles Surfaced with Mineral Granules Specifications for	ASTM D 225-70
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Fiberboard Nail-Base Sheathing Standard Specifications for	ASTM D 2277-72
Fiber Insulation Board, Structural and Decorative Manufacturers Standards for Fiberboard Nail-Base Sheathing	ABPA-IB Spec. No. 2-72
Manufacturers Standards for Insulating Roof Deck	ABPA-IB Spec. No. 1-70
Method of Testing (Made From Cellulosic Fiber)	ASTM C 209-72
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Gypsum Sheathing Board Specifications for	ASTM C 79-67
Wood Shingles (Red Ceder, Tidewater, Red Cypress And California Redwood)	USDC CS 31-52

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American Softwood Lumber Standard	USDC PS 20-70
Fire Retardant Pressure Treatment, Plywood	AWPA C 27-74
Fire Retardant Pressure Treatment, Structural Lumber	AWPA C 20-74
Flooring, Laminated Block-Interim Industry Standards for	HPMA LF - 70
Glue Laminated Structural Lumber Standards	
Structural Glue Laminated Members and Laminations Before Gluing of Southern Pine Pacific Coast Douglas Fir and Western Hemlock By Pressure Process	AWPA C 28-73
Structural Glued Laminated Southern Pine	SPIB- 1974
Structural Glued Laminated Timber	USDC PS 56-73

Structural Glued Laminated Timber of Douglas Fir, Western Larch, Southern Pine and California Redwood	AITC 117-1974
Hardboard-Commercial Standard for	USDC PS 58-73
Method for Establishing Structural Grades of Lumber	ASTM D 245-74
Methods of Test for Durability Of Fire Retardant Treatment of Wood	ASTM D 2898-72
Particle board-Commercial Standard for	USDC CS 236-66
Piles, Round Timber Establishing Design Stresses for	ASTM D 2899-74
Piles, Timber, Round Specifications for	ASTM D 25-73
Plywood Construction and Industrial Product Standard for	USDC PS I- 74
Hardwood and Decorative Produce Standard for	USDC PS 51-71
Preservative Treatment for Pressure Process	AWPA C 9-72

Swimming Pools:
NSPI-National Swimming Pool Institute Recommendations for Residential Swimming Pools