

March 1964 Edition

RULES AND REGULATIONS FOR THE  
CONSTRUCTION, ALTERATION, REPAIR AND CONVERSION OF  
BUILDINGS FOR RESIDENTIAL PURPOSES

Specifically -

for single family residences, 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 foregoing; 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 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 Official as the result of 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 Official, means the officer or other designated authority charged with the administration and enforcement of this code, or his duly authorized representative.

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

Fire resistance rating, means the time in hours that the material or construction will withstand the standard fire exposure as determined by a fire test made in conformity with the "Standard Methods of Fire Tests of Building Construction and Materials." See NEFU-Building Code-55.

## MINIMUM PLANNING REQUIREMENTS

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 required windows. All windows in addition to these, and also windows in rooms other than habitable rooms, are considered nonrequired 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.

## B Habitable Rooms: Rooms designed to be used for living, sleeping, eating or cooking, not including basement recreation rooms.

- 1 Required light and ventilation in each habitable room includes windows, glass sliding doors and other exterior doors with glass area for light and 20% of opening for ventilation.
- 2 Total glass area: Not less than 10 percent of floor area of room.
- 3 Ventilating area: Not less than 5 percent of floor area of 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, the area of which shall be not less than 60% of the area of the wall separating these rooms.

## D Bathrooms and Water Closet Compartments

Provide ventilation by one of the following means:

- 1 Window or skylight:
  - a Windows or skylights located in exterior walls or roofs with the light and vent area not less than 3 square feet.
- 2 Vent in or near ceiling with continuous duct connection to outside air.
  - a Gravity exhaust, connect to louvered roof vent, minimum duct dimension, 3-1/2 inches, minimum area, 48 square inches.
  - b Mechanical exhaust, 1 CFM per square foot.

## E Open Easements

Provide light and ventilation by windows or doors, in exterior walls with both glazed and ventilating area not less than 2 percent of the floor area.

## F Utility Rooms

Utility Rooms, Room or area, enclosed or un-enclosed where the major housekeeping appliances, laundry facilities, and water heating device are located.

Ventilate Utility Rooms by:

- 1 Windows or doors, in exterior walls with ventilating area not less than 5 percent of floor area; or
- 2 Duct or ducts to outside area minimum total free area 2 percent of floor area.

## G Heater Rooms.

Heater Room, Enclosed room or area where the central heat producing device is located.

Ducts to be screened and to have total free area equal to 1 square inch for each 4000 B.t.u. per hour of input rating of all appliances in the enclosure when communicating directly with the outdoors or 1 square inch for each 2000 B.t.u. per hour of input rating of all appliances in the enclosure when ducts are used to the outdoors.

Other requirements pertaining to heating see NBFU pamphlet No. 54 for gas and NBFU pamphlet 31 for oil.

## H Crawl Spaces: Area beneath the bottom of floor joists and the ground below.

- 1 All crawl spaces under houses without basements and other unexcavated spaces under porches, breezeways and patios or other appendages shall be ventilated by openings in the foundation walls. Such spaces shall be provided with access panels so that they may be easily inspected. The vent openings shall have a net area not less than 2 square feet for each 100 linear feet of exterior wall, plus  $\frac{1}{3}$  square foot for each 100 square feet of exterior wall, plus  $\frac{1}{3}$  square foot for each 100 square feet of crawl space. Openings shall be arranged to provide cross ventilation and covered with corrosion resistant wire mesh, not less than  $\frac{1}{4}$  inch nor more than  $\frac{1}{2}$  inch in any dimension. No unventilated, inaccessible spaces shall be permitted except when used as a plenum chamber for heating systems approved by the Building Official.
- 2 In crawl spaces ground shall be covered with 4 inches of coarse granular material (sand, gravel, or stone) reasonably level over which a vapor barrier of minimum 4 mil polyethylene film or better (or material of equal perm rating) lapped 4 inches. Extend up foundation wall 6 inches. 2 inches of rough concrete can be used in lieu of the vapor barrier.

## I 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 generally are provided and the net area of the opening shall be  $\frac{1}{300}$  of the area of the ceiling below. When a  $\frac{3}{4}$ -inch slot is provided beneath the eaves, the ventilating area may be reduced to  $\frac{1}{900}$ .
- 3 For hip roofs there shall be provided a  $\frac{3}{4}$ -inch slot beneath the eaves and a sheet metal ventilator near the peak, in which case the net area of the inlet shall be  $\frac{1}{900}$ , and that of the outlet  $\frac{1}{1600}$  of the area of the ceiling below.
- 4 For flat roofs, 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  $\frac{1}{250}$  of the area of the ceiling below.

201 SPACE REQUIREMENTS

A Minimum room sizes. Except as otherwise provided by ordinance, rooms for the following uses shall meet the standards specified below.

	<u>Min. Area</u> <u>Square ft.</u>
1 Living, dining, cooking,	
a Living, dining and cooking when in one room (includes area occupied by equipment)	220
b Living, dining, when in one room	180
c Living only in one room, when dining space is provided in kitchen or separate room.	160
d Kitchen, cooking only (including area occupied by equipment).....	60
Provide at least 30 square feet additional area, usable for dining purposes when dining space is included in the kitchen.	
e Dining only	100
2 Sleeping:	
a Major bedroom.....	100
b When no bedroom exists and bed is located in living room, the area of living room shall be increased 30 square feet over minimum area requirement of 201-A-1c.	
3 Bathroom:	
Size: Adequate for water closet, lavatory, and tub or shower. The water closet may be located in a separate compartment adjoining the bathroom.	
B Additional Habitable Rooms. See 200-B.	
1 Minimum floor area 80 square feet.	
C Bedroom Closets.	
1 Provide each bedroom with at least one closet or wardrobe having a minimum:	
a Depth: 1 foot 10 inches.	
b Floor area: 5 square feet.	
c Height: 6 feet.	
D Space for Heating Units.	
1 Provide space within the building for heating unit or system.	
2 Provide clearances for maintenance and repair.	
3 Provide clearances for fire safety, determined by insulation of heater and combustibility of walls, floor, and ceiling. As required by National Board of Fire Underwriters' gas and oil equipment list.	

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 below the adjoining outside finish grade:  
Maximum, 3'-6".

- C **Areaways:** Minimum width measured perpendicular to face of building wall, 2 feet. Increased 1 inch for every inch of depth over 2 feet. Head of window, in all cases, to be at or above top of areawall.

### 203 PORCHES AND TERRACES

- A Minimum dimension from face of building where there are more than two risers between grade and first floor, 4 feet.
- B Guardrails to be provided when steps extend more than 16 inches above or below grade.
- C Provide guardrails on exterior steps of more than 2 risers to porches or terraces above or below grade.

### 204 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.
- 2 Attics. Provide access to attics by means of scuttles, minimum 24" x 24", disappearing or built-in stairways. Required scuttles not permitted in closet ceilings.
- 3 Crawl spaces. Provide access from outside not less than 30 inches wide and 40 inches high. Areaway to equal area of access.
- 4 Basements. Provide direct access to outside by a door, or a window having an openable area at least 2 feet wide and 30 inches high, stool not more than 3 feet above floor. Where basement stairway is within 5 feet of exterior entrance door this will constitute direct access.

#### 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 opening directly into a kitchen.
  - b Bathroom providing sole access to any other room.
  - c Bathroom in the basement as the only one serving a living unit.

### 205 CEILING HEIGHTS

#### A Minimum Ceiling Heights

- 1 Basements: 7'-0" clear under joists.
- 2 Main floor of any living unit: 8'-0" clear for at least 75 percent of the total floor area.
- 3 Areas other than main floor: 7'-6" clear; under sloping roofs, 7'-6" for not less than 50 percent of floor area having 5 feet or more headroom.

206 DOORS

## A Exterior Doors

- 1 Minimum sizes
  - a Main entrance doors: 2'-10" wide.
  - b Service entrance doors: 2'-8" wide.
  - c Height: 6'-8".

## 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'-4" wide by 6'-6" high.
  - b Bathrooms: 2'-4" wide by 6'-6" high.
  - c Powder rooms: 2'-0" wide and 6'-6" high.

207 STAIRWAYS - See 307-K

## A Design and Location:

- 1 Headroom: Continuous clear headroom measured vertically from front edge of tread to a line parallel with stair run, minimum 6'-6".
- 2 Width:
  - a Main stairs: Minimum, 2'-9" clear of handrail.
  - b Basement stairs: Minimum, 2'-6" clear of handrail.
- 3 Treads: Minimum width, 9 $\frac{1}{2}$  inches, clear of tread above.
- 4 Rise: 8 inches maximum. All riser heights to be same in any one story.
- 5 Winders: Tread width 15 inches from converging end shall at least equal tread width on straight stair run unless a width of tread at converging end is 6 inches or more.
- 6 Landings: Width equal to that of stair.
- 7 Handrail: Install continuous handrail on at least one side of each run on all stairways extending at grasp level on lower floor or landing to grasp level on upper floor or landing without interruption by any means necessitating a change of handhold while traversing said stairway run. The grasp level shall remain a constant height paralleling the stair run and any side directional change shall not be greater than thirty (30) degrees from the direction of the stair run viewed vertically. Maximum width and depth of handrails shall be 2 1/2 inches, unless shaped to provide a secure handhold.
- 8 Guardrail: Provide guardrail around all stairways of more than 2 risers.

208 FLOOR AREAS AND FIRE WALLS

Provide one hour fire-resistive wall and/or ceiling without openings between living units of duplexes and row houses and between tiers of living units of other multiple family dwellings.

209 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 15 feet.

210 FIRE LIMITS

Within the fire limits residential buildings shall comply with the requirements of ordinances relating to construction within such limits.

## MINIMUM CONSTRUCTION REQUIREMENTS

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 the 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 proven 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 support safely their own weight and all other loads and forces to which they may be subjected.

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

a Ceiling or attic floor joists, no storage, none.

Attic floors, limited storage only, 20 lbs. per square foot.  
All other floors 40 lbs. per square foot.

b Girders: Dead loads of floor, partition and ceiling construction plus assumed live loads of floors plus combined dead and live loads of roof.

c Roofs, either pitched or flat: 20 lbs. per sq. ft. normal to the roof surface.

3 Wind loads

a On vertical faces: 20 lbs. per sq. ft. horizontally, any direction.

b Roofs or parts with slopes greater than 30 degrees: 20 lbs. per sq. ft. acting inward normal to surface, on windward slope only.

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

**C Special Conditions and Tests.**

When special conditions exist or arise during construction, which necessitate additional precautions, the Building Official may require work in excess of these requirements.

**D Vapor Barriers****1 General**

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

- 1 55 pounds per 108 square feet of smooth roofing.
- 2 Foil or foil backed board.
- 3 Duplex laminated papers 30-60-30.
- 4 Duplex papers coated w/metal oxides.
- 5 Insulation backup paper-treated.
- 6 Insulating gypsum wallboard.

- 2 **Ceiling:** Where unheated spaces above, install independent vapor barrier or one integral with insulating material immediately above ceiling interior finish.
- 3 **Sidewalls:** When exterior coefficient of heat transmission is not more than 0.16 B.t.u. per square foot, per degree temperature difference. Install immediately back of interior wall finish.
- 4 **Crawl Space:** See Section 200-H.
- 5 Vapor barrier to be applied tightly against any electrical outlets, registers or framed openings.

**E Thermal Insulations****1 Unheated crawl spaces**

a **Insulation of floors (anyone of the following):**

- 1 Foil reflective type on both sides between joists with 2 inches air space maintained between bottom of floor and foil. Install so that there are no openings at ends of joists.
- 2  $\frac{1}{2}$  inch rigid insulation board fastened to bottom of floor joists. Install so that there are no openings at ends of joists.
- 3 Any insulation better than that above. i.e. 1 inch blanket.

b **Insulation of ducts and pipes located in crawl space.**

- 1 Warm air ducts and plenum shall be covered with insulation material, minimum thickness 2 inches.
- 2 Return air ducts shall be covered with insulation material minimum thickness 1 inch.
- 3 Sewer and water supply shall be covered with insulation material, minimum thickness 1 inch.

**2 Heated Crawl Spaces**

a Install insulation minimum 1 inch thick, on all surfaces of foundation walls that are adjacent to crawl space.

b Insulation shall be waterproof and non-capillary, inorganic, and termite and fungi resistant.

c Insulation shall be installed to extend up to underside of sub-flooring, to extend down to 6 inches above ground and to be fastened to foundation walls.

**3 Insulation for exterior perimeters of concrete floor slabs**

a At least 1 inch thickness at edges.

b Where heating ducts in floor increase to  $1\frac{1}{2}$  inches at slab edge.

- c Extend insulation down along inside face of foundation wall for a distance of at least 18 inches.
- d Insulation material requirements shall be inorganic, waterproof, and non-capillary, or organic, termite and fungi resistant and saturated with asphalt to be waterproof.
- 4 Ceiling Insulation
  - a Ceilings shall be insulated to provide a U value of 0.15 or less for ceilings without heating panels and 0.06 or less for ceilings with heating panels.
  - b Foil of equivalent rating acceptable.
- 5 Heating Requirements
  - a Provide heating unit capable of heating dwelling from minus 10 degrees to 72 degrees Fahrenheit @ 15 mph outside wind with heat loss calculated in accord with American Society of Heating and Ventilating Engineers standards.
  - b Heating unit shall be constructed and installed in strict accord with the applicable current published standards, requirements and recommendations of the National Fire Protective Association, National Board of Fire Underwriters, American Standards Association, and the American Society of Mechanical Engineers. Labeling and listing by following shall be accepted as conforming with equipment design standards; Underwriters Laboratories, Inc., American Gas Association, or American Society of Mechanical Engineers.
  - c Clearance shall be provided for all heating equipment for access, repair and maintenance.
  - d Smoke pipes where extreme heat is hazardous to human occupancy shall be insulated from furnace to chimney with a minimum of  $\frac{1}{4}$  inch of asbestos material.
  - e Insulation of all heat producing devices shall be such that temperature rise of surrounding frame construction will not exceed 16C degrees Fahrenheit.

### 301 FOUNDATIONS

- A Walls and Piers
  - 1 Extend to solid ground. Do not place footing on filled ground.
  - 2 Bottom of footings: Not less than 3'-6" below finished grade, except where placed on solid rock.
  - 3 Protect against freezing. No concrete shall be placed on frozen ground.
- B Crawl Spaces
  - 1 Ground level at least 24 inches below bottom of floor joists and girders. Ground under dwelling to be approximately level.
  - 2 Remove all debris, sod, tree stumps and other organic matter within area occupied by dwelling.

### 302 GRADING

- A Grading or drainage or both shall be performed so that water will drain away from the building on all sides and off the lot in a manner which will provide reasonable freedom from erosion and pocketed surface water. Construction such as walks, driveways and retaining walls shall be installed so that they will not interfere with drainage.

303 MASONRY MATERIALS

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

## A Cement

- 1 Portland Cement. See ASTM C 150-61.
- 2 Prepared masonry cement for mortar. See ASTM C 91-55T.
- 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 laboratory.
- 4 Portland Cement, Air Entraining. See ASTM C 175-61.
- 5 Portland Blast-Furnace Slag Cement. See ASTM C 205-61T.

## B Aggregate

- 1 Sand: Clean, hard and sharp, free from harmful materials, graded according to intended use.
  - a Concrete Aggregate - See ASTM C33-61T.
  - b Masonry Mortar Aggregate - See ASTM C144-52T.
- 2 Coarse aggregate (crushed stone or gravel): Hard, strong crystalline rock, properly graded, clean and free from shale or other soft material. See ASTM C 33-61T.
- 3 Lightweight aggregate for structural concrete. See ASTM C 330-60T.

## C Water

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

## D Lime

- 1 Hydrated lime. See ASTM C 207-49.
- 2 Quick lime, slake thoroughly. See ASTM C5-26.

E Mortar. See ASTM C270-61T.

## F Brick

- 1 Face Brick: See ASTM C216-60.
- 2 Common Brick: See ASTM C62-58.
  - 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 FS-HH-B-671d.
- 4 Concrete brick. See ASTM C 55-52.
- 5 Second-hand 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 units.

## G Structural Hollow Clay Tile

- 1 Sound, kiln-burned units, free from defects that would impair the strength or permanence of the construction.

- 2 Load-bearing tile: See ASTM C34-57.
- 3 Non-load-bearing tile: See ASTM C56-57.
- 4 Glazed or unglazed facing tile: See ASTM C126-61T.

H Concrete Masonry Unit. See ASTM C 129-52, ASTM C 145-52 and ASTM C 90-52. Sound and thoroughly cured.

I Stone

- 1 Rubble and cut stone: Good quality building stone.
- 2 Cast stone. See ACI 704-44.

J Flue Lining

Glazed fire clay and vitrified tile, free from cracks or other defects.

K Glass Block. See NDFU-Bldg. Code-55.

304 CONCRETE WORK

A General

- 1 Materials: See 303.
- 2 Water content, including moisture in the aggregate, shall not exceed 7 gallons of water per bag of cement (except as noted).
- 3 Maximum slump: 6 inches (except as noted).
- 4 Calcium chloride may be used as an accelerator, but shall not exceed 2 lbs. per bag of cement, and shall be introduced in solution as part of the mixing water. Calcium chloride shall conform to ASTM D 98-59.
- 5 All concrete shall be air-entrained, 6%  $\pm$  1%. Air entraining admixtures shall conform to ASTM C 260-6CT.

B Quality of Concrete

- 1 Job Mix: Minimum cement proportions, by volume
  - a 1 part portland cement, 2 1/2 parts sand, 3 parts coarse aggregate (3/4 to 1 inch maximum size).
- 2 Commercial Ready-Mix. See ASTM C 94-61.
  - a Minimum portland cement content: 5 bags/cu.yd.
  - b Mixing period shall not extend beyond 1 1/2 hours per batch.
- 3 Exposed Concrete (driveways, sidewalks, curbs and gutters, patios, stoops, etc.)
  - a Minimum portland cement content: 6 bags/cu.yd., for 3/4 inch to 1 inch maximum size aggregate.
  - b Maximum slump: 4 inches.
  - c Maximum water content, including moisture in the aggregate: 6 gallons per bag of cement.
- 4 Hardened Concrete
  - a To determine the quality of hardened concrete, the water-cement ratio for a tested compressive strength shall be found in table 5, "Compressive Strength of Concrete for Various Water-Cement Ratios" of "Recommended Practice for Selecting Proportions for Concrete" (A.C.I. 613-54) published in the Proceedings of the American Concrete Institute, Vol. 51. The water-cement ratio thus established will determine whether or not the concrete meets the code requirements.

**C Reinforced Concrete**

- 1 The design and construction of reinforced concrete shall be in accordance with the provisions of the "Building Code Requirements for Reinforced Concrete" (ACI 318-63).

**D 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.

**E Placing**

- 1 Place continuously unless otherwise allowed by Building Official.
- 2 When not placed continuously, clean, score and wet the top surface of the concrete before continuing. Key all vertical joints.
- 3 Spade and rod thoroughly.

**F Curing and Protection**

- 1 Concrete shall be protected from drying for a minimum of 6 days by use of a membrane curing compound (ASTM C 309-58) burlap kept continuously wet, heavy waterproof paper (ASTM C 171-60T), or other approved method.
- 2 Concrete shall be maintained at temperatures of not less than:
  - a 70° for 3 days or 50° for 5 days for normal concrete.
  - b 70° for 2 days or 50° for 3 days for high early strength concretes.

**G Loading**

Allow sufficient time for strength of concrete to develop before subjecting to loads or traffic.

**H Footings**

- 1 General:
  - a Design for proper distribution of superimposed loads.
  - b Material: cast-in-place concrete.
  - c Bear on solid, unfilled ground.
  - 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 pounds per square foot.) For soils of lesser bearing capacity or where unusual loading conditions exist, larger footings will be required.
- 2 Wall Footings:
  - a Minimum dimensions for spread footings shall be 8 inches deep by 18 inches wide, except that masonry veneer on frame and solid masonry walls shall be 10 inches deep by 20 inches wide.

- 3 Pier, Post and Column Footings
  - a Dwellings: Minimum area 6.25 square feet; thickness minimum 12 inches. (Not permitted under exterior walls.)
- 4 Chimney Footings:
  - a Dwellings: Minimum thickness, 12 inches; minimum projection each side, 6 inches.
  - b Pour integral with wall footing when chimney occurs in outside wall or inside bearing wall.
- I Footing Drain Tile. See ASTM C4-55 (54T)
  - 1 Required outside or inside of basement footings, (if inside, at least 2 feet from footings). Minimum diameter 3 inches.
  - 2 Cover tile with 8 inches gravel, or crushed stone, (95 percent) passing 3/4 inch mesh, less than 5 percent passing 3/8 inch mesh.
  - 3 Connect with tight-joint glazed tile to storm sewer, dry well, or other outlet.
- J Concrete Foundation Walls Cast in Place. (For masonry unit foundation walls, see 3C5-E)
  - 1 General
    - a Materials. See 3C3.
    - b Walls supporting frame construction: Extend concrete not less than 6 inches above adjoining outside finished grade.
    - c Walls supporting masonry veneered wood frame: Extend foundation so that wood portion of wall is not less than 6 inches above outside finished grade.
  - 2 Minimum thickness:
    - a Not less than that of wall supported.
    - b Supporting porch slabs, steps and one-story wood frame structures without basement, minimum 8 inches.
    - c Interior walls not subject to lateral pressure, 6 inches minimum.
    - d All other walls 8 inches minimum.
  - 3 Girder pockets. Provide 4 inch end bearing on main wall for girder. Form pocket for wood girder 1 inch wider than girder.
  - 4 Sill anchor bolts to be installed:
    - a Diameter, 1/2 inch minimum.
    - b Minimum length, 10 inches.
    - c Provide washer under nuts on bolts.
    - d Spacing, not more than 8 feet on center; minimum, 2 bolts in each piece.
  - 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 1/2 inch round hooked bars 4 feet long in main wall, two near top and two near bottom of attached wall.
  - 6 Chimney foundations: Start at level of lowest adjacent foundation wall footings.
  - 7 If special or unforeseen soil conditions warrant, the Building Official may require either reinforcement of wall or increased thickness.
  - 8 Dampproofing and waterproofing. See 3C5-C.

## K Concrete Floor Slabs on Ground.

No floor slab to be placed in water or on a soft wet subgrade. Basements must be pumped dry at least twenty-four hours before floor is poured.

- 1 Construction:
  - a Fill under slabs: Gravel, sand, screenings, or crushed rock, minimum thickness 4 inches. Earth underfill thoroughly leveled and free from vegetable matter, thoroughly tamped.
  - b Wire mesh reinforcing: When required, minimum weight 40 pounds per 100 square feet.
  - c Bottom of slab: Not lower than top of footing. Provide at least 4 inch bearing on footing.
- 2 Cement floor finish:
  - a Finish basement slab with steel trowel.
  - b Integral finish on concrete slab.
- 3 Slabs on ground used as a base for floors or as a finish floor in habitable rooms.
  - a Minimum thickness, 4 inches.
  - b Provide membrane water proofing directly under slab, at least 4 mil polyethaline film, lapped 4 inches.
  - c Provide perimeter insulation. Insulating material shall be non-capillary waterproof not subject to deterioration by termite or fungi.
- 4 Basement floor slabs: Minimum thickness, 4 inches.
- 5 Garage floor slabs: See 315 A or B.
- 6 Terrace and porch floor slabs:
  - a Minimum thickness, 4 inches.
  - b If reinforced, fill may be omitted.
  - c Install metal flashing between slabs and all wood construction. See 311-F.
- 7 Slabs on ground used to support interior bearing walls or partitions: Thicken to at least 10 inches for a width of 20 inches.

## L Exterior Wood Stairs

Wood construction shall be at least 2 inches above walk or finished grade.

## 305 MASONRY WORK

### A General

- 1 Materials. See 303.
- 2 Mortar:
  - a Masonry below grade, portland cement mortar; 1 part portland cement, 3 parts sand by volume. Lime, not more than 25 percent of the cement by volume, may be added.
  - b All other masonry:
    - 1 Portland cement mortar. See (2a) above.
    - 2 Cement-lime mortar: 1 part portland cement, 1 part lime putty, 6 parts sand by volume.

- 3 Prepared masonry cement mortars; 1 part masonry cement, 3 parts sand by volume; add no materials other than sand and water.
- c Retempering of mortar: Mortar that has stiffened on the mortar board due to evaporation should be rettempered 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  $5/8$  inch. Joints for decorative stone work may be increased  $1/4$  inch.
- b Solid masonry units: Fill joints solid.
- c Hollow masonry units: No through mortar joints.
- d Fill all joints solid 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.
- 2 Bonding with metal ties.  
The facing and backing shall be bonded with corrosion-resistant metal ties conforming to requirements of Section 305-G-4 for cavity walls.  
There shall be one metal tie for not more than each  $4-1/2$  square feet of wall area. Ties in alternate courses shall be staggered. The maximum vertical distance between ties shall not exceed 18 inches, and the horizontal distance shall not exceed 36 inches.  
Walls so bonded shall conform to the thickness (excluding cavity), height and mortar requirements for cavity walls.
- b Masonry Walls of Hollow Units  
Where two or more hollow units are used to make up the thickness of a wall, bonding shall be in accord with recommendations of American Standard Building Code Requirements for Masonry M. P. No. 211 (7-15-1954) Section 7.2.
- c Stone Walls
- 1 Ashlar Masonry:  
Ashlar Masonry, bond stones uniformly distributed shall be provided to the extent of not less than 10 percent of exposed faces.
- 2 Rubble Stone Masonry:  
Rubble stone masonry 24 inches or less in thickness shall have bond stones with a maximum spacing of 3 feet vertically and 3 feet horizontally, and if the masonry is of greater thickness than 24 inches, shall have 1 bond stone for each 6 square feet of wall surface on both sides.
- d Intersecting concrete and masonry walls shall be bonded together in an approved manner.

- 5 Closed cell hollow units: Use for rough openings, corners, and wall intersection. Filling exposed ends of cells not acceptable.
- 6 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 American Standard Building Code Requirements for Masonry M P-211 shall be considered acceptable practice.)
- 7 Loading. Allow sufficient time for strength of masonry to develop before subjecting to loads.
- 8 Wetting Clay Masonry Units: All clay brick having absorption rates (determined in accordance with ASTM Specification C67-60) in excess of 0.025 oz. per sq. in. per min. shall be wetted sufficiently so that the rate of absorption does not exceed this amount.

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

- 1 General
  - a Materials. See 303.
  - b Walls supporting wood frame construction: extend not less than 6 inches above adjoining outside finish grade.
  - c Walls supporting masonry veneered wood frame: Extend foundation so that wood portion of wall is not less than 6 inches above outside finish grade.
  - d Walls of hollow masonry units: Cap with minimum of 4 inches 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 on minimum of 4 inches 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 their footings shall extend below the level of frost action (42 inches) and shall be not less in thickness than 10 inches.
  - b Foundation walls of coursed stone shall be at least 16 inches in thickness.
  - c Solid foundation walls of solid masonry units that do not extend more than 5 feet below the adjacent finished ground level may be 8 inches in thickness. The combined height of the 8 inch foundation wall and the wall supported shall not exceed 30 feet.
- 3 Girder pockets: Provide 4-inch end bearing for girder. For wood girder, leave  $\frac{1}{2}$  inch space each side.
- 4 Sill anchor bolts to be installed.
  - a Diameter:  $\frac{1}{2}$  inch minimum.
  - b Minimum length in masonry unit walls: 15 inches.
  - c Provide washer under nuts on bolts.
  - d Spacing: not more than 8 feet on center, minimum 2 bolts in each piece.
- 5 Anchorage for intersecting walls and slabs: Provide anchor-

for porch and terrace slabs, concrete or masonry steps and areawalls, which adjoin foundation walls.

- 6 Chimney foundations: Start at a level of lowest adjacent foundation wall footings.
- 7 If special or unforeseen soil conditions warrant, the Building Official may require either reinforcement of wall or increased thickness.

#### C Dampproofing and Waterproofing.

- 1 Dampproof basement or cellar walls on exterior from finish grade to outside edge of footing:
  - a Masonry unit walls: Apply 1/2 inch 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 the Building Official.
  - b Concrete walls cast in place: Apply at least one heavy coat of undiluted hot tar, asphalt or compound acceptable to the Building Official.

#### D Piers.

- 1 Piers only acceptable for open porches and car ports.
- 2 Materials: Masonry units or cast-in-place concrete. See 303.
- 3 Minimum sizes in inches:
  - a Masonry: 12" x 12".
  - b Plain concrete: 10" x 10" or 12 inch round.
- 4 Minimum height above grade, 6 inches.
- 5 When of hollow masonry units, cap with at least 4 inches solid masonry or concrete. See 305-B-1-e.
- 6 Sill anchor bolts or dowels to be installed.
- 7 Piers shall be poured to proper grade so that required shims shall not exceed  $\frac{1}{8}$  inch. Only metal plates and asbestos shims shall be used.

#### E Exterior Walls Above Grade:

- 1 Materials: All materials shall meet the requirements of Section 303.
- 2 Allowable Heights and Thicknesses:
  - a In residence buildings not more than two stories in height, walls other than coursed or rough or random rubble stone walls, may be of 8 inch thickness when not over 30 feet in height from grade to ridge at gable ends, and when the roof is designed to impart no lateral or horizontal thrust. When the roof imparts a horizontal thrust such walls shall have a minimum thickness of 12 inches.
  - b Rough or random or coursed rubble stone walls shall be not less than 16 inches in thickness.
  - c Hollow walls of masonry units shall not exceed 30 feet in height from grade to ridge of gable ends except that 10 inch cavity walls shall not exceed 25 feet in height above the support of such walls. The facing and backing shall each have a thickness of at least a nominal 4 inches and the cavity shall be not less than 2 inches (actual) nor more than 3 inches in width. The facing and backing of cavity walls shall be bonded with metal ties. (See Sec. 305-A-4-a-2.)

- d Walls of 1 story buildings may be of 6 inch thickness when not over 10 feet in height when solid structural clay masonry units are used, or 9 feet in height for hollow structural clay masonry units, except than an allowance of an additional 6 feet is permitted for gables.
- 3 Maximum height for 8 inch thickness: 22 feet from grade to eaves; or 30 feet from grade to ridge in gable ends. For greater heights, minimum thickness 12 inches except top 22 feet.
- 4 Backing, when used, solid or hollow masonry units, minimum thickness:
- a Bonded to facing, 4 inches. See 305-A-4-a 1 and 2.
  - b Tied to facing with sheet metal ties, 8 inches.
- 5 Furring when interior finish is applied: Not less than 1 inch wood strips. Spacing as permitted for interior finish. See 313. Bituminous waterproofing materials on masonry not acceptable for plaster base. Install horizontal furrer strips at ceiling and floor to form fire stops and prevent convection.
- 6 Lintels. Size to be determined by span in each case. No concentrated loads over nonreinforced lintels.
- a Lintels may be:
    - 1 Precast concrete, reinforced brick and reinforced structural hollow clay tile.
    - 2 Stone.
    - 3 Masonry arch.
    - 4 Steel. See ASTM A7-56T.
  - b Support on not less than 4 inches of solid masonry.
- 7 Rafter plate anchor bolts to be installed.
- a Diameter, 1/2 inch minimum.
  - b Minimum length in masonry unit walls, 15 inches; poured concrete walls, 10 inches.
  - c In masonry walls, washer and 3 inch square plate on bolts.
  - d Spacing, not more than 8 feet on center.
- 8 Radiator recesses:
- a Construct at time wall is built.
  - b Maximum recess depth, 4 inches in 8 inch walls, 8 inches in 12 inch walls.
  - c Back and sides of recess to be waterproofed and insulated.
  - d Width under windows not greater than rough opening.
- 9 Vertical chases:
- a Construct at time wall is built.
  - b Maximum length for chases where net wall thickness is 8 inches or less, 4 feet.
  - c Maximum chase depth, 4 inches.
  - d Back and sides of chase to be plastered with one-half inch of Portland cement mortar.
- 10 Horizontal chases:
- a Not acceptable unless wall thickness is at least 4 inches greater than thickness required under 305-E-2.
  - b Maximum depth, 4 inches.

## F Masonry Veneer.

- 1 Minimum thickness of material:
 

a Architectural terra cotta (cellular)	3 inches
b Architectural terra cotta (flat slabs)	1 1/4 inches
c Brick	2 inches
d Stone (natural)	2 inches
e Stone (cast artificial)	1 1/2 inches
f Clay tile (structural)	1 3/4 inches
g Clay tile (flat slab)	1/4-1 inch
h Marble slabs	1 inch
i Precast stone facing	5/8 inch
j Structural glass	11/32 inch
- 2 Masonry veneered wood frame construction. Veneer applied over sheathing with air space between.
  - a Air space: 1-inch minimum between masonry veneer and sheathing.
  - b Base flashing: Copper extending over top of foundation wall from outside face of wall and not less than 12 inches up on sheathing.
  - c Apply water resistant building paper or saturated asphalt felt over sheathing. Lap base flashing at least 4 inches.
  - d Bonding: Corrosion-resisting metal ties spaced not more than 15 inches vertically and 32 inches on center horizontally: When other than wood board sheathing is used, secure ties through to studs with corrosion-resisting nails of length sufficient to penetrate wood at least 1 inch.
  - e Lintels. Size to be determined by materials and span in each case. Bearing, at least 4 inches. Arches permitted.
  - f Weep Holes. See 305-G-6.

## G Cavity Walls.

- 1 The minimum thickness of the inner and outer wythes of cavity walls shall not be less than a nominal 4 inches, and the nominal out to out dimension of the wall shall not be less than 10 inches.
- 2 The maximum height of 10-inch cavity walls and the width of the cavity shall conform to the requirements of Section 305-E-2-c.
- 3 All masonry units shall be laid in a full head and bed mortar joint. The mortar used in cavity wall construction shall conform to the requirements of "Portland Cement Mortar" or "Cement-Lime Mortar". (See Section 305-A-2-a and b.)
- 4 The facing and backing of cavity walls shall be bonded with 3/16-inch diameter non-corrosive steel rods or metal ties of equivalent stiffness embedded in the horizontal joints. There shall be one metal tie for not more than each 4½ square feet of wall area. Ties in alternate courses shall be staggered, the maximum vertical distance between ties shall not exceed 18 inches, and the maximum horizontal distance shall not exceed 36 inches. Rods or ties bent to rectangular shape shall be used with hollow masonry units laid with the cells vertical; in other walls the ends of ties shall be bent to 90-degree angles to provide hooks not less than 2 inches long. Additional bonding ties shall be provided at all openings, spaced not more than 3 feet apart around the perimeter

- and within 12 inches of all openings.
- 5 Non-corrodible flashing shall be placed over the top of all openings, at window sills and at the bottom of the cavity.
  - 6 Weep holes shall be provided in the head joints in the first course immediately above all flashing. The weep holes shall be spaced not more than 24 inches on centers and every effort shall be made to keep the cavity clean of mortar droppings. When wicks of 1/4 inch fiberglass rope or similar materials are used, weep holes shall be spaced not more than 24 inches on centers.
  - 7 Furring: See 305-E-5.

#### H Interior Masonry Walls.

- 1 Material: Masonry or cast-in-place concrete.
- 2 Pipe recesses: Construct at time walls are built.
- 3 Party and fire walls:
  - a Minimum thickness: Cast-in-place concrete, 6 inches; masonry units 8 inches. Chases or recesses not permitted.
  - b Flat roofs: Extend above roof, flash and cap with stone, concrete, vitrified tile, or terra cotta.
  - c Under pitched roofs: Build masonry solid to underside of roof sheathing unless carried above roof.
- 4 Bearing partitions:
  - a Minimum thickness of plain concrete or unit masonry wall shall be not less than a nominal 6 inches.
  - b Sections of walls with distance between openings 2 feet or less: Solid masonry units or hollow units filled with concrete.
  - c Lintels: Steel, reinforced concrete, reinforced structural clay masonry or masonry arches. Not less than 4 inches bearing upon solid masonry at least 4 inches thick.
  - d Joist bearings: Solid masonry at least 4 inches thick.
  - e Girder bearing: Solid masonry at least 8 inches thick.
- 5 Nonbearing partitions:
  - a Minimum thickness, 3 inches.
  - b Lintels: Steel, reinforced concrete or masonry, or masonry arches.

#### I Chimneys

- 1 Provide masonry chimney.
  - a Separate flue required for each fireplace.
  - b Separate flue required for each appliance fired with natural-draft oil burner. Separate flues required for all other equipment, depending upon sustained chimney draft for proper operation, unless combined flue is specifically approved by the Building Official.
- 2 Materials: Solid masonry; footing concrete cast-in-place.
- 3 Effective flue area: At least as recommended by the manufacturer of equipment connected to chimney and at least equal to area of outlet (smoke or vent) of equipment connected to it, minimum diameter for house heating flue, 8 inches. For fireplaces, effective area not less than 1/10 of fireplace opening.

- 4 Chimney linings, withes and walls:
  - 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 flues may be grouped without a wythe of masonry between them provided the joints of the linings are staggered at least 7 inches.
  - c Withes separating flues or groups of flues with linings not staggered, 3-3/4 inches minimum thickness.
  - d Walls, minimum thickness, 3-3/4 inches in addition to lining.
- 5 Height of chimney: As recommended by equipment manufacturer. Chimney shall extend at least 2 feet above highest ridge or point of roof where it passes through the roof of a building and not less than 2 feet above the highest ridge within 15 feet of the chimney.
- 6 Cap chimney to form wash from flue to outside edge, minimum thickness, 2 inches.
- 7 Metal thimbles and clean-out doors to be built in at the time chimney is constructed. Clean-out doors not necessary for approved prefabricated chimneys.

#### J Fireplaces.

- 1 Smoke chamber and damper required in all fireplaces.
- 2 Minimum wall thickness: 8 inches 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 inch fire brick or other material acceptable to Building Official.
- 5 Hearth:
  - a Support independently on masonry or concrete.
  - b Projection from chimney breast, at least 16 inches.
  - c Width: At least 8 inches wider than fireplace opening on each side.
  - d Material, incombustible.
  - e Combined thickness of hearth and support, 6 inches.
- 6 Fireplace opening lintel: use brick arch, concrete, stone, steel or reinforced clay masonry.
- 7 Facing: masonry, no combustible material closer than 3 1/2 inches to fireplace opening.

#### K Glass Block.

- 1 May not use as load-bearing units.
- 2 Maximum size of unsubdivided panel: area 144 square feet; length 25 feet; height 20 feet.
- 3 Provide for expansion.

306 STRUCTURAL STEEL AND IRON**A Structural Steel Construction**

- 1 The design, fabrication and erection of structural steel for buildings 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, 1963.
- 2 Bearing: On walls, minimum, 4 inches.
- 3 Bearing Plates:
  - a Design to distribute load, minimum thickness, 5/16 inch.
  - b Bed in portland cement mortar.
  - c Plates may be omitted under wideflange type steel beams if width of flange provides sufficient bearing area so that allowable compressive stress of supporting material is not exceeded.

**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.
- 2 All individual structural members and assembled panels of light gage cold-formed steel construction, except where fabricated of approved corrosion-resistive steel or of steel having a corrosion-resistive metallic or other approved coating, shall be protected against corrosion with an acceptable shop coat of paint, enamel, or other approved protection.

**C Open Web Steel Joist Construction**

- 1 The design, fabrication and erection of open web steel joist construction shall comply with the following specifications:
  - a "Standard Specifications for Open Web Steel Joists, J-Series" adopted by the Steel Joist Institute, effective October 1, 1963.
  - b "Tentative Specifications for Open Web Steel Joists H-Series" adopted by the Steel Joist Institute, effective October 1, 1963.
  - c "Standard Specifications for Open Web Steel Joists, Longspan or LA-Series" adopted by the American Institute of Steel Construction and the Steel Joist Institute, July 1, 1961.
  - d "Standard Specifications for Open Web Steel Joists, High Strength Longspan or LH-Series," adopted by the American Institute of Steel Construction and the Steel Joist Institute, June 21, 1962.

**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 American Welding Society, April 15, 1946.

307 WOOD CONSTRUCTION

## A Lumber

- 1 Stress-Grade Lumber: Except as otherwise specifically provided in this code, "National Design Specifications for Stress Grade Lumber and Its Fastenings NLMA - 1962 Edition" shall be accepted as good engineering practice covering design and use of stress-grade lumber, of glue-laminated timber 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, species of veneer, and conformance with the appropriate U. S. Commercial Standard.
- 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 net dimensions (actual size) and not on the nominal sizes.
  - 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 glue-laminated timber, 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 and 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. If rough sizes or finished sizes greater or smaller than the American Lumber Standard dressed sizes are to be used, the actual sizes shall be specified.

## B Framing - General.

Except as specifically provided for herein, compliance with Wood Construction Data Series NLMA 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.
- 2 Framing at chimneys.
  - a Bearing of framing members on chimney masonry not acceptable. Piers built integral with chimney may be used for girder bearing provided end of girder is at least 2 inches away from chimney masonry.
  - b Framing members: Not closer than 2 inches to chimney masonry. Space may be 1/2 inch if asbestos board 1/4 inch thick and same width as framing members is used between masonry and framing.

- 3 Firestopping:
  - a Firestop all furring, partitions and outside stud walls at level of each floor or ceiling, and at juncture of roof rafters and wall.
  - b Wood or masonry, tightly fitted, or other methods acceptable to Building Official may be used.
- C Floor Framing.
  - 1 Columns and posts:
    - a Structural steel or iron. See 306. Shims, metal - loose shims not acceptable. Maximum of 2-1/4 inches.
    - b Wood posts: Bear on concrete base resting on footing, top of base 3 inches above finish floor; securely fasten top of post to girder. If necessary for bearing, install bearing plate or cap secured to both post and girder.
  - 2 Girders:
    - a Material: Structural steel, reinforced concrete, solid wood, or built-up wood.
    - 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.
    - d Air space each side of wood girders framing into masonry, 1/2 inch.
  - 3 Sills:

Level and grout with portland cement mortar. Wood shingles, chips, or similar material are not acceptable for permanent shims.
  - 4 Maximum spans for wood joists:

Except for stress-grade lumber of an assured quality, designed in accordance with the National Design Specifications, NLMA, all wood joist shall be limited as follows:

    - a Lumber, properly identified as to species and grade by an agency approved by the American Lumber Standards Committee, shall be limited to the spans given in the NLMA publication "Maximum Spans for Joists and Rafters".
    - b The table is for utility grade Douglas Fir. For all other grades use "Maximum Spans for Joists and Rafters".

FLOOR JOISTS

<u>Nominal Size Inches</u>	<u>Spacing C to C Inches</u>	<u>40 lb. Live Load</u>	
		<u>Ft.</u>	<u>In.</u>
2 x 6	12	8	8
	16	7	6
	24	6	2
2 x 8	12	13	6
	16	11	9
	24	9	6
2 x 10	12	16	9
	16	15	4
	24	13	0
2 x 12	12	19	11
	16	18	3
	24	15	6

- c Framing into headers or side of wood girders. Use steel joist hangers, metal framing anchors or wood bearing strip at least 2" x 3". Notching of joist more than 1/4 of depth not permitted.
- d Framing into side of steel girders. Allow 1/2 inch clearance over top of top flange. Secure to girder or to opposite joists, or bridge joist 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 inches.
  - 2 Fire cut or bevel, 2 inches.
  - 3 Second-story floor joists parallel with masonry: Tie to masonry with metal straps extending over and secured to at least 1 joist and not more than 8 feet on center.
- f Butt or lap joists over girders and bearing partitions.
- 1 Butting: center and tie with metal straps or 1 inch thick wood ties at least 2 feet long.
  - 2 Lapping: at least 4 inches; spike together; maximum projection beyond bearing, 1 foot.
- g Double Joists:
- 1 Under all bearing partitions and under plaster finished non-bearing partitions when parallel to floor joists.
  - 2 Where piping or duct work occurs block joists apart at 4 foot intervals.
  - 3 Under heading partitions, more than two joists may be required by the Building Official, depending upon loading conditions.
  - 4 Support of furnace unit: Double the floor joists framing each side of floor opening for plenum of furnace, spike joists together.

- 5 Support of hot water heater, washing machine or special loading conditions. Double the floor joists supporting unit, especially where the equipment is aligned on both sides of a partition wall.
- h Headers and trimmers:
- 1 Headers 4 feet or less in length may be single; headers receiving three or more tail beams, support in steel hangers, or on ledger boards not less than 2" x 3". If header is over 7 feet in length, secure ledger to trimmer with lag screws.
  - 2 For openings at end of joist span with headers 4 feet or less, trimmers may be single.
  - 3 Use double framing under all other conditions.
- i Cutting of floor joists:
- 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 1/2 inches; edges not nearer than 2 inches to top and bottom of joists.
- j Cross-bridging:
- 1 Maximum spacing, 8 feet; minimum size, 1" x 3" double nail at each end; bridging split in nailing not acceptable.
  - 2 Rigid metal bridging may be used when acceptable to Building Official.
- k Cantilevered construction: submit detail drawing.
- 5 Subflooring
- a Wood Boards:
- 1 Thickness, 1 inch; maximum width, 8 inches, unless triple-nailed. Maximum joists spacing: 16 inches on center.
  - 2 No two adjoining boards to break joints over same joist space; each board to bear on at least two joists.
  - 3 Other spacings may be used when subflooring is designed according to loads to be imposed.
- b Plywood
- 1 Apply with face grain perpendicular to supports and panels continuous over two or more spans.
  - 2 Minimum thickness, for indicated joist spacing - Douglas Fir, Western larch, or Exterior C-C or Structural Interior C-D grades of Western Softwood Group 1.
 

1/2 inch (3 ply or 5 ply)	16 inches o.c.
3/4 inch (5 ply)	24 inches o.c.
1-1/8 inch (7 ply)	48 inches o.c.
  - 3 Minimum Thickness, for indicated joist spacing - Western Softwood Group 2 and Western Softwood Group 1 in grades other than C-C and C-D.

5/8 inch (5 ply)	16 inches o.c.
3/4 inch (5 ply)	24 inches o.c.
1-1/8 inch (7 ply)	48 inches o.c.

- 4 Minimum Recommended Width of Girders, supporting floor loads for 1-1/8 inch plywood at 48 inches o.c. is 4 inches. Recommended sizes and spans for girders are:

4 x 6	8'0"
4 x 8	11'0"
4 x 10	14'0"
4 x 12	17'0"

- 5 Under nonstructural finish flooring, when used as a base for parquet wood finish flooring less than 25/32 inches thick, linoleum, composition, rubber or ceramic tile, 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.
- 6 Nailing: Nail securely to joists and blocking with nails 6 inches o.c. on edges and 10 inches o.c. at intermediate framing members. Use 6d common nails for 1/2" plywood, 8d for 5/8" and 3/4" and 10d common or 8d ring shank for 1-1/8" thick plywood.
- 7 As underlay, when used for leveling purposes over all subflooring, minimum thickness 1/4 inch 3-ply.  
See 314-D-2.
- c Clearance: Provide 1/2 inch clearance between all subflooring and all masonry walls, chimneys and partitions.
- d Floors finished with any material other than hardwood see 314-D-2.

#### D Ceiling Framing. See 30C-D.

##### 1 Joists:

- a Maximum spans for ceiling or attic floor joists are as follows:
- 1 For no attic storage, maximum access opening is 600 sq. inches.
  - 2 With larger access opening, design for limited attic storage.
  - 3 With permanent or disappearing stair, design according to floor joist table in 307-C-4-a.
- b Maximum spans for wood joists:  
Except for stress-grade lumber of an assured quality, designed in accordance with the National Design Specifications, NLMA, all wood joist shall be limited as follows:
- 1 Lumber, properly identified as to species and grade by an agency approved by the American Lumber Standards Committee, shall be limited to the spans given in the NLMA publication "Maximum Spans for Joists and Rafters".
  - 2 The table is for utility grade Douglas fir. For all other grades use "Maximum Spans for Joists and Rafters".

## CEILING JOISTS

<u>Nominal Size</u> Inches	<u>Spacing C to C</u> Inches	<u>20 lb. Attic Storage</u>		<u>No Attic Storage</u>	
		Ft.	In.	Ft.	In.
2 x 4	12	4	10	8	5
	16	4	2	7	4
	24	3	5	5	11
2 x 6	12	11	3	16	4
	16	9	9	14	11
	24	8	0	13	0
2 x 8	12	17	5	22	4
	16	15	1	20	3
	24	12	4	17	9
2 x 10	12	22	6	28	3
	16	20	5	25	9
	24	16	10	22	5

c Use ceiling joists as ties for rafters whenever possible.

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

e Framing of ceiling joists over girders and bearing partitions; as required for floor joists. See 307-C-4-e.

2 Hung ceilings, flat roof construction:

a Minimum size 2" x 4" on edge separated by wood or metal hangars, not more than 10 feet on center.

b Ceiling joist bridging not required.

## E Roof Framing.

### 1 General

a Headers and trimmers:

1 Headers 4 feet or less in length may be single.

2 When chimney is at ridge or eaves and header is 4 feet or less, trimmers may be single; use double framing under all other conditions.

3 Dormer windows not supported on partitions: Double headers and rafters.

b Anchor wall plates for rafters and roof joists on masonry wall. See 305-E-7.

### 2 Pitched Roofs:

a Minimum pitch. See 310-A-1.

b Maximum rafter spans are as follows:

Maximum spans for wood joists; except for stress-grade lumber of an assured quality, designed in accordance with the National Design Specifications, NLMA, all wood joist shall be limited as follows:

- 1 Lumber, properly identified as to species and grade by an agency approved by the American Lumber Standards Committee, shall be limited to the spans given in the NLMA publication "Maximum Spans for Joists and Rafters".
- 2 The table is for utility grade Douglas fir. For all other grades use "Maximum Spans for Joists and Rafters".

## LOW SLOPE ROOF JOISTS

Nominal Size Inches	Spacing C to C Inches	3 in 12 or less				Greater than 3 in 12	
		Supporting finished ceiling		Not Supporting finished ceiling		Ft.	In.
		Ft.	In.	Ft.	In.		
2 x 4	12					5	8
	16					4	11
	24					4	0
2 x 6	12	10	5	11	3	13	2
	16	9	0	9	9	11	4
	24	7	4	8	0	9	3
2 x 8	12	16	2	17	5	20	4
	16	14	0	15	1	17	7
	24	11	5	12	4	14	4
2 x 10	12	22	1	23	10	27	10
	16	19	2	20	9	24	2
	24	15	7	16	10	19	9
2 x 12	12	26	1	31	1		
	16	22	7	24	5		
	24	18	6	19	11		

- c Rafters: Cut for level bearing and spike to wall plate; no portion of cut end of rafters to project beyond inside edge of wall plate; frame rafters opposite at ridge; provide tie for rafters to prevent thrust and uplift.
- d Collar beams:
- 1 Minimum size 1" x 6" or 2" x 4"; maximum spacing 4 feet on center.
  - 2 When ceiling joists do not serve as tie at plate line or are not below lower third of rafters, install ceiling joists (collar beams) same size as rafters on each pair of rafters, and make special provisions for tying the lower end of rafters to the floor or wall construction.
- e Ridge boards: Not required for simple gable roofs where rafters frame opposite each other. All other types, use 2 inch member with depth not less than cut end of rafter.
- f Valley rafters:
- 1 Minimum thickness, 2 inches: minimum depth, not less than cut end of jack rafters.

- 2 Maximum unsupported length of single valley rafters, 8 feet; double rafters, 12 feet.
  - 3 May be omitted when jack rafters of one roof frame on sole plate on top of roof sheathing of adjoining roof.
  - g Crickets or chimney saddles at upper side of all chimneys not in contact with ridge.
  - 3 Flat Roofs:
    - a Roof joist spans. See 307-E-2-b.
    - b Cross-bridging: Minimum size, 1" x 3" maximum spacing, 8 feet on center.
    - c Joists supporting hung ceilings. See 307-D-2.
    - d Framing of roof joists over girders and bearing partitions: As required for floor joists. See 307-C-4-e.
  - 4 Trussed rafters: Trussed rafters may be used in construction of roofs for residence and buildings of similar size and design, when designed according to generally accepted good engineering practices.
- F Exterior Wall and Bearing Partition Framing.
- 1 Studs:
    - a Continuous lengths without splicing.
    - b Minimum size, 2" x 4".
    - c Maximum spacing for all construction, 16 inches on center; one-story detached accessory buildings, 24 inches.
    - d Maximum length for balloon frame, 20 feet; notch studs at second floor to receive 1" x 4" ribbon. Nail joists to studs.
  - 2 Corner posts: Not less than three 2" x 4"s set to receive interior finish.
  - 3 Corner Bracing:
    - a Braces at external corners; 1" x 4", let into outside face of studs and plates, set approximately at 45 degrees, extend from sill to plate. Attaching ends of braces to blocks nailed to studs or plates not acceptable. May be omitted only when wood sheathing boards are laid diagonally, when fiberboard, minimum 25/32" x 4' x 8' or nail base or intermediate fiberboard, minimum 1/2" x 4' x 8' or gypsum sheathing, minimum 1/2" x 4' x 8' or plywood, minimum 5/16" x 4' x 8' (see Sec. 307-H-2) is applied vertically.
    - b Openings near corner: Use 1" x 4" knee braces, extending from corner post to sill and to top plate. Extend over at not less than three stud spaces.
    - c Openings at corner: Brace as in (a), set as near opening as possible.
  - 4 Sill Construction:
    - a Sill anchorage. See 304-J-4 and 305-B-4.
    - b Sills and girders on top of foundation walls and piers; level and grout with portland cement mortar; wood not to be used for permanent shims.
    - c Other methods may be used if detailed on drawings submitted with application and acceptable to Building Official.
  - 5 Window and door openings:
    - a Inner stud on jambs: Extend in one piece from header to bearing and nail to outer stud.

## b Headers for usual loading conditions:

Size	Maximum span
Two 2x4s on edge.....	3'-6"
Two 2x6s on edge.....	4'-6"
Two 2x8s on edge.....	6'-0"
Two 2x10s on edge.....	7'-6"

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

d If desired, truss construction may be used.

## 6 Plates:

a Top plates, two 2x4s. Lap at corners and intersecting partitions. Single 2x4 acceptable for bearing partitions when studs occur directly under joists or rafters. When plates are cut for piping or duct work, install steel angles on each side of plate not less than 1 1/2" x 1 1/2" x 1/8", to serve as plate ties and bearing for joists. Spike angles to joists and plates, using not less than 3 nails at each end. Alternate method for reenforcing cut plates: solid full depth 2 inch header and metal tie 1/2 inch by 12 gauge with three heavy nails or screws at each end.

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

c Sole plates, minimum thickness, 2 inches; exterior wall studs may bear on the sill or on a sole plate on top of subfloor.

7 End studs of bearing partitions connecting to masonry walls. Anchor with bolts or spikes.

8 Wood bearing partitions in cellars or basements are not acceptable.

9 Studs to be continuous (balloon frame) when exterior is to have continuous stucco finish.

## G Non-bearing Partition Framing.

## 1 Studs:

a Use continuous lengths without splicing.

b Partitions exceeding 6 feet of unsupported length containing openings; size and spacing same as bearing partitions.

c Partitions less than 6 feet unsupported length with openings:

Minimum Size	Maximum Spacing
2x4s (2" thickness)	16" on center.
2x4s (4" thickness)	24" on center.
2x3s (3" thickness)	16" on center.

d Partitions 6 feet or over in length without openings.

## Minimum Size

## Maximum Spacing.

2x4s (2" thickness)  
 2x3s (3" thickness)  
 2x4s (4" thickness)

16" on center.  
 24" on center.  
 24" on center.

## 2 Openings:

- a In 2 inch thick partitions: Inner stud on jambs, size 2" x 2" extend in one piece from header to bearing and nail to outer stud; or single frame with 2" x 6" jambs continuous from top plate to sole plate with header notched 2 inches into each jamb.
- b In 3 inch and 4 inch thick partitions: Single framing permitted provided opening does not exceed 3 feet in width and header is secured by spiking through jamb studs.
- c Headers.

Opening width, 3 feet or less:

2"-thick partitions, 2" x 4" on edge.  
 3"-thick partition, 2" x 3" flat.  
 4"-thick partition, 2" x 4" flat.

Opening width, over 3 feet:

2"-thick partition, 2" x 4" on edge.  
 3"-thick partition, two 2x3s flat.  
 4"-thick partition, two 2x4s.

- 3 Top and sole plates: Minimum thickness, 2 inches; lap top plate at outside walls and at bearing partitions.
- 4 Wardrobes, cabinets or casework acceptable as non-bearing partition.
- 5 Solid plaster partitions.
  - a Maximum unsupported length 16 feet.
  - b Core: 1/8 or 1/2 inch gypsum lath continuous from floor to ceiling and full width of door frames. Set in grooves of wood sill and plate members and of jambs and heads of door frames. Grooved member not required at intersection of walls to be plastered. At masonry wall intersections, tie or lace cornerite through lath core with wire. Cutting units may be fastened as recommended by manufacturer and as approved by the Building Official.
  - c Sill and plate members: Finished thickness, 1-1/4 inches minimum. Securely nail to floor and structural framing.
  - d Doorframes: Mill built as finished frame. Thickness 1-5/8 inches minimum. Prime coat all sides. Secure to floor framing and sill members. Provide anchor for plaster by driving 8d nails on each side of lath, 3/8 inch out from groove, at 30 degree angle with plane of lath, on 12 inch centers staggered, then bend back against lath.
  - e Pipes and conduits: Plumbing pipes, not permitted. Moisture resistant electrical conduit, tie securely to face of lath. Use shallow outlet box.
  - f Coat core both sides with gypsum plaster to overall thickness of 2 inches, three coat or two coat double-up work.

- 6 Solid gypsum wallboard partitions.
- a Maximum unsupported length:
    - 12' partition height - 12' maximum length
    - 11' partition height - 18' maximum length
    - 10' partition height - Unlimited length
  - b Core - 1" thick gypsum coreboard either single or multiple layers of 2' or 4' widths.
  - c Face panels - 1/2", 5/8" or multiple laminations of regular or type "X" gypsum wallboard of 4' widths.
  - d Runners - 20 to 26 gauge metal or construction grade lumber.
  - e Laminating Adhesive - Gypsum wallboard joint compound for tape embedment, complying with ASTM C475, or as recommended by wallboard manufacturer.
- 7 Gypsum wallboard hollow partitions.
- a Maximum unsupported height:
    - 12' maximum height for 2-1/4" thick partition
    - 14' maximum height for 2-5/8" thick partition
  - b Ribs - 1" thick gypsum coreboard, or multiple layers of 1/2", 5/8" or 1" thicknesses laminated to the required core thickness, in 6" or 8" widths and lengths of approximately 6" less than partition height.
  - c Face panels - 1/2", 5/8" or multiple layers of regular or type "X" gypsum wallboard of 4' widths.
  - d Minimum thickness - hollow wallboard partitions shall be not less than 2-1/4" thick (1" core and two 5/8" face panels).
  - e Runners - construction grade lumber of thickness equal to partition core or 20 to 26 gauge metal runners.
  - f Laminating Compound - Gypsum wallboard joint compound for tape embedment, complying with ASTM C475, or as otherwise recommended by wallboard manufacturer.
- H Wall Sheathing. Sheathing may be omitted on detached accessory buildings not containing habitable rooms.
- 1 Wood boards:
    - a May be used under any exterior finish material.
    - b Minimum thickness, 1/2 inch; maximum width, 8 inches unless triple nailed; maximum stud spacing 24 inches on center.
    - c Break joints over center of studs unless end-matched (T&G) boards are used; no two adjoining end-matched boards to break joints over same stud space and each board to bear on at least two studs.
    - d Application: When laid diagonally extend at 45 degrees in opposite directions from each corner; apply horizontally under stucco finish.
  - 2 Plywood.
    - a May be used under any exterior finish material.
    - b Minimum thickness
 

	Maximum stud spacing
5/16 inch	16 inches
3/8 inch	24 inches



- 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.

### Roof Sheathing.

#### 1 Wood boards:

- a May be used under any roofing material.  
 b Minimum thickness, 1 inch (5/8); maximum width 8 inches maximum rafter spacing, 24 inches on center.  
 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 two rafters.  
 d Application: Lay closed under all roof material except wood shingles. Under wood shingles, use 1" x 4" shingle lath spaced according to shingles exposure.

#### 2 Plywood:

- a May be used under any roofing material.  
 b Apply with face grain perpendicular to supports and panels continuous over two or more spans.  
 c Minimum thickness:

Roofing Material	Rafters Maximum Spacing (Inches)	Plywood Minimum	Plywood Minimum
		Thickness (Inches) D. Fir, Western Larch or Western Softwood Group 1 <sup>d</sup>	Thickness (Inches) Western Softwood Group 2 <sup>e</sup>
Wood and asphalt shingles <sup>f</sup>	16	3/8	3/8
	24	3/8	1/2
Slate, Tile and Asbestos-cement shingle	16	1/2	1/2
	24	5/8	5/8
Flat Roofs <sup>g</sup>	16	3/8	3/8
	24	3/8	1/2

- d Exterior C-C or Structural Interior C-D unsanded or touch-sanded grades of Group 1 Western softwood only.  
 e Also standard grades of Western softwood plywood of Group 1 species except the C-C and C-D grades covered by footnote d.  
 f Edges of 3/8" thick plywood shall be blocked or ply clips used.  
 g Flat roofs used for walking traffic shall be designed as floors.  
 h Nailing: Nail securely to rafters with 6d nails for 1/2" 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.  
 i Protect exposed edges of sheathing along eaves and rake of roof with mouldings or sheet-metal flashing. Flashing along eaves may be integral with gutters. If gutters are not installed, form the flashing to provide a drip.

- 3 Fiberboard acceptable for roof sheathing, 1-1/2" minimum thickness for regular density and 3/4" for high density, when installed at rafter and purlin spacings in accordance with manufacturers recommendations.

K Stair Stringers. (Also see 207)

- 1 Provide solid bearing at top and bottom.
- 2 Effective depth of wooden stringers, minimum, 3-1/2 inches.
- 3 Open basement stairs: Minimum stringer thickness, 2 inches.
- 4 Third stringer: Install if treads are less than 1-1/8 inches thick and stair is more than 2'-6" wide.

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 not apply to tops of foundations.
- 3 Caulking shall remain elastic non-hardening and firmly adherent.

309 EXTERIOR WALL FINISH See 307-H.

A Wood siding.

- 1 Use well-seasoned material.
- 2 Nail at each bearing with hot-dipped galvanized or cement-coated nails.
- 3 Bevel siding:
  - a Finish dimensions to comply with the following limitations as to minimum top and butt thickness:
 

Nominal width (in.)	Thickness at top (in.)	Thickness at butt (in.)
4, 6 and 8	3/16	7/16
10 and 12	3/16	9/16
  - b Minimum headlap: 1 inch for 4 inch width; 1 1/4 inches for widths over 4 inches.
  - c Nail near butt only. Do not nail through board underneath.
- 4 Rustic and drop siding: Minimum thickness, 3/4 inch (finished); maximum width 8 inches (nominal).
- 5 Shiplap or matched siding:
  - a Minimum thickness, 25/32 inch (finished); maximum width, 12 inches (nominal).
  - b Triple-nail all boards over 8 inches in width.
  - c When boards are applied vertically, set edges in white lead.

B Wood Shingle Siding.

- 1 Shingle grades.
  - a Single course siding, No. 1 or No. 2.
  - b Double course siding, No. 1 for exposed shingles; under course may be No. 1 or No. 2.
- 2 Minimum size:
 

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

3	Maximum exposure:		
	Shingle	Single course	Double course
	length - in.	exposure - in.	exposure - in.
	16	7 1/2	12
	18	8 1/2	14
	24	11	16

- 4 Nailing:
- a Nails: Noncorrodible.
  - b Butt nail double coursing: exposed nails may be small-headed.

C Asbestos-Cement Siding and Shingles. See 307-H-2-c-3-b.

- 1 Material. See SS-S-291c.
- 2 Apply clapboards and shingles in accordance with manufacturer's recommendations.
- 3 Nails, noncorrodible.

D Plywood

- 1 Each sheet of plywood shall bear an approved trademark identifying the material as Exterior type.
- 2 Plywood 3/8 inch nominal thickness may be used on sheathed.
- 3 Installation:
  - a Protect edges prior to erection with paint, mixed 100 lbs. white lead paste, 1 3/4 gallons raw linseed oil and 1 pine dryer, applied without thinning, or equal.
  - b Vertical joints: To occur over studs.
  - c Horizontal joints: Install solid blocking between studing for nailing.
  - d Butt joints of square-edge material, wheter exposed or covered by battens, fill with mastic.
  - e Corner boards: Apply over plywood or butt plywood against boards at all corners.
  - f Nails: Cement-coated or hot-dipped galvanized, flat head or casing. Minimum size 6d for plywood 1/2" thick or less, 8d for plywood thicker than 1/2". Nail spacing 6" at all panel edges and 12" at intermediate bearings.

E Stucco. See 307-F-9 and 307-H-1-d.

- 1 Lath for stucco. See FS-QQ-B-1C1c; wood lath not acceptable.
  - a Expanded metal lath, painted; with large openings. 1.8 lbs. per sq. yd.
  - b Nails: electrolytic zinc-coated furring nails.
  - c Metal lath, held at least 1/4 inch away from sheathing by furring nails. Furring strips and self-furring lath not permitted.
- 2 Stucco:
  - a Materials. See 303.
  - b Mixture: 1 part portland cement, 3 parts sand, and hydrated lime equal to 10 percent of cement by volume; or prepared portland cement stucco used in accordance with manufacturer's recommendations.
  - c Thickness: 3 coat work, 1 inch total, 2 coat work, 5/8 inch total.

## d Application:

- 1 3 coat work, over wood frame.
- 2 2 coat work, over masonry surfaces.
- 3 Finish coat may be trowel coat of prepared exterior portland cement stucco.
- 4 Thoroughly cover and embed lath in stucco.
- 5 Keep wet 2 days after application of each coat.
- 6 Drying time before application of finished coat, 7 days.
- 7 Stucco not to be applied when temperature is lower than 40 degrees F.

## F Hardboard

- 1 Material.
- 2 Grade: tempered, exterior shall be of a type specially manufactured for siding purposes.
- 3 Hardboard 1/4", 5/16", 3/8", or 7/16" in thickness may be used over sheathed or unsheathed walls.
- 4 Application: hardboard siding shall be applied in accordance with the manufacturer's recommendations provided they are not in conflict with these regulations.

310 ROOF COVERINGS

## A General

## 1 Roof Slope:

- a Shingle and tile roof, 4 in 12 minimum.
  - b Single roofs less than 4 in 12 but not less than 2 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 in 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 4 minimum requirements to assure a weather-tight roof, above roof slopes may be reduced 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 not permitted.

## B Asphalt Shingles

- 1 Fire Underwriters' Class C Label on each bundle.
- 2 Approximate shipping weights per square:
  - a Square butt strip, 235 pounds.
  - b Hexagon strip, 200 pounds.

- 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 inches.
- 5 Underlay:
- Asphalt saturated felt; weight approximately 15 pounds per 100.
  - No underlay required on roof slopes of 7 in 12 inches or more; or when triple thickness is obtained at all points on roof slopes of 4 in 12 inches or more.
  - One layer of 15 pound Asphalt saturated felt shall be required under all double thickness shingles on roof slopes between 4 in 12 and 7 in 12.
  - On roof slopes less than 4 in 12 but not less than 2 in 12 all double thickness shingles shall have all tabs cemented down with quick-setting cement or be Wind Resistant self-sealing shingles with an underlay of two layers of 15 pound asphalt saturated felt by commencing with a 19" width strip laid along the eaves followed by a 36 inch sheet completely overlapping the first 19 inch sheet and continuing with 36 inch sheets each overlapping the preceding sheet by 19 inches. A continuous layer of plastic roof cement shall be applied at the rate of two gallons per 100 sq. ft. between the two layers of asphalt felt on the roof area starting from the eaves to a point on the roof 24 inches 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.

### C Wood Shingles.

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

Length (Inches)	Thickness
16	5 Butts in 2 inches.
18	5 Butts in 2 1/4 inches.
24	4 Butts in 2 inches.
- Maximum exposure:
 

Slope of Roof	Exposure for shingle length - inches			
<u>Rise</u>	<u>Run</u>	<u>16</u>	<u>18</u>	<u>24</u>
3 to 7	12	4	4 1/2	6
7 to 18	12	5	5 1/2	7 1/2
- Underlay not permitted.

### D Asbestos Cement Shingles.

- Quality: Dense, hard structure and thoroughly seasoned. See FS-SS-S-291c.
- Fire Underwriters' Class A or B label on each bundle.
- Underlay: one layer asphalt-saturated felt, approximately 30 pounds per 100 square feet.
- American Method:
  - Standard shingle: Minimum weight per square, 470 pounds.
 

Length of Shingle - in.	Maximum Exposure - in.
16	7
15	6 1/2
12	5
  - Strip shingle: Minimum weight per square, 285 pounds.

- 5 Dutch method:
  - a Minimum weight per square, 265 pounds.
  - b Minimum headlap, 3 inches.
  - c Minimum sidelap, 4 inches.
- 6 French or Hexagonal Method:
  - a Minimum weight per square, 250 pounds.
  - b Minimum overlap 2 edges, 3 inches.

#### E Tile Roofing.

- 1 Quality: Hard-burned roofing tile.
- 2 Underlay: One layer asphalt saturated felt approximately 30 pounds per 100 square feet.
- 3 Shingle tile, American Method.
 

Length of shingle - in.	Maximum exposure - in.
16	7
15	6 1/2
14	6
12	5
- 4 Interlocking tile and curved tile: Lay in accordance with manufacturer's recommendations.

#### F 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 pounds per 100 square feet.
- 3 Laid American Method.
  - a Minimum thickness, 3/16".
  - b Length of shingle - in.
 

Length of shingle - in.	Maximum exposure - in.
18	7 1/2
16	6 1/2
14	5 1/2
12	4 1/2
10	3 1/2

#### G Built-Up Roofs.

- 1 Asphalt or tar and gravel coverings, including flashings: 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 pounds per 100 square feet.
- 4 Surface with:
  - a Roofing gravel or crushed stone: Approximately 400 pounds per 100 square feet; or
  - b Crushed slag: Approximately 300 pounds 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 pounds per square.

**H Metal Roofs.**

- 1 Materials.
  - a Galvanized sheet metal; 26-gauge sheets, 1.25-ounce (total weight both sides) zinc coating per square foot.
  - b Copper: 16-ounce soft (roofing temper).
  - c Roofing tin: 40-pound coating.
  - d Lead: Sheet lead, 2 1/2 lbs. per sq. ft.
- 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.

**I Other types of roof coverings.**

Roof coverings such as metal shingles, 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-ounce soft (roofing temper).
- 2 Galvanized sheet metal: 26-gauge, 1.25-ounce (total weight both sides) zinc coating per square foot.
- 3 Lead: Hard lead, 2 pounds; soft lead, 4 pounds.
- 4 Tin: 40-pound 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 inches. Extend behind siding. Blind tack at outside edge of drip cap, 1 inch on center.
- 2 Heads and sills of openings, masonry-veneered wood frame 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 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 inch 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 building 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 inch.

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 inches.
    - 2 Roof slopes 7 in 12 or more, width 12 inches.
- 2 Asphalt shingle roof covering:
  - a Flash with sheet metal; or
  - b Two thicknesses of mineral surfaced roll-roofing material cut from rolls weighing not less than 85 pounds per square. Bottom strip, 18 inches wide, top strip at least 36 inches wide, lapped 12 inches.

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 inch outside exterior face of finish, turn up 4 inches behind exterior finish, thence turn down and extend 4 inches below top of outside of foundation.

G Chimneys.

- 1 All chimney and roof intersections, sheet metal flashing.
- 2 Cricket or saddle covering: Sheet metal.

512 GUTTERS AND DOWNSPOUTS

When dwelling is provided with a basement install gutters and downspouts unless omission is specifically permitted by Building Official.

**A Materials.**

- 1 Copper, 16-ounce, hard (cornice temper).
- 2 Galvanized sheet metal: 26-gauge sheets, 1.25 ounce (total weight both sides) zinc coating per square foot.
- 3 Solid wood gutters: Paint inside with two coats pitch or three coats lead and oil after installation.
- 4 Aluminum of suitable weight acceptable to Building Official.

**B Basket strainers.**

- 1 Material: copper wire for copper gutters, heavily galvanized wire for all other gutters.
- 2 Install strainers in all gutter outlets to down-spouts.

**C Roof water disposal: Provide outlet acceptable to Building Official.****313 INTERIOR WALL AND CEILING FINISH****A Lath and Plaster.**

- 1 Wood Lath:
  - a Maximum stud or furring spacing, 16 inches on center.
  - b Lath, No. 1, 5/16 inch thick.
  - c Space lath 1/4 to 3/8 inch 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.

<u>Use</u>	<u>Pounds per yd.</u>	<u>Stud spacing - in.</u>
Walls:		
All dwellings	2.5	16
1 Story dwellings	x3.4	20
	x4.0	24
	xx3.0	24
		<u>Joist Spacing - in.</u>
Ceilings	x2.75	16
	3.4	16
	xx3.4	24
x Flat rib		
xx High rib		

- 3 Insulating fiberboard lath:
  - a Minimum thickness, 1/2 inch.
  - b Lath size, 18" x 48". Lath, 24" x 48" may be used provided all joints at right angles to the framing members are covered with continuous strips of metal lath and ends of lath are nailed to solid bearing (framing members) at approximately 4 inches on center including intermediate supports.
  - c Maximum stud or joist spacing, 16 inches on center.
  - d Apply in accordance with manufacturer's directions.
- 4 Gypsum lath:
  - a Minimum Thickness, 3/8 inch.
  - b Size 16" x 48".

- c Maximum stud or joist spacing, 16 inches 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 1/2 inch 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 inch 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 six feet above shower bases and not less than four feet 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:
- | Type of wall finish | Actual Inches                      |             |             |
|---------------------|------------------------------------|-------------|-------------|
|                     | Spacing of studs or furring strips |             |             |
| Wood boards         | 16<br>3/8                          | 20<br>1 1/2 | 24<br>1 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 1/2 inch thick, may be used when acceptable to the Building Official. Maximum stud spacing 16" on center.
- E Heater Room Interior Finish.
- 1 Materials. 1-hour fire-resistive construction. See NBFU-Building Code-55.

## 2 Installation.

- a Apply over all combustible materials, including ceiling area, within 4 feet of heating unit and flue pipe.

314 FINISH FLOORS

## A Cement Floors.

- 1 Mix. See 304-B and 304-K-2.
- 2 Heater room floors on wood construction where solid or liquid fuel is used:
  - a Minimum thickness, 4 inches.
  - b Use sheet metal over tops of joists for concrete forms or cut in 1-inch boards flush with top of joists. If wood boards are used, remove after the slab has set.
  - c Reinforce slab with wire mesh weighing not less than 30 pounds per 100 square feet, or with 1/4 inch bars spaced 1 foot on center each way.
- 3 Heater room floors on wood construction where gas burning equipment raises temperature of floor to above 160 degrees, comply with the provisions of 2 above. See American Gas Assoc. specifications.

## B Wood Floors. See 307-C-5.

- 1 Materials.
  - a Flooring: Kiln-dried materials.
  - b Strip flooring, hardwood or softwood, minimum thickness 25/32 inch, maximum width 2 1/4 inches for hardwood, 3 1/4 inches for softwood. 3/8 inch 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 inches 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 inches 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 floorings on concrete: Set blocks in mastic and install in accordance with flooring manufacturer's directions.

## C 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 1 part portland cement, 4 parts sand; or 1 part portland cement, 2 parts sand, and 4 parts pea-size aggregate.
  - b Minimum thickness: 1 1/4 inches, if re-inforced with wire mesh; 3 inches when installed below top of chamfered

- joists, with finish tile surface at least 1 1/2 inches above tops of joists.
- 4 When applied over wood subfloor: Install asphalt saturated felt over sub-floor underneath the wire mesh.
- D Rubber Tile, Asphalt Tile, Linoleum and Wall to Wall Carpeting.
- 1 Do not apply rubber tile or linoleum on slabs resting on the ground. Asphalt tile may be used on slabs bearing on the ground provided the slab area where the tile are to be applied has first been covered with membrane waterproofing.
  - 2 Hardboard, plywood or similar underlayment leveler having a nominal thickness of 1/4 inch shall be used over wood sub-floors to provide a smooth, flat surface for the finish floor covering (including wall to wall carpeting.) Apply in accordance with manufacturer's recommendations.
  - 3 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 inch curb at the service door, or construct garage floor 6 inches lower than adjoining floor.
  - 3 Installation of house heating unit or other fuel burning appliance in garage space not permitted. Install partition between space containing house heating unit and garage space. Doors are not permitted common to heater room or garage.
  - 4 Wood frame walls and doors common to dwelling and garage: Finish on garage side to be 1-hour fire resistive construction. Where gable-type breezeway connection is used, a 1-hour fire resistive bulkhead may be established in the attic space directly above and continuous from the interior 1-hour fire resistive garage wall. Where rooms occur over garage area, ceilings and all walls shall be of 1-hour fire resistive construction. Service doors common to dwelling are to be 1-hour fire resistive. 1 3/4 inches solid wood will be considered in lieu of a rated door.
- B One-story Detached Garages and Accessory Buildings:
- 1 Comply with construction requirements for 1-story dwellings with the following exceptions:
    - a Footings, minimum 6 inches deep and 16 inches wide not less than 18 inches below finish grade.
    - b Foundation wall, minimum 8 inches of poured concrete or solid masonry.
    - c Grade beam construction permitted consisting of a 4 inch concrete floor on minimum 4 inches of crushed stone or gravel poured monolithically with a minimum 10 inch thickened outer edge a width of 20 inches around perimeter of building, said 20 inch grade beam to be of equal depth and on undisturbed soil.
    - d Studs, maximum spacing 24 inches o.c. Doubling of studs not required on jams of openings less than 3'-5" wide.

- e Wall sheathing and building 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 72 inches from corner at sill plate, and may be applied on the inside surface of studs, minimum 1" x 4".
- f Corner post may be two 2" x 4"s or one 4" x 4".
- g Top plate may be single, provided rafters occur directly over studs and plate at corners is lapped to provide tie.
- h Rafter ties at eaves not less than 2" x 4"s, maximum spacing 6 feet o.c.
- i Flooring may be gravel if foundation is in accordance with 315-B-1 a and b. If concrete, minimum 4 inches on minimum 4 inches of crushed stone or gravel.

LIST OF REFERENCE MATERIAL

Abbreviation and Name of Standard - Address

A. C. I. . . . .	American Concrete Institute 18263 West McNichols Road, Detroit, Mich.
A. H. A. . . . .	American Hardboard Association 20 North Wacker Drive, Chicago 6, Ill.
A. I. S. C. . . . .	American Institute of Steel Construction 100 Park Avenue, New York 17, N.Y.
A. I. S. I. . . . .	American Iron and Steel Institute 150 East Forty-Second Street New York 17, New York
A. S. T. M. . . . .	American Society for Testing Materials 206 South Broad Street, Philadelphia, Pa.
F. S. . . . .	Federal Specifications U. S. Department of Commerce General Service Administration 219 South Clark Street, Chicago, Illinois
G. A. . . . .	Gypsum Association 201 North Wells Street, Chicago 6, Ill.
I. B. I. . . . .	Insulation Board Institute 111 W. Washington Street, Chicago, Ill.
N. B. F. U. . . . .	National Board of Fire Underwriters 85 John Street, New York City
N. L. M. A. . . . .	National Lumber Manufacturing Association 176 West Adams Street, Chicago, Illinois
S. J. I. . . . .	Steel Joist Institute 1346 Connecticut Avenue, N.W. Washington, D. C.

MATERIAL

Standard and Specification  
Number or Volume

Aggregates, Concrete	ASTM C 33-61T
Aggregates, Lightweight, Structural Concrete	ASTM C 330-60T
Block, Glass	National Building Code- 55 (NEFU)
Board, Sheathing	ASTM C 79-54
Board, Fiber	FS-LLL-F-321b
Brick, Common	ASTM C 6262
Brick, Concrete	ASTM C 55-55
Brick, Face	ASTM C 216-62
Brick, Fire	FS-HH-E-671d

Cast Stone	ACI 704-44
Cement, Portland	ASTM C 150-62
Cement, Prepared Masonry (for Mortar)	ASTM C 91-60
Concrete, Masonry Units, Hollow Load Bearing	ASTM C 90-59
Concrete, Masonry Units, Solid Load Bearing	ASTM C 145-59
Fire Resistance Ratings	NEFU - 55
Lime, Hydrated	ASTM C 207-49
Lime, Quick	ASTM C 5-59
Lumber	National Design Standards 1962 (NLMA)
Shingles, Asbestos Cement	FS-SS-S-291c
Shingles, Slate	FS-SS-S-451
Steel, For Bridges and Buildings	ASTM A 7-61T
Stucco	FS-QQ-B-101c
Tile, Ceramic	ASTM C 126-62
Tile, Facing, Glazed and Unglazed	ASTM C 126-62
Tile, Footing Drain	ASTM C 4-62
Tile, Load Bearing	ASTM C 34-62
Tile, Non Load Bearing	ASTM C 56-62

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