TABLE 13.—SAFE LOADS FOR FRAME BEARING WALLS AND PARTITIONS WITH SHEATHING OR PLASTERING ON BOTH SIDES

Thousands of pounds—per foot—concentric load

Size of studs in inches	Spacing in inches	7	8	9	10	11	12	14	16	18	20	25
2 x 2	16	0.5	0.3									
	24	0.3	0.2									
	36	0.2	0.1									
	48	0.15	0.05									
2 x 3	16	1.6	1.3	0.9	0.8	0.6	0.5					
	24	1.1	0.8	0.6	0.5	0.4	0.3					
	36	0.7	0.6	0.5	0.4	0.3	0.2					
	48	0.6	0.5	0.4	0.3	0.2	0.1					
2 x 4	16	3.8	2.6	2.2	1.8	1.5	1.3	1.1	0.7			
	24	2.5	1.8	1.5	1.2	1.0	0.8	0.7	0.4			
	36	1.7	1.2	1.0	0.8	0.7	0.6	0.5	0.3			
	48	1.3	0.9	0.7	0.6	0.5	0.4	0.3	0.2			
3 x 4	16	6.0	4.0	3.5	3.0	2.5	2.0	1.5	1.0			
	24	4.0	3.0	2.5	2.0	1.7	1.5	1.2	0.7			
	36	2.7	1.9	1.6	1.3	1.1	1.0	0.8	0.5			
	48	2.0	1.4	1.2	0.9	0.8	0.7	0.6	0.4			
2 x 6	16	6.0	5.8	5.6	5.5	4.8	4.0	3.4	2.7	2.0	1.7	1.0
	24	4.0	3.9	3.8	3.7	3.2	2.7	2.3	1.8	1.4	1.1	0.7
	36	2.6	2.5	2.4	2.3	2.1	1.8	1.5	1.2	0.9	0.8	0.5
	48	2.0	1.9	1.8	1.7	1.6	1.4	1.1	0.9	0.7	0.6	0.3
3 x 6	16	9.5	9.4	9.2	8.9	7.7	6.6	5.5	4.4	3.3	2.2	1.7
	24	6.3	6.1	6.0	5.9	5.2	4.4	3.7	2.9	2.2	1.8	1.1
	36	4.2	4.1	4.0	3.9	3.4	2.9	2.5	2.0	1.5	1.2	0.7
	48	3.1	3.0	2.9	2.8	2.6	2.2	1.8	1.5	1.1	0.9	0.6
4 x 6	16	13.0	12.8	12.6	12.2	10.7	9.1	7.6	6.1	4.6	3.8	2.3
	24	8.7	8.6	8.4	8.1	7.1	6.0	5.0	4.0	3.0	2.5	1.5
	36	5.8	5.7	5.6	5.4	4.8	4.1	3.4	2.7	2.0	1.7	1.0
	48	4.3	4.2	4.1	4.0	3.5	3.0	2.5	2.0	1.5	1.3	0.8
2 x 8	16	8.2	8.1	8.0	7.8	7.6	7.5	7.3	5.5	4.5	3.5	2.5
	24	5.5	5.4	5.3	5.2	5.1	5.0	4.9	3.5	3.0	2.5	1.8
	36	3.7	3.6	3.5	3.4	3.3	3.2	3.1	2.5	2.0	1.5	1.2
	48	2.7	2.7	2.6	2.6	2.5	2.5	2.4	1.8	1.5	1.2	0.8
3 x 8	16	13.3	13.0	12.9	12.7	12.5	12.0	11.8	9.0	7.5	6.0	4.0
	24	8.9	8.7	8.6	8.4	8.3	8.1	7.9	5.9	4.9	3.9	2.8
	36	5.9	5.8	5.7	5.6	5.5	5.4	5.2	3.9	3.3	2.6	1.8
	48	4.4	4.3	4.3	4.2	4.2	4.1	3.9	2.9	2.5	2.0	1.4

111.82. Interior Surfaces.—In all habitable spaces, interior exposed wall and partition surfaces shall be faced with materials which are not more combustible than wood and which are capable of resisting a horizontal load of not less than five (5) pounds per square foot. Combustible materials used as finish shall not exceed the limits of combustibility prescribed by section 904.4 of the Basic Building Code.

111.9. Fire-Resistance and Clearance of Combustible Framing. When required to meet fire-resistive performance for specific applications and uses by the provisions of this code, structural wood units and assemblies shall be protected with metal or other component materials, or shall be treated by approved pressure processes to develop the fire-resistance ratings specified in this code.

111.91. Clearance for Chimney.—Combustible framing shall be trimmed away from all flues and chimneys and no such combustible material shall be placed within one (1) inch of any chimney nor within six (6) inches of any inlet opening to such chimney. Finished flooring shall have not less than one-half (½) inch-clearance from the chimney flue.

111.92. Clearance from Fireplaces.—All combustible headers and trimmer beams shall be placed not less than two (2) inches from the face and backs of fireplaces and the spaces shall be fire-stopped as required in section 119.9. Wood or other combustible trim shall not be installed on or about a fireplace less than six (6) inches from the fireplace opening; and when located within the twelve (12) inch boundary of the opening, such combustible construction shall project not more than one-eighth (⅛) inch from the face of the masonry for each one (1) inch distance from the fireplace opening; and no combustible mantel shall be located less than twelve (12) inches above such opening.

SECTION 112.0. MASONRY CONSTRUCTION

112.1. Wall Thickness and Height.—In all buildings and structures not more than three (3) stories or forty (40) feet in height, covered by the provisions of this code, with a clear span between exterior walls or between walls and an interior support of not more than twenty-six (26) feet, the thickness of masonry bearing walls shall be not less than herein specified; but in no case less than one-twentieth (1/20) of the height between lateral supports. The finished thickness of interior non-bearing masonry partitions or walls shall be not less than specified in section 112.18.

112.11. Solid and Hollow Unit Masonry Construction.—For all buildings in other than the institutional and residence use groups bearing walls of brick, structural clay tile, hollow or solid concrete units, or stone ashlar, shall be not less than eight (8) inches thick in the top story, but not more than twelve (12) feet in height, and not less than twelve (12) inches thick in the lower stories.

Residence Buildings not Exceeding Thirty-Five Feet.—The thickness of bearing and non-bearing walls in buildings of the residence and institutional use groups shall be not less than eight (8) inches, provided the total height of such eight (8) inch walls including any portion below grade is not more than thirty-five (35) feet except as provided herein for one and one-half story dwellings.

Residence Buildings Exceeding Thirty-Five Feet.—In residence and institutional buildings which exceed thirty-five (35) feet in height, the thickness of walls in the second and third stories shall be not less than eight (8) inches provided the total height of eight (8) inch walls is not more than thirty (30) feet, and not less than twelve (12) inches thick in the first story.

One and One-Half Story Dwellings.—In dwellings not more than one and one-half (1½) stories or twenty (20) feet in height, interior masonry bearing partitions may be six (6) inches thick. The exterior masonry walls of dwellings and private garages which are not more than nine (9) feet in height to the eaves, nor more than fifteen (15) feet in height to the peak of the gable, may be six (6) inches thick.

112.12. Cavity and Hollow Wall Construction.—Both the facing and backing wythes of bearing and non-bearing walls of cavity or other hollow wall construction of solid units shall each be not less than four (4) inches thick. The wythes shall be bonded together to comply with section 112.3. The cavity shall be not less than two (2) nor more than four (4) inches wide and the total thickness of wall shall be not less than ten (10) inches in buildings which are not more than twenty-five (25) feet in height; and not less than fourteen (14) inches in buildings which are not more than forty (40) feet in height with the inner wythe not less than eight (8) inches thick.

112.13. Rubble Stone Construction.—Bearing and non-bearing walls of rubble stone shall be not less than sixteen (16) inches thick.

112.14. Plain Concrete Wall Construction.—Unreinforced mass concrete walls may be two (2) inches less in thickness than solid masonry construction; but in no case shall such walls be less than eight (8) inches thick except where six (6) inch walls are permitted in one and one-half (1½) story dwellings and private garages.

112.15. Composite Wall Construction.—Bearing and non-bearing walls constructed of a combination of hollow and solid masonry units forming a composite wall shall be not less in thickness than required for walls constructed of either of the materials forming the facing and the backing. There shall be not less than two (2) inches of solid masonry on the exterior face exposed to the weather. Such walls shall be bonded as required in Section 112.3 with headers extending not less than four (4) inches into the backing.

112.16. Veneer Masonry Construction.—The thickness of the backing in bearing and non-bearing walls of veneer masonry construction shall be of the required minimum thickness for solid or hollow unit construction specified in this section, except that brick, stone or other approved masonry facing not less than four (4) inches thick, bonded as required in section 112.3, may be included in the required thickness of the wall. No material used for veneering masonry walls shall have less than the following thickness:

Architectural terra cotta (cellular)	3 inches
Architectural terra cotta (flat slabs)	1¼ inches
Brick	2¼ inches
Stone (natural)	2 inches
Stone (cast, artificial)	1½ inches
Clay tile (structural)	1¾ inches
Clay tile (flat slabs)	1 inch
Marble slabs	1 inch
Structural glass	11/32 inch
Aluminum	.03 inch
Metal (approved corrosion-resistive)	28 U.S. gage

Facing or veneers or masonry walls or partitions shall not be considered to have structural value unless bonded as required in section 112.35 and shall be excluded in determining required thickness of bearing walls.

112.17. Anchorage of Veneers.—Four (4) inch ashlar facing shall be bonded as required in section 112.35. Thin stone, tile and terra cotta veneers three (3) inches or less in thickness shall be frost-proofed and not more than one hundred and forty-four (144) square inches in area when subject to frost action and when not so exposed, the size of the tile may be increased a maximum of fifty (50) per cent in area and shall be anchored with corrosion-resistive anchors as provided for unbonded ashlar. Veneers one (1) inch in thickness or less of stone, ceramic or porcelain tiles or terra cotta shall be set in a waterproofed, cement-mortar float coat, mounted on a one (1) inch thick mortar base. The base shall be reinforced as required for exterior stucco in section 111.63 and the veneers shall be anchored to the masonry backing.

112.18. Non-Bearing Partitions.—When required to develop fire-resistance ratings, interior non-bearing masonry partitions of terra-cotta, gypsum or other approved noncombustible materials shall be of the minimum thicknesses specified in table C 2 of appendix C; but in no case shall the unsupported height exceed the following unless reinforced or approved after test:

Solid Masonry (in Inches) Thickness Exclusive of Plaster	Unsupported Height Feet
2	8
3	12
4	15
6	20
8	25

Solid partitions of metal lath, studs and plaster may be two (2) inches thick for heights up to twelve (12) feet and shall increase one-quarter (¼) inch in thickness for each four (4) feet increase in height.

112.2. Mortar and Concrete Mixes.—All masonry shall be laid up in mortar with cement, lime and aggregates mixed to a workable consistency in the proportions by volume herein specified. Materials used in preparing gypsum mortar shall be measured by weight.

112.21. Cement Mortar.—Cement mortar shall be composed of one (1) part of approved portland cement and a maximum of three (3) parts of approved sand aggregates to which may be added hydrated lime or lime putty not to exceed twenty-five (25) per cent of the cement content by volume. All foundations and other masonry in contact with the ground and cavity walls shall be laid up in cement mortar or masonry mortars approved for this purpose.

112.22. Cement-Lime Mortar.—Cement-lime mortar shall be composed of one (1) part of approved portland cement to not more than one (1) part of approved lime putty or hydrated lime and a maximum of six (6) parts of approved sand aggregate, or shall be an approved masonry mortar. Such mortar may be used in all walls within the provisions of this code other than specified in section 112.21 and where gypsum mortars are permitted.

112.23. Lime Mortar.—Lime mortar shall be composed of one part of approved lime putty or hydrated lime and a maximum of three (3) parts of approved aggregate. Cement may replace equal volumes of lime in lime mortar, provided the cement gaging is uniformly distributed by approved methods of mixing. Lime mortar may be used in bearing walls not more than twenty-five (25) feet in height.

112.24. Gypsum Mortar.—Gypsum mortar shall be composed of one (1) part of unfibered calcined neat gypsum plaster and not more than three (3) parts of approved sand aggregate. Gypsum mortar shall be used in all gypsum block masonry partitions.

112.25. Mass Concrete Proportions.—Cast in place plain or mass concrete when used for foundations or footings or any accepted structural use shall be so proportioned as to develop an ultimate compressive strength of not less than two thousand (2000) pounds per square inch at twenty-eight (28) days.

112.26. Reinforced Concrete Proportions.—Concrete for reinforced concrete shall be so proportioned as to develop an ultimate compressive strength of not less than twenty-five hundred (2500) pounds per square inch at twenty-eight (28) days.

112.3. Bonding of Walls.

112.31. Solid Walls.—In solid brick masonry walls, the facing and backing shall be bonded together with not less than one (1) header course in each seven (7) courses; or with not less than one full length header in each one and one-half (1½) square feet of wall surface. The distance between adjacent full length headers shall in no case be more than twenty (20) inches either vertically or horizontally. Header bricks from opposite faces of the wall shall break joints at the inner ends in alternate courses in walls more than eight (8) inches thick.

112.32. Hollow Unit Walls.—In walls of hollow structural clay tile, concrete or other approved hollow masonry units, the stretcher courses shall be bonded at vertical intervals of not more than thirty-four (34) inches, either by lapping not less than three and three-quarter (3¾) inches over the unit below, or by lapping with units of not less than fifty (50) per cent greater thickness than the units below at vertical intervals of not more than seventeen (17) inches.

112.33. Cavity and Hollow Walls.—Hollow walls of solid units shall have a masonry bond equivalent to solid walls and the facing and backing shall be bonded together with headers or equivalent masonry bonding units with not less than one (1) header unit for each three (3) square feet of wall surface. Cavity walls shall be tied together with not less than three-sixteenths (3/16) inch rounds or one-eighth (⅛) by three-quarters (¾) inch flats of corrosion-resistive non-ferrous metal ties with not less than one (1) approved tie to each three (3) square feet of wall surface.

112.34. Composite Walls.—The facing shall be bonded to the backing with headers or stretchers not less than four (4) inches thicker than the facing to the equivalent extent of one-seventh (1/7) of the area of the wall as provided in section 112.31.

112.35. Ashlar Facing.—Facings of dressed natural or cast stone shall be bonded to the backing with at least one-seventh (1/7) of the superficial area extending not less than four (4) inches into the backing. In plain coursed ashlar, at least every fourth course shall be a bond course. Bond stones shall be uniformly distributed throughout the walls; except when alternate courses are full bond courses, every stone which is not a bond stone shall be anchored to the backing with an approved corrosion-resistive metal anchor to each three (3) square feet of superficial area or part thereof.

112.36. Rubble Stone Walls.—All stones in rubble masonry shall be laid on their natural bed and the walls shall be bonded with at least one (1) through bond stone for each nine (9) superficial square feet of area when less than twenty-four (24) inches thick and one (1) bond stone on both sides for each six (6) square feet in area of thicker walls.

112.4. Hollow Wall Construction.

112.41. Bearing Area.—Joist, beam girder and other concentrated loads shall be provided with a bearing of solid masonry in all hollow unit and hollow wall construction or with a bearing plate of four (4) inches of solid brick or the equivalent, or more if necessary to distribute the load, and the wall it twelve (12) inches or less shall be reinforced with four (4) inch by twelve (12) inch bonded pilaster at all main girder bearings.

112.42. Closure Blocks.—All open cells in tiles of blocks at wall ends and at wall openings shall be filled solidly with concrete or its equivalent for a length of wall of not less than twelve (12) inches or reversed closure tile shall be used.

112.43. Cavity Walls.—Approved flashing shall be provided around all openings and drainage pipes or other protection shall be provided to prevent water from accumulating in the cavity. During construction, precautions shall be taken to prevent mortar droppings from obstructing and filling the cavity. All openings in cavity wall construction shall be provided with perimeter ties as specified in section 112.33 between the two wythes at not more than three (3) feet centers on all sides.

112.44. Transition in Wall Thickness.—When walls of hollow masonry are decreased in thickness, the top course units of the lower thicker wall shall be filled solidly for not less than four (4) inch depth with concrete, or such course shall be covered with solid tile slabs not less than one (1) inch in thickness, or with brick or other approved masonry not less than two (2) inches thick.

112.5. Chases and Alcoves.

112.51. Size Limitations.—The maximum permitted depth of a chase shall be not more than one-third (⅓) the wall thickness and the maximum length of a horizontal chase or maximum horizontal projection of a diagonal chase shall not exceed four (4) feet; except that the length of the apron below window sills in all walls may equal the width of the window opening and such aprons in eight (8) inch walls may be chased not more than four (4) inches in depth when waterproofed to comply with section 116.45.

112.52. Alcoves.—Recesses for alcoves, elevators, dumbwaiters, and stairways and for similar purposes shall have not less than eight (8) inches of masonry at the back.

112.53. Lintels over Chases.—When the length of a chase in bearing walls is more than twelve (12) inches, lintels shall be provided to support the masonry above the chase. All chases shall be built to have not less than eight (8) inches of approved masonry at the jambs of openings.

112.54. Hollow Walls.—Chases and recesses in hollow walls and walls constructed of hollow blocks or tiles shall be built in with the wall; and no chases shall be cut in such walls after erection.

112.55. Cutting Fire Walls.—No masonry walls of a required fire-resistance rating, which are eight (8) inches or less in thickness shall be cut for chases or socketed for insertion of structural members subsequent to erection.

112.6. Structural Members, Buttresses and Piers.

112.61. Lintels and Arches.—All openings in masonry walls shall be spanned by plain or reinforced arches, steel lintels or other approved non-combustible supports with not less than four (4) inch bearing on the wall at each end on bearing plates of metal not less than one-half (½) inch thick or of natural or reinforced artificial stone not less than four (4) inches thick. Plain stone lintels shall not be used on spans greater than four (4) feet nor to support load concentrations on the wall less than two (2) feet above the top of the lintel unless supplemented by structural lintels or arches. All lintels shall be of sufficient strength to support the superimposed load with a deflection of not more than one three-hundred-and-sixtieth (1/360) of the clear span; and arches shall be designed to support the load with provision to resist the lateral thrust.

112.62. Buttresses and Piers.—All wall buttresses and piers shall be built into the wall with a masonry bond. Isolated piers shall be not less than twelve (12) inches square nor more than twelve (12) times the least dimension in height when of solid masonry construction nor more than four (4) times the least dimension when of hollow masonry unless filled solidly with approved concrete. Isolated masonry piers shall be bonded as required for solid walls of the same thickness and shall be provided with a cap stone or bearing plate of the full dimension of the pier or with other adequate means for distributing the load on the top.

112.63. Bearing and Anchorage of Structural Members.—All structural joists, beams and girders producing concentrated loads shall have a bearing on solid masonry of not less than four (4) inch thickness and shall project not less than four (4) inches into masonry walls with adequate wall-bearing plates as provided in section 112.61. All such beams and girders shall be anchored to the masonry with standard steel anchors.

112.64. Concrete Slab Floors.—Ground supported unreinforced concrete slabs shall be not less than four (4) inches thick. (See Section 112.25).

112.7. Corbeling and Projecting Masonry.

112.71. Limiting Projections.—No masonry wall less than twelve (12) inches thick shall be corbeled except to support firestopping around combustible floor framing and as provided for foundation walls in section 110.6. The support of chimneys shall conform to section 113.15. The maximum horizontal projection of corbels shall be not more than one-third (1/3) the thickness of the wall nor shall the projection of any single course of masonry exceed one-third (1/3) the height of the masonry unit.

112.72. Hollow Walls.—Corbeling of hollow masonry or masonry built of hollow units shall be supported on one full course of solid masonry not less than twelve (12) inches deep.

112.8. Cornices and Exterior Trim.

112.81. Cornice Construction.—Terra cotta, metal and molded cornices shall be installed with a structural frame anchored and supported to resist the overturning moment due to the loads specified in section 109. When exterior cornices of wood or other combustible construction are permitted they shall be fire-stopped at maximum intervals of twenty (20) feet. If non-continuous, they shall be closed solidly at the ends with at least four (4) inch separation between adjoining sections; and if continuous, noncombustible firestops shall be provided at the lot lines complying with section 119.9. The maximum projection of a cornice over a street line shall be in the ratio of one (1) foot for each sixteen (16) feet, but not more than two (2) feet.

112.82. Balconies and Bay Windows.—All balconies, bay and oriel windows attached to or supported by walls of other than frame construction shall be constructed of approved noncombustible materials with brackets and supports of steel, concrete or other approved noncombustible materials.

112.83. Half-Timbering.—Exterior half-timbering and other architectural decorative trim erected on the face of masonry enclosure walls may be constructed of wood and similar combustible materials on all buildings within the scope of this code when backed up solidly with noncombustible materials.

112.84. Existing Combustible Trim.—Any existing cornice or other decorative elements constructed of wood or other combustible materials where prohibited by the provisions of this code may be repaired with the same materials, but such repairs shall not exceed fifty (50) per cent of the area of such prohibited construction in any one year.

112.9. Lateral Bracing of Walls and Erection Precautions.—All masonry bearing walls shall be laterally supported by horizontal bracing of floor and roof framing or by vertical bracing of columns, pilasters, buttresses or crosswalls at the intervals herein specified. In non-bearing enclosure, partition or fire division walls, the intervals between lateral bracing may be increased fifty (50) per cent above the specified limits.

112.91. Vertical and Horizontal Intervals.—The interval between horizontal or vertical bracing of masonry bearing walls shall be not more than twenty (20) times the wall thickness in walls of solid masonry; eighteen (18) times the wall thickness in hollow walls and walls of hollow units; and fourteen (14) times the wall thickness in cavity wall construction.

112.92. Maximum Unbraced Length.—In no case shall the length of bearing or non-bearing walls between columns, pilasters, buttresses, crosswalls or other equivalent vertical bracing be more than seventy-five (75) times the wall thickness.

112.93. Temporary Bracing.—Whenever practical, masonry enclosure walls shall be carried up together and shall be temporarily braced during erection where necessary.

112.94. Anchorage of Beams.—All wood floor beams, joists and roof rafters resting on masonry walls shall be anchored with not less than one-eighth by one by sixteen (1/8 x 1 x 16) inch metal anchors with split and upset ends at maximum intervals of six (6) feet in one and two-family dwellings and not more than four (4) feet on centers in all other buildings. Masonry walls parallel to beams or joists shall be provided with anchors which engage not less than three (3) beams or joists at maximum intervals of eight (8) feet in one and two-family dwellings and not more than six (6) feet in all other buildings.

112.95. Intersecting Walls.—The intersection of two (2) walls shall be bonded by not less than fifty (50) per cent of the masonry units when the two walls are laid together; and when carried up separately, the intersection shall be toothed with eight (8) inch maximum offsets and tied together with approved spear anchors at vertical intervals of not more than four (4) feet.

112.96. Erection Precautions.—All masonry shall be protected against freezing for not less than forty-eight (48) hours after installation and shall not be constructed below twenty-eight (28) degrees F. on rising temperatures or below thirty-two (32) degrees F. on falling temperatures without temporary heated enclosures or without heating materials or other approved precautions necessary to prevent freezing. No frozen materials shall be used or shall frozen materials be built upon. In warm weather all clay or shale units of high absorption characteristics shall be thoroughly wet before laying in the wall. All other masonry units, except gypsum units, laid in other than lime mortar, shall be wetted before laying in the wall if the absorption resulting from partial immersion in one-eighth (⅛) inch of water for one (1) minute is less than one (1) per cent.

SECTION 113.0. CHIMNEYS, FLUES, VENTS AND SMOKEPIPES

All chimneys, flues, vents and smokepipes for the removal of the products of combustion hereafter erected or altered in all buildings and structures shall comply with the provisions of this section; except that minor repairs for the purpose of maintenance and upkeep which do not increase the capacity of the heating apparatus or appliances or which do not involve structural changes in the permanent chimney, flues or vents may be made without a permit.

113.1. Solid and Liquid Fuel-Fired Equipment.—Chimneys, flues and smokestacks for all solid and liquid fuel-fired heating equipment or appliances when constructed of solid masonry, reinforced concrete, metal or other approved noncombustible materials shall conform to the following requirements. When lining is required, it shall comply with section 113.3.

113.11. Solid Masonry.—The walls of all masonry chimneys and flues shall not be less than eight (8) inches thick when constructed of brick, stone or mass concrete, except, that in single family dwellings and buildings of like heating requirements the thickness of chimney walls shall be not less than four (4) inches and provided further that such chimneys or flues shall be lined as provided in section 113.17.

113.12. Reinforced Concrete.—Except in dwellings, the walls of chimneys and flues shall be not less than six (6) inches thick when constructed of reinforced concrete.

113.13. Dwellings.—In one and two-family dwellings and multiple family dwellings, chimney and flue walls may be constructed of solid masonry or reinforced concrete not less than four (4) inches thick when the area of the flue is not more than one hundred and fifty (150) square inches and the flue is provided with a fire clay lining. All flue walls that are less than eight (8) inches thick shall be lined to comply with Section 113.17.

113.14. Metal Smokestacks.—Exterior metal smokestacks shall be not less than one-eighth (⅛) inch thick for diameters up to three (3) feet and three-sixteenths (3/16) inch thick for diameters up to four (4) feet. Interior metal smokestacks shall be constructed of metal not less than No. 16 U.S. gage for areas up to one hundred and fifty-four (154) square inches, No. 14 U.S. gage for areas not more than two hundred (200) square inches, No. 12 U.S. gage for areas not more than two hundred and fifty-four (254) square inches and not less than No. 10 U.S. gage for greater areas. All metal smokestacks shall be galvanized or painted with an approved paint, or shall be constructed of corrosion-resistive metals or steel alloys. All such stacks shall be securely guyed, braced, anchored and supported.

113.15. Support of Masonry Chimneys and Smokestacks.—All masonry chimneys and smokestacks shall rest on a foundation located on permanently undisturbed soil or shall be supported on fireproof construction; and no chimney shall rest on or be hung or otherwise supported from combustible floor or wall construction; except as provided in section 113.2. Chimneys may be corbeled from masonry walls other than hollow or cavity wall construction or walls built of hollow masonry units; provided such corbels do not exceed the limits specified in section 112.7. Metal smokestacks erected on the exterior of a building or structure shall be supported on independent substantial masonry or reinforced concrete foundations. Interior smokestacks may be supported on fireproof construction at intermediate floor levels. Masonry chimneys erected outside of frame dwellings shall be anchored to the stud walls at each floor level or at vertical intervals of not more than ten (10) feet.

113.16. Clearances.—Combustible construction shall be trimmed away from all flues and chimneys as specified in section 111.91. Every exterior metal smokestack shall have a clearance of not less than twenty-four (24) inches from frame wall construction unless insulated with not less than two (2) hour fire-resistive construction. All interior metal smokestacks shall be enclosed with walls of not less than two (2) hour fire-resistive construction. Where such interior stacks pass through a combustible roof, it shall be guarded with a metal ventilating thimble extending not less than nine (9) inches above and below the roof with a clearance of not less than twelve (12) inches on all sides of the stack, unless insulated to prevent a temperature greater than two hundred and fifty (250) degrees F. on the exterior exposed surface.

113.17. Linings.—Masonry chimneys with walls less than eight (8) inches thick shall be lined with approved flue linings to comply with section 113.3. Medium and high temperature chimneys and stacks as defined in article 10 of the Basic Building Code shall be lined with four and one-half (4½) inches of fire brick, for the entire height from a point two (2) feet below the inlet opening, or shall be of double wall construction with an intervening air space of not less than two (2) inches. All flue linings shall be supported on solid brick offset or on foundations below the bottom of the cleanout.

113.18. Cleanouts.—Cleanouts or other approved devices shall be provided at the base of all chimneys and metal smokestacks to enable the flues to be maintained clear.

113.19. Chimney Sizes.—Only one (1) inlet shall be permitted in a flue eight by eight (8 x 8) inches nominal size or smaller, or with a cross-sectional area of less than seventy-four (74) square inches. The size of the flue shall be proportionately increased for a larger number of inlets. For flues larger than one hundred and twenty (120) square inches, the walls shall be not less than eight (8) inches thick, except as provided in section 113.13. No change in the size or shape of a chimney shall be made within six (6) inches of the roof framing through which it passes.

113.2. Alternate Chimney and Vent Construction.

113.22. Liquid and Gas Fuel-Fired Equipment.—In lieu of masonry construction chimneys in one and two family dwellings for flues and vents from gas and liquid-fired appliances may be constructed with a lining of approved corrosion-resistive materials enclosed in an insulating wall of acid- and heat-resisting metal. The enclosure shall be so constructed and designed as to prevent a temperature greater than two hundred and fifty (250) degrees F. on the exterior exposed surface. Clearances shall be maintained from combustible construction as provided in section 113.21. Flue assemblies which have been tested and approved by accredited authoritative agencies and which meet the requirements of this code may be accepted for use with gas- and liquid-fired heating equipment.

113.23. Single Family Dwellings.—In single-family dwellings which are not more than two (2) stories and attic in height, alternate chimney construction as herein described may be supported on concrete-filled pipe columns or may be hung from attic or ceiling joists of adequate strength protected with component materials to afford a fire resistance of not less than three-quarter (¾) hour, provided all clearances are maintained as specified in this code and the vents are supported on corrosion-resistive metal brackets of not less than No. 16 U.S. gage.

113.3. Flue Construction and Lining.—All heating equipment, except electric and gas-fired appliances, specifically exempted by the provisions of section 113.5, shall be connected by smokepipes or breeching to flues which conform to this section.

113.31. Labeling Flues.—Flues installed for the use of gas appliances which are not suitable for solid or liquid fuel-fired equipment shall be plainly and permanently labeled to that effect.

113.32. Existing Flues.—No existing flue which does not conform to all the requirements of this section shall be continued in use unless it does not endanger the fire safety of the building and is acceptable to the building official.

113.33. Flue Linings.—Flue linings shall be made of fire clay or other approved refractory materials with a shell thickness of not less than five-eights (⅝) inch capable of resisting the action of flue gases at a temperature of not less than two thousand (2000) degrees F. without softening or cracking. The flue lining shall start not less than eight (8) inches below the inlet of the smokepipe or the throat of a fireplace and shall extend not less than four (4) inches above the top of the chimney; except that when no masonry division is provided between flues, the flue linings shall extend to the bottom of the cleanout.

113.34. Number and Size.—Not more than two (2) flues shall be enclosed in a single chimney unless separated by not less than four (4) inches of masonry or reinforced concrete bonded into the chimney walls. When not so separated, the bed joints of the flue linings shall be staggered not less than seven (7) inches. The cross-sectional area of flues shall be not less than specified in table 14.

TABLE 14.—MINIMUM SIZES OF FLUES

Type of equipment	Cross-sectional area in square inches
Small space stove or heater	27
Stove, range or room heater	35
Fireplace (not less than 1-12 fireplace opening)	57
Hot water and low pressure steam boiler	57
Bakery oven with venting capacity of a nominal 8" by 12" standard tile-lined 4" brick chimney and similar equipment	120

113.4. Heights of Chimneys and Smokestacks.

113.41. Masonry Chimneys.—Chimneys and flues shall extend not less than three (3) feet above the adjacent roof and not less than two (2) feet above any roof ridge within a horizontal distance of ten (10) feet. They shall be capped with concrete, terra cotta tile or other approved noncombustible and weatherproof materials. If the height above the roof exceeds four (4) times the minimum dimension, the chimney shall be braced and anchored to the roof framing.

113.42. Metal Smokestacks.—All metal smokestacks shall extend to a height of not less than four (4) feet above any roof within a horizontal distance of twenty (20) feet; except that smokestacks from cupola, blast and similar industrial furnaces shall extend not less than twenty-five (25) feet above any roof within a radius of fifty (50) feet and shall be covered with a spark arrestor complying with section 113.93.

113.5. Gas-Fired Equipment.—All gas-fired equipment including boilers, furnaces, incinerators and all appliances which produce flue temperatures under normal operation more than six hundred (600) degrees F. at the outlet of the draft hood when burning gas at the manufacturer's input rating, or which can be readily converted to the use of solid or liquid fuels shall be provided with chimneys, metal smokestacks or flues as specified in sections 113.1. The room in which gas equipment of any kind is installed shall be adequately ventilated to comply with section 114.41.

113.51. Vents for Gas Fuel and Electric Appliances.—Flue or vent connections shall not be required for electric and gas appliances of such size or character that no hazard to the fire and health safety of the building or its occupants would result from the absence of such connection. All other approved gas appliances of the input ratings herein specified shall be vented to the outer air with approved vents of noncombustible corrosion-resistive materials of adequate strength and heat resisting value: All domestic appliances with a rating in excess of fifty thousand (50,000) B.T.U. per hour other than manually controlled cooking ranges, or when equipped with automatic means for shutting off the gas supply to one or more burners, or when equipped with automatic means for turning on the gas supply to one or more burners when such burners are furnished with automatic ignition and an automatic pilot;

All automatically controlled appliances with a rating in excess of five thousand (5000) B.T.U. per hour; except when equipped with controls which cannot automatically reduce the gas supply to less than thirty (30) per cent of the peak demand;

All automatically controlled appliances with a rating of five thousand (5000) or less B.T.U. per hour equipped with an automatic pilot; except instantaneous water heaters which supply water to one integral faucet and other automatic appliances equipped with controls as herein specified;

All multiple appliances which, if not vented, have an aggregate input rating of thirty (30) B.T.U. per hour or more per cubic foot room volume, other than domestic gas ranges;

All room or space heaters installed in sleeping quarters for transients other than heaters with a sealed combustion chamber and direct air supply for complete combustion from the outside and direct discharge of all products of combustion to the outside; and

All gas-fired incinerators.

113.52. Size of Vents.—The cross-sectional area of a flue or vent for gas-fired appliances shall be not less than one (1) square inch for each seventy-five hundred (7500) B.T.U. per hour input; nor shall the internal area of the flue or vent be less than the internal area of the largest vent connection. Rectangular or oval vents shall have an area of not less than twelve (12) square inches and the diameter of a round flue shall be not less than three (3) inches. For rough brick-lined flues, the design capacity shall be increased fifteen (15) per cent.

113.53. Draft Hood.—Every flue-connected gas appliance, except an incinerator, shall be equipped with an effective draft hood installed in accordance with the manufacturer's directions, or integrally incorporated in the construction of the equipment.

113.54. Dampers.—No manually operated damper shall be placed in any vent connection to a flue and the vent pipe shall be pitched toward the appliance at not less than one-quarter (¼) inch to the foot of horizontal projection.

113.6. Vent and Duct Construction.—

113.61. Gas Appliance Vents.—Vents for gas-fired appliances shall be constructed of galvanized steel, cement-asbestos, metalbestos, fire-clay or other approved corrosion-resistive, noncombustible materials for the temperatures involved with tight joints as herein provided; and shall comply with the minimum thicknesses herein specified for ducts and vents in tables 15 and 16.

113.62. Ducts in One and Two-Family Dwellings.—Warm air supply ducts in heating and air conditioning systems of one and two-family dwellings shall be constructed of aluminum, copper, galvanized steel or other approved noncombustible materials of equal strength and durability to the material specified in table 16.

TABLE 15.—METAL DUCT AND VENT CONSTRUCTION, OTHER THAN DWELLINGS

Diameters, or diagonal of rectangular ducts, dimension in inches	Minimum Thickness: Galvanized Steel U. S. gage number	Minimum Thickness: Aluminum B & S gage number
Up to 12	28	26
12-20	26	24
20-30	24	22
30-48	22	20
48-60	20	18
60-90	18	16
90 and over	16	14

113.63. Types of Gas Vents.—Type A vents shall be constructed the same as masonry flues or metal smokestacks for use with boilers, warm air furnaces and incinerators unless special approval is granted by the building official for a type B vent.

Type B vents shall be constructed of noncombustible, corrosion-resistive materials sufficient to prevent a temperature of not more than two hundred and fifty (250) degrees F. on adjacent construction and when approved by accredited authoritative agencies for use with gas-fired appliances which produce flue gas temperatures not more than five hundred and fifty (550) degrees F. at the outlet of the draft hood.

Type C vents shall be constructed of not less than No. 24 U.S. gage sheet copper or No. 20 U.S. gage galvanized steel or of other approved noncombustible corrosion-resistive materials of equivalent strength and durability for use in vent pipes which pass directly through the roof or exterior wall to the outer air. Such flues shall not pass through any attic or other concealed space nor through any intermediate floor construction.

113.64. Fire-Clay Vents.—Fire-clay vent pipes shall have a thickness of not less than one-half (½) inch for an internal diameter of less than six (6) inches and three-quarter (¾) inches for an internal diameter of six (6) or more inches. The joints shall be made tight with bell and spigot, sheet metal sleeves, or galvanized iron bands of not less than No. 26 U.S. gage, thoroughly secured and cemented in place with high temperature cement mortar.

113.65. Clearances and Protection.—No gas-appliance vent shall pass through an attic, concealed space, combustible floor or roof, wall or partition unless constructed as herein provided. Such vents shall be fitted with a ventilating collar or double thimble with the annular space filled with approved noncombustible insulating material. A clearance of not less than one (1) inch shall be maintained from all combustible construction when plastered and not less than two (2) inches when unplastered; except that a vent from a floor furnace, water heater or space heater shall have a clearance of not less than three (3) inches for a distance of not less than three (3) feet from the outlet of the draft hood. All vents shall be enclosed in one-quarter (¼) inch asbestos or three-eighth (⅜) inch gypsum boards where they pass through habitable spaces.