

2021 Virginia Construction Code

CHAPTER 21 MASONRY

SECTION 2113 MASONRY CHIMNEYS

2113.1 General.

The construction of masonry chimneys consisting of solid *masonry units*, hollow *masonry units* grouted solid, stone or concrete shall be in accordance with this section.

2113.2 Footings and foundations.

Footings for masonry chimneys shall be constructed of concrete or *solid masonry* not less than 12 inches (305 mm) thick and shall extend not less than 6 inches (152 mm) beyond the face of the foundation or support wall on all sides. Footings shall be founded on natural undisturbed earth or engineered fill below frost depth. In areas not subjected to freezing, footings shall be not less than 12 inches (305 mm) below finished grade.

2113.3 Seismic reinforcement.

In structures assigned to *Seismic Design Category A* or *B*, seismic reinforcement is not required. In structures assigned to *Seismic Design Category C* or *D*, masonry chimneys shall be reinforced and anchored in accordance with [Sections 2113.3.1](#), [2113.3.2](#) and [2113.4](#). In structures assigned to *Seismic Design Category E* or *F*, masonry chimneys shall be reinforced in accordance with the requirements of [Sections 2101](#) through [2108](#) and anchored in accordance with [Section 2113.4](#).

2113.3.1 Vertical reinforcement.

For chimneys up to 40 inches (1016 mm) wide, four No. 4 continuous vertical bars anchored in the foundation shall be placed in the concrete between *wythes* of *solid masonry* or within the *cells* of hollow unit masonry and grouted in accordance with [Section 2103.3](#). Grout shall be prevented from bonding with the flue liner so that the flue liner is free to move with thermal expansion. For chimneys greater than 40 inches (1016 mm) wide, two additional No. 4 vertical bars shall be provided for each additional 40 inches (1016 mm) in width or fraction thereof.

2113.3.2 Horizontal reinforcement.

Vertical reinforcement shall be placed enclosed within $\frac{1}{4}$ -inch (6.4 mm) ties, or other reinforcing of equivalent net cross-sectional area, spaced not to exceed 18 inches (457 mm) on center in concrete, or placed in the *bed joints* of unit masonry, at not less than every 18 inches (457 mm) of vertical height. Two such ties shall be provided at each bend in the vertical bars.

2113.4 Seismic anchorage.

Masonry chimneys and foundations shall be anchored at each floor, ceiling or roof line more than 6 feet (1829 mm) above grade with two $\frac{3}{16}$ -inch by 1-inch (4.8 mm by 25 mm) straps embedded not less than 12 inches (305 mm) into the chimney. Straps shall be hooked around the outer bars and extend 6 inches (152 mm) beyond the bend. Each strap shall be fastened to not less than four floor joists with two $\frac{1}{2}$ -inch (12.7 mm) bolts.

Exception: Seismic anchorage is not required for the following:

1. In structures assigned to *Seismic Design Category A* or *B*.
2. Where the masonry fireplace is constructed completely within the *exterior walls*.

2113.5 Corbeling.

Masonry chimneys shall not be corbeled more than half of the chimney's wall thickness from a wall or foundation, nor shall a chimney be corbeled from a wall or foundation that is less than 12 inches (305 mm) in thickness unless it projects equally on each side of the wall, except that on the second *story* of a two-story *dwelling*, corbeling of chimneys on the exterior of the enclosing walls is permitted to equal the wall thickness. The projection of a single course shall not exceed one-half the unit height or one-third of the unit bed depth, whichever is less.

2113.6 Changes in dimension.

The chimney wall or chimney flue lining shall not change in size or shape within 6 inches (152 mm) above or below where the chimney passes through floor components, ceiling components or roof components.

2113.7 Offsets.

Where a masonry chimney is constructed with a fireclay flue liner surrounded by one *wythe* of masonry, the maximum offset shall be such that the centerline of the flue above the offset does not extend beyond the center of the chimney wall below the offset. Where the chimney offset is supported by masonry below the offset in an *approved* manner, the maximum offset limitations shall not apply. Each individual corbeled masonry course of the offset shall not exceed the projection limitations specified in [Section 2113.5](#).

2113.8 Additional load.

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Chimneys shall not support *loads* other than their own weight unless they are designed and constructed to support the additional *load*. Masonry chimneys are permitted to be constructed as part of the masonry walls or concrete walls of the building.

2113.9 Termination.

Chimneys shall extend not less than 2 feet (610 mm) higher than any portion of the building within 10 feet (3048 mm), but shall be not less than 3 feet (914 mm) above the highest point where the chimney passes through the roof.

2113.9.1 Chimney caps.

Masonry chimneys shall have a concrete, metal or stone cap, sloped to shed water, a drip edge and a caulked bond break around any flue liners in accordance with [ASTM C1283](#).

2113.9.2 Spark arrestors.

Where a spark arrestor is installed on a masonry chimney, the spark arrestor shall meet all of the following requirements:

1. The net free area of the arrestor shall be not less than four times the net free area of the outlet of the chimney flue it serves.
2. The arrestor screen shall have heat and *corrosion resistance* equivalent to 19-gage galvanized steel or 24-gage stainless steel.
3. Openings shall not permit the passage of spheres having a diameter greater than $1\frac{1}{2}$ inch (12.7 mm) nor block the passage of spheres having a diameter less than $\frac{3}{8}$ inch (9.5 mm).
4. The spark arrestor shall be accessible for cleaning and the screen or chimney cap shall be removable to allow for cleaning of the chimney flue.

2113.9.3 Rain caps.

Where a masonry or metal rain cap is installed on a masonry chimney, the net free area under the cap shall be not less than four times the net free area of the outlet of the chimney flue it serves.

2113.10 Wall thickness.

Masonry chimney walls shall be constructed of concrete, solid *masonry units* or hollow *masonry units* grouted solid with not less than 4 inches (102 mm) nominal thickness.

2113.10.1 Masonry veneer chimneys.

Where masonry is used as *veneer* for a framed chimney, through flashing and weep holes shall be provided as required by [Chapter 14](#).

2113.11 Flue lining (material).

Masonry chimneys shall be lined. The lining material shall be appropriate for the type of appliance connected, according to the terms of the appliance listing and the manufacturer's instructions.

2113.11.1 Residential-type appliances (general).

Flue lining systems shall comply with one of the following:

1. Clay flue lining complying with the requirements of [ASTM C315](#).
2. *Listed* chimney lining systems complying with [UL 1777](#).
3. Factory-built chimneys or chimney units *listed* for installation within masonry chimneys.
4. Other *approved* materials that will resist corrosion, erosion, softening or cracking from flue gases and condensate at temperatures up to 1,800°F (982°C).

2113.11.1.1 Flue linings for specific appliances.

Flue linings other than those covered in [Section 2113.11.1](#) intended for use with specific appliances shall comply with [Sections 2113.11.1.2](#) through [2113.11.1.4](#), [2113.11.2](#) and [2113.11.3](#).

2113.11.1.2 Gas appliances.

Flue lining systems for gas appliances shall be in accordance with the [International Fuel Gas Code](#).

2113.11.1.3 Pellet fuel-burning appliances.

Flue lining and vent systems for use in masonry chimneys with pellet fuel-burning appliances shall be limited to flue lining systems complying with [Section 2113.11.1](#) and pellet vents *listed* for installation within masonry chimneys (see [Section 2113.11.1.5](#) for marking).

2113.11.1.4 Oil-fired appliances approved for use with L-vent.

Flue lining and vent systems for use in masonry chimneys with oil-fired appliances *approved* for use with Type L vent shall be limited to flue lining systems complying with [Section 2113.11.1](#) and *listed* chimney liners complying with [UL 641](#) (see [Section 2113.11.1.5](#) for marking).

2113.11.1.5 Notice of usage.

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When a flue is relined with a material not complying with [Section 2113.11.1](#), the chimney shall be plainly and permanently identified by a *label* attached to a wall, ceiling or other conspicuous location adjacent to where the connector enters the chimney. The *label* shall include the following message or equivalent language: "This chimney is for use only with (type or category of appliance) that burns (type of fuel). Do not connect other types of appliances."

2113.11.2 Concrete and masonry chimneys for medium-heat appliances.

Concrete and masonry chimneys for medium-heat appliances shall comply with [Sections 2113.11.2.1](#) through [2113.11.2.5](#).

2113.11.2.1 Construction.

Chimneys for mediumheat appliances shall be constructed of solid *masonry units* or of concrete with walls not less than 8 inches (203 mm) thick, or with stone masonry not less than 12 inches (305 mm) thick.

2113.11.2.2 Lining.

Concrete and masonry chimneys shall be lined with an *approved* medium-duty refractory brick not less than $4\frac{1}{2}$ inches (114 mm) thick laid on the $4\frac{1}{2}$ -inch bed (114 mm) in an *approved* medium-duty refractory *mortar*. The lining shall start 2 feet (610 mm) or more below the lowest chimney connector entrance. Chimneys terminating 25 feet (7620 mm) or less above a chimney connector entrance shall be lined to the top.

2113.11.2.3 Multiple passageway.

Concrete and masonry chimneys containing more than one passageway shall have the liners separated by a minimum 4-inch-thick (102 mm) concrete or *solid masonry* wall.

2113.11.2.4 Termination height.

Concrete and masonry chimneys for medium-heat appliances shall extend not less than 10 feet (3048 mm) higher than any portion of any building within 25 feet (7620 mm).

2113.11.2.5 Clearance.

A minimum clearance of 4 inches (102 mm) shall be provided between the exterior surfaces of a concrete or masonry chimney for medium-heat appliances and combustible material.

2113.11.3 Concrete and masonry chimneys for highheat appliances.

Concrete and masonry chimneys for high-heat appliances shall comply with [2113.11.3.1](#) through [2113.11.3.4](#).

2113.11.3.1 Construction.

Chimneys for high-heat appliances shall be constructed with double walls of solid *masonry units* or of concrete, each wall to be not less than 8 inches (203 mm) thick with a minimum airspace of 2 inches (51 mm) between the walls.

2113.11.3.2 Lining.

The inside of the interior wall shall be lined with an *approved* high-duty refractory brick, not less than $4\frac{1}{2}$ inches (114 mm) thick laid on the $4\frac{1}{2}$ -inch bed (114 mm) in an *approved* high-duty refractory *mortar*. The lining shall start at the base of the chimney and extend continuously to the top.

2113.11.3.3 Termination height.

Concrete and masonry chimneys for high-heat appliances shall extend not less than 20 feet (6096 mm) higher than any portion of any building within 50 feet (15 240 mm).

2113.11.3.4 Clearance.

Concrete and masonry chimneys for high-heat appliances shall have *approved* clearance from buildings and structures to prevent overheating combustible materials, permit inspection and maintenance operations on the chimney and prevent danger of burns to persons.

2113.12 Clay flue lining (installation).

Clay flue liners shall be installed in accordance with [ASTM C1283](#) and extend from a point not less than 8 inches (203 mm) below the lowest inlet or, in the case of fireplaces, from the top of the smoke chamber to a point above the enclosing walls. The lining shall be carried up vertically, with a maximum slope not greater than 30 degrees (0.52 rad) from the vertical.

Clay flue liners shall be laid in medium-duty nonwatersoluble refractory *mortar* conforming to [ASTM C199](#) with tight *mortar* joints left smooth on the inside and installed to maintain an airspace or insulation not to exceed the thickness of the flue liner separating the flue liners from the interior face of the chimney masonry walls. Flue lining shall be supported on all sides. Only enough *mortar* shall be placed to make the joint and hold the liners in position.

2113.13 Additional requirements.

2113.13.1 Listed materials.

Listed materials used as flue linings shall be installed in accordance with the terms of their listings and the manufacturer's instructions.

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2113.13.2 Space around lining.

The space surrounding a chimney lining system or vent installed within a masonry chimney shall not be used to vent any other appliance.

Exception: This shall not prevent the installation of a separate flue lining in accordance with the manufacturer’s instructions.

2113.14 Multiple flues.

Where two or more flues are located in the same chimney, masonry wythes shall be built between adjacent flue linings. The masonry wythes shall be not less than 4 inches (102 mm) thick and bonded into the walls of the chimney.

Exception: Where venting only one appliance, two flues are permitted to adjoin each other in the same chimney with only the flue lining separation between them. The joints of the adjacent flue linings shall be staggered not less than 4 inches (102 mm).

2113.15 Flue area (appliance).

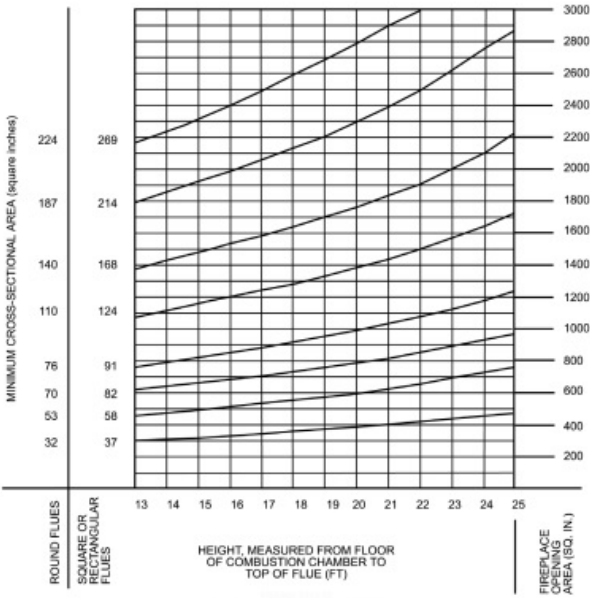
Chimney flues shall not be smaller in area than the area of the connector from the appliance. Chimney flues connected to more than one appliance shall be not less than the area of the largest connector plus 50 percent of the areas of additional chimney connectors.

Exceptions:

- 1. Chimney flues serving oil-fired appliances sized in accordance with NFPA 31.
- 2. Chimney flues serving gas-fired appliances sized in accordance with the International Fuel Gas Code.

2113.16 Flue area (masonry fireplace).

Flue sizing for chimneys serving fireplaces shall be in accordance withSection 2113.16.1 or 2113.16.2.



Note: 1 inch = 25.4 mm, 1 square inch = 645 mm².

FIGURE 2113.16
FLUE SIZES FOR MASONRY CHIMNEYS

TABLE 2113.16(1)
NET CROSS-SECTIONAL AREA OF ROUND FLUE SIZES^a

FLUE SIZE, INSIDE DIAMETER (inches)	CROSS-SECTIONAL AREA (square inches)
6	28
7	38
8	50
10	78
10 ³ / ₄	90
12	113
15	176

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For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm².

- a. Flue sizes are based on [ASTM C315](#).

TABLE 2113.16(2)
NET CROSS-SECTIONAL AREA OF SQUARE AND RECTANGULAR FLUE SIZES

FLUE SIZE, OUTSIDE NOMINAL DIMENSIONS (inches)	CROSS-SECTIONAL AREA (square inches)
4.5 × 8.5	23
4.5 × 13	34
8 × 8	42
8.5 × 8.5	49
8 × 12	67
8.5 × 13	76
12 × 12	102
8.5 × 18	101
13 × 13	127
12 × 16	131
13 × 18	173
16 × 16	181
16 × 20	222
18 × 18	233
20 × 20	298
20 × 24	335
24 × 24	431

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm².

2113.16.1 Minimum area.

Round chimney flues shall have a minimum net cross-sectional area of not less than $\frac{1}{12}$ of the fireplace opening. Square chimney flues shall have a minimum net cross-sectional area of not less than $\frac{1}{10}$ of the fireplace opening. Rectangular chimney flues with an aspect ratio less than 2 to 1 shall have a minimum net cross-sectional area of not less than $\frac{1}{10}$ of the fireplace opening. Rectangular chimney flues with an aspect ratio of 2 to 1 or more shall have a minimum net cross-sectional area of not less than $\frac{1}{8}$ of the fireplace opening.

2113.16.2 Determination of minimum area.

The minimum net cross-sectional area of the flue shall be determined in accordance with [Figure 2113.16](#). A flue size providing not less than the equivalent net cross-sectional area shall be used. Cross-sectional areas of clay flue linings are as provided in [Tables 2113.16\(1\)](#) and [2113.16\(2\)](#) or as provided by the manufacturer or as measured in the field. The height of the chimney shall be measured from the firebox floor to the top of the chimney flue.

2113.17 Inlet.

Inlets to masonry chimneys shall enter from the side. Inlets shall have a thimble of fireclay, rigid refractory material or metal that will prevent the connector from pulling out of the inlet or from extending beyond the wall of the liner.

2113.18 Masonry chimney cleanout openings.

Cleanout openings shall be provided within 6 inches (152 mm) of the base of each flue within every masonry chimney. The upper edge of the cleanout shall be located not less than 6 inches (152 mm) below the lowest chimney inlet opening. The height of the opening shall be not less than 6 inches (152 mm). The cleanout shall be provided with a noncombustible cover.

Exception: Chimney flues serving masonry fireplaces, where cleaning is possible through the fireplace opening.

2113.19 Chimney clearances.

Any portion of a masonry chimney located in the interior of the building or within the *exterior wall* of the building shall have a minimum airspace clearance to combustibles of 2 inches (51 mm). Chimneys located entirely outside the *exterior walls* of the building, including chimneys that pass through the soffit or *cornice*, shall have a minimum airspace clearance of 1 inch (25 mm). The airspace shall not be filled, except to provide *fireblocking* in accordance with [Section 2113.20](#).

Exceptions:

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1. Masonry chimneys equipped with a chimney lining system *listed* and *labeled* for use in chimneys in contact with combustibles in accordance with [UL 1777](#), and installed in accordance with the manufacturer's instructions, are permitted to have combustible material in contact with their exterior surfaces.
2. Where masonry chimneys are constructed as part of masonry or concrete walls, combustible materials shall not be in contact with the masonry or concrete wall less than 12 inches (305 mm) from the inside surface of the nearest flue lining.
3. Exposed combustible *trim* and the edges of sheathing materials, such as wood siding, are permitted to abut the masonry chimney sidewalls, in accordance with [Figure 2113.19](#), provided that such combustible *trim* or sheathing is not less than 12 inches (305 mm) from the inside surface of the nearest flue lining. Combustible material and *trim* shall not overlap the corners of the chimney by more than 1 inch (25 mm).

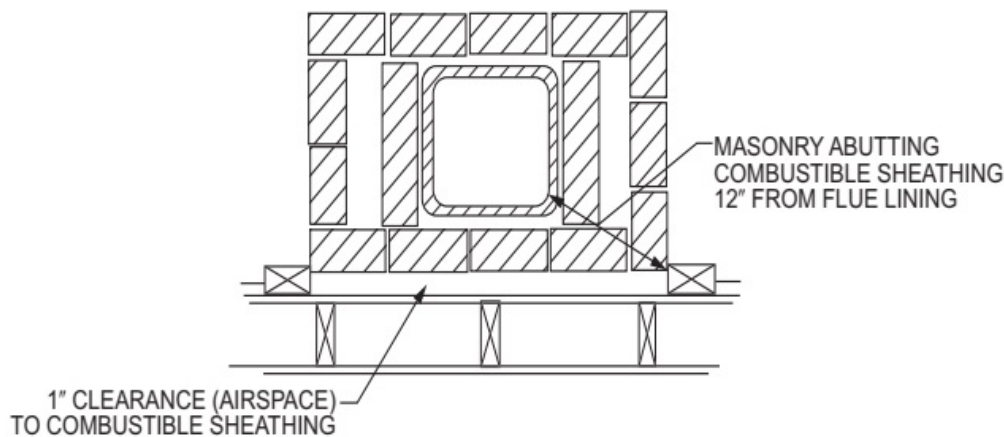


FIGURE 2113.19
ILLUSTRATION OF EXCEPTION THREE CHIMNEY CLEARANCE PROVISION

2113.20 Chimney fireblocking.

All spaces between chimneys and floors and ceilings through which chimneys pass shall be fireblocked with noncombustible material securely fastened in place. The *fireblocking* of spaces between wood joists, beams or headers shall be self-supporting or be placed on strips of metal or metal lath laid across the spaces between combustible material and the chimney.