NFPA 96

Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

1998 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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Standard for

Ventilation Control and Fire Protection of Commercial Cooking Operations

1998 Edition

This edition of NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, was prepared by the Technical Committee on Venting Systems for Cooking Appliances and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 18–21, 1998, in Cincinnati, OH. It was issued by the Standards Council on July 16, 1998, with an effective date of August 5, 1998, and supersedes all previous editions.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

This edition of NFPA 96 was approved as an American National Standard on August 6, 1998.

Origin and Development of NFPA 96

The subject of the ventilation of restaurant-type cooking equipment was first considered by the NFPA Committee on Blower and Exhaust Systems. That committee developed material on ventilation of restaurant-type cooking equipment to be included in NFPA 91, *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying*. This was adopted by the Association in 1946. Revisions to the applicable sections were adopted in 1947 and 1949.

When the NFPA Committee on Chimneys and Heating Equipment was organized in 1955, the material on ventilation of restaurant cooking equipment in NFPA 91 was assigned to this new committee with the suggestion that it be revised and published as a separate standard. Thus, in recent years this standard has been published as NFPA 96. Previous editions of the standard prepared by the Committee on Chimneys and Heating Equipment were adopted by the Association in 1961, 1964, 1969, 1970, 1971, 1973, 1976, 1978, 1980, and 1984.

The Correlating Committee on Chimneys and Other Heat and Vapor Removal Equipment was discharged by the Standards Council in 1986. The Technical Committee that prepared the 1987 edition became known as the Technical Committee on Venting Systems for Cooking Appliances.

In the 1991 edition, clearance requirements to combustible material were revised and expanded, including appendix figures that illustrate examples. A new definition for limited-combustible was added to the standard, and an appendix table was included to show typical construction assemblies. Chapters 3 and 4 were totally revised.

In the 1994 edition, the Committee changed the name of the standard from *Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment* to *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*. The title change reflected other changes in the standard, such as new chapters on recirculating systems, and solid fuel cooking operations were added in 1994. A change to clearance and enclosure requirements in the 1994 edition allowed, for the first time, materials or products directly applied to a duct.

The Committee prepared a revision to the standard, reporting to the 1996 Fall Meeting, that was returned to Committee at the Technical Committee Reports Session.

This 1998 edition contains new definitions, minor revisions throughout, and a completely revised Chapter 7 on fire-extinguishing equipment.

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NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on fire safety in the design, installation, and use of exhaust systems (including hoods, grease removal devices, exhaust ducts, dampers, air-moving devices, and auxiliary equipment) for the removal of products of combustion, heat, grease, and vapors from cooking equipment, including the application of associated fire-extinguishing systems.

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Appendix A.

Information on referenced publications can be found in Chapter 12 and Appendix B.

Chapter 1 General

1-1* Scope.

1-1.1 This edition of NFPA 96 provides the minimum fire safety requirements (preventative and operative) related to the design, installation, operation, inspection, and maintenance of all public and private cooking operations except for single-family residential usage. These requirements include, but are not limited to, all manner of cooking equipment, exhaust hoods, grease removal devices, exhaust ductwork, exhaust fans, dampers, fire-extinguishing equipment, and all other auxiliary or ancillary components or systems that are involved in the capture, containment, and control of grease-laden cooking effluent.

1-1.2 The provisions of this standard are considered necessary to provide a reasonable level of protection from loss of life and property from fire and explosion. They reflect conditions and the state of the art prevalent at the time the standard was issued. This standard is intended to be applied as a united whole. It cannot provide safe design and operation if parts of it are not enforced or are arbitrarily deleted in any applications. The authority having jurisdiction shall determine compliance with this standard and authorize equivalent deviations from it in all applications.

1-2 Definitions.

Access Panel. A closure device used to cover an opening into a duct, an enclosure, equipment, or an appurtenance.

Air Intakes. An opening in a building's envelope whose purpose is to allow outside air to be drawn into the structure to replace inside air that is removed by exhaust systems or to improve the quality of the inside air by providing a source of air having a lower concentration of odors, suspended particles, or heating content.

Air Pollution Control Devices. Equipment and devices used for the purpose of cleaning air passing through them or by them in such a manner as to reduce or remove the impurities contained therein.

Appliance Flue Outlet. The opening or openings in a cooking device where vapors, combustion gases, or both leave the cooking device. There might or might not be ductwork attached to this opening.

Approved.* Acceptable to the authority having jurisdiction.

Appurtenance. An accessory or a subordinate part that enables the primary device to perform or improve its intended function.

Authority Having Jurisdiction.* The organization, office, or individual responsible for approving equipment, an installation, or a procedure.

Automatic. Operating by its own mechanism when actuated by some impersonal influence, such as a change in current, strength, pressure, temperature, or mechanical configuration.

Baffle Plate. An object placed in or near an appliance to change the direction, or to retard the flow, of air, air–fuel mixtures, or flue gases.

Classified. See Listed.

Clearly Identified. Capable of being recognized by a person of normal vision without causing uncertainty and indecisiveness about the location or operating process of the identified item.

Closed Combustible Construction.* Combustible building construction including walls, structural framing, roofs, roof ceilings, floors, and floor ceiling assemblies continuously enclosing a grease duct on four sides where one or more sides require protection per 1-3.2.

Combustible Material. Material subject to an increase in combustibility or flame spread rating beyond the limits established in the definition of Limited-Combustible.

Concealed Spaces. That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and elsewhere whose size might normally range from 1¾-in. (44.45-mm) stud spaces to 8-ft (2.44-m) interstitial truss spaces and that might contain combustible materials such as building structural members, thermal and/or electrical insulation, and ducting. Such spaces have sometimes been used as HVAC plenum chambers.

Continuous Enclosure. A recognized architectural or mechanical component of a building having a fire resistance rating as required for the structure and whose purpose is to enclose the vapor removal duct for its full length to its termination point outside the structure without any portion of the enclosure having a fire resistance rating less than the required value.

Continuous Weld.* A metal-joining method that produces a product without visible interruption or variation in quality. For the purpose of the definition, it specifically includes the exhaust compartment of hoods and welded joints of exhaust ducts, yet specifically does not include filter support frames or appendages inside hoods.

Damper. A valve or plate within a duct or its terminal components for controlling draft or the flow of gases, including air.

Detection Devices. Electrical, pneumatic, thermal, mechanical, or optical sensing instruments, or subcomponents of such instruments, whose purpose is to cause an automatic action upon the occurrence of some preselected event. In the context of this document, the event in question could be excessive temperature or flame, and the action could be the operation of a fire-extinguishing system.

Dips. Depression or cuplike places in horizontal duct runs in which liquids could accumulate.

Discharge. The final portion of a duct or pipe where the product being conveyed is emptied or released from confinement; the termination point of the pipe or duct.

Ducts (or Duct System). A continuous passageway for the transmission of air and vapors that, in addition to the containment components themselves, might include duct fittings, dampers, plenums, and/or other items or air-handling equipment.

Easily Accessible. Within comfortable reach, with limited dependence on mechanical devices, extensions, or assistance.

Factory-Built Grease Duct Enclosures. A listed factory-built grease duct enclosure system evaluated for reduced clearances to combustibles and as an alternative to a duct with its fire-rated enclosure.

Field-Applied Grease Duct Enclosure. A listed system evaluated for reduced clearances to combustibles and as an alternative to a duct with its fire-rated enclosure.

Fire Barrier Wall. A wall assembly complying with the requirements of NFPA 221, *Standard for Fire Walls and Fire Barrier Walls,* having a fire resistance rating of 4 hours.

Fire Partition. An interior wall or partition of a building that separates two areas and serves to restrict the spread of fire but does not qualify as a fire wall.

Fire Resistance Rating. A relative value in minutes or hours assigned to materials or assemblies that have withstood a fire exposure as established in accordance with NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials.*

Fume Incinerators. Devices utilizing intense heat or fire to break down and/or oxidize vapors and odors contained in gases or air being exhausted into the atmosphere.

Fusible Link. A form of fixed temperature heat detecting device sometimes employed to restrain the operation of an electrical or mechanical control until its designed temperature is reached. Such devices are to be replaced following each operation.

Grease. Rendered animal fat, vegetable shortening, and other such oily matter used for the purposes of and resulting from cooking and/or preparing foods. Grease might be liberated and entrained with exhaust air or might be visible as a liquid or solid.

Grease Ducts. A containment system for the transportation of air and grease vapors that is designed and installed to reduce the possibility of the accumulation of combustible condensation and the occurrence of damage if a fire occurs within the system.

Grease Filter. A removable component of the grease removal system designed to capture grease and direct it to a safe collection point. Filters are expected to minimize the projection of flames downstream when attacked by flame on the upstream side and are expected to maintain their strength, shape, and integrity when exposed to the anticipated rough handling, cleaning, and service found in the field.

Grease Filter Mesh Type. A general-purpose air filter designed to collect and retain lint and grease from the air passing through it. This type of filter is not tested, listed, or acceptable for commercial cooking operations due to the increased fire hazard.

Grease Removal Devices. A system of components designed for and intended to process vapors, gases, and/or air as it is drawn through such devices by collecting the airborne grease particles and concentrating them for further action at some future time, leaving the exiting air with a lower amount of combustible matter.

Greasetight. Constructed and performing in such a manner as not to permit the passage of any grease under normal cooking conditions.

High Broiler. See Upright Broiler.

High Limit Control. An operating device installed in and serving as an integral component of a deep fat fryer. Its purpose is the secondary limitation of temperature allowed by the cooking operation and, if that temperature is exceeded, the automatic interruption of the thermal energy input.

Hood.* A device provided for a cooking appliance(s) to direct and capture grease-laden vapors and exhaust gases.

Hood, Fixed Baffle. A listed unitary exhaust hood design where the grease removal device is a nonremovable assembly that contains an integral fire-activated water-wash fire-extinguishing system listed for this purpose.

Interconnected. Mutually assembled to another component in such a manner that the operation of one directly affects the other or that the contents of one specific duct system are allowed to encounter or contact the products being moved by another duct system.

Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Limited-Combustible Material.* A building construction material that does not comply with the definition of noncombustible material, that, in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) *(see NFPA 259, Standard Test Method for Potential Heat of Building Materials),* and that complies with either of the following (a) or (b). Materials subject to an increase in combustibility or flame-spread rating beyond the limits herein established through the effects of age, moisture, or other atmospheric conditions shall be considered combustible.

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of ⅛ in. (3.2 mm), and with a flame-spread rating not greater than 50

(b) Materials in the form and thickness used, other than as described in (a), having neither a flame-spread rating greater than 25 nor evidence of continued progressive combustion and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame-spread rating greater than 25 nor evidence of continued progressive combustion.

Liquidtight. Constructed and performing in such a manner as not to permit the passage of any liquid at any temperature.

Listed.* Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the

equipment, material, or service meets identified standards or has been tested and found suitable for a specified purpose.

Noncombustible Material. A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials that are reported as passing ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, shall be considered noncombustible materials.

Open Combustible Construction.* Combustible building construction including wall, structural framing, roof, roof ceiling, floor and floor ceiling assemblies adjacent to a grease duct on three or fewer sides where one or more sides require protection per 1-3.2.

Pitched. To be fixed or set at a desired angle or inclination.

Recirculating Systems. Systems for control of smoke or grease-laden vapors from commercial cooking equipment that do not exhaust to the outside.

Removable. Capable of being transferred to another location with a limited application of effort and tools.

Replacement Air. Air deliberately brought into the structure, then specifically to the vicinity of either a combustion process or a mechanically or thermally forced exhausting device, to compensate for the vapor and/or gases being consumed or expelled.

Salamander Broiler. See Upright Broiler.

Shall. Indicates a mandatory requirement.

Single Hazard Area. As considered in the applicable extinguishing system standard *(see Section 7-2)* or as determined by the authority having jurisdiction.

Solid Cooking Fuel. Any solid, organic, consumable fuel such as briquettes, mesquite, hardwood, or charcoal.

Solid Fuel Cooking Equipment. Cooking equipment that is fired with solid cooking fuel. This equipment includes ovens, tandoori charcoal pots, grills, broilers, rotisseries, barbecue pits, or any other type of cooking equipment that derives all or part of its heat source from the burning of solid cooking fuel.

Solvent. A substance (usually liquid) capable of dissolving or dispersing another substance; a chemical compound designed and used to convert solidified grease into a liquid or semiliquid state in order to facilitate a cleaning operation.

Spark Arrester. A device or method that minimizes the passage of airborne sparks and embers into a plenum, duct, and flue.

Standard. A document, the main text of which contains only mandatory provisions using the word ''shall'' to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

Termination. The final or intended end-portion of a duct system that is designed and functions to fulfill the obligations of the system in a satisfactory manner.

Thermal Recovery Unit. A device or series of devices whose purpose is to reclaim only the heat content of air, vapors, gases, or fluids that are being expelled through the exhaust system and to transfer the thermal energy so reclaimed to a location whereby a useful purpose can be served.

Trap. A cuplike or U-shaped configuration located on the inside of a duct system component where liquids can accumulate.

Upright Broiler. An appliance used in the preparation of food whereby foods are exposed to intense radiant heat, and perhaps to convective heat, with the food or the food and the radiant source not limited to a horizontal mode.

1-3 General Requirements.

1-3.1 Cooking equipment used in processes producing smoke or grease-laden vapors shall be equipped with an exhaust system that complies with all the equipment and performance requirements of this standard, and all such equipment and performance shall be maintained per this standard during all periods of operation of the cooking equipment. Specifically, the following equipment shall be kept in good working condition:

(a) Cooking equipment
(b) Hoods
(c) Ducts (if applicable)
(d) Fans
(e) Fire suppression systems
(f) Special effluent or energy control equipment

All airflows shall be maintained. Maintenance and repairs shall be performed on all components at intervals necessary to maintain these conditions.

1-3.1.1* All solid fuel cooking equipment shall comply with the requirements of Chapter 11.

1-3.1.2 Multiple tenancy applications shall require the concerted cooperation of design, installation, operation, and maintenance responsibilities by tenants and by the building owner.

1-3.1.3 All interior surfaces of the exhaust system shall be reasonably accessible for cleaning and inspection purposes.

1-3.1.4* Cooking equipment used in fixed, mobile, or temporary concessions, such as trucks, buses, trailers, pavilions, tents, or any form of roofed enclosure, shall comply with this standard unless all or part of the installation is exempted by the authority having jurisdiction.

1-3.2* Clearance.

1-3.2.1 Except where enclosures are required, hoods, grease removal devices, exhaust fans, and ducts shall have a clearance of at least 18 in. (457.2 mm) to combustible material, 3 in. (76.2 mm) to limited-combustible material, and 0 in. (0 mm) to noncombustible material. *[See Figures A-1-3.2(a) through (e).]*

Exception No. 1: Where the hood, duct, or grease removal device is listed for lesser clearances.

Exception No. 2: Reduced clearance to combustible material if the combustible material is protected as follows:

(a) 0.013-in. (0.33-mm) (28-gauge) sheet metal spaced out 1 in. (25.4 mm) on noncombustible spacers shall have 9-in. (228.6-mm) clearance to combustible material.

(b) 0.027-in. (0.69-mm) (22-gauge) sheet metal on 1-in. (25.4-mm) mineral wool bats or ceramic fiber blanket reinforced with wire mesh or equivalent spaced out 1 in. (25.4 mm) on noncombustible spacers shall have 3-in. (76.2-mm) clearance to combustible material.

See Figures A-1-3.2(f) and (g) for examples of clearance reduction systems.

Exception No. 3: Reduced clearance to limited-combustible materials to zero clearance where protected by metal lath and plaster, ceramic tile, quarry tile, other noncombustible materials or assembly of noncombustible materials, or materials and products that are listed for the purpose of reducing clearance and are acceptable to the authority having jurisdiction. The listed materials shall be installed in accordance with the conditions of the listing and the manufacturer's instructions and shall be acceptable to the authority having jurisdiction.

1-3.2.1.1 Measures shall be taken to prevent physical damage to any material or product used for the purpose of reducing clearances. In the event of damage, the material or product shall be repaired and restored to meet its intended listing or clearance requirements and shall be acceptable to the authority having jurisdiction. In the event of a fire within a kitchen exhaust system, the duct and its enclosure (rated shaft, factory-built grease duct enclosure, or field applied grease duct enclosure) shall be inspected by qualified personnel to determine whether the duct and protection method are structurally sound, capable of maintaining their fire protection function, and suitable for continued operation.

1-3.2.2 The protection methods for ducts to reduce clearance shall be applied to the combustible or limited-combustible construction, not to the duct itself.

Exception: Field applied grease duct enclosures and factory-built grease duct enclosures.

1-3.2.3 Field applied grease duct enclosures and factory-built grease duct enclosures shall demonstrate that they provide sufficient mechanical and structural integrity, resiliency, and stability when subjected to expected building environmental conditions, duct movement under general operating conditions, and duct movement due to fire conditions. Measures shall be taken to prevent physical damage to any material or product used for the purpose of reducing clearances.

Exception: When the duct is protected with a field applied grease duct enclosure or factory-built grease duct enclosure.

1-3.2.3.1 The specifications of material, gauge, and construction of the duct used in the testing and listing of field applied grease duct enclosures and factory-built grease duct enclosures shall be included as minimum requirements in their listing and installation documentation.

1-3.2.3.2* The following clearance options for which field applied grease duct enclosures and factory-built grease duct enclosures have been successfully evaluated shall be clearly identified in their listing and installation documentation and on their label.

(a) Open combustible clearance at manufacturer's requested dimensions

(b) Closed combustible clearance at manufacturer's requested dimensions, with or without specified ventilation

(c) Rated shaft clearance at manufacturer's requested dimensions, with or without specified ventilation

1-3.2.4 A duct shall be permitted to contact noncombustible floors, interior walls, and other noncombustible structures or supports, but it shall not be in contact for more than 50 percent of its surface area per each lineal foot of contact length. Where such direct contact is made, the duct shall be protected from corrosion due to this contact.

Exception: When the duct is protected with a material or product listed for the purpose of reducing clearance to zero.

1-3.2.5 For clearances between the duct and interior surfaces of enclosures, see 4-7.2.3.

1-3.3 A drawing(s) of the exhaust system installation along with a copy of operating instructions for subassemblies and components used in the exhaust system, including electrical schematics, shall be available on the premises.

1-3.4 If required by the authority having jurisdiction, notification in writing shall be given of any alteration, replacement, or relocation of any exhaust or extinguishing system or part thereof or cooking equipment. Satisfaction shall be provided to the authority having jurisdiction that the complete exhaust system as addressed in this standard is installed and operable in accordance with the approved design and the manufacturer's instructions.

1-3.5 Alternative Methods. Nothing in this standard is intended to prevent the use of other methods or devices, provided that sufficient technical data are submitted to the authority having jurisdiction to demonstrate that the proposed method or device is equivalent in quality, strength, fire endurance, effectiveness, durability, and safety to that prescribed by this standard.

Chapter 2 Hoods

2-1 Construction.

2-1.1 The hood or that portion of a primary collection means designed for collecting cooking vapors and residues shall be constructed of and be supported by steel not less than 0.043 in. (1.09 mm) (No. 18 MSG) in thickness, stainless steel not less than 0.037 in. (0.94 mm) (No. 20 MSG) in thickness, or other approved material of equivalent strength and fire and corrosion resistance.

Exception: Listed exhaust hoods with or without exhaust dampers.

2-1.2 All seams, joints, and penetrations of the hood enclosure that direct and capture grease-laden vapors and exhaust gases shall have a liquidtight continuous external weld to the hood's lower outermost perimeter. Internal hood joints, seams, filter support frames, and appendages attached inside the hood need not be welded but shall be sealed or otherwise made greasetight.

Exception No. 1: Penetrations shall be permitted to be sealed by devices that are listed for such use and whose presence does not detract from the hood's or duct's structural integrity.

Exception No. 2: Eyebrow-type hoods over gas or electric ovens shall be permitted to have a duct constructed as in Chapter 4 from the oven flue(s) connected to the hood canopy upstream of the exhaust plenum as shown in Figure 2-1.2. The duct shall be connected to the hood with a continuous weld or have a duct-to-duct connection as shown in Figures 5-1.2.1(b), (c), or (d).

Exception No. 3: Seams, joints, and penetrations of the hood shall be permitted to be internally welded, provided that the weld is formed smooth or ground smooth, so as to not trap grease, and is readily cleanable.

Exception No. 4: Listed exhaust hoods with or without exhaust dampers.

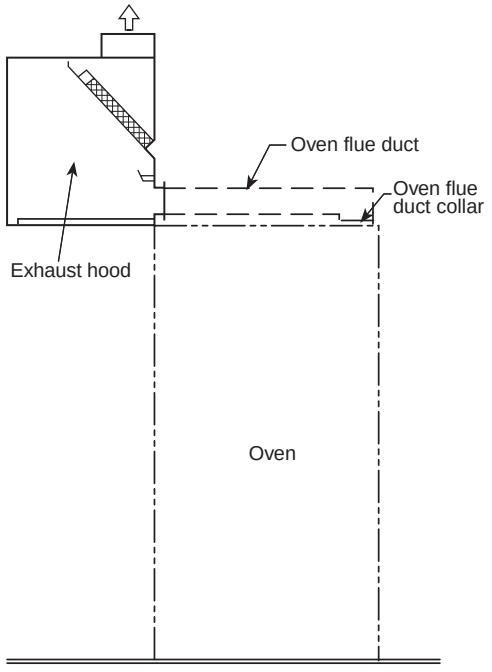


Figure 2-1.2 Typical section of eyebrow-type hood.

2-1.3 Insulation materials other than electrical insulation shall have a flame-spread rating of 25 or less when tested in accordance with UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials.* Adhesives or cements used in the installation of insulating materials shall comply with the preceding requirements when tested with the specific insulating material.

2-2 Hood Size. Hoods shall be sized and configured to provide for the capture and removal of grease-laden vapors. *(See 5-2.2.)*

2-3 Exhaust Hood Assemblies with Integrated Supply Air Plenums. The construction and size of these hoods shall comply with the requirements of Sections 2-1 and 2-2.

2-3.1 The construction of the outer shell or the inner exhaust shell shall comply with 2-1.2. If the outer shell is welded, the inner shell shall be of greasetight construction.

2-3.2* A fire-actuated damper shall be installed in the supply air plenum at each point where a supply air duct inlet or a supply air outlet penetrates the continuously welded shell of the assembly. The damper shall be listed for such use or be part of a listed exhaust hood with or without exhaust damper. The actuation device shall have a maximum temperature rating of 286°F (141°C). Supply air plenums that discharge air from the face rather than from the bottom or into the exhaust hood and that are isolated from the exhaust hood by the continuously welded shell extending to the lower outermost perimeter of the entire hood assembly shall not require a fire-actuated damper. *(See Figure A-2-3.2.)*

2-4 Listed Hood Assemblies. Listed hood assemblies shall be installed in accordance with the terms of their listing and the manufacturer's instructions.

2-5 Solid Fuel Hood Assemblies. Where solid fuel cooking equipment is to be used, the solid fuel hood assembly shall comply with Chapter 11.

Chapter 3 Grease Removal Devices in Hoods

3-1 Grease Removal Devices. Listed grease filters, baffles, or other approved grease removal devices for use with commercial cooking equipment shall be provided. Listed grease filters shall be tested in accordance with UL 1046, *Grease Filters for Exhaust Ducts.* Mesh filters shall not be used.

3-2 Installation.

3-2.1 The distance between the grease removal device and the cooking surface shall be as great as possible but not less than 18 in. (457.2 mm). Where grease removal devices are used in conjunction with charcoal or charcoal-type broilers, including gas or electrically heated char-broilers, a minimum vertical distance of 4 ft (1.22 m) shall be maintained between the lower edge of the grease removal device and the cooking surface.

Exception No. 1: Grease removal devices supplied as part of listed hood assemblies shall be installed in accordance with the terms of the listing and the manufacturer's instructions.

Exception No. 2: For cooking equipment without exposed flame and where flue gases bypass grease removal devices, the minimum vertical distance shall be permitted to be reduced to not less than 6 in. (152.4 mm).

3-2.2 Grease removal devices shall be protected from combustion gas outlets and from direct flame impingement occurring during normal operation of cooking appliances producing high flue gas temperatures, such as deep fat fryers or upright or high broilers (salamander broilers), where the distance between the grease removal device and the appliance flue outlet (heat source) is less than 18 in. (457.2 mm). This protection shall be permitted to be accomplished by the installation of a steel or stainless steel baffle plate between the heat source and the grease removal device. The baffle plate shall be sized and located so that flames or combustion gases shall travel a distance not less than 18 in. (457.2 mm) from the heat source to the grease removal device. The baffle shall be located not less than 6 in. (152.4 mm) from the grease removal devices.

Exception: See Exceptions No. 1 and No. 2 to 3-2.1.

3-2.3 Grease filters shall be listed and constructed of steel or listed equivalent material and shall be of rigid construction that will not distort or crush under normal operation, handling, and cleaning conditions. Filters shall be tightfitting and firmly held in place.

3-2.4 Filters shall be easily accessible and removable for cleaning.

3-2.5 Filters shall be installed at an angle not less than 45 degrees from the horizontal.

3-2.6 Filters shall be equipped with a drip tray beneath their lower edges. The tray shall be kept to the minimum size needed to collect grease and shall be pitched to drain into an enclosed metal container having a capacity not exceeding 1 gal (3.785 L).

3-2.7 Grease filters that require a specific orientation to drain grease shall be clearly so designated, or the hood shall be constructed so that filters cannot be installed in the wrong orientation.

3-3 Solid Fuel Grease Removal Devices. Where solid fuel cooking equipment is provided with grease removal devices, these devices shall comply with Chapter 11.

Chapter 4 Exhaust Duct Systems

4-1 General.

4-1.1 Ducts shall not pass through fire walls or fire partitions.

4-1.2* All ducts shall lead as directly as is practicable to the exterior of the building, so as not to unduly increase any fire hazard.

4-1.3 Duct systems shall not be interconnected with any other building ventilation or exhaust system.

4-1.4 All ducts shall be installed without forming dips or traps that might collect residues. In manifold (common duct) systems, the lowest end of the main duct shall be connected flush on the bottom with the branch duct.

4-1.5 Openings required for accessibility shall comply with Section 4-3.

4-1.6 A sign shall be placed on all access panels stating the following:

ACCESS PANEL—DO NOT OBSTRUCT

4-2 Clearance.

4-2.1 Clearance between ducts and combustible materials shall be provided in accordance with the requirements of 1-3.2.

4-2.2 For listed grease ducts, see Section 4-4.

4-3 Openings.

4-3.1 Openings shall be provided at the sides or at the top of the duct, whichever is more accessible, and at changes of direction. Openings shall be protected by approved access panels that comply with 4-3.4.4.

Exception: Openings shall not be required in portions of the duct that are accessible from the duct entry or discharge.

4-3.2 For hoods with dampers in the exhaust or supply collar, an access panel for cleaning and inspection shall be provided in the duct or the hood collar. This access panel shall be as close to the hood as possible but shall not exceed 18 in. (457.2 mm).

Exception: Dampers that are accessible from under the hood.

4-3.3 Exhaust fans with ductwork connected to both sides shall have access for cleaning and inspection within 3 ft (0.92 m) of each side of the fan.

4-3.4 Openings shall conform with 4-3.4.1 through 4-3.4.5.

4-3.4.1 On horizontal ducts, at least one 20 in. by 20 in. (508 mm by 508 mm) opening shall be provided for personnel entry. Horizontal ducting shall be secured sufficiently to allow for the weight of personnel entry into the duct. Where an opening of this size is not possible, openings large enough to permit thorough cleaning shall be provided at 12-ft (3.7-m) intervals.

4-3.4.2 On nonlisted ductwork, the edge of the opening shall be not less than 1½ in. (38.1 mm) from all outside edges of the duct or welded seams.

4-3.4.3 On vertical ductwork where personnel entry is possible, access shall be provided at the top of the vertical riser to accommodate descent. Where personnel entry is not possible, adequate access for cleaning shall be provided on each floor.

4-3.4.4 Access panels shall be of the same material and thickness as the duct *(see 4-5.1)*. Access panels shall have a gasket or sealant that is rated for 1500°F (815.6°C) and shall be greasetight. Fasteners, such as bolts, weld studs, latches, or wing nuts, used to secure the access panels shall be carbon steel or stainless steel and shall not penetrate duct walls.

Exception: Listed grease duct access door assemblies (access panels) shall be installed in accordance with the terms of the listing and the manufacturer's instructions.

4-3.4.5 Openings for installation, servicing, and inspection of listed fire protection system devices and for duct cleaning shall be provided in ducts and enclosures and shall conform to the requirements of 4-3.4 and 4-7.5. Enclosure openings required to reach access panels in the ductwork shall be large enough for the removal of the access panel.

4-4 Listed Grease Ducts. Listed grease ducts shall be installed in accordance with the terms of the listing and the manufacturer's instructions.

4-5 Other Grease Ducts. Other grease ducts shall comply with 4-5.1 through 4-5.2.2.

4-5.1 Materials. Ducts shall be constructed of and supported by carbon steel not less than 0.054 in. (1.37 mm) (No. 16 MSG) in thickness or stainless steel not less than 0.043 in. (1.09 mm) (No. 18 MSG) in thickness.

4-5.2 Installation.

4-5.2.1 All seams, joints, penetrations, and duct-to-hood collar connections shall have a liquidtight continuous external weld.

Exception No. 1: Duct-to-hood collar connections as shown in Figure 4-5.2.1 shall be permitted.

Exception No. 2: Penetrations shall be permitted to be sealed by other listed devices that are tested to be greasetight and are evaluated under the same conditions of fire severity as the hood or enclosure of listed grease extractors and whose presence does not detract from the hood's or duct's structural integrity.

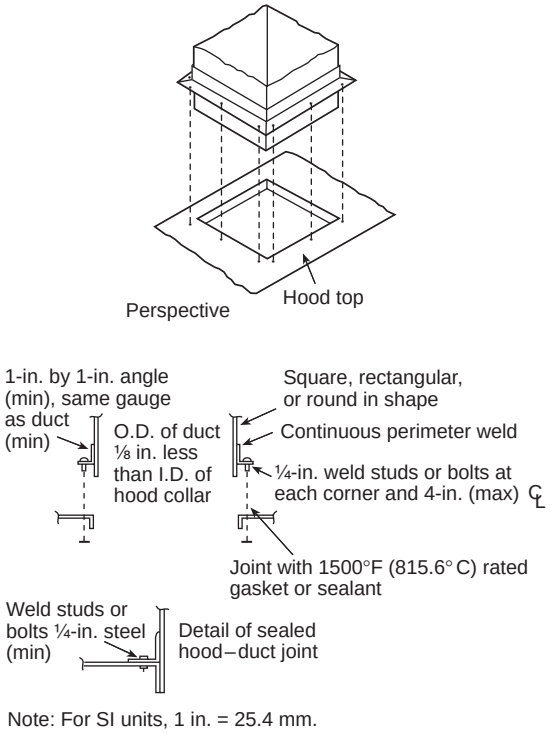


Figure 4-5.2.1 Permitted duct-to-hood collar connection.

Exception No. 3: Internal welding shall be permitted, provided the joint is formed or ground smooth and is readily accessible for inspection.

4-5.2.2 Overlapping duct connections of either the telescoping or the bell type shall be used for welded field joints, not butt-weld connections. The inside duct section shall always be uphill of the outside duct section. The difference between inside dimensions of overlapping sections shall not exceed ¼ in. (6.4 mm). The overlap shall not exceed 2 in. (50.8 mm). *(See Figure 4-5.2.2.)*

4-6 Exterior Installations.

4-6.1 The exterior portion of the ductwork shall be vertical wherever possible and shall be installed and adequately supported on the exterior of a building. Bolts, screws, rivets, and other mechanical fasteners shall not penetrate duct walls. Clearance of any ducts shall comply with 1-3.2.

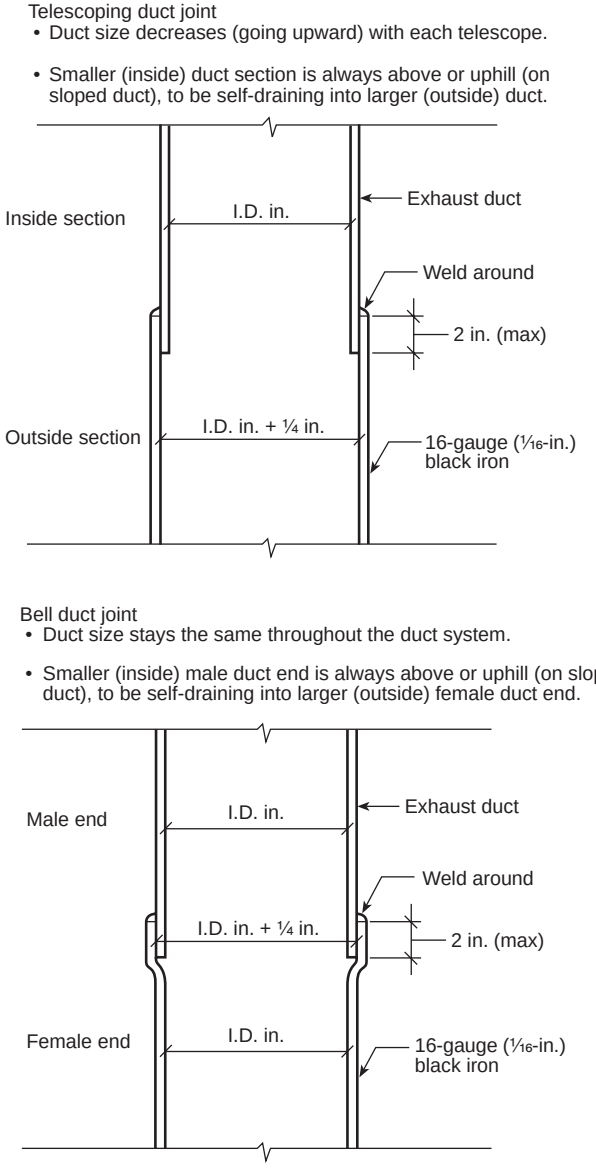


Figure 4-5.2.2 Telescoping and bell-type duct connections.

4-6.2 All ducts shall be protected on the exterior by paint or other suitable weather-protective coating or shall be constructed of noncorrosive stainless steel. Ductwork subject to corrosion shall have minimal contact with the building surface.

4-7 Interior Installations.

4-7.1 In all buildings more than one story in height, and in one-story buildings where the roof–ceiling assembly is required to have a fire resistance rating, the ducts shall be enclosed in a continuous enclosure extending from the lowest fire-rated ceiling or floor above the hood, through any concealed spaces, to or through the roof so as to maintain the integrity of the fire separations required by the applicable building code provisions. The enclosure shall be sealed around the duct at the point of penetration of the lowest fire-rated ceiling or floor above the hood in order to maintain the fire resistance rating of the enclosure and shall be vented to the exterior of the building through weather-protected openings.

Exception: The continuous enclosure provisions shall not be required where a field applied grease duct enclosure or a factory-built grease duct enclosure (see 1-3.2.3) is protected with a listed duct-through-penetration protection system equivalent to the fire resistance rating of the assembly being penetrated and the materials are installed in accordance with the conditions of the listing and the manufacturer's instructions and are acceptable to the authority having jurisdiction.

4-7.2 The enclosure required in 4-7.1 shall conform to 4-7.2.1 through 4-7.2.3.

4-7.2.1 If the building is less than four stories in height, the enclosure wall shall have a fire resistance rating of not less than 1 hour.

4-7.2.2 If the building is four stories or more in height, the enclosure wall shall have a fire resistance rating of not less than 2 hours.

4-7.2.3* Clearance from the duct or the exhaust fan to the interior surface of enclosures of combustible construction shall be not less than 18 in. (457.2 mm), and clearance from the duct to the interior surface of enclosures of noncombustible or limited-combustible construction shall be not less than 6 in. (152.4 mm). Provisions for reducing clearances as described in 1-3.2 are not applicable to enclosures.

Exception: Clearance from the outer surfaces of field applied grease duct enclosures and factory-built grease duct enclosures to the interior surfaces of construction installed around them shall be permitted to be reduced where the field applied grease duct enclosure materials and factory-built grease duct enclosures are installed in accordance with the conditions of the listing and manufacturer's instructions and are acceptable to the authority having jurisdiction.

4-7.3 For field applied grease duct enclosures and factory-built grease duct enclosures, the materials and products shall conform to 4-7.3.1 through 4-7.3.3.

4-7.3.1 Field applied grease duct enclosures and factory-built grease duct enclosures shall demonstrate that they provide sufficient mechanical and structural integrity, resiliency, and stability when subjected to expected building environmental conditions, duct movement under general operating conditions, and duct movement due to interior and exterior fire conditions.

4-7.3.2 Measures shall be taken to prevent physical damage to any covering or enclosure material. Any damage to the covering or enclosure shall be repaired and the covering or

enclosure restored to meet its intended listing and fire-resistive rating and to be acceptable to the authority having jurisdiction.

4-7.3.3 In the event of a fire within a kitchen exhaust system, the duct, the enclosure, or the covering directly applied to the duct shall be inspected by qualified personnel to determine whether the duct, the enclosure, and the covering directly applied to the duct are structurally sound, capable of maintaining their fire protection functions, suitable for continued operation, and acceptable to the authority having jurisdiction.

4-7.4 For listed grease ducts, see Section 4-4.

4-7.5 If openings in the enclosure walls are provided, they shall be protected by approved self-closing fire doors of proper rating. Fire doors shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*. Openings on other listed materials or products shall be clearly identified and labeled according to the terms of the listing and the manufacturer's instructions and shall be acceptable to the authority having jurisdiction. The panels shall be readily accessible.

4-7.6 Each duct system shall constitute an individual system serving only exhaust hoods in one fire zone on one floor. Multiple ducts shall not be permitted in a single enclosure unless acceptable to the authority having jurisdiction.

4-8* Termination of Exhaust System.

4-8.1 The exhaust system shall terminate as follows:

(a)* Outside the building with a fan or duct
(b) Through the roof, or to the roof from outside, as in 4-8.2, or through a wall, as in 4-8.3

4-8.2 Rooftop Terminations.

4-8.2.1 Rooftop terminations shall be arranged with or provided with the following:

(a) A minimum of 10 ft (3.05 m) of clearance from the outlet to adjacent buildings, property lines, and air intakes. Where space limitations absolutely prevent a 10-ft (3.05-m) horizontal separation from an air intake, a vertical separation shall be permitted, with the exhaust outlet being a minimum of 3 ft (0.92 m) above any air intake located within 10 ft (3.05 m) horizontally.

(b) The exhaust flow directed up and away from the surface of the roof and a minimum of 40 in. (1.02 m) above the roof surface

(c) The ability to drain grease out of any traps or low points formed in the fan or duct near the termination of the system into a collection container that is noncombustible, closed, rainproof, structurally sound for the service to which it is applied, and will not sustain combustion. A grease collection device that is applied to exhaust systems shall not inhibit the performance of any fan.

Exception: Grease containers that are evaluated for equivalency with the preceding requirements and listed as such.

(d) A listed grease duct complying with Section 4-4, or with ductwork complying with Section 4-5

(e) A hinged upblast fan supplied with flexible weatherproof electrical cable and service hold-open retainer to permit proper inspection and cleaning that is listed for commercial cooking equipment, provided the ductwork extends a minimum of 18 in. (457.2 mm) above the roof surface and the fan discharges a minimum of 40 in. (1.02 m) above the roof surface *(see 5-1.1)*

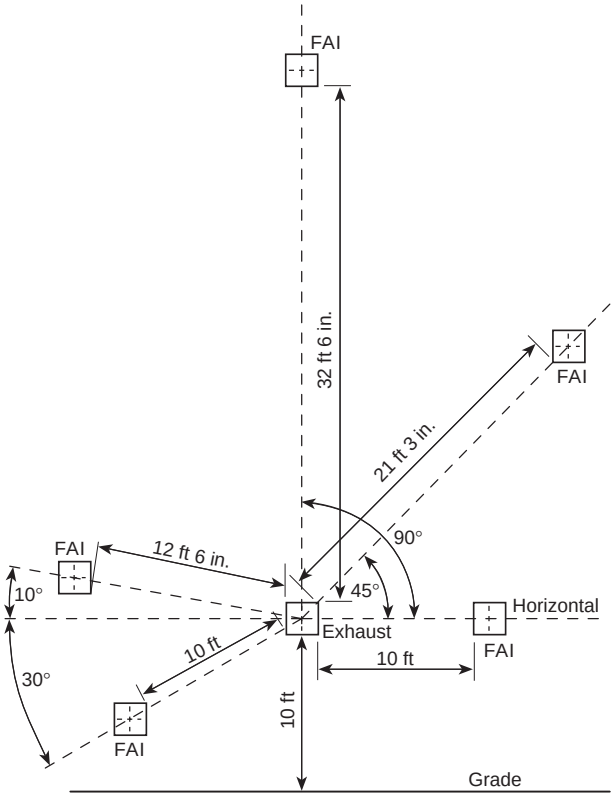
(f) Other approved fan, provided (1) it meets the requirements of 4-8.2.1(c) and 5-1.3 and (2) its discharge or its extended duct discharge meets the requirements of 4-8.2.1(b). *(See 5-1.3.)*

4-8.2.2* Fans shall be provided with safe access and a work surface for inspection and cleaning.

4-8.3 Wall Terminations.

4-8.3.1 Wall terminations shall be arranged with or provided with the following properties:

(a) Through a noncombustible wall with a minimum of 10 ft (3.05 m) of clearance from the outlet to adjacent buildings, property lines, grade level, combustible construction, electrical equipment or lines, and the closest point of any air intake or operable door or window at or below the plane of the exhaust termination. The closest point of any air intake or operable door or window above the plane of the exhaust termination shall be a minimum of 10 ft (3.05 m) distant, plus 0.25 ft (0.076 m) for each 1 degree from horizontal, the angle of degree being measured from the center of the exhaust termination to the center of the air intake or operable door or window. *[See Figure 4-8.3.1(a).]*



Fresh air intake (FAI) applies to any air intake, including an operable door or window.

Example:

FAI is same plane as exhaust or lower: 10 ft (min) between closest edges.

FAI above plane of exhaust: 10 ft + 0.25 ft per degree between closest edges

Note: For SI units, 1 ft = 0.305 m.

Figure 4-8.3.1(a) Exhaust termination distance from fresh air intake (FAI) or operable door or window.

Exception: A wall termination in a secured area can be at a lower height above grade if acceptable to the authority having jurisdiction.

(b) The exhaust flow directed perpendicularly outward from the wall face or upward

(c) All the ductwork pitched to drain the grease back into the hood(s), or with a drain provided to bring the grease back into a container within the building or into a remote grease trap

(d) A listed grease duct complying with Section 4-4, or other ducts complying with Section 4-5

(e) An approved fan, provided it meets the requirements of 4-8.3.1(c) and 5-1.1 or 5-1.3

4-9 Solid Fuel Duct Systems. Where solid fuel cooking equipment is to be vented, the duct system shall comply with Chapter 11.

Chapter 5 Air Movement

5-1 Exhaust Fans for Commercial Cooking Equipment. Where solid fuel cooking equipment is to be vented, the duct system shall comply with Chapter 11.

5-1.1* Approved upblast fans with motors surrounded by the airstream shall be hinged, supplied with flexible weatherproof electrical cable and service hold-open retainers, and listed for this use *(see Figure 5-1.1)*. Installation shall conform to the requirements of Section 4-8.

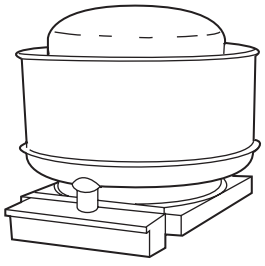


Figure 5-1.1 Upblast fan.

5-1.2 In-Line Exhaust Fans.

5-1.2.1 In-line fans shall be of the type with the motor located outside the airstream and with belts and pulleys protected from the airstream by a greasetight housing. *[See Figure 5-1.2.1(a).]* They shall be connected to the exhaust duct by flanges securely bolted as shown in Figures 5-1.2(b), (c), (d), or (e) or by a system specifically listed for such use. Flexible connectors shall not be used.

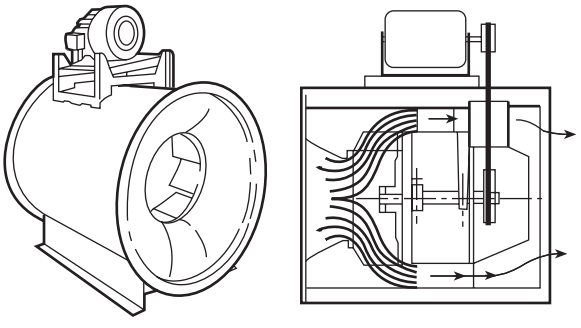


Figure 5-1.2.1(a) In-line fan.

5-1.2.2* If the design or positioning of the fan allows grease to be trapped, a drain directed to a readily accessible and visible grease receptacle, not exceeding 1 gal (3.8 L), shall be provided. In-line exhaust fans shall be located in an easily accessible area of adequate size to allow for service or removal. If the duct system connected to the fan is in an enclosure, the space or room in which the exhaust fan is located shall have the same fire resistance rating as the enclosure.

5-1.3* Utility set exhaust fans *(see Figure 5-1.3)*, if installed at the rooftop termination point, shall meet the requirements

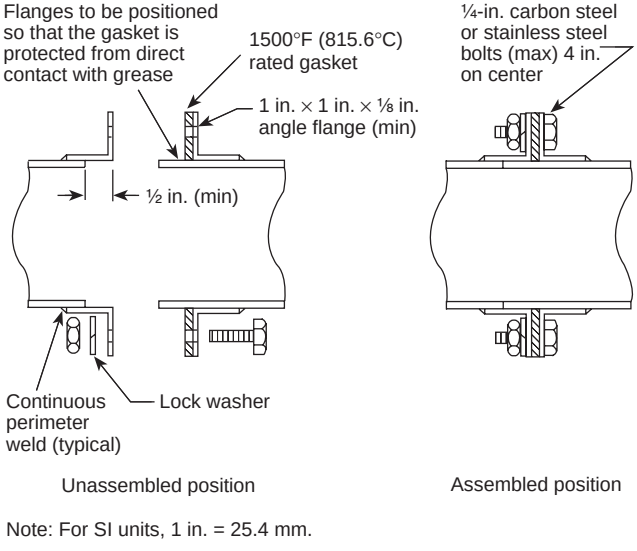


Figure 5-1.2.1(b) Typical section of duct-to-fan connection—butt joint method.

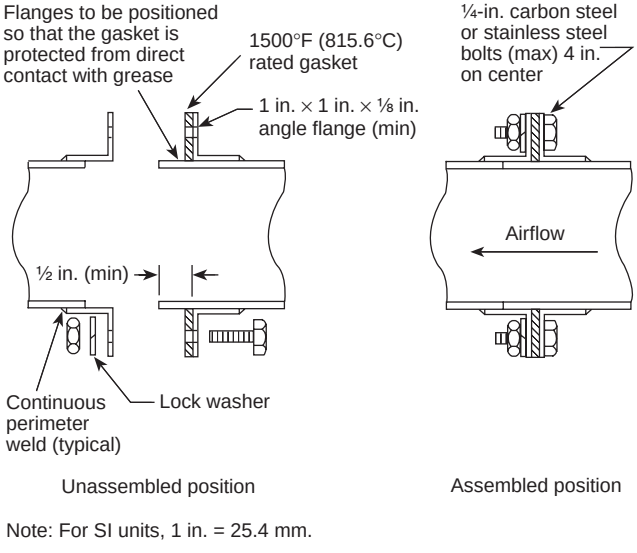


Figure 5-1.2.1(c) Typical section of duct-to-fan connection—overlapping method.

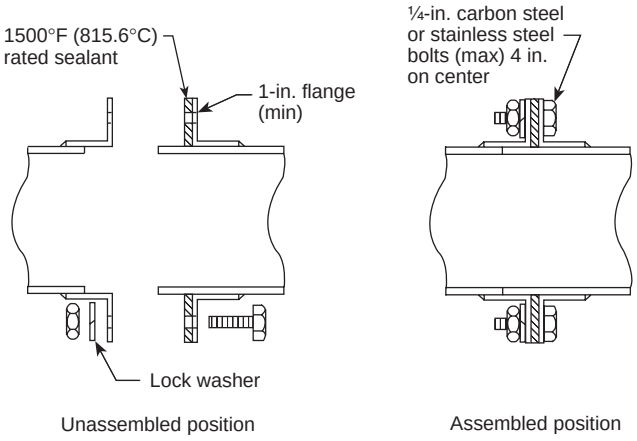


Figure 5-1.2.1(d) Typical section of duct-to-fan connection—sealant method.

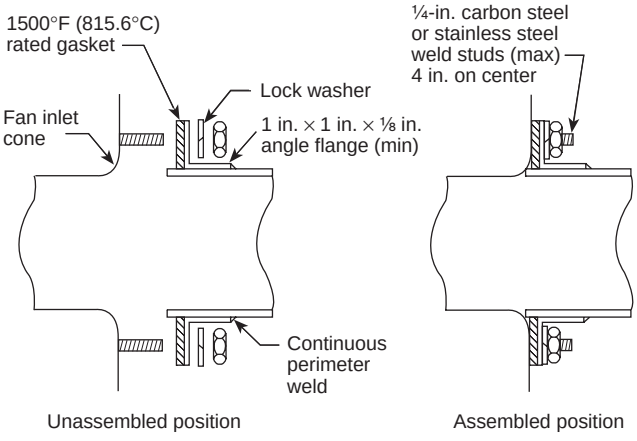


Figure 5-1.2.1(e) Typical section of duct-to-fan connection—direct to fan inlet cone method.

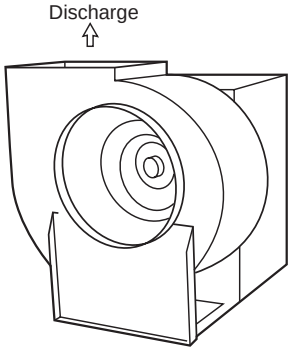


Figure 5-1.3 Utility set fan.

of 4-8.2.1(a) through (c) and 4-8.2.2. If the fan is installed within the building, it shall be located in an easily accessible area of adequate size to allow for service or removal. If the duct system connected to the fan is in an enclosure, the space or room in which the exhaust fan is located shall have the same fire resistance rating as the enclosure. The fan shall be connected to the exhaust duct by flanges securely bolted as shown in Figures 5-1.2.1(b), (c), (d), or (e) or by a system specifically listed for such use. Flexible connectors shall not be used. Exhaust fans shall have a drain directed to a readily accessible and visible grease receptacle not to exceed 1 gal (3.8 L).

5-1.4 Exhaust fan housings shall be constructed of carbon steel not less than 0.054 in. (1.37 mm) (No. 16 MSG) in thickness or stainless steel not less than 0.043 in. (1.09 mm) (No. 18 MSG) in thickness or, if listed, constructed in accordance with the terms of the listing.

5-1.5 Openings for cleaning, servicing, and inspection shall conform to the requirements of 4-3.3. Clearances shall conform to the requirements of 1-3.2 or 4-7.2.3 if installed within an enclosure.

5-1.6 All wiring and electrical equipment shall comply with NFPA 70, *National Electrical Code© (see also Chapter 6).*

5-2 Airflow.

5-2.1 The air velocity through any duct shall be not less than 1500 ft (457.2 m) per minute.

Exception: Transition duct sections shall be permitted to be connected to hoods and exhaust fans that do not meet this velocity, provided that they do not exceed 3 ft (0.92 m) in length and do not contain traps for grease.

5-2.2 Exhaust air volumes for hoods shall be of sufficient level to provide for capture and removal of grease-laden cooking vapors. Test data, performance acceptable to the authority having jurisdiction, or both, shall be provided, displayed, or both, upon request.

Exception: Lower exhaust air volumes shall be permitted during no-load cooking conditions, provided they are sufficient to capture and remove flue gases and residual vapors from cooking equipment.

5-2.3 A hood exhaust fan(s) shall continue to operate after the extinguishing system has been activated, unless fan shutdown is required by a listed component of the ventilation system or by the design of the extinguishing system. It shall not be required to restart the hood exhaust fan when the extinguishing system is activated if the exhaust fan and all cooking equipment served by the fan had previously been shut down.

5-3* Replacement Air. Replacement air quantity shall be adequate to prevent negative pressures in the commercial cooking area(s) from exceeding 0.02 in. water column (4.98 kPa).

Exception: When its fire-extinguishing system discharges, makeup air supplied internally to a hood shall be shut off.

5-4 Common Duct (Manifold) Systems. Master kitchen exhaust ducts that serve multiple tenants shall include provision to bleed air from outdoors or from adjacent spaces into the master exhaust duct where required to maintain the necessary minimum air velocity in the master exhaust duct. This bleed air duct shall connect to the top or side of the master exhaust duct. The bleed air duct shall have a fire damper at least 12 in. (304.8 mm) from the exhaust duct connection. The bleed air duct shall have the same construction and clearance

requirements as the main exhaust duct from the connection to the exhaust duct to at least 12 in. (304.8 mm) on both sides of the fire damper. Each bleed air duct shall have a means of adjusting (e.g., using volume dampers) the bleed air quantity. Such means shall be installed in between the fire damper and the source of bleed air *(see Figure 5-4)*. A bleed air duct shall not be used for the exhaust of grease-laden vapors and shall be so labeled. Unused tenant exhaust connections to the master exhaust duct that are not used as bleed air connections shall be disconnected and sealed at the main duct.

5-5 Solid Fuel Air Movement Requirements. Where solid fuel cooking equipment is used, exhaust and replacement air also shall comply with Chapter 11.

Chapter 6 Auxiliary Equipment

6-1 Dampers. Dampers shall not be installed in exhaust ducts or exhaust duct systems.

Exception: Where specifically listed for such use or where required as part of a listed or approved device or system.

6-2 Electrical Equipment.

6-2.1 Wiring systems of any type shall not be installed in ducts.

6-2.2 Motors, lights, and other electrical devices shall not be installed in ducts or hoods or located in the path of travel of exhaust products.

Exception: Where specifically approved for such use.

6-2.3 Lighting units in hoods shall be listed for use over commercial cooking appliances and installed in accordance with the terms of their listing.

6-2.4 Lighting units on hoods shall not be located in concealed spaces.

Exception No. 1: Where part of a listed exhaust hood.

Exception No. 2: Where specifically listed for such use and installed in accordance with the terms of the listing.

6-2.5 All electrical equipment shall be installed in accordance with NFPA 70, *National Electrical Code*, with due regard to the effects of heat, vapor, and grease on the equipment.

6-3 Other Equipment.

6-3.1 Fume incinerators, thermal recovery units, air pollution control devices, or other devices shall be permitted to be installed in ducts or hoods or located in the path of travel of exhaust products where specifically approved for such use. Downgrading other parts of the exhaust system due to the installation of these approved devices, whether listed or not, shall not be allowed.

6-3.2 Any equipment, listed or otherwise, that provides secondary filtration or air pollution control and that is installed in the path of travel of exhaust products shall be provided with an approved automatic fire-extinguishing system for the protection of the component sections of the equipment and shall include protection of the ductwork downstream of the equipment, whether or not the equipment is provided with a damper. If the equipment can be a source of ignition, it shall be provided with appropriate detection to operate the fire-extinguishing system.

6-3.3 Where a cooking exhaust system employs an air pollution control device that recirculates air into the building, the provisions of Chapter 10 shall apply.

6-4 Solid Fuel Auxiliary Equipment. Where solid fuel cooking comprises any part of a cooking operation, additional provisions and equipment as described in Chapter 11 shall be used where required.

Chapter 7 Fire-Extinguishing Equipment

7-1 General Requirements.

7-1.1 Fire-extinguishing equipment for the protection of grease removal devices, hood exhaust plenums, and exhaust duct systems shall be provided.

7-1.2 Cooking equipment that produces grease-laden vapors (such as, but not limited to, deep fat fryers, ranges, griddles, broilers, woks, tilting skillets, and braising pans) shall be protected by fire-extinguishing equipment.

7-2 Types of Equipment.

7-2.1 Fire-extinguishing equipment shall include both automatic fire-extinguishing systems as primary protection and portable fire extinguishers as secondary backup.

7-2.1.1 A placard identifying the use of the extinguisher as a secondary backup means to the automatic fire suppression system shall be conspicuously placed near each portable fire extinguisher in the cooking area.

7-2.2* Automatic fire-extinguishing systems shall comply with standard UL 300, *Fire Testing of Fire Extinguishing Systems*

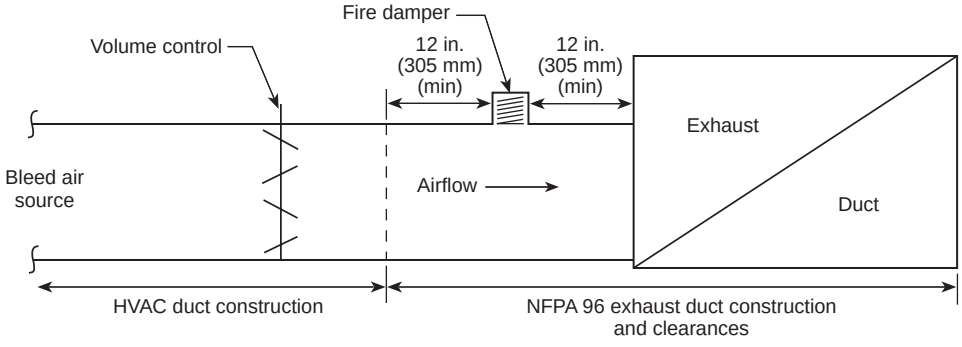


Figure 5-4 System for introducing bleed air into a master exhaust duct.

for Protection of Restaurant Cooking Areas, or other equivalent standards and shall be installed in accordance with their listing.

Exception: Automatic fire-extinguishing equipment provided as part of listed recirculating systems complying with standard UL 197, Standard for Safety—Commercial Electric Cooking Appliances.

7-2.2.1 Automatic fire-extinguishing systems shall be installed in accordance with the terms of their listing, the manufacturer's instructions, and the following standards where applicable.

(a) NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*

(b) NFPA 13, *Standard for the Installation of Sprinkler Systems*

(c) NFPA 17, *Standard for Dry Chemical Extinguishing Systems*

(d) NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*

7-2.3 Grease removal devices, hood exhaust plenums, and exhaust ducts requiring protection in accordance with 7-1.1 shall be permitted to be protected by a listed fixed baffle hood containing a constant or fire-actuated water-wash system that is listed to extinguish a fire in the grease removal devices, hood exhaust plenums, and exhaust ducts. Each such area not provided with a listed water-wash extinguishing system shall be provided with an appropriate fire suppression system listed for the purpose.

7-2.3.1 The water for listed fixed baffle hood assemblies shall be permitted to be supplied from the domestic water supply when the minimum water pressure and flow are provided in accordance with the terms of the listing. The water supply shall be monitored by an annunciated low–water pressure switch.

7-2.3.2 The water wash in the fixed baffle hood shall be activated by the cooking equipment extinguishing system.

7-3 Simultaneous Operation. Fixed pipe extinguishing systems in a single hazard area *(see Section 1-2 for the definition of single hazard area)* shall be arranged for simultaneous automatic operation upon actuation of any one of the systems.

Exception No. 1: Where the fixed pipe extinguishing system is an automatic sprinkler system.

Exception No. 2: A dry or wet chemical system shall be permitted to be used to protect common exhaust ductwork by one of the methods specified in NFPA 17, Standard for Dry Chemical Extinguishing Systems, or NFPA 17A, Standard for Wet Chemical Extinguishing Systems, in lieu of simultaneous automatic operation.

7-4 Fuel Shutoff.

7-4.1 Upon activation of any fire-extinguishing system for a cooking operation, all sources of fuel and electric power that produce heat to all equipment requiring protection by that system shall automatically shut off.

Exception No. 1: Steam supplied from an external source.

Exception No. 2: Solid fuel cooking operations.

7-4.2 Any gas appliance not requiring protection, but located under the same ventilating equipment, shall also automatically shut off upon activation of any extinguishing system.

7-4.3 Shutoff devices shall require manual reset.

7-5 Manual Activation.

7-5.1 A readily accessible means for manual activation shall be located between 42 in. and 60 in. (1067 mm and 1524 mm) above the floor, located in a path of exit or egress, and clearly identify the hazard protected. The automatic and manual means of system activation external to the control head or releasing device shall be separate and independent of each other so that failure of one will not impair the operation of the other.

Exception No. 1: The manual means of system activation shall be permitted to be common with the automatic means if the manual activation device is located between the control head or releasing device and the first fusible link.

Exception No. 2: An automatic sprinkler system.

7-5.2 The means for manual actuator(s) shall be mechanical and shall not rely on electrical power for actuation.

Exception: Electrical power shall be permitted to be used for manual activation if a standby power supply is provided or if supervision is provided as per 7-7.1.

7-6 System Annunciation.

7-6.1 Upon activation of an automatic fire-extinguishing system, an audible alarm or visual indicator shall be provided to show that the system has activated.

7-6.2 Where a fire alarm signaling system is serving the occupancy where the extinguishing system is located, the activation of the automatic fire-extinguishing system shall activate the fire alarm signaling system.

7-7 System Supervision.

7-7.1 Where electrical power is required to operate the automatic fire-extinguishing system, it shall be monitored by a supervisory alarm, with a standby power supply provided.

Exception No. 1: Where automatic fire-extinguishing systems include automatic mechanical detection and actuation as a backup detection system.

Exception No. 2: Where fire-extinguishing systems are interconnected or interlocked with the cooking equipment power sources so that if the fire-extinguishing system becomes inoperable due to power failure, all sources of fuel or electric power that produce heat to all cooking equipment serviced by that hood shall automatically shut off.

7-8 Special Design and Application.

7-8.1 Hoods containing automatic fire-extinguishing systems are protected areas; therefore, these hoods are not considered obstructions to overhead sprinkler systems and shall not require floor coverage underneath.

7-8.2 A single listed detection device shall be permitted for more than one appliance when installed in accordance with the terms of the listing.

7-9 Review and Certification.

7-9.1 Where required, complete drawing of the system installation, including the hood(s), exhaust duct(s), and appliances, along with the interface of the fire-extinguishing system detectors, piping, nozzles, fuel shutoff devices, agent storage container(s), and manual actuation device(s), shall be submitted to the authority having jurisdiction.

7-9.2* Installation of systems shall be performed only by persons properly trained and qualified to install the specific system being provided. The installer shall provide certification to the authority having jurisdiction that the installation is in agreement with the terms of the listing and the manufacturer's instructions and/or approved design.

7-10 Portable Fire Extinguishers.

7-10.1* Portable fire extinguishers shall be installed in kitchen cooking areas in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*. Such extinguishers shall use agents that saponify upon contact with hot grease such as sodium bicarbonate and potassium bicarbonate dry chemical and potassium carbonate solutions. Class B gas-type portables such as CO_2 and halon shall not be permitted in kitchen cooking areas. Manufacturer's recommendations shall be followed.

7-10.1.1 Portable fire extinguishers listed specifically for use in the kitchen cooking areas shall also be permitted.

7-10.2 Other fire extinguishers in the kitchen area shall be installed in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

7-11 Solid Fuel Fire-Extinguishing Equipment. Where solid fuel cooking equipment is served by fire-extinguishing equipment, the provisions of Chapter 11 shall apply.

Chapter 8 Procedures for the Use and Maintenance of Equipment

8-1 Operating Procedures.

8-1.1 Exhaust systems shall be operated whenever cooking equipment is turned on.

8-1.2 Filter-equipped exhaust systems shall not be operated with filters removed.

8-1.3 Openings provided for replacing air exhausted through ventilating equipment shall not be restricted by covers, dampers, or any other means that would reduce the operating efficiency of the exhaust system.

8-1.4 Instructions for manually operating the fire-extinguishing system shall be posted conspicuously in the kitchen and shall be reviewed periodically with employees by the management.

8-1.5 Listed exhaust hoods shall be operated in accordance with the terms of their listings and the manufacturer's instructions.

8-1.6 Cooking equipment shall not be operated while its fire-extinguishing system or exhaust system is nonoperational or otherwise impaired.

8-2* Inspection. An inspection and servicing of the fire-extinguishing system and listed exhaust hoods containing a constant or fire-actuated water system shall be made at least every 6 months by properly trained and qualified persons.

8-2.1 All actuation components, including remote manual pull stations, mechanical or electrical devices, detectors, actuators, and fire-actuated dampers, shall be checked for proper operation during the inspection in accordance with the manufacturer's listed procedures. In addition to these requirements, the specific inspection requirements of the applicable NFPA standard shall also be followed.

8-2.2 Fusible links (including fusible links on fire-actuated damper assemblies) and automatic sprinkler heads shall be replaced at least annually, or more frequently if necessary, to ensure proper operation of the system. Other detection devices shall be serviced or replaced in accordance with the manufacturer's recommendations.

Exception: Where automatic bulb-type sprinklers or spray nozzles are used and annual examination shows no buildup of grease or other material on the sprinkler or spray nozzles.

8-2.3 If required, certificates of inspection and maintenance shall be forwarded to the authority having jurisdiction.

8-3 Cleaning.

8-3.1* Hoods, grease removal devices, fans, ducts, and other appurtenances shall be cleaned to bare metal at frequent intervals prior to surfaces becoming heavily contaminated with grease or oily sludge. After the exhaust system is cleaned to bare metal, it shall not be coated with powder or other substance. The entire exhaust system shall be inspected by a properly trained, qualified, and certified company or person(s) acceptable to the authority having jurisdiction in accordance with Table 8-3.1.

Table 8-3.1 Exhaust System Inspection Schedule

Type or Volume of Cooking	Frequency
Systems serving solid fuel cooking operations	Monthly
Systems serving high-volume cooking operations such as 24-hour cooking, charbroiling or wok cooking	Quarterly
Systems serving moderate-volume cooking operations	Semiannually
Systems serving low-volume cooking operations, such as churches, day camps, seasonal businesses, or senior centers	Annually

8-3.1.1 Upon inspection, if found to be contaminated with deposits from grease-laden vapors, the entire exhaust system shall be cleaned by a properly trained, qualified, and certified company or person(s) acceptable to the authority having jurisdiction in accordance with Section 8-3.

8-3.1.2 When a vent cleaning service is used, a certificate showing date of inspection or cleaning shall be maintained on the premises. After cleaning is completed, the vent cleaning contractor shall place or display within the kitchen area a label indicating the date cleaned and the name of the servicing company. It shall also indicate areas not cleaned.

8-3.2 Flammable solvents or other flammable cleaning aids shall not be used.

8-3.3 At the start of the cleaning process, electrical switches that could be activated accidentally shall be locked out.

8-3.4 Components of the fire suppression system shall not be rendered inoperable during the cleaning process.

Exception: Servicing by properly trained and qualified persons in accordance with Section 8-2.

8-3.5 Care shall be taken not to apply cleaning chemicals on fusible links or other detection devices of the automatic extinguishing system.

8-3.6 When cleaning procedures are completed, all electrical switches and system components shall be returned to an operable state. All access panels (doors) and cover plates shall be replaced. Dampers and diffusers shall be positioned for proper airflow.

8-4 Operation, Maintenance, and Inspection of Solid Fuel Cooking Equipment. Where solid fuel cooking equipment is used, the special provisions of Chapter 11 shall apply.

Chapter 9 Minimum Safety Requirements for Cooking Equipment

9-1 Cooking Equipment.

9-1.1 Cooking equipment shall be approved based on one of the following criteria:

(a) Listings by a testing laboratory

(b) Test data acceptable to the authority having jurisdiction

9-1.2 Installation.

9-1.2.1 All listed appliances shall be installed in accordance with the terms of their listings and the manufacturer's instructions.

9-1.2.2* Cooking appliances requiring protection shall not be moved, modified, or rearranged without prior reevaluation of the fire-extinguishing system by the system installer or servicing agent, unless otherwise allowed by the design of the fire-extinguishing system.

Exception: Cooking appliances moved to perform maintenance and cleaning provided the appliances are returned to their original positioning prior to cooking operations, and any disconnected fire-extinguishing system nozzles attached to the appliances are reconnected in accordance with the manufacturer's listed design manual.

9-1.2.3 All deep fat fryers shall be installed with at least a 16-in. (406.4-mm) space between the fryer and surface flames from adjacent cooking equipment.

Exception: Where a steel or tempered glass baffle plate is installed at a minimum 8 in. (203 mm) in height between the fryer and surface flames of the adjacent appliance.

9-2 Operating Controls. Deep fat fryers shall be equipped with a separate high-limit control in addition to the adjustable operating control (thermostat) to shut off fuel or energy when the fat temperature reaches 475°F (246°C) at 1 in. (25.4 mm) below the surface.

Chapter 10 Recirculating Systems

10-1 General Requirements. Recirculating systems containing or for use with appliances used in processes producing smoke or grease-laden vapors shall be equipped with components complying with the following:

(a) The clearance requirements of 1-3.2

(b) A hood complying with the requirements of Chapter 2

(c) Grease removal devices complying with Chapter 3

(d) The air movement requirements of Chapter 5, Exceptions to 5-2.1 and 5-2.2

(e) Auxiliary equipment (such as particulate and odor removal devices) complying with Chapter 6

Exception: As permitted by 10-2.5.

(f) Fire-extinguishing equipment complying with the requirements of Chapter 7

Exception: References to ducts in 7-1.1 and 7-5.1.

(g) The use and maintenance requirements of Chapter 8

(h) The minimum safety requirements of Chapter 9

(i) All the requirements of this chapter

10-2 Design Restrictions. All recirculating systems shall comply with 10-2.1 through 10-2.7.

10-2.1 Only gas- or electrically fueled cooking appliances shall be used. Gas-fueled appliances shall not have the combustion flue outlet(s) directly connected to the recirculating system. Gas-fueled appliances shall have a minimum 18-in. (457.2-mm) clearance from the flue outlet to the filter inlet in accordance with 3-2.2 and shall meet the installation requirements of NFPA 54, *National Fuel Gas Code*, or NFPA 58, *Liquefied Petroleum Gas Code.*

10-2.2 Recirculating systems shall be listed with a testing laboratory. There shall be no substitution or exchange of cooking appliances, filter components, blower components, or fire-extinguishing system components that would violate the listing of the appliance.

10-2.3 A recirculating system shall use cooking equipment that exceeds that system's labeled maximum limits for that type of equipment, stated in maximum energy input, maximum cooking temperature, and maximum square area of cooking surface or cubic area of cooking cavity. The listing label shall show the type(s) of cooking equipment tested and the preceding maximum limits.

10-2.4 A fire-actuated damper shall be installed at the exhaust outlet of the system. The damper shall be constructed of at least the same gauge as the shell. The actuation device shall have a maximum temperature rating of 375°F (190°C).

10-2.5 No electrical wiring shall be installed in the interior sections of the hood plenum that might become exposed to grease.

Exception: As permitted by NFPA 70, National Electrical Code.

10-2.6 The power supply of any electrostatic precipitator (ESP) shall be of the ''cold spark,'' ferro-resonant type in which the voltage falls off as the current draw of a short increases.

10-2.7 Listing evaluation shall include the following:

(a) Capture and containment of vapors at published and labeled airflows

(b) Grease discharge at the exhaust outlet of the system not to exceed an average of 5 mg/m^3 of exhausted air sampled from that equipment at maximum amount of product that is capable of being processed over a continuous 8-hour test per EPA Test Method 202, *Determination of Condensable Particulate Emissions for Stationary Sources*, with the system operating at its minimum listed airflow.

(c) Listing and labeling of clearance to combustibles from all sides, top, and bottom

(d) Electrical connection in the field in accordance with NFPA 70, *National Electrical Code*

(e) Interlocks on all removable components that lie in the path of airflow within the unit to ensure that they are in place during operation of the cooking appliance

10-3 Interlocks. The recirculating system shall be provided with interlocks of all critical components and operations as indicated in 10-3.1 through 10-3.4 such that, if any of these

interlocks are interrupted, the cooking appliance shall not be able to operate.

10-3.1 All closure panels encompassing airflow sections shall have interlocks to ensure the panels are in place and fully sealed.

10-3.2 Each filter component (grease and odor) shall have an interlock to prove the component is in place.

10-3.3 Each ESP shall have a sensor to prove its performance is as designed, with no interruption of the power to exceed 2 minutes. This sensor shall be a manual reset device or circuit.

10-3.4 An airflow switch or transducer shall be provided after the last filter component to ensure that a minimum airflow is maintained. This device opens the interlock circuit when the airflow falls 25 percent below the system's normal operating flow or 10 percent below its listed minimum rating, whichever is lower. This switch or transducer shall be a manual reset device or circuit.

10-4 Location and Application Restrictions. The location of recirculating systems shall be approved by the authority having jurisdiction. Items to be reviewed in the fire risk assessment shall include, but not be limited to, life safety, combustibility of surroundings, proximity to air vents, and total fuel load.

10-5 Additional Fire Safety Requirements.

10-5.1 In addition to the appliance nozzle(s), a recirculating system shall be listed with the appropriate fire protection for grease filters, grease filtration, odor filtration units, and ductwork where applicable.

10-5.2 In addition to any other fire-extinguishing system actuation device, there shall be a fire-extinguishing system actuation device installed downstream of any ESP.

10-5.3 The requirements of Section 7-6 shall also apply to recirculating system locations.

10-6 Use and Maintenance.

10-6.1 Automatic or manual covers on cooking appliances, especially fryers, shall not interfere with the application of the fire suppression system.

10-6.2 All filters shall be cleaned or replaced in accordance with the manufacturer's instructions.

10-6.3 All ESPs shall be cleaned a minimum of once per week following manufacturer's cleaning instructions.

10-6.4 The entire hood plenum and the blower section shall be cleaned a minimum of once every 3 months.

10-6.5 Inspection and testing of the total operation and all safety interlocks in accordance with the manufacturer's instructions shall be performed by qualified service personnel a minimum of once every 6 months or more frequently if required.

Exception: Fire extinguishing equipment shall be inspected in accordance with Section 8-2.

10-6.6 A signed and dated log of maintenance as performed in accordance with 10-6.4 and 10-6.5 shall be available on the premises for use by the authority having jurisdiction.

Chapter 11 Solid Fuel Cooking Operations

11-1 Venting Application. Venting requirements of solid fuel cooking operations shall be determined in accordance with 11-1.1 through 11-1.6.

11-1.1 Where solid fuel cooking equipment is required by the manufacturer to have a natural draft, the vent shall comply with Section 11-4.

11-1.2 Where the solid fuel cooking equipment has a self-contained top, is the only appliance to be vented in an isolated space (except for a single water heater with its own separate vent), has a separate makeup air system, and is provided with supply and return air (not supplied or returned from other spaces), the system shall comply with Sections 11-4 and 11-6.

11-1.3 Where the solid fuel cooking equipment is located in a space with other vented equipment, all vented equipment shall have an exhaust system interlocked with a makeup air system for the space as per Section 11-6.

11-1.4 Natural draft ventilation systems and power-exhausted ventilation systems shall comply with Sections 11-3, 11-4, and 11-6.

11-1.5 Where a solid fuel cooking appliance allows effluent to escape from the appliance opening, this opening shall be covered by a hood and an exhaust system that meets the requirements of Sections 11-3, 11-4, and 11-6.

11-1.6 Solid fuel cooking operations shall have spark arresters to minimize the passage of airborne sparks and embers into plenums and ducts. Where the solid fuel cooking operation is not located under a hood, a spark arrester shall be provided to minimize the passage of sparks and embers into flues and chimneys.

11-2 Location of Appliances.

11-2.1 Every appliance shall be located with respect to building construction and other equipment so as to permit access to the appliance.

11-2.2 Solid fuel cooking appliances shall not be installed in confined spaces. The space or room shall be of ample size to permit adequate circulation of heated air.

Exception: Solid fuel cooking appliances listed for installation in confined spaces such as alcoves shall be installed in accordance with the terms of the listing and the manufacturer's instructions.

11-2.3 Solid fuel cooking appliances shall not be installed in any location where gasoline or any other flammable vapors or gases are likely to be present.

11-3 Hoods for Solid Fuel Cooking.

11-3.1 Hoods shall be sized and located in a manner capable of capturing and containing all of the effluent discharging from the appliances. The hood and its exhaust system shall comply with Chapters 2 through 7.

11-3.2 All solid fuel cooking equipment served by hood and duct systems shall be separate from all other exhaust systems.

Exception: Cooking equipment not requiring automatic fire-extinguishing equipment (as per the provisions of Chapter 7) shall be permitted to be installed under a common hood with solid fuel cooking equipment that is served by a duct system separate from all other exhaust systems.

11-4 Exhaust Systems for Solid Fuel Cooking. Where a hood is not required, a duct complying with Chapter 4 shall be provided.

11-4.1 If a hood is used, the duct system shall conform with Chapter 4.

11-4.2 Wall terminations of solid fuel exhaust systems shall be prohibited.

11-5 Grease Removal Devices for Solid Fuel Cooking. Grease removal devices shall be constructed of steel or stainless steel or be approved for solid fuel cooking.

11-5.1 If airborne sparks and embers can be generated by the solid fuel cooking operation, spark arrester devices shall be used prior to the grease removal device to minimize the entrance of these sparks and embers into the grease removal device and into the hood and duct system.

11-5.2 Filters shall be a minimum of 4 ft (1.2 m) above the appliance cooking surface.

11-6 Air Movement for Solid Fuel Cooking. Exhaust system requirements shall comply with Chapter 5 for hooded operation or shall be installed in accordance with the manufacturer's recommendation for unhooded applications.

11-6.1 A replacement or makeup air system shall be provided to ensure a positive supply of replacement air at all times during cooking operations.

11-6.2 Makeup air systems serving solid fuel cooking operations shall be interlocked with the exhaust air system and powered, if necessary, to prevent the space from attaining a negative pressure while the solid fuel appliance is in operation.

11-7 Fire-Extinguishing Equipment for Solid Fuel Cooking.

11-7.1 Approved fire-extinguishing equipment shall be provided to protect all solid fuel burning cooking appliances that might be a source of ignition of grease in the hood, grease removal device, or duct.

Exception: If acceptable to the authority having jurisdiction, solid fuel burning cooking appliances constructed of solid masonry or reinforced portland or refractory cement concrete and vented in accordance with NFPA 211, Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances, Chapters 3 and 4, shall not require fixed automatic fire-extinguishing equipment.

11-7.2 Approved fire-extinguishing equipment shall be provided for the protection of grease removal devices, hoods, and duct systems.

Exception: If acceptable to the authority having jurisdiction, solid fuel burning cooking appliances constructed of solid masonry or reinforced portland or refractory cement concrete and vented in accordance with NFPA 211, Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances, Chapters 3 and 4, shall not require automatic fire-extinguishing equipment.

11-7.3 Approved fire-extinguishment equipment for solid fuel burning cooking appliances, where required, shall comply with Chapter 7, "Fire-Extinguishing Equipment," and shall be comprised of water-based agents.

11-7.4 Fire-extinguishing equipment shall be rated and designed to extinguish solid fuel cooking fires, in accordance with the manufacturer's recommendations. The fire-extinguishing equipment shall be of sufficient size to totally extinguish fire in the entire hazard area and prevent reignition of the fuel.

11-7.5 All solid fuel appliances (whether or not under a hood) with fireboxes of 5-ft^3 (0.14-m^3) volume or less shall at least have a 2-A-rated water-type or wet chemical fire extinguisher in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, in the immediate vicinity of the appliance. Two portable fire extinguishers of at least 1½ gal (5.7 L) each and containing potassium citrate, potassium acetate, or potassium carbonate solutions shall be permitted to be used instead of the one 2-A-rated portable fire extinguisher.

11-7.6 Solid fuel appliances with fireboxes exceeding 5 ft^3 (0.14 m^3) shall be provided with a fixed water pipe system with a hose in the immediate vicinity of the appliance. The system shall have a minimum operating pressure of 40 psi (275.8 kPa) and shall provide a minimum of 5 gpm.

11-7.7 Fire suppression for fuel storage areas shall comply with Section 11-9 of this standard.

11-7.8 In addition to the requirements of 11-7.5 or 11-7.6, where any solid fuel cooking appliance is also provided with auxiliary electric, gas, oil, or other fuel for ignition or supplemental heat and the appliance is also served by any portion of a fire-extinguishing system complying with Chapter 7, such auxiliary fuel shall be shut off upon actuation of the fire-extinguishing system.

11-8 Procedures for Inspection, Cleaning, and Maintenance for Solid Fuel Cooking. Solid fuel cooking appliances shall be inspected, cleaned, and maintained in accordance with procedures outlined in Chapter 8, and with 11-8.1 through 11-8.4.

11-8.1 The combustion chamber shall be scraped clean to its original surface once each week and inspected for deterioration or defects. Any significant deterioration or defect that might weaken the chamber or reduce its insulation capability shall be immediately repaired.

11-8.2 The flue or chimney shall be inspected weekly for the following conditions:

(a) Residue that might begin to restrict the vent or create an additional fuel source. The flue or chimney shall be cleaned before these conditions exist.
(b) Corrosion or physical damage that might reduce the flue's capability to contain the effluent. The flue or chimney shall be repaired or replaced if any unsafe condition is evident.

11-8.3 Spark arrester screens located at the entrance of the flue or in the hood assembly shall be cleaned prior to becoming heavily contaminated and restricted.

11-8.4 Filters and filtration devices installed in a hood shall be cleaned per 11-8.3.

11-9 Minimum Safety Requirements: Fuel Storage, Handling, and Ash Removal for Solid Fuel Cooking.

11-9.1 Installation Clearances.

11-9.1.1 Solid fuel cooking appliances shall be installed on floors of noncombustible construction that extend 3 ft (0.92 m) in all directions from the appliance.

Exception No. 1: Floors with noncombustible surfaces that have been approved for such use by the authority having jurisdiction.

Exception No. 2: Floor assemblies that have been listed for such applications.

Exception No. 3: Solid fuel cooking appliances that have been listed for zero clearance to combustibles on the bottom and sides; they shall

have an approved hearth extending 3 ft (0.92 m) in all directions from the service door(s).

11-9.1.2 Combustible and limited-combustible surfaces or construction within 3 ft (0.92 m) of the sides or 6 ft (1.8 m) above a solid fuel cooking appliance shall be protected in a manner acceptable to the authority having jurisdiction.

Exception No. 1: Construction that is approved for less clearance.

Exception No. 2: Solid fuel cooking appliances that are specifically listed for less clearance to combustibles.

11-9.2 Solid Fuel Storage.

11-9.2.1 Fuel storage shall not exceed a one-day supply where stored in the same room as the solid fuel appliance or in the same room as the fuel-loading or clean-out doors.

11-9.2.2 Fuel shall not be stored above any heat-producing appliance or vent or closer than 3 ft (0.92 m) to any portion of a solid fuel appliance constructed of metal or to any other cooking appliance that could ignite the fuel.

Exception: A solid fuel appliance or other cooking appliance that is listed or approved for less clearance to combustibles.

11-9.2.3 Fuel shall not be stored in the path of the ash removal.

11-9.2.4 Where stored in the same building as the solid fuel appliance, fuel shall be stored only in an area with walls, floor, and ceiling of noncombustible construction extending at least 3 ft (0.92 m) past the outside dimensions of the storage pile.

Exception: Combustible or limited-combustible materials protected in accordance with 1-3.2.1, Exception No. 2 or 3.

11-9.2.5 Fuel shall be separated from all flammable liquids, all ignition sources, all chemicals, and all food supplies and packaging goods.

11-9.2.6 All fuel storage areas shall be provided with a sprinkler system meeting the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, and acceptable to the authority having jurisdiction or with a fixed pipe system with a hose in the immediate vicinity of the storage area able to reach all parts of the area. This fixed pipe system shall meet the requirements of 11-7.1 through 11-7.8.

Exception: The portable fire extinguisher specified in 11-7.5 shall be permitted to be used for a solid fuel pile, provided that the fuel pile does not exceed 5 ft^3 (0.14 m^3).

11-9.3 Solid Fuel Handling and Ash Removal.

11-9.3.1 Solid fuel shall be ignited with a match or an approved built-in gas flame or other approved ignition source. Combustible or flammable liquids shall not be used to assist ignition. Matches and other portable ignition sources shall not be stored in the vicinity of the solid fuel appliance, where they might ignite by radiant heat or spark.

11-9.3.2 Solid fuel shall be added to the fire as required in a safe manner and in quantities and ways not creating a higher flame than is required. Long-handled tongs, hooks, and other required devices shall be provided and used in order to safely add fuel, adjust the fuel position, and control the fire without having to reach into the firebox.

11-9.3.3 Ash, cinders, and other fire debris shall be removed from the firebox at adequately regular intervals to prevent interference with the draft to the fire and to minimize the length of time the access door is open. All ash shall be removed from the chamber a minimum of once a day.

11-9.3.4 The ash shall be sprayed adequately with water before removal in order to extinguish any hot ash or cinders and to control the dust when the ash is moved. For these purposes, and to cool a fire that has become too hot and to stop all fire before leaving the premises, a water supply with a flexible hose shall be provided at the solid fuel appliance. For appliances with fireboxes not exceeding 5 ft^3 (0.14 m^3), the water source shall be permitted to be a 10-gal (37.9-L) container with a gravity arrangement or a hand pump for pressure. For appliances with fireboxes over 5 ft^3 (0.14 m^3), the water source shall be a fixed pipe water system with a hose of adequate length to reach the combustion and cooking chambers of the appliance. For either application, the nozzle shall be fitted with a manual shutoff device and shall be of the type to provide a fine-to-medium spray of adequate length to reach all areas of the combustion and cooking chambers. A full flow or strong stream shall not be used.

11-9.3.5 A heavy metal container or cart (minimum 16 gauge) with a cover shall be provided for the removal of ash. It shall not exceed a maximum of 20-gal (75.7 L) capacity, shall be assigned for this one purpose, shall be able to be handled easily by any employee assigned the task, and shall pass easily through any passageway to the outside of the building. The container or cart shall always be covered when it is being moved through the premises. When any hole occurs in a container from corrosion or damage, it shall be repaired or replaced immediately.

11-9.3.6 Tools shall be provided so that ash removal can be accomplished without having to reach into the chamber. The ash shall be spread out gently in small lots on the chamber floor or on a shovel to be sprayed before it is removed to the metal container or cart. If the floor of the chamber is of a metal that is subject to rapid corrosion from water, then a noncombustible, corrosion-resistant pan shall be placed just outside the clean-out door for this purpose.

11-9.3.7 The ash shall be carried to a separate heavy metal container (or dumpster) used exclusively for the purpose.

11-9.4 Other Safety Requirements.

11-9.4.1 Metal-fabricated solid fuel cooking appliances shall be listed for the application where produced in practical quantities or shall be approved by the authority having jurisdiction. When listed, they shall be installed in accordance with the terms of their listing and with the applicable requirements of this standard.

11-9.4.2 Site-built solid fuel cooking appliances shall be submitted for approval to the authority having jurisdiction before being considered for installation. All units submitted to the authority having jurisdiction shall be installed, operated, and maintained in accordance with the approved terms of the manufacturer's instructions and any additional requirements set forth by the authority having jurisdiction.

11-9.4.3 Except for the spark arrester required in 11-1.6, there shall be no additional devices of any type in any portion of the appliance, flue pipe, and chimney of a natural draft solid fuel operation.

11-9.4.4 No solid fuel cooking device of any type shall be permitted for deep fat frying involving more than one quart of liquid shortening, nor shall any solid fuel cooking device be permitted within 3 ft (0.92 m) of any deep fat frying unit.

Chapter 12 Referenced Publications

12-1 The following documents or portions thereof are referenced within this standard as mandatory requirements and shall be considered part of the requirements of this standard. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this standard. Some of these mandatory documents might also be referenced in this standard for specific informational purposes and, therefore, are also listed in Appendix B.

12-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 1998 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 1998 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1996 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 1998 edition.

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 1998 edition.

NFPA 54, *National Fuel Gas Code*, 1996 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 1998 edition.

NFPA 70, *National Electrical Code©*, 1999 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1995 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 1996 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 1998 edition.

12-1.2 Other Publications.

12-1.2.1 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* 1977.

ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials,* 1995.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 1993.

12-1.2.2 EPA Publication. Environmental Protection Agency (EPA), Crystal Station, 2800 Crystal Drive, Arlington, VA 22202.

EPA Test Method 202, *Determination of Condensable Particulate Emissions for Stationary Sources.*

12-1.2.3 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 197, *Standard for Safety—Commercial Electric Cooking Appliances.*

UL 300, Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas, 1996.

UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 1996.

UL 1046, *Grease Filters for Exhaust Ducts*, 1979.

Appendix A Explanatory Material

Appendix A is not a part of the requirements of this NFPA document but is included for informational purposes only. This appendix contains explanatory material, numbered to correspond with the applicable text paragraphs.

A-1-1 The application of this standard is concerned with the potential fire hazard of cooking operations, irrespective of the type of cooking equipment used and whether used in public or private facilities.

This standard is also intended to include residential cooking equipment where used for purposes other than residential family use, such as employee kitchens or break areas and church and meeting hall kitchens, regardless of frequency of use. Because this standard cannot address specific installations, the judgment should be made by the authority having jurisdiction.

A-1-2 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A-1-2 Authority Having Jurisdiction. The phrase ''authority having jurisdiction'' is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

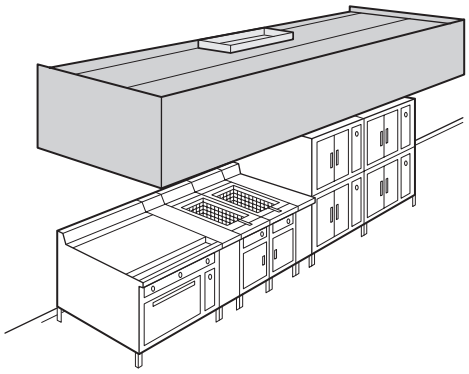
A-1-2 Closed Combustible Construction. See Figure A-1-3.2.3.2.

A-1-2 Continuous Weld. Welding is a fabrication technique for joining metals by heating the materials to the point that they melt and flow together to form an uninterrupted surface of no less strength than the original materials.

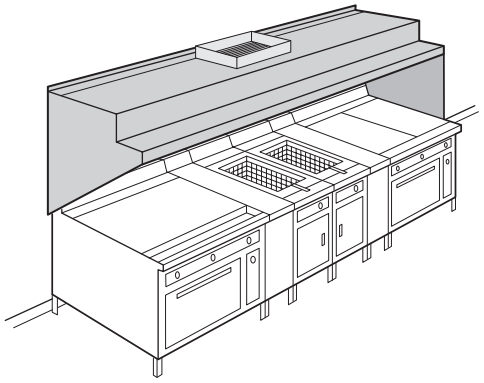
A-1-2 Hood. Hoods as used in this document are often referred to as Type I hoods, meaning those applied to grease exhaust applications. They are built in various styles referred to as island canopy, wall canopy, noncanopy, backshelf, high sidewall, eyebrow, and so on. All such type and style hoods are applicable to this document provided they meet all the material and performance requirements of this document. *(See Figure A-1-2.)*

(a) Types of hoods

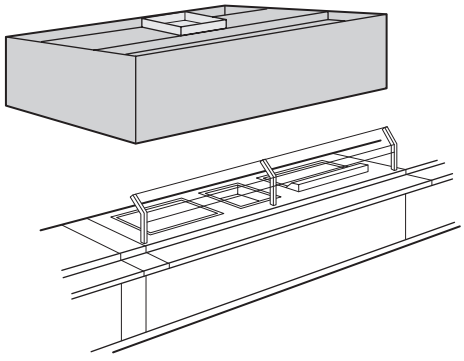
1. *Type I.* Hoods designed for grease exhaust applications
2. *Type II.* Hoods designed for heat and steam removal and other nongrease applications. These hoods are not applicable to the standard.



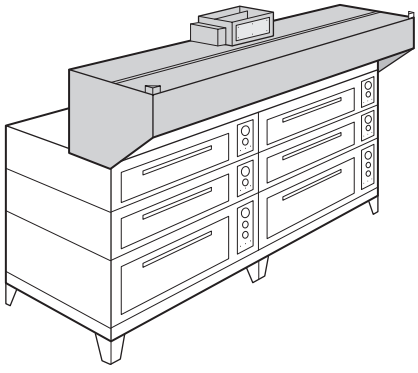
Wall-mounted canopy



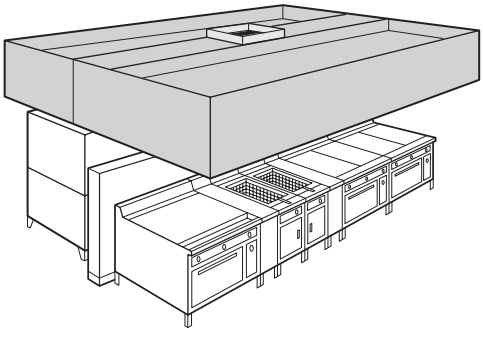
Backshelf



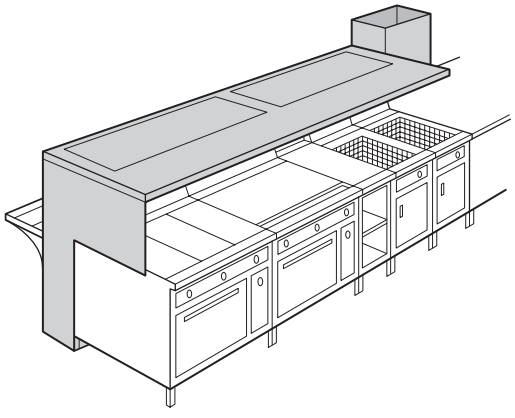
Single-island canopy



Eyebrow



Double-island canopy



Pass-over style

Figure A-1-2 Hood.

(b) Style of hoods
1. Wall-mounted
2. Single island
3. Double island
4. Backshelf
5. Eyebrow

A-1-2 Limited-Combustible Material. See Table A-1-2.

A-1-2 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A-1-2 Open Combustible Construction. See Figure A-1-3.2.3.2.

A-1-3.1.1 When solid fuel is burned in cooking operations, increased quantities of carbon, creosote, and grease-laden vapors are produced that rapidly contaminate surfaces, produce airborne sparks and embers, and are subject to significant flare-ups. Also, solid fuel cooking requires fuel storage and handling and produces ash that requires disposal. For these reasons, solid fuel cooking operations should comply with Chapter 11.

A-1-3.1.4 The authority having jurisdiction might exempt temporary facilities, such as a tent, upon evaluation for compliance to the applicable portions of this standard.

Although it might not be practical to enforce all requirements of this standard in temporary facilities, the authority having jurisdiction should determine that all necessary provisions that impact on the personal safety of the occupants are considered.

A-1-3.2 See Figures A-1-3.2(a) through (g).

A-1-3.2.3.2 See Figure A-1-3.2.3.2.

A-2-3.2 See Figure A-2-3.2.

A-4-1.2 Vertical or substantially pitched ducts are preferred over horizontal ducts because of their capacity to drain grease and to transfer heated vapors more rapidly to the exterior of a building.

A-4-7.2.3 Noncombustible materials such as reinforced concrete floors or protected steel beams, which might protrude into an enclosure and cause reduced clearance, may be permitted by the authority having jurisdiction if the installation and accessibility of the duct system are considered adequate.

Table A-1-2 Types of Construction Assemblies Containing Noncombustible, Limited-Combustible, and Combustible Materials

Type of Assembly	Classification for Determining Hood and Grease Duct Clearance*		
	Noncombustible	Limited-Combustible	Combustible
Wall assemblies			
Brick, clay tile, or concrete masonry products	X		
Plaster, ceramic, or quarry tile on brick, clay tile, or concrete masonry products	X		
Plaster on metal lath on metal studs	X		
Gypsum board on metal studs		X	
Solid gypsum board†		X	
Plaster on wood or metal lath on wood studs			X
Gypsum board on wood studs			X
Plywood or other wood sheathing on wood or metal studs			X
Floor–ceiling or roof–ceiling assemblies			
Plaster applied directly to underside of concrete slab	X		
Suspended membrane ceiling			
With noncombustible mineral wool acoustical material	X		
With combustible fibrous tile			X
Gypsum board on steel joists beneath concrete slab		X	
Gypsum board on wood joists			X

Notes:
1. Wall assembly descriptions assume same facing material on both sides of studs.
2. Categories are not changed by use of fire-retardant-treated wood products.
3. Categories are not changed by use of Type X gypsum board.
4. See definitions of *combustible*, *limited-combustible*, and *noncombustible* in Section 1-2, Definitions.
*See clearance requirements in 1-3.2.
†Solid gypsum walls and partitions, 2-in. (50.8-mm) or 2¼-in. (57.15-mm) thickness, are described in the Fire Resistance Design Manual published by the Gypsum Association, Washington, DC.

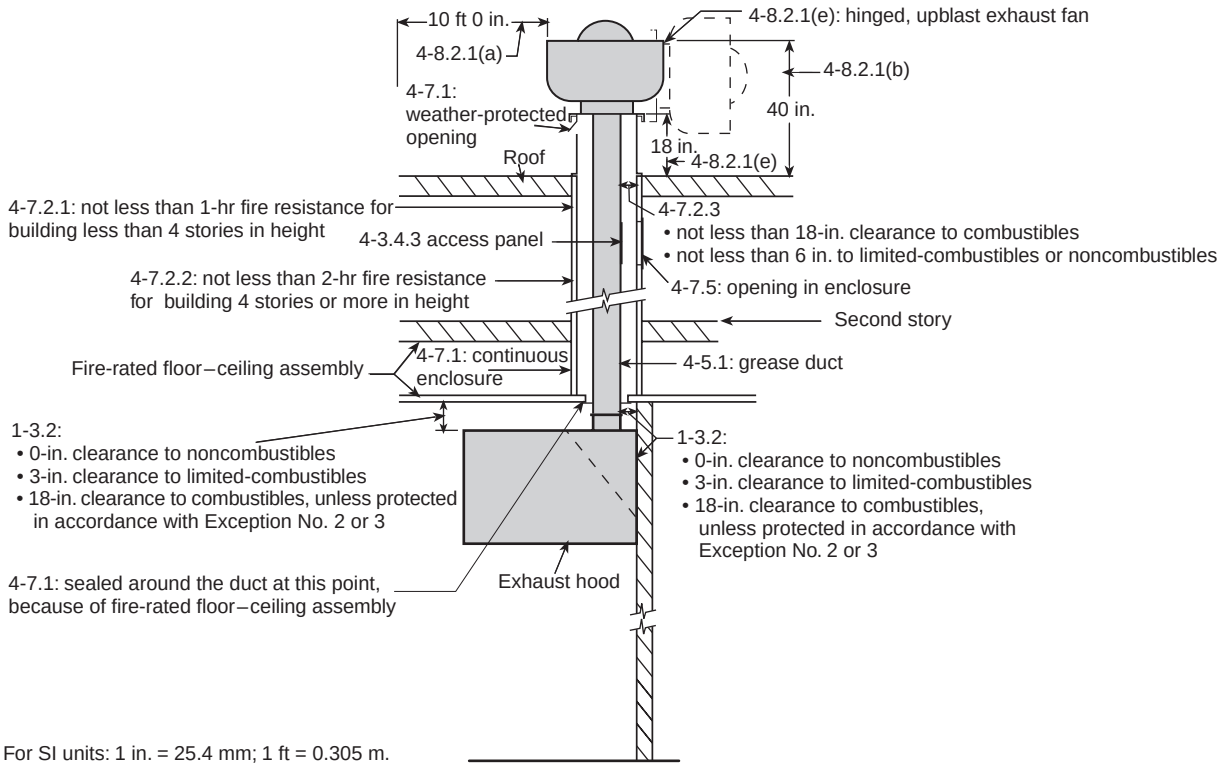
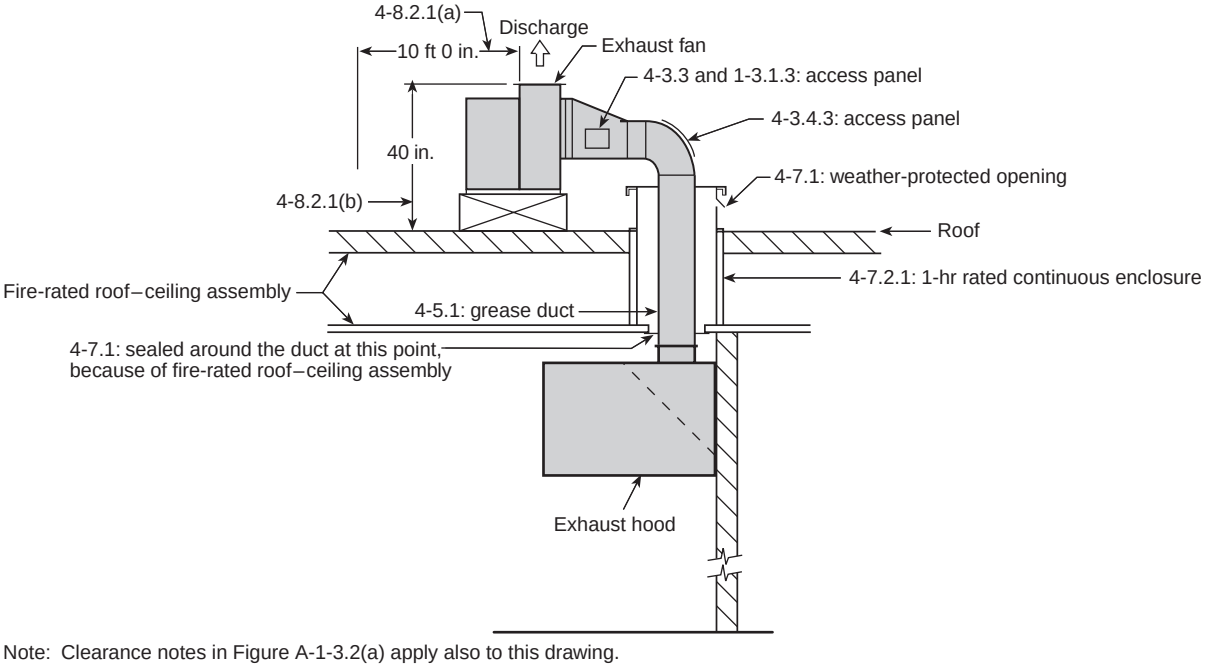


Figure A-1-3.2(a) Typical section view for building with two stories or more with fire-rated floor–ceiling assembly.



Note: Clearance notes in Figure A-1-3.2(a) apply also to this drawing.
For SI units: 1 in. = 25.4 mm; 1 ft = 0.305 m.

Figure A-1-3.2(b) Typical section view for one-story building with fire-rated roof–ceiling assembly.