

# NFPA® 96

## Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

### 2008 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471  
An International Codes and Standards Organization

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## NFPA® 96

### Standard for

## Ventilation Control and Fire Protection of Commercial Cooking Operations

### 2008 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 NFPA at its June Association Technical Meeting held June 3–7, 2007, in Boston, MA. It was issued by the Standards Council on July 26, 2007, with an effective date of August 15, 2007, and supersedes all previous editions.

This edition of NFPA 96 was approved as an American National Standard on August 15, 2007.

### 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, which 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*. That standard was adopted by the Association in 1946, and revisions 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 the new committee with the suggestion that it be revised and published as a separate standard. Since then, the standard has been published as NFPA 96. Editions 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 of NFPA 96 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 illustrated 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: two new chapters on recirculating systems and solid fuel cooking operations were added. A change to clearance and enclosure requirements in the 1994 edition allowed, for the first time, materials or products to be directly applied to a duct.

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

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

The 2001 edition revised the document scope to clarify the application of the standard regarding residential-type cooking equipment. Further technical changes clarified requirements for duct installation, rooftop terminations, and fire protection equipment. The 2001 edition also contained a significant organizational and editorial revision based on the *Manual of Style for NFPA Technical Committee Documents*.

The 2004 edition added a chapter that addressed the requirements for downdraft appliance ventilation as well as clarifications of the requirements for cleaning and maintaining exhaust systems and diagrams detailing new arrangements for hoods with integrated supply air.

The 2008 edition provides clarification of the requirements for field-applied and factory-built grease duct enclosures. It also recognizes new technologies for venting, such as ultraviolet hoods and ventilating ceilings. New requirements were also added for documentation of exhaust system cleaning and maintenance.

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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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## NFPA 96

### Standard for

## Ventilation Control and Fire Protection of Commercial Cooking Operations

### 2008 Edition

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Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

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Information on referenced publications can be found in Chapter 2 and Annex B.

### Chapter 1 Administration

#### 1.1 Scope.

**1.1.1\*** This standard shall provide the minimum fire safety requirements (preventative and operative) related to the design, installation, operation, inspection, and maintenance of all public and private cooking operations.

**1.1.2** This standard shall apply to residential cooking equipment used for commercial cooking operations.

**1.1.3** This standard shall not apply to cooking equipment located in a single dwelling unit.

**1.1.4\*** This standard shall not apply to facilities where all of the following are met:

- (1) Only residential equipment is being used.
- (2) Fire extinguishers are located in all kitchen areas in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.
- (3) Facility is not an assembly occupancy.
- (4) The authority having jurisdiction has approved the installation.

**1.2 Purpose.** The purpose of this standard shall be to reduce the potential fire hazard of cooking operations, irrespective of the type of cooking equipment used and whether used in public or private facilities.

#### 1.3 Application.

**1.3.1\*** This standard shall be applied as a united whole.

**1.3.2** The authority having jurisdiction shall determine compliance with this standard and authorize equivalent deviations from it in all applications.

**1.4 Retroactivity.** The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

**1.4.1** Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

**1.4.2** In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

**1.4.3** The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction and only where it is clearly evident that a reasonable degree of safety is provided.

**1.5 Equivalency.** Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

**1.5.1** Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

**1.5.2** The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

### Chapter 2 Referenced Publications

**2.1 General.** The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

**2.2 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2007 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2008 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2007 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 2002 edition.

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 2002 edition.

NFPA 54, *National Fuel Gas Code*, 2006 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2008 edition.

NFPA 70, *National Electrical Code*®, 2008 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2007 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2006 edition.

NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Materials*, 2006 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 2008 edition.

## 2.3 Other Publications.

**2.3.1 ASTM Publications.** ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*, 2006.

ASTM E 2336, *Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems*, 2004.

**2.3.2 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*.

**2.3.3 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 197, *Standard for Commercial Electric Cooking Appliances*, 1993.

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

UL 710, *Standard for Exhaust Hoods for Commercial Cooking Equipment*, 1995.

UL 710B, *Outline of Investigation for Recirculating Exhaust Systems*, 2003.

UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2001.

UL 1046, *Standard for Grease Filters for Exhaust Ducts*, 2000.

UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, 2003.

UL 1978, *Standard for Safety for Grease Ducts*, 2002.

UL 2221, *Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies*, 2001.

## 2.3.4 Other Publications.

*Merriam-Webster's Collegiate Dictionary*, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

## 2.4 References for Extracts in Mandatory Sections.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2007 edition.

NFPA 101®, *Life Safety Code*®, 2006 edition.

NFPA 150, *Standard on Fire and Life Safety in Animal Housing Facilities*, 2007 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2006 edition.

NFPA 5000®, *Building Construction and Safety Code*®, 2006 edition.

## Chapter 3 Definitions

**3.1 General.** The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

### 3.2 NFPA Official Definitions.

**3.2.1\* Approved.** Acceptable to the authority having jurisdiction.

**3.2.2\* Authority Having Jurisdiction (AHJ).** An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

**3.2.3 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.

**3.2.4\* 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 appropriate designated standards or has been tested and found suitable for a specified purpose.

**3.2.5 Shall.** Indicates a mandatory requirement.

**3.2.6 Should.** Indicates a recommendation or that which is advised but not required.

**3.2.7 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 or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

### 3.3 General Definitions.

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

**3.3.2 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.

**3.3.3 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.



**3.3.4\* Appliance Flue Outlet.** The opening or openings in a cooking device where vapors, combustion gases, or both leave the cooking device.

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

**3.3.6 Automatic.** That which provides a function without the necessity of human intervention. [101, 2006]

**3.3.7 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.

**3.3.8 Broiler.**

**3.3.8.1 High Broiler.** See 3.3.8.3, Upright Broiler.

**3.3.8.2 Salamander Broiler.** See 3.3.8.3, Upright Broiler.

**3.3.8.3 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.

**3.3.9\* Certified.** A formally stated recognition and approval of an acceptable level of competency, acceptable to the AHJ.

**3.3.10 Classified.** Products or materials of a specific group category that are constructed, inspected, tested, and subsequently reinspected in accordance with an established set of requirements. The classification process is performed by an organization acceptable to the authority having jurisdiction. [80, 2007]

**3.3.11 Clean(ing).** For kitchen exhaust systems and cooking equipment, the act of removing grease, oil deposits, and other residue.

**3.3.12 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.

**3.3.13\* Construction.**

**3.3.13.1 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 are protected.

**3.3.13.2 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 are protected.

**3.3.14\* Continuous Weld.** A metal-joining method that produces a product without visible interruption or variation in quality.

**3.3.15 Damper.** A valve or plate for controlling draft or flow of gases, including air.

**3.3.16 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.

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

**3.3.18 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.

**3.3.19 Duct 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.

**3.3.20 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.

**3.3.20.1 Bleed Air Duct.** An intake duct in a manifold duct system, designed to input air to maintain system balance.

**3.3.20.2 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.

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

**3.3.22 Enclosure.**

**3.3.22.1 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.

**3.3.22.2 Grease Duct Enclosure.**

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

**3.3.22.2.2 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.

**3.3.23 Equipment.**

**3.3.23.1 Fire-Extinguishing Equipment.** Automatic fire-extinguishing systems and portable fire extinguishers provided for the protection of grease removal devices, hoods, duct systems, and cooking equipment, and listed for such use.

**3.3.23.2\* Solid Fuel Cooking Equipment.** Cooking equipment that utilizes solid fuel.

**3.3.24 Filter.**

**3.3.24.1\* Grease Filter.** A removable component of the grease removal system designed to capture grease and direct it to a safe collection point.

**3.3.24.2\* Mesh-Type Filter.** A general purpose air filter not listed for or intended for grease applications.

**3.3.25 Fire Resistance Rating.** The time, in minutes or hours, that materials or assemblies have withstood a fire exposure as established in accordance with the test procedures of NFPA 251. [150, 2006]

**3.3.26 Fire Wall.** A wall separating buildings or subdividing a building to prevent the spread of the fire and having a fire resistance rating and structural stability.

**3.3.27 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.

**3.3.28 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.

**3.3.29\* Grease.** Rendered animal fat, vegetable shortening, and other such oily matter used for the purposes of and resulting from cooking and/or preparing foods.

**3.3.30 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.

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

**3.3.32 High Limit Control Device.** An operating device installed and serving as an integral component of a deep fat fryer that provides secondary limitation of the grease temperature by automatically disconnecting the thermal energy input when the temperature limit is exceeded.

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

**3.3.33.1 Fixed Baffle Hood.** 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.

**3.3.34 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.

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

#### **3.3.36\* Material.**

**3.3.36.1 Combustible Material.** Any material that will burn regardless of its autoignition temperature.

**3.3.36.2 Limited-Combustible Material.** Refers to a building construction material not complying with the definition of noncombustible material that, in the form in which it is used, has a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb), where tested in accordance with NFPA 259 and includes (1) materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of  $\frac{1}{8}$  in. (3.2 mm) that has a flame spread index not greater than 50; and (2) materials, in the form and thickness used, other than as described in (1), having neither a flame spread index 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 index greater than 25 nor evidence of continued progressive combustion. [5000, 2006]

**3.3.36.3\* Noncombustible Material.** A substance that will not ignite and burn when subjected to a fire.

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

**3.3.38 Qualified.** A competent and capable person or company that has met the requirements and training for a given field acceptable to the AHJ.

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

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

**3.3.41 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.

**3.3.42 Single Hazard Area.** Where two or more hazards can be simultaneously involved in fire by reason of their proximity, as determined by the authority having jurisdiction.

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

**3.3.44 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 semi-liquid state in order to facilitate a cleaning operation.

#### **3.3.45 Space.**

**3.3.45.1 Concealed Spaces.** That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and whose size might normally range from 44.45 mm ( $1\frac{1}{4}$  in.) stud spaces to 2.44 m (8 ft) interstitial truss spaces and that might contain combustible materials such as building structural members, thermal and/or electrical insulation, and ducting.

**3.3.45.2 Confined Space.** A space whose volume is less than 1.42 m<sup>3</sup>/293 W (50 ft<sup>3</sup>/1000 Btu/hr) of the aggregate input rating of all appliances installed in that space. [211, 2006]

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

**3.3.47 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.

**3.3.48\* Trained.** A person who has become proficient in performing a skill reliably and safely through instruction and practice/field experience acceptable to the AHJ.

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



## Chapter 4 General Requirements

### 4.1 General.

**4.1.1** 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.

**4.1.1.1\*** Cooking equipment that has been listed in accordance with UL 197 or an equivalent standard for reduced emissions shall not be required to be provided with an exhaust system.

**4.1.1.2** The listing evaluation of cooking equipment covered by 4.1.1.1 shall demonstrate that the grease discharge at the exhaust duct of a test hood placed over the appliance shall not exceed  $5 \text{ mg/m}^3$  when operated with a total airflow of  $0.236 \text{ m}^3/\text{s}$  (500 cfm).

**4.1.2** All such equipment and its performance shall be maintained in accordance with the requirements of this standard during all periods of operation of the cooking equipment.

**4.1.3** The following equipment shall be kept in working condition:

- (1) Cooking equipment
- (2) Hoods
- (3) Ducts (if applicable)
- (4) Fans
- (5) Fire-extinguishing systems
- (6) Special effluent or energy control equipment

**4.1.3.1** Maintenance and repairs shall be performed on all components at intervals necessary to maintain good working condition.

**4.1.4** All airflows shall be maintained.

**4.1.5** The responsibility for inspection, maintenance, and cleanliness of the ventilation control and fire protection of the commercial cooking operations shall be the ultimate responsibility of the owner of the system provided that this responsibility has not been transferred in written form to a management company or other party.

**4.1.6\*** All solid fuel cooking equipment shall comply with the requirements of Chapter 14.

**4.1.7** Multi-tenant applications shall require the concerted cooperation of design, installation, operation, and maintenance responsibilities by tenants and by the building owner.

**4.1.8** All interior surfaces of the exhaust system shall be accessible for cleaning and inspection purposes.

**4.1.9\*** 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.

### 4.2\* Clearance.

**4.2.1** Where enclosures are not required, hoods, grease removal devices, exhaust fans, and ducts shall have a clearance of at least 457 mm (18 in.) to combustible material, 76 mm (3 in.) to limited-combustible material, and 0 mm (0 in.) to noncombustible material.

**4.2.2** Where a hood, duct, or grease removal device is listed for clearances less than those required in 4.2.1, the listing requirements shall be permitted.

### 4.2.3 Clearance Reduction.

**4.2.3.1** Where a clearance reduction system consisting of 0.33 mm (0.013 in.) (28 gauge) sheet metal spaced out 25 mm (1 in.) on noncombustible spacers is provided, there shall be a minimum of 229 mm (9 in.) clearance to combustible material.

**4.2.3.2** Where a clearance reduction system consisting of 0.69 mm (0.027 in.) (22 gauge) sheet metal on 25 mm (1 in.) mineral wool batts or ceramic fiber blanket reinforced with wire mesh or equivalent spaced out 25 mm (1 in.) on noncombustible spacers is provided, there shall be a minimum of 76 mm (3 in.) clearance to combustible material.

**4.2.3.3** Zero clearance to limited-combustible materials shall be permitted 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.

### 4.2.4 Clearance Integrity.

**4.2.4.1** 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.

**4.2.4.2\*** 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 in compliance with this standard for continued operation.

**4.2.4.3** Protection shall be provided on the wall from the bottom of the hood to the floor, or to the top of the noncombustible material extending to the floor, to the same level as required in 4.2.1.

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

### 4.3 Field-Applied and Factory-Built Grease Duct Enclosures.

**4.3.1** Field-applied grease duct enclosures shall be protected with a through-penetration firestop system classified in accordance with ASTM E 814 or UL 1479 having an "F" and "T" rating equal to the fire resistance rating of the assembly being penetrated.

**4.3.1.1** The surface of the field fabricated grease duct shall be continuously covered on all sides from the point at which the duct enclosure penetrates a ceiling, wall, or floor to the outlet terminal.

**4.3.1.2** The field-applied grease duct shall be listed in accordance with ASTM E 2336, and installed in accordance with the manufacturer's instructions and the listing requirements.

**4.3.2\*** Where subject to physical damage, field-applied grease duct enclosures shall be protected as deemed necessary by the authority having jurisdiction.

**4.3.3** Factory-built grease duct enclosures shall be protected with a through-penetration firestop system classified in accordance with ASTM E 814 or UL 1479 having an "F" and "T" rating equal to the fire resistance rating of the assembly being penetrated from the point at which the duct penetrates a ceiling, wall, or floor to the outlet terminal.

**4.3.3.1** The factory-built grease duct protection system shall be listed in accordance with UL 2221.

**4.3.3.2** The factory-built grease duct protection system shall be installed in accordance with the manufacturer's instructions and the listing requirements.

**4.3.4** Field-applied grease duct enclosures and factory-built grease duct enclosures shall demonstrate that they provide 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.

**4.3.5** 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.

**4.3.6 Clearance Options for Field-Applied and Factory-Built Grease Duct Enclosures.** 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 labels:

- (1) Open combustible construction clearance at manufacturer's requested dimensions
- (2) Closed combustible construction clearance at manufacturer's requested dimensions, with or without specified ventilation
- (3) Rated shaft clearance at manufacturer's requested dimensions, with or without specified ventilation

#### **4.4 Building and Structural Duct Contact.**

**4.4.1** 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 for each linear foot of contact length.

**4.4.2** Where duct contact must exceed the requirements of 4.4.1, the duct shall be protected from corrosion.

**4.4.3** Where the duct is listed for zero clearance to combustibles or is otherwise protected with a material or product listed for the purpose of reducing clearance to zero, the duct shall be permitted to exceed the contact limits of 4.4.1 without additional corrosion protection.

**4.4.4** Where the duct is listed for zero clearance to combustibles, the duct shall be permitted to exceed the contact limits of 4.4.1 without additional corrosion protection.

**4.5 Duct Clearances to Enclosures.** Clearances between the duct and interior surfaces of enclosures shall meet the requirements of Section 4.2.

**4.6 Drawings.** A drawing(s) of the exhaust system installation along with copies of operating instructions for subassemblies and components used in the exhaust system, including electrical schematics, shall be kept on the premises.

**4.7 Authority Having Jurisdiction Notification.** 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.

## **Chapter 5 Hoods**

### **5.1 Construction.**

**5.1.1** 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 1.09 mm (0.043 in.) (No. 18 MSG) in thickness, stainless steel not less than 0.94 mm (0.037 in.) (No. 20 MSG) in thickness, or other approved material of equivalent strength and fire and corrosion resistance.

**5.1.2** 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.

**5.1.3** 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 cleanable.

**5.1.4\*** Internal hood joints, seams, filter support frames, and appurtenances attached inside the hood shall be sealed or otherwise made greasetight.

**5.1.5** 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.

**5.1.6** Listed exhaust hoods with or without exhaust dampers shall be permitted to be constructed of materials required by the listing.

**5.1.7** Listed exhaust hoods with or without exhaust dampers shall be permitted to be assembled in accordance with the listing requirements.

#### **5.1.8 Eyebrow-Type Hoods.**

**5.1.8.1** Eyebrow-type hoods over gas or electric ovens shall be permitted to have a duct constructed as required in Chapter 7 from the oven flue(s) connected to the hood canopy upstream of the exhaust plenum, as shown in Figure 5.1.8.1.

**5.1.8.2** The duct connecting the oven flue(s) to the hood canopy shall be connected with a continuous weld or have a duct-to-duct connection. [See Figure 8.1.2.2(b) through Figure 8.1.2.2(d).]

**5.1.9** Insulation materials other than electrical insulation shall have a flame spread rating of 25 or less when tested in accordance with UL 723.

**5.1.10** Adhesives or cements used in the installation of insulating materials shall comply with the requirements of 5.1.9 when tested with the specific insulating material.

**5.1.11** Penetrations shall be sealed with listed devices in accordance with the requirements of 5.1.12.

**5.1.12** Devices that require penetration of the hood, such as pipe and conduit penetration fittings and fasteners, shall be listed in accordance with UL 1978.

**5.1.13** Wall-mounted exhaust hood assemblies shall be tight fitting against the back wall so as to not permit passage of grease vapor behind the hood or between the back wall and the hood assembly.

**5.2 Hood Size.** Hoods shall be sized and configured to provide for the capture and removal of grease-laden vapors. (See 8.2.2.)



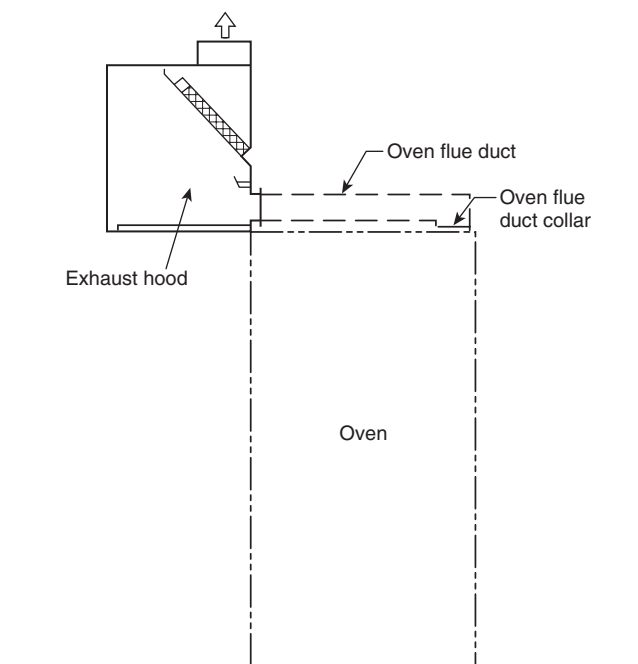


FIGURE 5.1.8.1 Typical Section of Eyebrow-Type Hood.

### 5.3 Exhaust Hood Assemblies with Integrated Supply Air Plenums.

**5.3.1** The construction and size of exhaust hood assemblies with integrated supply air plenums shall comply with the requirements of Sections 5.1 and 5.2.

**5.3.2** The construction of the outer shell or the inner exhaust shell shall comply with Section 5.1.

**5.3.3** Where the outer shell is welded, the inner shell shall be of greasetight construction.

#### 5.3.4\* Fire Dampers.

**5.3.4.1** 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.

**5.3.4.2** The fire damper shall be listed for such use or be part of a listed exhaust hood with or without exhaust damper.

**5.3.4.3** The actuation device shall have a maximum temperature rating of 141°C (286°F).

**5.3.4.4** 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 diagram A in Figure A.5.3.4.)

### 5.4\* Listed Hood Assemblies.

**5.4.1** Listed hood assemblies shall be installed in accordance with the terms of their listing and the manufacturer's instructions.

**5.4.2** Listed hood assemblies shall be tested in accordance with UL 710 or equivalent.

**5.5 Listed Ultraviolet Hoods.** Listed ultraviolet hoods shall be installed and maintained in accordance with the terms of their listing and the manufacturer's instructions.

**5.6 Listed Ventilated Ceiling Technology.** Listed ventilated ceiling technology shall be installed and maintained in accordance with the terms of its listing and the manufacturer's instructions.

## Chapter 6 Grease Removal Devices in Hoods

### 6.1 Grease Removal Devices.

**6.1.1** Listed grease filters, listed baffles, or other listed grease removal devices for use with commercial cooking equipment shall be provided.

**6.1.2** Listed grease filters shall be tested in accordance with UL 1046.

**6.1.3** Mesh filters shall not be used.

### 6.2 Installation.

#### 6.2.1 Separation Distance.

**6.2.1.1** The distance between the grease removal device and the cooking surface shall be as great as possible but not less than 457 mm (18 in.).

**6.2.1.2** Where grease removal devices are used in conjunction with charcoal or charcoal-type broilers, including gas or electrically heated charbroilers, a minimum vertical distance of 1.22 m (4 ft) shall be maintained between the lower edge of the grease removal device and the cooking surface.

**6.2.1.3** 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 152 mm (6 in.).

**6.2.1.4** Where a grease removal device is listed for separation distances less than those required in 6.2.1.1 and 6.2.1.2, the listing requirements shall be permitted.

**6.2.1.5** 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.

#### 6.2.2 Grease Removal Device Protection.

**6.2.2.1\*** 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, where the distance between the grease removal device and the appliance flue outlet (heat source) is less than 457 mm (18 in.).

**6.2.2.2** 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.

**6.2.2.3** The baffle plate shall be sized and located so that flames or combustion gases travel a distance not less than 457 mm (18 in.) from the heat source to the grease removal device.

**6.2.2.4** The baffle shall be located not less than 152 mm (6 in.) from the grease removal devices.