

# NFPA 96

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

2001 Edition



NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101  
An International Codes and Standards Organization

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## NFPA 96

### Standard for

# Ventilation Control and Fire Protection of Commercial Cooking Operations

### 2001 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 May Association Technical Meeting held May 13–17, 2001, in Anaheim, CA. It was issued by the Standards Council on July 13, 2001, with an effective date of August 2, 2001, and supersedes all previous editions.

This edition of NFPA 96 was approved as an American National Standard on August 2, 2001.

### 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; two 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 to be directly applied to a duct.

The Committee prepared a revision to the standard, reporting to the 1996 Fall Meeting, that 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.

This 2001 edition revises the document scope to clarify the application of the standard regarding residential-type cooking equipment. Further technical changes clarify requirements for duct installation, roof top terminations, and fire protection equipment. This edition also contains a significant organizational and editorial revision based on the NFPA *Manual of Style*.

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**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.

*This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.*

**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.

## Contents

<b>Chapter 1 Administration</b> .....	<b>96- 4</b>	<b>9.3 Other Equipment</b> .....	<b>96-16</b>
1.1 Scope .....	96- 4		
1.2 Purpose .....	96- 4		
1.3 Application .....	96- 4		
1.4 Retroactivity .....	96- 4		
1.5 Equivalency .....	96- 4		
<b>Chapter 2 Referenced Publications</b> .....	<b>96- 4</b>		
2.1 General .....	96- 4		
<b>Chapter 3 Definitions</b> .....	<b>96- 5</b>		
3.1 General .....	96- 5		
3.2 NFPA Official Definitions .....	96- 5		
3.3 General Definitions .....	96- 5		
<b>Chapter 4 General Requirements</b> .....	<b>96- 7</b>		
4.1 General .....	96- 7		
4.2 Clearance .....	96- 7		
4.3 Field-Applied and Factory-Built Grease Duct Enclosures .....	96- 8		
4.4 Building and Structural Duct Contact .....	96- 8		
4.5 Duct Clearances to Enclosures .....	96- 8		
4.6 Drawings .....	96- 8		
4.7 Authority Having Jurisdiction Notification .....	96- 8		
<b>Chapter 5 Hoods</b> .....	<b>96- 8</b>		
5.1 Construction .....	96- 8		
5.2 Hood Size .....	96- 9		
5.3 Exhaust Hood Assemblies with Integrated Supply Air Plenums .....	96- 9		
5.4 Listed Hood Assemblies .....	96- 9		
<b>Chapter 6 Grease Removal Devices in Hoods</b> .....	<b>96- 9</b>		
6.1 Grease Removal Devices .....	96- 9		
6.2 Installation .....	96- 9		
<b>Chapter 7 Exhaust Duct Systems</b> .....	<b>96-10</b>		
7.1 General .....	96-10		
7.2 Clearance .....	96-10		
7.3 Openings .....	96-10		
7.4 Openings in Ducts .....	96-10		
7.5 Other Grease Ducts .....	96-11		
7.6 Exterior Installations .....	96-12		
7.7 Interior Installations .....	96-12		
7.8 Termination of Exhaust System .....	96-13		
<b>Chapter 8 Air Movement</b> .....	<b>96-14</b>		
8.1 Exhaust Fans for Commercial Cooking Equipment .....	96-14		
8.2 Airflow .....	96-15		
8.3 Replacement Air .....	96-16		
8.4 Common Duct (Manifold) Systems .....	96-16		
<b>Chapter 9 Auxiliary Equipment</b> .....	<b>96-16</b>		
9.1 Dampers .....	96-16		
9.2 Electrical Equipment .....	96-16		
<b>Chapter 10 Fire-Extinguishing Equipment</b> .....	<b>96-16</b>		
10.1 General Requirements .....	96-16		
10.2 Types of Equipment .....	96-16		
10.3 Simultaneous Operation .....	96-17		
10.4 Fuel Shutoff .....	96-17		
10.5 Manual Activation .....	96-17		
10.6 System Annunciation .....	96-18		
10.7 System Supervision .....	96-18		
10.8 Special Design and Application .....	96-18		
10.9 Review and Certification .....	96-18		
10.10 Portable Fire Extinguishers .....	96-18		
<b>Chapter 11 Procedures for the Use and Maintenance of Equipment</b> .....	<b>96-18</b>		
11.1 Operating Procedures .....	96-18		
11.2 Inspection of Fire-Extinguishing Systems .....	96-18		
11.3 Inspection of Exhaust Systems .....	96-19		
11.4 Cleaning of Exhaust Systems .....	96-19		
<b>Chapter 12 Minimum Safety Requirements for Cooking Equipment</b> .....	<b>96-19</b>		
12.1 Cooking Equipment .....	96-19		
12.2 Operating Controls .....	96-20		
<b>Chapter 13 Recirculating Systems</b> .....	<b>96-20</b>		
13.1 General Requirements .....	96-20		
13.2 Design Restrictions .....	96-20		
13.3 Interlocks .....	96-20		
13.4 Location and Application Restrictions .....	96-20		
13.5 Additional Fire Safety Requirements .....	96-21		
13.6 Use and Maintenance .....	96-21		
<b>Chapter 14 Solid Fuel Cooking Operations</b> .....	<b>96-21</b>		
14.1 Venting Application .....	96-21		
14.2 Location of Appliances .....	96-21		
14.3 Hoods for Solid Fuel Cooking .....	96-21		
14.4 Exhaust for Solid Fuel Cooking .....	96-21		
14.5 Grease Removal Devices for Solid Fuel Cooking .....	96-22		
14.6 Air Movement for Solid Fuel Cooking .....	96-22		
14.7 Fire-Extinguishing Equipment for Solid Fuel Cooking .....	96-22		
14.8 Procedures for Inspection, Cleaning, and Maintenance for Solid Fuel Cooking .....	96-22		
14.9 Minimum Safety Requirements: Fuel Storage, Handling, and Ash Removal for Solid Fuel Cooking .....	96-22		
<b>Annex A Explanatory Material</b> .....	<b>96-24</b>		
<b>Annex B Informational References</b> .....	<b>96-31</b>		
<b>Index</b> .....	<b>96-32</b>		

**NFPA 96**  
**Standard for**  
**Ventilation Control and Fire Protection of**  
**Commercial Cooking Operations**  
**2001 Edition**

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

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. 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 located in all kitchen areas in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.
- (3) Facility is not an assembly occupancy.
- (4) Subject to the approval of the authority having jurisdiction.

**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.

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

**2.1.1 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*, 2000 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1999 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*, 1999 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2001 edition.

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

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1999 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2000 edition.

NFPA 220, *Standard on Types of Building Construction*, 1999 edition.

NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, 1999 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 2000 edition.

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

### 2.1.2 Other Publications.

**2.1.2.1 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*.

**2.1.2.2 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

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

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

UL 1978, *Standard for Safety for Grease Ducts*, 1995.

## 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 included, common usage of the terms shall apply.

### 3.2 NFPA Official Definitions.

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

**3.2.2\* Authority Having Jurisdiction.** The organization, office, or individual responsible 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, 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 improve its intended function.

**3.3.6 Automatic.** Providing a function without the necessity of human intervention.

**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 Upright Broiler.

**3.3.8.2 Salamander Broiler.** See 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 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. [80:1.4]

**3.3.10 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.

### 3.3.11\* Construction.

**3.3.11.1 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.

**3.3.11.2 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.

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

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

**3.3.14 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.

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

**3.3.16 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.

**3.3.17 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.

**3.3.18 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.

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

**3.3.18.2 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.

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

### 3.3.20 Enclosure.

**3.3.20.1 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.

### 3.3.20.2 Grease Duct Enclosure.

**3.3.20.2.1 Factory-Built Grease Duct Enclosures.** 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.

**3.3.20.2.2 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.

### 3.3.21 Equipment.

**3.3.21.1 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.

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

### 3.3.22 Filter.

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

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

**3.3.23 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, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*. [150:1.4]

**3.3.24 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.

**3.3.25 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.

**3.3.26 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.

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

**3.3.28 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.

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

**3.3.30 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.

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

**3.3.31.1 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.

**3.3.32 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.

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

### 3.3.34\* Material.

**3.3.34.1 Combustible Material.** A material capable of undergoing combustion.

**3.3.34.2 Limited-Combustible Material.** As applied to a material of construction, any material that does not meet the definition of noncombustible, as stated elsewhere in this section, and that, in the form in which it is used, has a potential heat value not exceeding 8141 kJ/kg (3,500 Btu/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, and also meets one of the following subparagraphs (a) or (b). (a) Materials having a structural base of noncombustible material, with a surfacing not exceeding

ing a thickness of 3.2 mm (1/8 in.) that has a flame spread rating not greater than 50, when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. (b) Materials, in the form and thickness used and not described by (a) above, having neither a flame spread rating greater than 25 nor evidence of continued progressive combustion and having such composition that surfaces that would be exposed by cutting through the material in any plane have neither a flame spread rating greater than 25 nor evidence of continued progressive combustion, when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*.

**3.3.34.3\* Noncombustible Material.** A material not capable of supporting combustion.

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

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

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

**3.3.38 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.

**3.3.39 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.

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

**3.3.41 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.

### 3.3.42 Space.

**3.3.42.1 Concealed Spaces.** That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and in whose size might normally range from 44.45 mm (1 3/4 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.

**3.3.42.2 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. [211:1.5]

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

**3.3.44 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.

**3.3.45 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.

**4.1.2** 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 good working condition:

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

**4.1.4** All airflows shall be maintained.

**4.1.5** Maintenance and repairs shall be performed on all components at intervals necessary to maintain these conditions.

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

**4.1.7** Multiple tenancy 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 unless all or part of the installation is exempted by the authority having jurisdiction.

### 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 bats 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 and factory-built grease duct enclosures shall be installed in accordance with the manufacturers' instructions and the listing requirements.

**4.3.2** 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.

**4.3.3** 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.

**4.3.4 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 label:

- (1) Open combustible clearance at manufacturer's requested dimensions
- (2) Closed combustible 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 per each lineal 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 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.

**4.5 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 a copy 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.

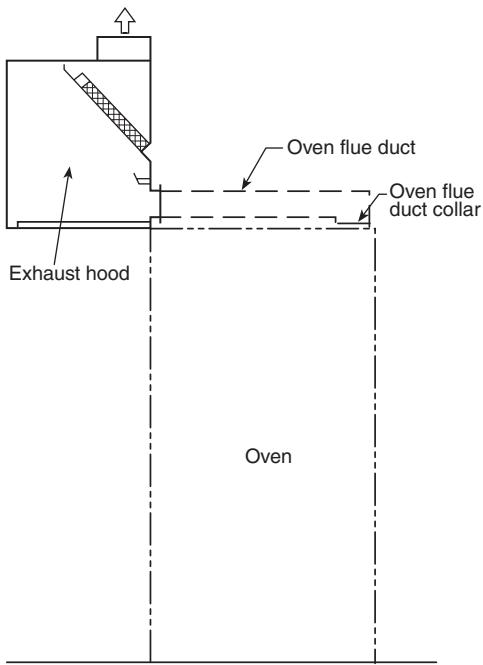
**5.1.6** Listed exhaust hoods with or without exhaust dampers shall be permitted to be constructed of materials required by the listing.

**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).]



**FIGURE 5.1.8.1** Typical section of eyebrow-type hood.

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

**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, *Standard for Safety Grease Ducts*.

**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.)

### 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 gaskettight 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 of Figure A.5.3.4.)

**5.4 Listed Hood Assemblies.** Listed hood assemblies shall be installed in accordance with the terms of their 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, *Standard for Grease Filters for Exhaust Ducts*.

**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 457.2 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 char-broilers, 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 152.4 mm (6 in.).

**6.2.1.4** 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 457.2 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 shall travel a distance not less than 457.2 mm (18 in.) from the heat source to the grease removal device.

**6.2.2.4** The baffle shall be located not less than 6 in. (152.4 mm) from the grease removal devices.

### 6.2.3 Grease Filters.

**6.2.3.1** Grease filters shall be listed and constructed of steel or listed equivalent material.

**6.2.3.2** Grease filters shall be of rigid construction that will not distort or crush under normal operation, handling, and cleaning conditions.

**6.2.3.3** Grease filters shall be arranged so that all exhaust air shall pass through the grease filters.

**6.2.3.4** Grease filters shall be easily accessible and removable for cleaning.

**6.2.3.5** Grease filters shall be installed at an angle not less than 45 degrees from the horizontal.

### 6.2.4 Grease Drip Trays.

**6.2.4.1** Grease filters shall be equipped with a grease drip tray beneath their lower edges.

**6.2.4.2** Grease drip trays shall be kept to the minimum size needed to collect grease.

**6.2.4.3** Grease drip trays shall be pitched to drain into an enclosed metal container having a capacity not exceeding 3.785 L (1 gal).

**6.2.5 Grease Filter Orientation.** 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.

## Chapter 7 Exhaust Duct Systems

### 7.1 General.

**7.1.1** Ducts shall not pass through fire walls.

**7.1.2\*** All ducts shall lead directly to the exterior of the building, so as not to unduly increase any fire hazard.

**7.1.3** Duct systems shall not be interconnected with any other building ventilation or exhaust system.

**7.1.4** 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.

**7.1.5** Openings required for accessibility shall comply with Section 7.3.

**7.1.6** A sign shall be placed on all access panels stating the following:

ACCESS PANEL — DO NOT OBSTRUCT

**7.1.7** Listed grease ducts shall be installed in accordance with the terms of the listing and the manufacturers' instructions.

**7.2 Clearance.** Clearance between ducts and combustible materials shall be provided in accordance with the requirements of Section 4.2.

### 7.3 Openings.

**7.3.1** Openings shall be provided at the sides or at the top of the duct, whichever is more accessible, and at changes of direction.

**7.3.2** Openings shall be protected by approved access constructed and installed in accordance with the requirements of 7.4.4.

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

**7.3.4** 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 within 457 mm (18 in.) of the damper.

**7.3.5** For common exhaust duct systems, access panel openings shall be provided for installation and servicing of the fire-extinguishing system.

**7.3.6** Access panel opening shall not be required in portions of the common exhaust duct or branch duct that are accessible from the branch duct connection to the exhaust hood.

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

**7.4 Openings in Ducts.** All openings shall comply with the requirements of Section 7.4.

### 7.4.1 Horizontal Ducts.

**7.4.1.1** Horizontal ducting support systems for nonlisted grease duct systems 24 in. and larger than 609 mm in any cross-sectional dimension shall be designed for the weight of the ductwork plus 363 kg (800 lbs) at any point in the duct systems.

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

### 7.4.2 Vertical Ducts.

**7.4.2.1** On vertical ductwork where personnel entry is possible, access shall be provided at the top of the vertical riser to accommodate descent.

**7.4.2.2** Where personnel entry is not possible, adequate access for cleaning shall be provided on each floor.

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

### 7.4.3 Access Panels.

**7.4.3.1** Access panels shall be of the same material and thickness as the duct.

**7.4.3.2** Access panels shall have a gasket or sealant that is rated for 815.6°C (1500°F) and shall be greasetight.

**7.4.3.3** 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.

**7.4.3.4** Listed grease duct access door assemblies (access panels) shall be installed in accordance with the terms of the listing and the manufacturers' instructions.

### 7.4.4 Protection of Openings.

**7.4.4.1** 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 Section 7.3 and 7.7.4.

**7.4.4.2** Enclosure openings required to reach access panels in the ductwork shall be large enough for the removal of the access panel.

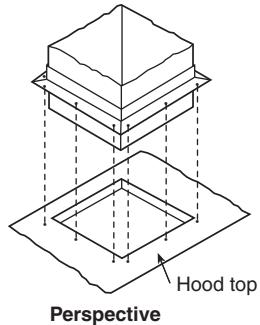
**7.5 Other Grease Ducts.** Other grease ducts shall comply with the requirements of this section.

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

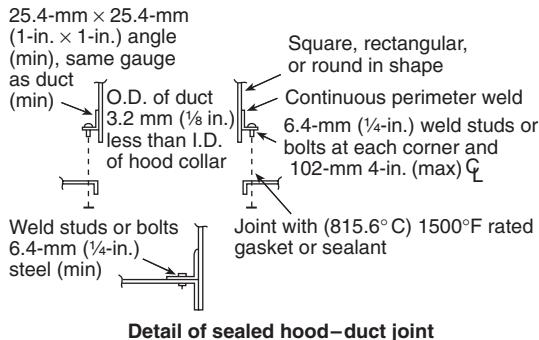
### 7.5.2 Installation.

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

**7.5.2.2** Duct-to-hood collar connections as shown in Figure 7.5.2.2 shall not require a liquidtight continuous external weld.



Perspective



Detail of sealed hood-duct joint

**FIGURE 7.5.2.2** Permitted duct-to-hood collar connection.

**7.5.2.3** 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.

**7.5.2.4** Internal welding shall be permitted, provided the joint is formed or ground smooth and is readily accessible for inspection.

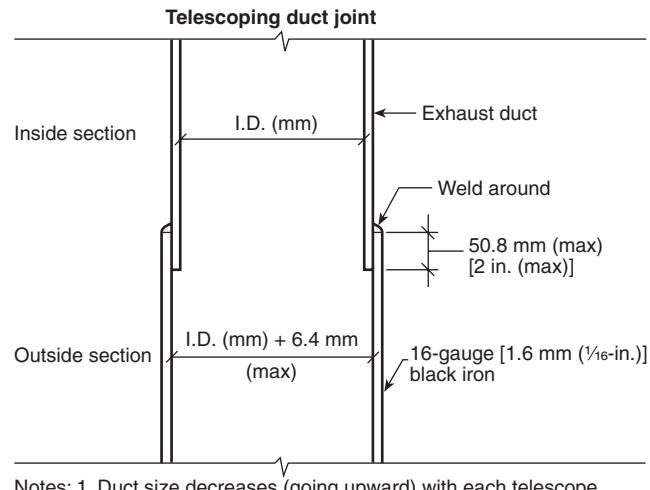
**7.5.3** Penetrations shall be sealed with listed devices in accordance with the requirements of 4.2.3.3.

**7.5.4** Devices that require penetration of the ductwork, such as pipe and conduit penetration fittings and fasteners, shall be listed in accordance with UL 1978, *Standard for Safety for Grease Ducts*.

### 7.5.5 Duct Connections.

**7.5.5.1** Acceptable duct-to-duct connection shall be as follows:

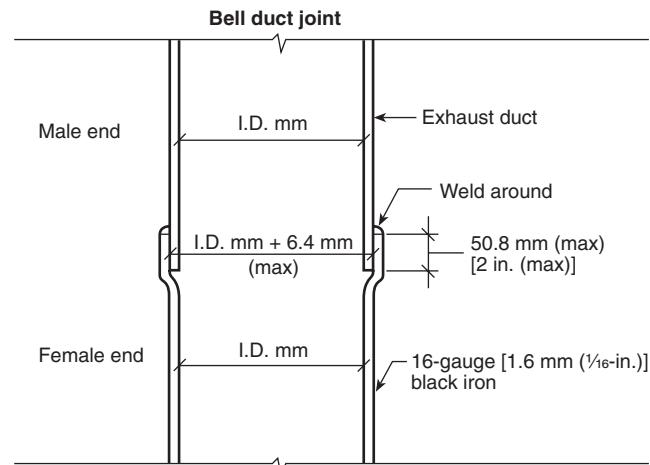
- (1) Telescoping joint as shown in Figure 7.5.5.1(a)
- (2) Bell type joint as shown in Figure 7.5.5.1(b)
- (3) Flange edge weld as shown in Figure 7.5.5.1(c)
- (4) Flange filled weld as shown in Figure 7.5.5.1(d)



Notes: 1. Duct size decreases (going upward) with each telescope.

2. Smaller (inside) duct section is always above or uphill (on sloped duct), to be self-draining into larger (outside) duct.

**FIGURE 7.5.5.1(a)** Telescoping-type duct connection.



Notes: 1. Duct size stays the same throughout the duct system.

2. Smaller (inside) male duct end is always above or uphill (on sloped duct), to be self-draining into larger (outside) female duct end.

**FIGURE 7.5.5.1(b)** Bell-type duct connection.

**7.5.5.2** Butt welded connections shall not be permitted.

**7.5.5.3** For telescoping and bell type connections, the inside duct section shall always be uphill of the outside duct section.

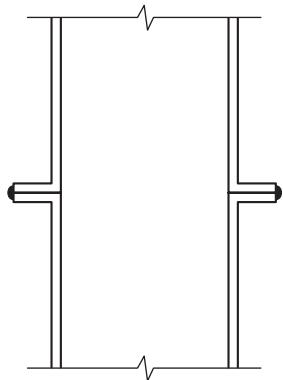


FIGURE 7.5.5.1(c) Flanged with edge weld.

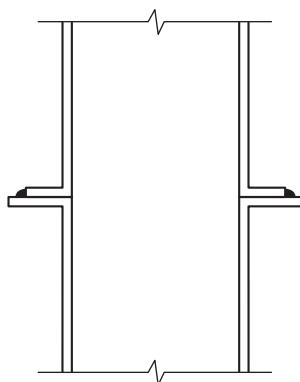


FIGURE 7.5.5.1(d) Flanged with filled weld.

**7.5.5.4** For telescoping and bell type connections, the difference between inside dimensions of overlapping sections shall not exceed 6.4 mm (1/4 in.).

**7.5.5.5** For telescoping and bell type connections, the overlap shall not exceed 50.8 mm (2 in.).

#### 7.6 Exterior Installations.

**7.6.1** The exterior portion of the ductwork shall be vertical wherever possible and shall be installed and supported on the exterior of a building.

**7.6.2** Bolts, screws, rivets, and other mechanical fasteners shall not penetrate duct walls.

**7.6.3** Clearance of any ducts shall comply with Section 4.2.

**7.6.4** All ducts shall be protected on the exterior by paint or other suitable weather-protective coating.

**7.6.5** Ducts constructed of stainless steel shall not be required to have additional paint or weather protective coatings.

**7.6.6** Ductwork subject to corrosion shall have minimal contact with the building surface.

#### 7.7 Interior Installations.

##### 7.7.1 Duct Enclosures.

**7.7.1.1** In all buildings where vertical fire barriers are penetrated, the ducts shall be enclosed in a continuous enclosure extending from the first penetrated fire barrier and any subsequent fire barriers or concealed spaces, to or through the exterior, so as to maintain the fire resistance rating of the highest fire barrier penetrated.

**7.7.1.2** 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.

**7.7.1.3** The enclosure shall be sealed around the duct at the point of penetration of the first fire-rated barrier after the hood in order to maintain the fire resistance rating of the enclosure.

**7.7.1.4** The enclosure shall be vented to the exterior of the building through weather-protected openings.

**7.7.1.5** The continuous enclosure provisions shall not be required where a field-applied grease duct enclosure or a factory-built grease duct enclosure (*see Section 4.3*) is protected with a listed duct-through-penetration protection system equivalent to the fire resistance rating of the assembly being penetrated, and where the materials are installed in accordance with the conditions of the listing and the manufacturers' instructions and are acceptable to the authority having jurisdiction.

#### 7.7.2 Enclosure Fire Resistance Rating and Enclosure Clearance.

##### 7.7.2.1 Fire Resistance Rating.

**7.7.2.1.1** Buildings less than four stories in height shall have an enclosure with a fire resistance rating of not less than 1 hour.

**7.7.2.1.2** Buildings four stories or more in height shall have enclosure with a fire resistance rating of not less than 2 hours.

##### 7.7.2.2\* Enclosure Clearance.

**7.7.2.2.1** Clearance from the duct or the exhaust fan to the interior surface of enclosures of combustible construction shall be not less than 457.2 mm (18 in.).

**7.7.2.2.2** Clearance from the duct to the interior surface of enclosures of noncombustible or limited-combustible construction shall be not less than 152.4 mm (6 in.).

**7.7.2.2.3** Provisions for reducing clearances as described in Section 4.2 shall not be applicable to enclosures.

**7.7.2.2.4** 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 manufacturers' instructions and are acceptable to the authority having jurisdiction.

**7.7.2.2.5** Field-applied grease duct enclosures and factory-built grease duct enclosures shall provide mechanical and structural integrity, resiliency, and stability when subjected to expected building environmental conditions, duct movement under general operating conditions, and duct movement as a result of interior and exterior fire conditions.

### 7.7.3 Protection of Coverings and Enclosure Materials.

**7.7.3.1** Measures shall be taken to prevent physical damage to any covering or enclosure material.

**7.7.3.2** Any damage to the covering or enclosure shall be repaired and the covering or enclosure shall be restored to meet its intended listing and fire-resistive rating and to be acceptable to the authority having jurisdiction.

**7.7.3.3** 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.

**7.7.3.4** Listed grease ducts shall be installed in accordance with the terms of the listing and the manufacturers' instructions.

### 7.7.4 Enclosure Openings.

**7.7.4.1** Where openings in the enclosure walls are provided, they shall be protected by listed fire doors of proper rating.

**7.7.4.2** Fire doors shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*.

**7.7.4.3** Openings on other listed materials or products shall be clearly identified and labeled according to the terms of the listing and the manufacturers' instructions and shall be acceptable to the authority having jurisdiction.

**7.7.4.4** The fire door shall be readily accessible, aligned, and of sufficient size to allow access to the rated access panels on the ductwork.

### 7.7.5 Ducts with Enclosure(s).

**7.7.5.1** Each duct system shall constitute an individual system serving only exhaust hoods in one fire zone on one floor.

**7.7.5.2** Multiple ducts shall not be permitted in a single enclosure unless acceptable to the authority having jurisdiction.

## 7.8\* Termination of Exhaust System.

**7.8.1** The exhaust system shall terminate as follows:

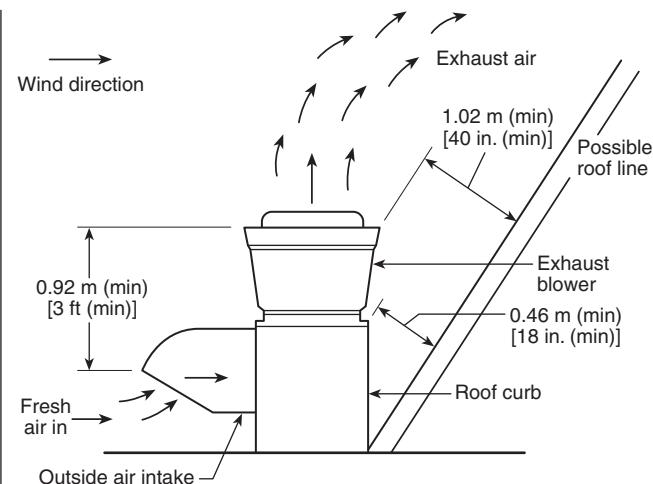
- (1)\*Outside the building with a fan or duct
- (2) Through the roof, or to the roof from outside, as in 7.8.2, or through a wall, as in 7.8.3

### 7.8.2 Rooftop Terminations.

**7.8.2.1** Rooftop terminations shall be arranged with or provided with the following:

- (1) A minimum of 3.05 m (10 ft) of horizontal clearance from the outlet to adjacent buildings, property lines and air intakes.
- (2) A minimum of 1.5 m (5 ft) of horizontal clearance from the outlet (fan housing) to any combustible structure.
- (3) A vertical separation of 0.92 m (3 ft) below any exhaust outlets for air intakes within 3.05 m (10 ft) of the exhaust outlet.
- (4) 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.

- (5) A grease collection device that is applied to exhaust systems that does not inhibit the performance of any fan.
- (6) Listed grease collection systems that meet the requirements of 7.8.2.1(4) and 7.8.2.1(5).
- (7) A listed grease duct complying with Section 4.4, or with ductwork complying with Section 4.5.
- (8) A hinged upblast fan supplied with flexible weatherproof electrical cable and service hold-open retainer to permit inspection and cleaning that is listed for commercial cooking equipment with the following conditions:
  - (a) Where the fan attaches to the ductwork, the ductwork shall be a minimum of 0.46 m (18 in.) away from any roof surface as shown in Figure 7.8.2.1.
  - (b) The fan shall discharge a minimum of 1.02 m (40 in.) away from any roof surface as shown in Figure 7.8.2.1.
- (9) Other approved fan, provided it meets both of the following:
  - (a) The requirements of 7.8.2.1(3) and 8.1.3
  - (b) Its discharge or its extended duct discharge meets the requirements of 7.8.2.1(2). (See 8.1.3.)



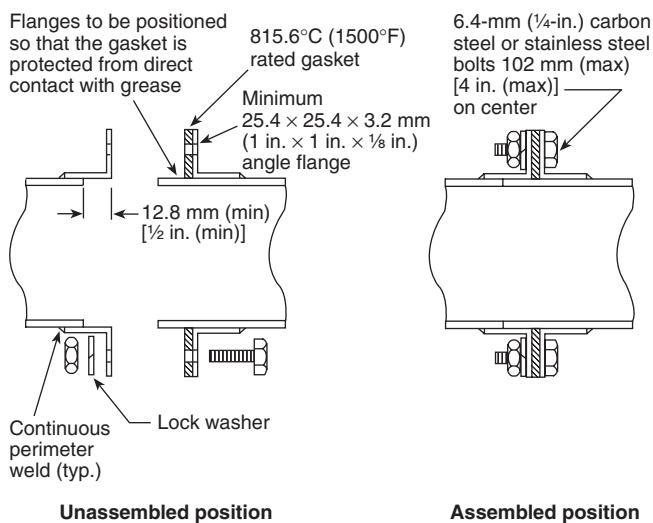
**FIGURE 7.8.2.1 Upblast fan clearances.**

**7.8.2.2\*** Fans shall be provided with safe access and a work surface for inspection and cleaning.

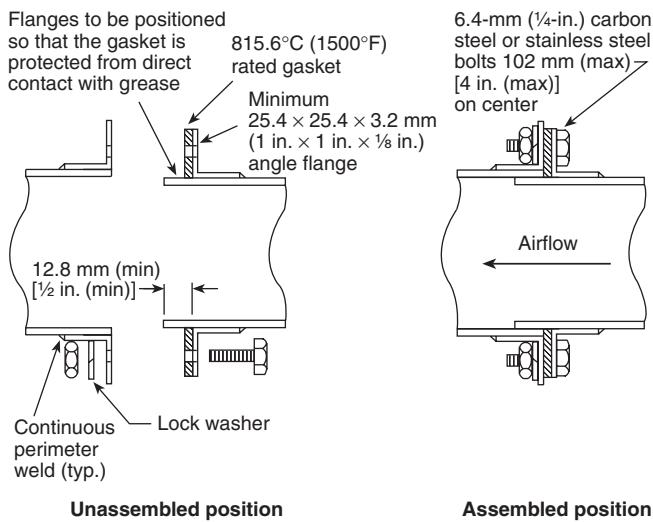
**7.8.3 Wall Terminations.** Wall terminations shall be arranged with or provided with the following properties:

- (1) Through a noncombustible wall with a minimum of 3.05 m (10 ft) 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.
- (2) The closest point of any air intake or operable door or window above the plane of the exhaust termination shall be a minimum of 3 m (10 ft) in distance, plus 0.076 m (0.25 ft) 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 as indicated in Figure 7.8.3.





**FIGURE 8.1.2.2(a) Typical section of duct-to-fan connection — butt joint method.**



**FIGURE 8.1.2.2(b) Typical section of duct-to-fan connection — overlapping method.**

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

#### 8.1.5 Openings for Cleaning, Servicing, and Inspection.

**8.1.5.1** Openings for cleaning, servicing, and inspection shall conform to the requirements of 7.3.7.

**8.1.5.2** Clearances shall conform to the requirements of Section 4.2 or 7.7.2.2 if installed within an enclosure.

**8.1.6 Wiring and Electrical Equipment.** All wiring and electrical equipment shall comply with NFPA 70, *National Electrical Code®* (see also Chapter 9).

#### 8.2 Airflow.

##### 8.2.1 Air Velocity.

**8.2.1.1** The air velocity through any duct shall be not less than 365.8 m/min (1200 ft/min).

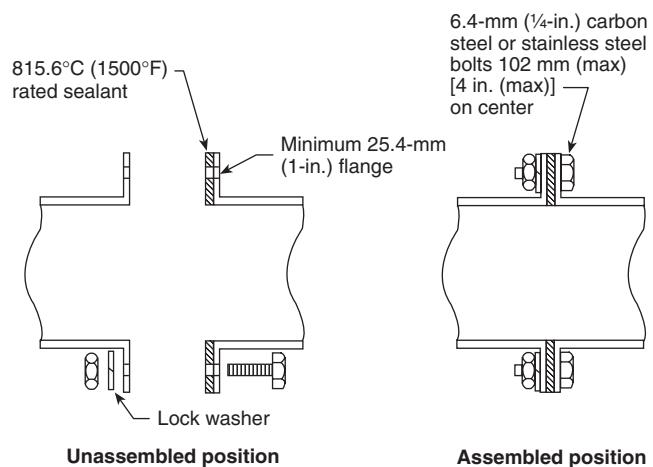
**8.2.1.2** Transition duct sections that do not exceed 1 m (3 ft) in length and do not contain grease traps shall be permitted to be connected to hoods and exhaust fans that do not meet this velocity.

##### 8.2.2 Air Volume.

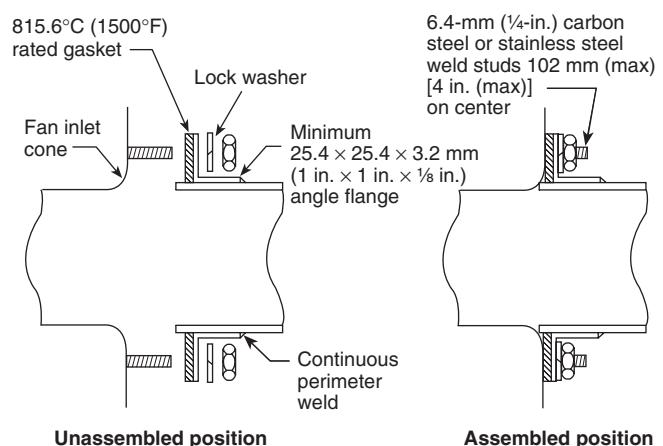
**8.2.2.1** Exhaust air volumes for hoods shall be of a sufficient level to provide for capture and removal of grease-laden cooking vapors.

**8.2.2.2** Test data, performance acceptable to the authority having jurisdiction, or both, shall be provided, displayed, or both, upon request.

**8.2.2.3** Lower exhaust air volumes shall be permitted during no-load cooking conditions provided they are sufficient to



**FIGURE 8.1.2.2(c) Typical section of duct-to-fan connection — sealant method.**



**FIGURE 8.1.2.2(d) Typical section of duct-to-fan connection — direct to fan inlet cone method.**

capture and remove flue gases and residual vapors from cooking equipment.

### 8.2.3 Exhaust Fan Operation.

**8.2.3.1** 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.

**8.2.3.2** The hood exhaust fan shall not be required to restart upon activation of the extinguishing system if the exhaust fan and all cooking equipment served by the fan have previously been shut down.

### 8.3\* Replacement Air.

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

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

### 8.4 Common Duct (Manifold) Systems.

**8.4.1\*** 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.

**8.4.2** Bleed air ducts shall connect to the top or side of the master exhaust duct.

**8.4.3** The bleed air duct shall have a fire damper at least 304.8 mm (12 in.) from the exhaust duct connection.

**8.4.4** 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 304.8 mm (12 in.) on both sides of the fire damper.

**8.4.5** Each bleed air duct shall have a means of adjusting (e.g., using volume dampers) the bleed air quantity.

**8.4.6** Means to adjust the bleed air quantity shall be installed in between the fire damper and the source of bleed air.

**8.4.7** A bleed air duct shall not be used for the exhaust of grease-laden vapors and shall be so labeled.

**8.4.8** 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.

## Chapter 9 Auxiliary Equipment

### 9.1 Dampers.

**9.1.1** Dampers shall not be installed in exhaust ducts or exhaust duct systems.

**9.1.2** Where specifically listed for such use or where required as part of a listed device or system, dampers in exhaust ducts or exhaust duct systems shall be permitted.

### 9.2 Electrical Equipment.

**9.2.1** Wiring systems of any type shall not be installed in ducts.

**9.2.2** Only where specifically listed for such use shall motors, lights, and other electrical devices be permitted to be installed in ducts or hoods or to be located in the path of travel of exhaust products.

### 9.2.3 Lighting Units.

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

**9.2.3.2** Lighting units on hoods shall not be located in concealed spaces.

**9.2.3.3** Lighting units shall be permitted in concealed spaces where such units are part of a listed exhaust hood.

**9.2.3.4** Listed lighting units specifically listed for such use and installed in accordance with the terms of the listing shall be permitted to be installed in concealed spaces.

**9.2.4\*** All electrical equipment shall be installed in accordance with NFPA 70, *National Electrical Code*.

### 9.3 Other Equipment.

**9.3.1** Fume incinerators, thermal recovery units, air pollution control devices, or other devices shall be permitted to be installed in ducts or hoods or to be located in the path of travel of exhaust products where specifically approved for such use.

**9.3.2** Downgrading other parts of the exhaust system due to the installation of these approved devices, whether listed or not, shall not be allowed.

**9.3.3** 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.

**9.3.4** If the equipment provides a source of ignition, it shall be provided with detection to operate the fire-extinguishing system protecting the equipment.

**9.3.5** Where a cooking exhaust system employs an air pollution control device that recirculates air into the building, the requirements of Chapter 13 shall apply.

## Chapter 10 Fire-Extinguishing Equipment

### 10.1 General Requirements.

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

**10.1.2\*** Cooking equipment that produces grease-laden vapors and that might be a source of ignition of grease in the hood, grease removal device, or duct shall be protected by fire-extinguishing equipment.

### 10.2 Types of Equipment.

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

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

**10.2.2.1** The language and wording for the placard shall be approved by the authority having jurisdiction.

**10.2.3\*** Automatic fire-extinguishing systems shall comply with standard UL 300, *Standard for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, or other equivalent standards and shall be installed in accordance with the requirements of the listing.

**10.2.4** Grease removal devices, hood exhaust plenums, exhaust ducts, and cooking equipment that are not addressed in UL 300 or other equivalent test standards, shall be protected with an automatic fire-extinguishing system(s) in accordance with the applicable NFPA standard(s) and all local building and fire codes, and shall be approved by the authority having jurisdiction.

**10.2.5** Automatic fire-extinguishing equipment provided as part of listed recirculating systems shall comply with standard UL 197, *Standard for Commercial Electric Cooking Appliances*.

**10.2.6** 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.

- (1) NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*
- (2) NFPA 13, *Standard for the Installation of Sprinkler Systems*
- (3) NFPA 17, *Standard for Dry Chemical Extinguishing Systems*
- (4) NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*

#### **10.2.7 Fixed Baffle Hoods with Water Wash.**

**10.2.7.1** Grease removal devices, hood exhaust plenums, and exhaust ducts requiring protection in accordance with 10.1.1 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.

**10.2.7.2** Each such area not provided with a listed water-wash extinguishing system shall be provided with a fire-extinguishing system listed for the purpose.

**10.2.7.3** 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.

**10.2.7.4** The water supply shall be controlled by a supervised water supply control valve.

**10.2.7.5** The water wash in a fixed baffle hood, specifically listed to extinguish a fire, shall be activated by the cooking equipment extinguishing system.

**10.2.7.6** A water-wash system, approved to be used for protection of the grease removal device(s), hood exhaust plenum(s), exhaust duct(s), or combination thereof shall include instruction and appropriate electrical interface for simultaneous activation of the water-wash system from an automatic fire-extinguishing system, where the automatic fire-extinguishing system is used for cooking equipment protection only.

**10.2.7.7** Where the fire-extinguishing system provides protection for the cooking equipment, hood, and duct, activation of the water wash shall not be required.

**10.2.8** The water required for listed automatic fire-extinguishing systems shall be permitted to be supplied from the domestic water supply where the minimum water pressure and flow are provided in accordance with the terms of the listing. The water supply shall be controlled by a supervised water supply control valve.

**10.2.9 Water Valve Supervision.** Valves controlling the water supply to listed fixed baffle hood assemblies, automatic fire-extinguishing systems, or both shall be listed indicating type of valve and shall be supervised open by one of the following methods:

- (1) Central station, proprietary, or remote station alarm service
- (2) Local alarm service that will cause the sounding of an audible signal at a constantly attended point
- (3) Locking valves open
- (4)\*Sealing of valves and approved weekly recorded inspection

#### **10.3 Simultaneous Operation.**

**10.3.1** Fixed pipe extinguishing systems in a single hazard area (see Section 3.3 for the definition of single hazard area) shall be arranged for simultaneous automatic operation upon actuation of any one of the systems.

**10.3.2** Simultaneous operation shall not be required where the fixed pipe extinguishing system is an automatic sprinkler system.

**10.3.3** Simultaneous operation shall not be required where 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*.

#### **10.4 Fuel Shutoff.**

**10.4.1** 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.

**10.4.2** Steam supplied from an external source shall not be required to automatically shut off.

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

**10.4.4** Shutoff devices shall require manual reset.

#### **10.5 Manual Activation.**

**10.5.1** A readily accessible means for manual activation shall be located between 1067 mm and 1219 mm (42 in. and 48 in.) above the floor, be accessible in the event of a fire, be located in a path of egress, and clearly identify the hazard protected.

**10.5.2** 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.

**10.5.3** 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.

**10.5.4** An automatic sprinkler system shall not require a manual means of system activation.

**10.5.5** The means for manual activation shall be mechanical or rely on electrical power for activation in accordance with 10.5.6.

**10.5.6** Electrical power shall be permitted to be used for manual activation if a standby power supply is provided or if supervision is provided in accordance with Section 10.7.

#### **10.6 System Annunciation.**

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

**10.6.2** 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.

#### **10.7 System Supervision.**

**10.7.1** 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.

**10.7.2** System supervision shall not be required where an automatic fire-extinguishing system(s) includes automatic mechanical detection and actuation as a backup detection system.

**10.7.3** System supervision shall not be required where a fire-extinguishing system(s) is interconnected or interlocked with the cooking equipment power source(s) 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.

**10.7.4** System supervision shall not be required where an automatic fire-extinguishing system, including automatic mechanical detection and actuation, is electrically connected to a listed fire-actuated water-wash system for simultaneous operation of both systems.

#### **10.8 Special Design and Application.**

**10.8.1** 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.

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

#### **10.9 Review and Certification.**

**10.9.1** 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.

#### **10.9.2\* Installation Requirements.**

**10.9.2.1** Installation of systems shall be performed only by persons properly trained and qualified to install the specific system being provided.

**10.9.2.2** 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.

#### **10.10 Portable Fire Extinguishers.**

**10.10.1\*** Portable fire extinguishers shall be installed in kitchen cooking areas in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, and shall be specifically listed for such use.

**10.10.2** Extinguishers shall use agents that saponify upon contact with hot grease such as sodium bicarbonate and potassium bicarbonate dry chemical and potassium carbonate solutions.

**10.10.3** Class B gas-type portables shall not be permitted in kitchen cooking areas.

**10.10.4** Manufacturer's recommendations shall be followed.

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

### **Chapter 11 Procedures for the Use and Maintenance of Equipment**

#### **11.1 Operating Procedures.**

**11.1.1** Exhaust systems shall be operated whenever cooking equipment is turned on.

**11.1.2** Filter-equipped exhaust systems shall not be operated with filters removed.

**11.1.3** 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.

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

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

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

#### **11.2 Inspection of Fire-Extinguishing Systems.**

**11.2.1\*** 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.

**11.2.2** 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.

**11.2.3** In addition to these requirements, the specific inspection requirements of the applicable NFPA standard shall also be followed.

**11.2.4\*** Fusible links (including fusible links on fire damper assemblies) and automatic sprinkler heads shall be replaced at least annually, or more frequently if necessary where required by the manufacturer.

**11.2.5** The year of manufacture and the date of installation of the fusible links shall be marked on the system inspection tag. The tag shall be signed or initialed by the installer.

**11.2.6** Other detection devices not including fusible links and automatic sprinklers shall be serviced or replaced in accordance with the manufacturer's recommendations.

**11.2.7** 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, annual replacement shall not be required.

**11.2.8** Where required, certificates of inspection and maintenance shall be forwarded to the authority having jurisdiction.

**11.3 Inspection of Exhaust Systems.** 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 11.3.

**Table 11.3 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

#### 11.4 Cleaning of Exhaust Systems.

**11.4.1** 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 11.3.

**11.4.2\*** Hoods, grease removal devices, fans, ducts, and other appurtenances shall be cleaned to bare metal prior to surfaces becoming heavily contaminated with grease or oily sludge.

**11.4.3** At the start of the cleaning process, electrical switches that could be activated accidentally shall be locked out.

**11.4.4** Components of the fire suppression system shall not be rendered inoperable during the cleaning process.

**11.4.5** Fire-extinguishing systems shall be permitted to be rendered inoperable during the cleaning process where serviced by properly trained and qualified persons in accordance with Section 11.3.

**11.4.6** Flammable solvents or other flammable cleaning aids shall not be used.

**11.4.7** Cleaning chemicals shall not be applied on fusible links or other detection devices of the automatic extinguishing system.

**11.4.8** After the exhaust system is cleaned to bare metal, it shall not be coated with powder or other substance.

**11.4.9** All access panels (doors) and cover plates shall be replaced.

**11.4.10** Dampers and diffusers shall be positioned for proper airflow.

**11.4.11** When cleaning procedures are completed, all electrical switches and system components shall be returned to an operable state.

**11.4.12** When a vent cleaning service is used, a certificate showing date of inspection or cleaning shall be maintained on the premises.

**11.4.13** 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, and areas not cleaned.

**11.4.14** Where required, certificates of inspection and cleaning shall be submitted to the authority having jurisdiction.

## Chapter 12 Minimum Safety Requirements for Cooking Equipment

### 12.1 Cooking Equipment.

**12.1.1** Cooking equipment shall be approved based on one of the following criteria:

- (1) Listings by a testing laboratory
- (2) Test data acceptable to the authority having jurisdiction

### 12.1.2 Installation.

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

**12.1.2.2\*** 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.

**12.1.2.3** The fire-extinguishing system shall not require re-evaluation where the cooking appliances are moved to perform maintenance and cleaning provided the appliances are returned to approved design location 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.

**12.1.2.3.1** An approved method shall be provided that will ensure that the appliance is returned to an approved design location.

**12.1.2.4** All deep fat fryers shall be installed with at least a 406-mm (16-in.) space between the fryer and surface flames from adjacent cooking equipment.

**12.1.2.5** Where a steel or tempered glass baffle plate is installed at a minimum 203 mm (8 in.) in height between the

fryer and surface flames of the adjacent appliance the requirement for a 406 mm (16 in.) space shall not apply.

**12.1.2.5.1** If the fryer and the surface flames are at different horizontal planes, the minimum height of 203 mm (8 in.) shall be measured from the higher of the two.

**12.2 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 246°C (475°F) at 25.4 mm (1 in.) below the surface.

## Chapter 13 Recirculating Systems

**13.1 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:

- (1) The clearance requirements of Section 4.2
- (2) A hood complying with the requirements of Chapter 5
- (3) Grease removal devices complying with Chapter 6
- (4) The air movement requirements of 8.2.1.2 and 8.2.2.3
- (5) Auxiliary equipment (such as particulate and odor removal devices) complying with Chapter 9
- (6) Fire-extinguishing equipment complying with the requirements of Chapter 10; 10.1.1 and 10.5.1 shall not apply
- (7) The use and maintenance requirements of Chapter 11
- (8) The minimum safety requirements of Chapter 11
- (9) All the requirements of Chapter 13

**13.2 Design Restrictions.** All recirculating systems shall comply with the requirements of Section 13.2.

**13.2.1** Only gas-fueled or electrically fueled cooking appliances shall be used.

**13.2.2** Listed gas-fueled equipment designed for use with specific recirculating systems shall have the flue outlets connected in the intended manner.

**13.2.3** Gas-fueled appliances shall have a minimum 457.2-mm (18-in.) clearance from the flue outlet to the filter inlet in accordance with 6.2.2 and shall meet the installation requirements of NFPA 54, *National Fuel Gas Code*, or NFPA 58, *Liquefied Petroleum Gas Code*.

**13.2.4** Recirculating systems shall be listed with a testing laboratory.

**13.2.5** 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.

**13.2.6** A recirculating system shall not 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 volume of cooking cavity.

**13.2.7** The listing label shall show the type(s) of cooking equipment tested and the preceding maximum limits specified in 13.2.6.

**13.2.8** A fire-actuated damper shall be installed at the exhaust outlet of the system.

**13.2.9** The fire damper shall be constructed of at least the same gauge as the shell.

**13.2.10** The actuation device for the fire damper shall have a maximum temperature rating of 190°C (375°F).

**13.2.11** 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.

**13.2.12** Listing evaluation shall include the following:

- (1) Capture and containment of vapors at published and labeled airflows
- (2) Grease discharge at the exhaust outlet of the system not to exceed an average of 5 mg/m<sup>3</sup> 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
- (3) Listing and labeling of clearance to combustibles from all sides, top, and bottom
- (4) Electrical connection in the field in accordance with NFPA 70, *National Electrical Code*
- (5) 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

### 13.3 Interlocks.

**13.3.1** The recirculating system shall be provided with interlocks of all critical components and operations as indicated in 13.3.2 through 13.3.4 such that, if any of these interlocks are interrupted, the cooking appliance shall not be able to operate.

**13.3.2** All closure panels encompassing airflow sections shall have interlocks to ensure the panels are in place and fully sealed.

**13.3.3** Each filter component (grease and odor) shall have an interlock to prove the component is in place.

### 13.3.4 ESP Interlocks.

**13.3.4.1** Each ESP shall have a sensor to prove its performance is as designed, with no interruption of the power to exceed 2 minutes.

**13.3.4.2** The sensor shall be a manual reset device or circuit.

### 13.3.5 Airflow Switch or Transducer.

**13.3.5.1** An airflow switch or transducer shall be provided after the last filter component to ensure that a minimum airflow is maintained.

**13.3.5.2** The airflow switch or transducer shall open 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.

**13.3.5.3** The airflow switch or transducer shall be a manual reset device or circuit.

### 13.4 Location and Application Restrictions.

**13.4.1** The location of recirculating systems shall be approved by the authority having jurisdiction.

**13.4.2** 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.

### 13.5 Additional Fire Safety Requirements.

**13.5.1** 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 duct-work where applicable.

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

**13.5.3** The requirements of Section 10.6 shall also apply to recirculating system locations.

**13.5.4** A means of manual activation of the fire-extinguishing system shall be provided in an area where it is safely accessible in the event of a fire in the appliance.

**13.5.5** The manual activation device for the fire-extinguishing system shall be clearly identified.

### 13.6 Use and Maintenance.

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

**13.6.2** All filters shall be cleaned or replaced in accordance with the manufacturer's instructions.

**13.6.3** All ESPs shall be cleaned a minimum of once per week following manufacturer's cleaning instructions.

**13.6.4** The entire hood plenum and the blower section shall be cleaned a minimum of once every 3 months.

**13.6.5** 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.

**13.6.6** Fire-extinguishing equipment shall be inspected in accordance with Section 11.2.

**13.6.7** A signed and dated log of maintenance as performed in accordance with 13.6.4 and 13.6.5 shall be available on the premises for use by the authority having jurisdiction.

## Chapter 14 Solid Fuel Cooking Operations

**14.1 Venting Application.** Venting requirements of solid fuel cooking operations shall be determined in accordance with 14.1.1 through 14.1.7.

**14.1.1** Where solid fuel cooking equipment is required by the manufacturer to have a natural draft, the vent shall comply with Section 14.4.

**14.1.2** 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 14.4 and 14.6.

**14.1.3** 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 14.6.

**14.1.4** Natural draft ventilation systems and power-exhausted ventilation systems shall comply with Sections 14.3, 14.4, and 14.6.

**14.1.5** 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 14.3, 14.4, and 14.6.

**14.1.6** Solid fuel cooking operations shall have spark arresters to minimize the passage of airborne sparks and embers into plenums and ducts.

**14.1.7** 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.

### 14.2 Location of Appliances.

**14.2.1** Every appliance shall be located with respect to building construction and other equipment so as to permit access to the appliance.

**14.2.2\*** Solid fuel cooking appliances shall not be installed in confined spaces.

**14.2.3** 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.

**14.2.4** Solid fuel cooking appliances shall not be installed in any location where gasoline or any other flammable vapors or gases are present.

### 14.3 Hoods for Solid Fuel Cooking.

**14.3.1** Hoods shall be sized and located in a manner capable of capturing and containing all of the effluent discharging from the appliances.

**14.3.2** The hood and its exhaust system shall comply with the requirements of Chapters 5 through 10.

**14.3.3** All solid fuel cooking equipment served by hood and duct systems shall be separate from all other exhaust systems.

**14.3.4** Cooking equipment not requiring automatic fire-extinguishing equipment (as per the provisions of Chapter 10) 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.

**14.4 Exhaust for Solid Fuel Cooking.** Where a hood is not required, in buildings where the duct system is three stories or less in height, a duct complying with Chapter 7 shall be provided.

**14.4.1** If a hood is used in buildings where the duct system is three stories or less in height, the duct system shall comply with Chapter 7.

**14.4.2** A listed or approved grease duct system shall be provided for solid fuel cooking exhaust systems that is four stories in height or greater.

**14.4.3** Where a hood is used, the duct system shall conform with the requirements of Chapter 7.

**14.4.4** Wall terminations of solid fuel exhaust systems shall be prohibited.

**14.5 Grease Removal Devices for Solid Fuel Cooking.**

**14.5.1** Grease removal devices shall be constructed of steel or stainless steel or be approved for solid fuel cooking.

**14.5.2** 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.

**14.5.3** Filters shall be a minimum of 1.2 m (4 ft) above the appliance cooking surface.

**14.6 Air Movement for Solid Fuel Cooking.**

**14.6.1** Exhaust system requirements shall comply with Chapter 8 for hooded operation or shall be installed in accordance with the manufacturer's recommendation for unhooded applications.

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

**14.6.3** 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.

**14.7 Fire-Extinguishing Equipment for Solid Fuel Cooking.**

**14.7.1** Solid fuel cooking appliances that produce grease-laden vapors shall be protected by listed fire-extinguishing equipment.

**14.7.2** Where 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 Chapters 3 and 4 of NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, shall not require fixed automatic fire-extinguishing equipment.

**14.7.3** Listed fire-extinguishing equipment shall be provided for the protection of grease removal devices, hoods, and duct systems.

**14.7.4** Where 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 Chapters 3 and 4 of NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, shall not require automatic fire-extinguishing equipment for the protection of grease removal devices, hoods and duct systems.

**14.7.5** Listed fire-extinguishing equipment for solid fuel-burning cooking appliances, where required, shall comply with Chapter 10 and shall be comprised of water-based agents.

**14.7.6** Fire-extinguishing equipment shall be rated and designed to extinguish solid fuel cooking fires, in accordance with the manufacturer's recommendations.

**14.7.7** The fire-extinguishing equipment shall be of sufficient size to totally extinguish fire in the entire hazard area and prevent reignition of the fuel.

**14.7.8** All solid fuel appliances (whether or not under a hood) with fireboxes of 0.14 m<sup>3</sup> (5 ft<sup>3</sup>) volume or less shall at least have a 2-A-rated water-type or wet chemical fire extin-

guisher in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, in the immediate vicinity of the appliance.

**14.7.9** Two portable fire extinguishers of at least 5.7 L (1½ gal) 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.

**14.7.10 Hose Protection.**

**14.7.10.1** Solid fuel appliances with fireboxes exceeding 0.14 m<sup>3</sup> (5 ft<sup>3</sup>) shall be provided with a fixed water pipe system with a hose in the kitchen capable of reaching the firebox.

**14.7.10.2** The system shall have a minimum operating pressure of 275.8 kPa (40 psi) and shall provide a minimum of 192 L/min (5 gpm).

**14.7.11** Fire suppression for fuel storage areas shall comply with Section 14.9 of this standard.

**14.7.12** In addition to the requirements of 14.7.8 through 14.7.10, 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 10, such auxiliary fuel shall be shut off upon actuation of the fire-extinguishing system.

**14.8 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 11, and with 14.8.1 through 14.8.5.

**14.8.1** The combustion chamber shall be scraped clean to its original surface once each week and shall be inspected for deterioration or defects.

**14.8.2** Any significant deterioration or defect that might weaken the chamber or reduce its insulation capability shall be immediately repaired.

**14.8.3** The flue or chimney shall be inspected weekly for the following conditions:

- (1) 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.
- (2) 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.

**14.8.4** 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.

**14.8.5** Filters and filtration devices installed in a hood shall be cleaned per 14.8.4.

**14.9 Minimum Safety Requirements: Fuel Storage, Handling, and Ash Removal for Solid Fuel Cooking.****14.9.1 Installation Clearances.**

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

**14.9.1.2** Floors with noncombustible surfaces shall be permitted to be used where they have been approved for such use by the authority having jurisdiction.

**14.9.1.3** Floor assemblies that have been listed for solid fuel appliance applications shall be permitted to be used.

**14.9.1.4** Solid fuel cooking appliances that have been listed for zero clearance to combustibles on the bottom and sides and have an approved hearth extending 0.92 m (3 ft) in all directions from the service door(s) shall be permitted to be used on combustible floors.

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

**14.9.1.6** Solid fuel cooking appliances that are specifically listed for less clearance to combustibles shall be permitted to be installed in accordance with the requirements of the listing and the manufacturers' instructions.

#### **14.9.2 Solid Fuel Storage.**

**14.9.2.1** 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.

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

**14.9.2.3** Fuel shall be permitted to be stored closer than the requirements of 14.9.2.4, where a solid fuel appliance or other cooking appliance is listed or approved for less clearance to combustibles.

**14.9.2.4** Fuel shall not be stored in the path of the ash removal.

**14.9.2.5** 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 0.92 m (3 ft) past the outside dimensions of the storage pile.

**14.9.2.6** Fuel shall be permitted in the protected areas where combustible or limited-combustible materials are protected in accordance with 4.2.3.

**14.9.2.7** Fuel shall be separated from all flammable liquids, all ignition sources, all chemicals, and all food supplies and packaging goods.

**14.9.2.8** 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.

**14.9.2.9** Where acceptable to the authority having jurisdiction, fuel storage areas shall be permitted to be protected with a fixed pipe system capable of reaching all parts of the area and meeting the requirements of 14.7.1 through 14.7.12.

**14.9.2.10** The portable fire extinguisher specified in 14.7.5 shall be permitted to be used for a solid fuel pile, provided that the fuel pile does not exceed 0.14 m<sup>3</sup> (5 ft<sup>3</sup>).

#### **14.9.3 Solid Fuel Handling and Ash Removal.**

**14.9.3.1** Solid fuel shall be ignited with a match or an approved built-in gas flame or other approved ignition source.

**14.9.3.2** Combustible or flammable liquids shall not be used to assist ignition.

**14.9.3.3** Matches and other portable ignition sources shall not be stored in the vicinity of the solid fuel appliance.

**14.9.3.4** 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.

**14.9.3.5** 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 the user having to reach into the firebox.

#### **14.9.3.6 Ash Protection.**

**14.9.3.6.1** 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.

**14.9.3.6.2** All ash shall be removed from the chamber a minimum of once a day.

**14.9.3.6.3** 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.

#### **14.9.3.7 Hose Protection.**

**14.9.3.7.1** For the purposes described in 14.9.3.6.3, and to cool a fire that has become too hot and to stop all fire before the premises is vacated, a water supply with a flexible hose shall be provided at the solid fuel appliance.

**14.9.3.7.2** For appliances with fireboxes not exceeding 0.14 m<sup>3</sup> (5 ft<sup>3</sup>), the water source shall be permitted to be a 37.9-L (10-gal) container with a gravity arrangement or a hand pump for pressure.

**14.9.3.7.3** For appliances with fireboxes over 0.14 m<sup>3</sup> (5 ft<sup>3</sup>), 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.

**14.9.3.7.4** 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.

#### **14.9.3.8 Ash Removal Container or Cart.**

**14.9.3.8.1** A heavy metal container or cart (minimum 16 gauge) with a cover shall be provided for the removal of ash.

**14.9.3.8.2** The ash removal container or cart shall not exceed a maximum of 75.7-L (20-gal) 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.

**14.9.3.8.3** The container or cart shall always be covered when it is being moved through the premises.

**14.9.3.8.4** When any hole occurs in a container from corrosion or damage, it shall be repaired or replaced immediately.

#### **14.9.3.9 Ash Removal Process.**

**14.9.3.9.1** Tools shall be provided so that ash removal can be accomplished without having to reach into the chamber.

**14.9.3.9.2** 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.

**14.9.3.9.3** 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.

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

#### 14.9.4 Other Safety Requirements.

**14.9.4.1** 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.

**14.9.4.2** Where listed, they shall be installed in accordance with the terms of their listing and with the applicable requirements of this standard.

#### 14.9.4.3 Site-Built Solid Fuel Cooking Appliances.

**14.9.4.3.1** Site-built solid fuel cooking appliances shall be submitted for approval to the authority having jurisdiction before being considered for installation.

**14.9.4.3.2** 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.

**14.9.4.4** Except for the spark arrester required in 14.1.6, 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.

**14.9.4.5** No solid fuel cooking device of any type shall be permitted for deep fat frying involving more than 0.95 L (1 qt) of liquid shortening, nor shall any solid fuel cooking device be permitted within 0.92 m (3 ft) of any deep fat frying unit.

### Annex A Explanatory Material

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

**A.1.1.1** 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.

**A.1.1.4** This judgment should take into account the type of cooking being performed, items being cooked and the frequency of cooking operations. Examples of operations that might not require compliance with this standard are: Day care centers warming bottles and lunches, therapy cooking facilities in health care, churches and meeting operations that are not cooking meals that produce grease-laden vapors, and employee break rooms where food is warmed.

**A.1.3.1** This standard cannot provide safe design and operation if parts of it are not enforced or are arbitrarily deleted in any application.

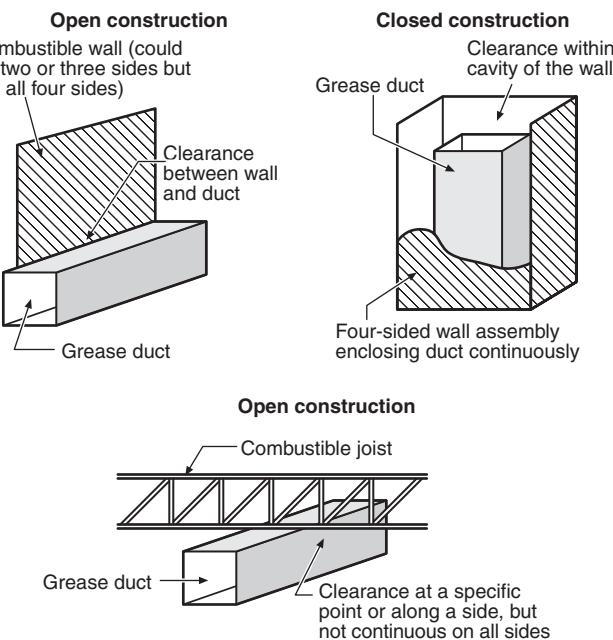
**A.3.2.1 Approved.** The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the 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.3.2.2 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.3.2.4 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.3.3.4 Appliance Flue Outlet.** There might or might not be ductwork attached to this opening.

**A.3.3.11 Construction.** See Figure A.3.3.11.



**FIGURE A.3.3.11 Examples of open and closed combustible construction.**

**A.3.3.12 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.

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.

**A.3.3.21.2 Solid Fuel Cooking Equipment.** 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.

**A.3.3.22.1 Grease Filter.** 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.

**A.3.3.22.2 Mesh-Type Filter.** This type of filter is not tested, listed, or acceptable for commercial cooking operations due to the increased fire hazard. (See definition of *Grease Filter*.)

**A.3.3.27 Grease.** Grease might be liberated and entrained with exhaust air or might be visible as a liquid or solid.

**A.3.3.31 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.3.3.31.)

The following are 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

The following are styles of hoods:

- (1) Wall-mounted
- (2) Single island
- (3) Double island
- (4) Backshelf
- (5) Eyebrow

**A.3.3.34 Material.** Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition should be considered combustible. See Table A.3.3.34.

**A.3.3.34.3 Noncombustible Material.** Materials that are reported as passing ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, should be considered noncombustible materials.

**A.4.1.6** 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.

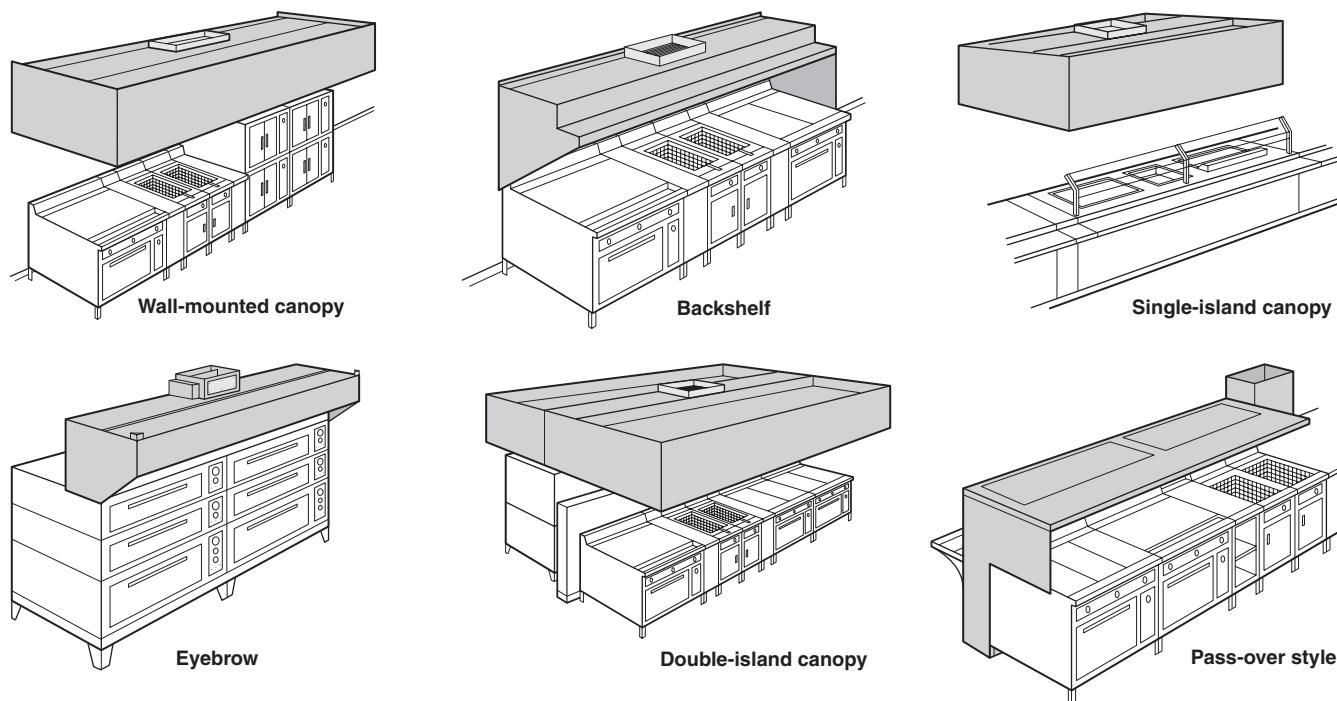


FIGURE A.3.3.31 Types of hoods.

**Table A.3.3.34 Types of Construction Assemblies Containing Noncombustible, Limited-Combustible, and Combustible Materials**

Type of Assembly	Classification for Determining Hood and Grease Duct Clearance <sup>1</sup>		
	Limited-Noncombustible	Combustible	Combustible
<b>Wall assemblies</b>			
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 <sup>2</sup>		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
<b>Floor-ceiling or roof-ceiling assemblies</b>			
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 Chapter 3.

<sup>1</sup>See clearance requirements in Section 4.2.

<sup>2</sup>Solid gypsum walls and partitions, 50.8-mm (2-in.) or 57.15-mm (2½-in.) thickness, are described in the *Fire Resistance Design Manual* published by the Gypsum Association, Washington, DC.

**A.4.1.9** 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.4.2** See Figure A.4.2(a) through Figure A.4.2(g) for clarification of the appropriate clearances required in Section 4.2.

**A.4.2.4.2** The intent of this section is to maintain the systems and their function in accordance with the requirements of the edition of NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, that the system were designed and installed under.

**A.5.1.4** Welding is one acceptable method.

**A.5.3.4** Figure A.5.3.4 provides examples of exhaust hood assemblies with integrated supply air plenums.

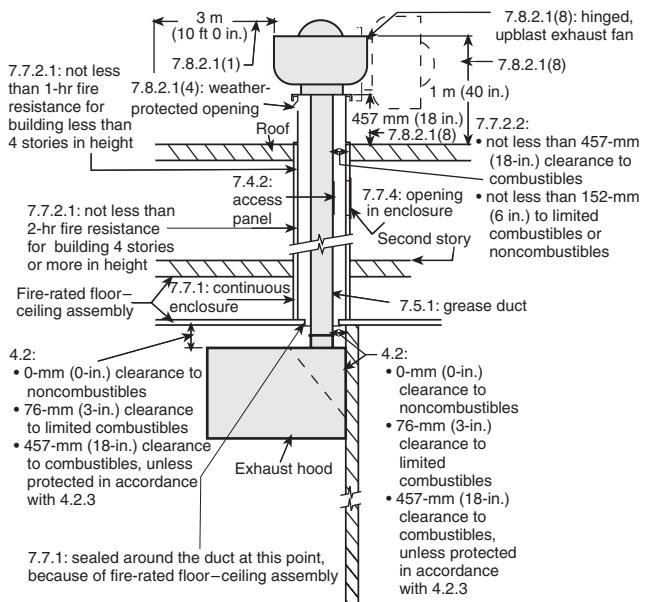
**A.6.2.2.1** Appliances that produce high flue gas temperatures include deep fat fryers or upright or high broilers and salamander broilers.

**A.7.1.2** 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.

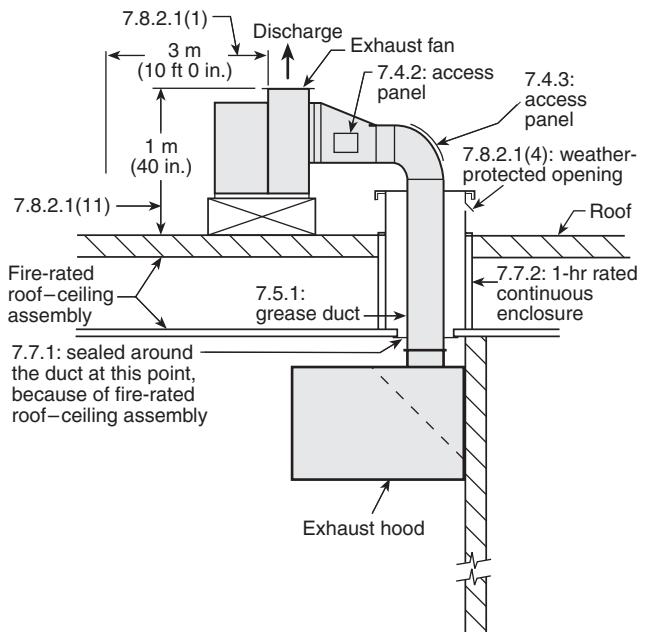
**A.7.5.1** Examples of acceptable materials for ducts include the following:

- (1) Steel
- (2) Galvanized steel
- (3) Stainless steel

**A.7.7.2.2** Noncombustible materials such as reinforced concrete floors or protected steel beams, which might protrude into an enclosure and cause reduced clearance, can be permitted by the authority having jurisdiction if the installation and accessibility of the duct system are considered adequate.

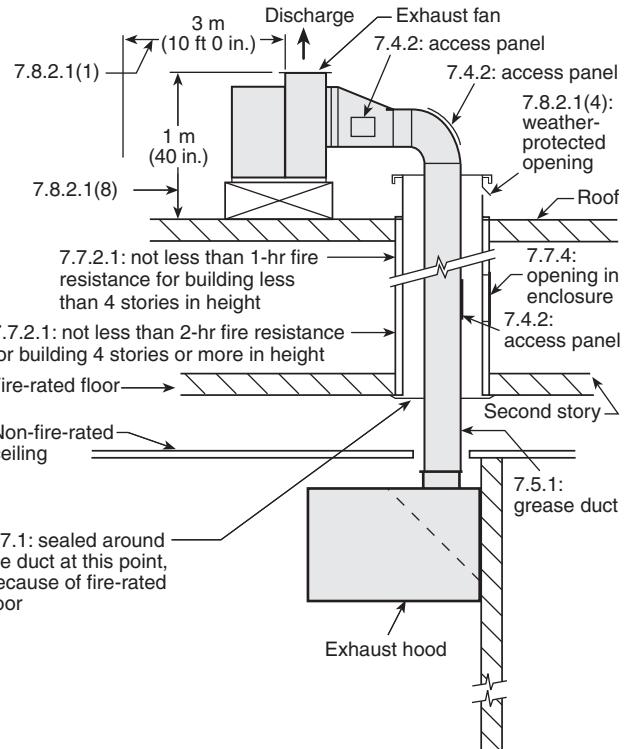


**FIGURE A.4.2(a)** Typical section view for building with two stories or more with fire-rated floor-ceiling assembly.



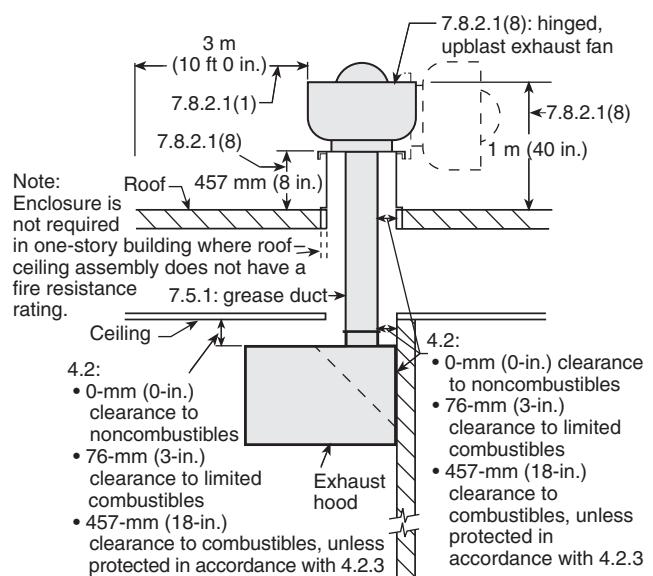
Note: Clearance notes in Figure A.4.2(a) apply also to this drawing.

**FIGURE A.4.2(b)** Typical section view for one-story building with fire-rated roof-ceiling assembly.

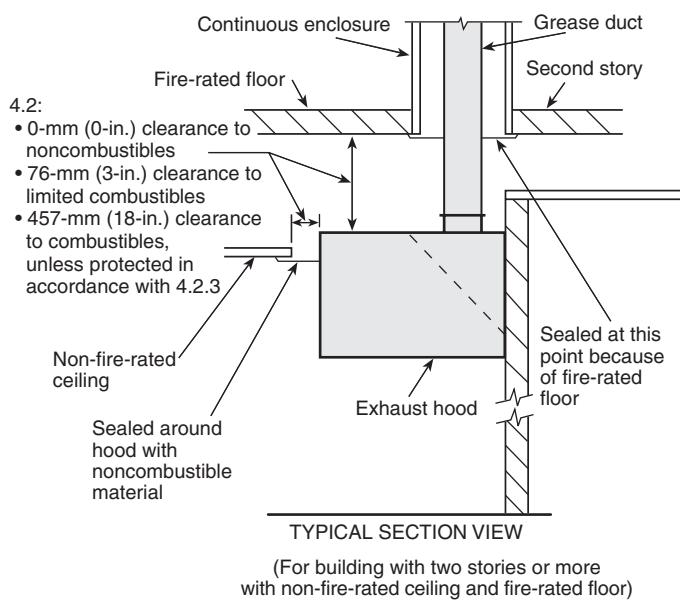
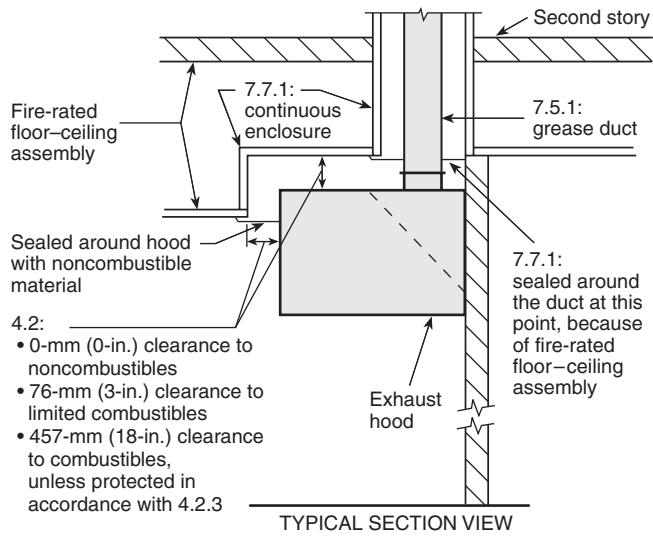


Note: Clearance notes in Figure A.4.2(a) apply also to this drawing.

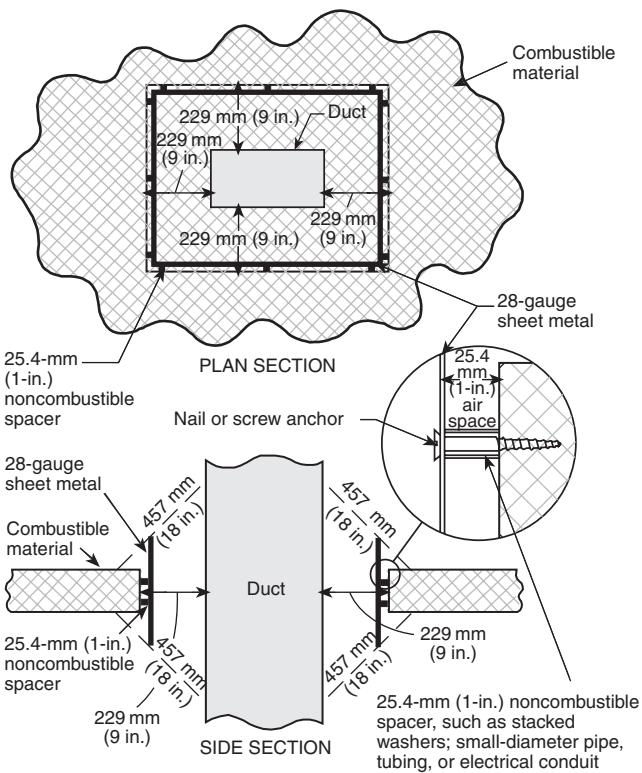
**FIGURE A.4.2(c)** Typical section view for building with two stories or more with non-fire-rated ceiling and fire-rated floor.



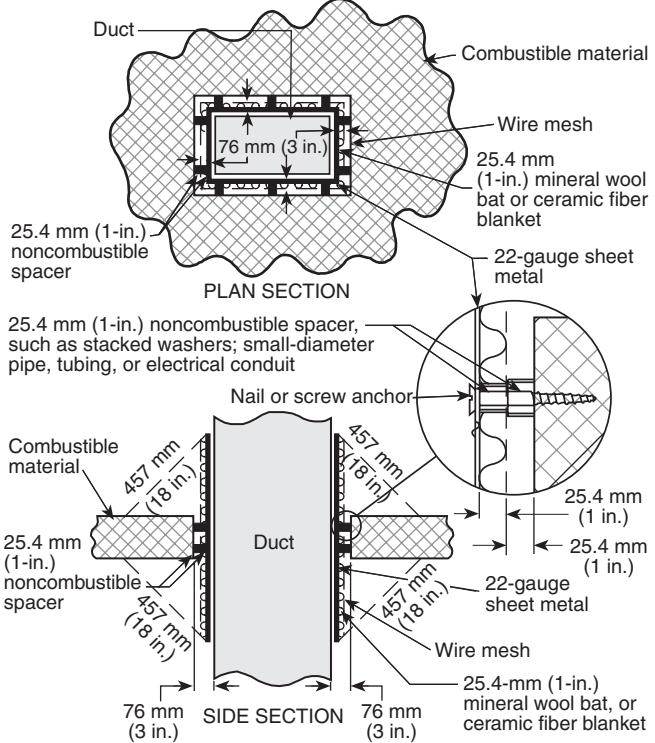
**FIGURE A.4.2(d)** Typical section view for one-story building without fire-rated roof-ceiling assembly.



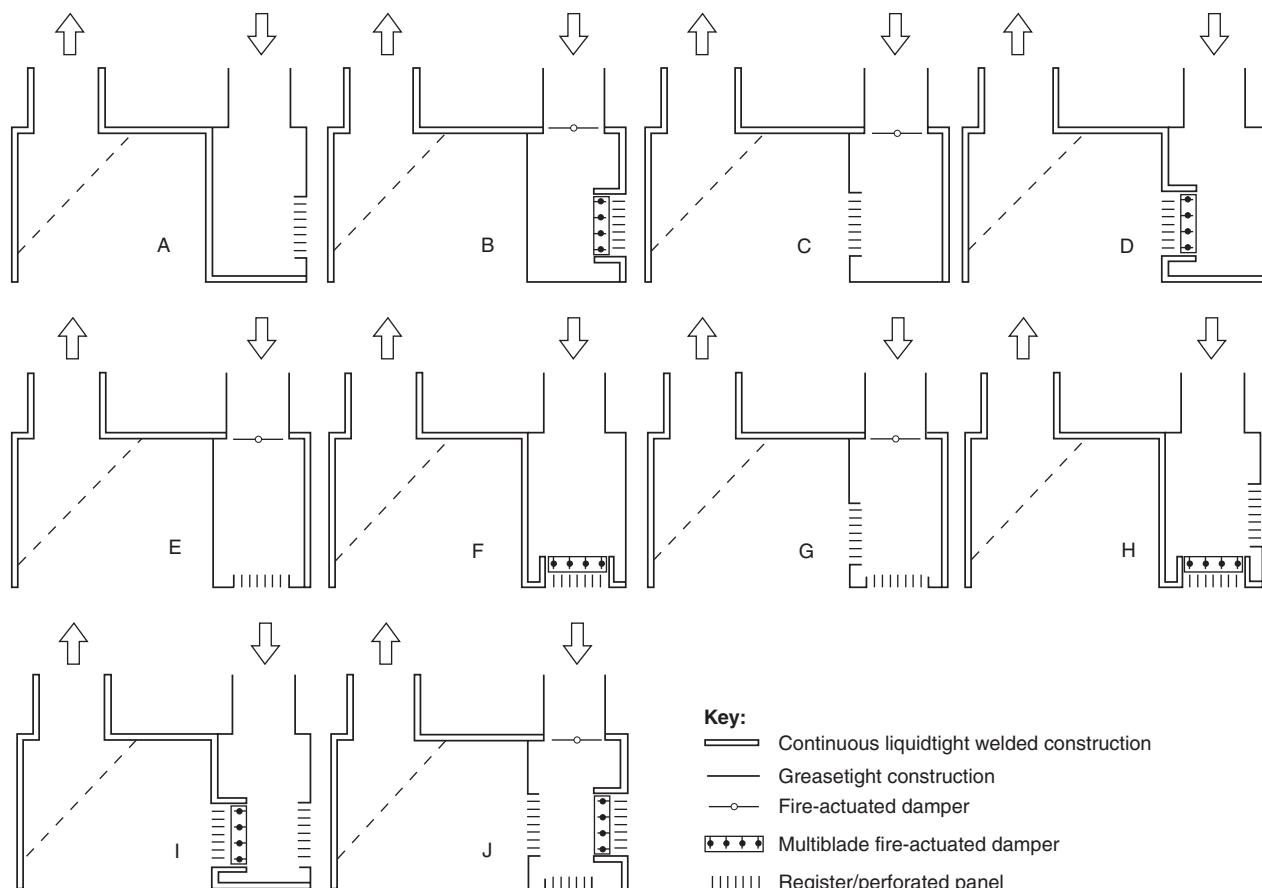
**FIGURE A.4.2(e)** Detail drawings showing hoods penetrating ceilings.



**FIGURE A.4.2(f)** Example of clearance reduction system: 228.6-mm (9-in.) clearance to combustible material.



**FIGURE A.4.2(g)** Example of clearance reduction system: 76.2-mm (3-in.) clearance to combustible material.



**FIGURE A.5.3.4 Examples of exhaust hood assemblies with integrated supply air plenums.**

**A.7.8** It is preferable for the fan to be at, or as close as possible to, the end of the duct in order to minimize the number of pressurized duct joints and clean-outs through which grease might leak more easily.

Wherever possible and practicable, the termination of an exhaust system should be above a roof. Fans on walls should be used only when absolutely necessary because of the many problems encountered: such as contaminated air lowering environmental quality in traveled or public areas; and recirculating through air intakes including operable windows' accessibility to vandalism and accidental damage; and strong wind currents restricting airflow.

**A.7.8.1(1)** It is preferable for the fan to be at or as close to the end of the duct as possible in order to minimize the number of pressurized duct joints and clean-outs through which grease might leak more easily.

**A.7.8.2.2** Both types of fan terminations should be accessible as follows:

(1) *Rooftop Terminations.* All roof exhaust fans (whether through the roof or to the roof from outside) should have ready access to all sides from a flat roof surface without a ladder, or they should be provided with safe access via built-in stairs or walkway or a portable ladder to a flat work surface on all sides of the fan (see 7.8.2).

(2) *Wall Terminations.* All through-the-wall exhaust fans should have ready access from the ground from no more

than a 2-m (6-ft) stepladder or should be provided with a flat work surface under the fan that allows for access to all sides of the fan, accessible from no more than a 6.0-m (20-ft) extension ladder (see 7.8.3).

**A.7.8.4** Figure A.7.8.4 is an example of a rooftop termination for a duct travelling up the exterior of the building after penetrating a wall.

**A.8.1.1** An upblast exhaust fan is popular due to its low cost and ease of installation and is common in one- or two-story freestanding restaurants. The fan housing is typically made of spun aluminum. The motor and belt drive are outside the airstream. See Figure A.8.1.1 for an example.

**A.8.1.2** Figure A.8.1.2 shows an in-line fan, which normally is used where space is not available for a utility set fan. It typically is located in a horizontal duct run in the false ceiling (interstitial) space.

**A.8.1.3** See Figure A.8.1.3 for an example of an utility set fan. This type of fan generally is used for large exhaust systems such as found in hotels, hospitals, and prisons, or in restaurants located in high-rise buildings. It typically is mounted on the roof but sometimes is located in a mechanical room.

**A.8.3** It is not advisable to discontinue the use of replacement air systems during cooking operations. Exhaust function, indoor pollution, indoor comfort, and grease removal, for example, will be adversely affected.

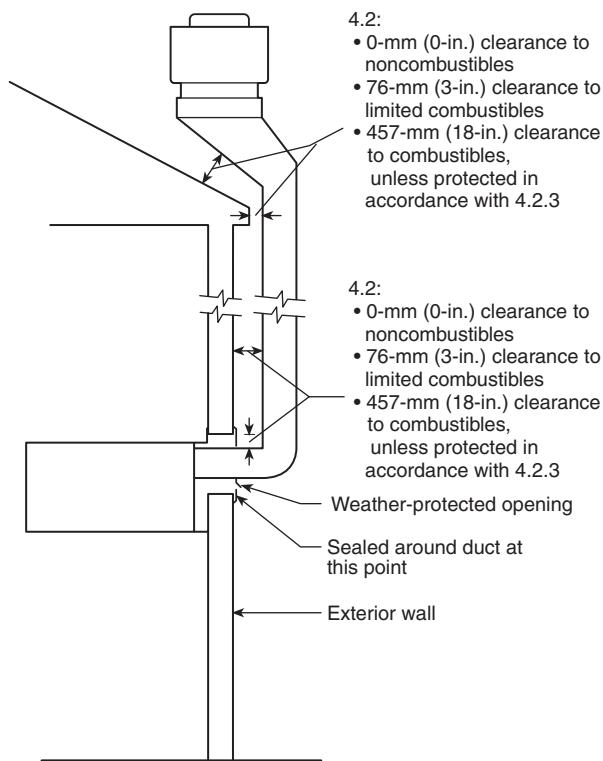


FIGURE A.7.8.4 Roof top terminations through combustible or limited-combustible walls.

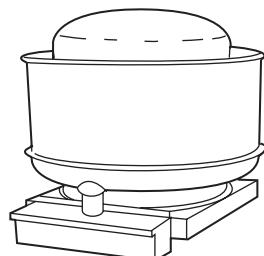


FIGURE A.8.1.1 Typical upblast fan.

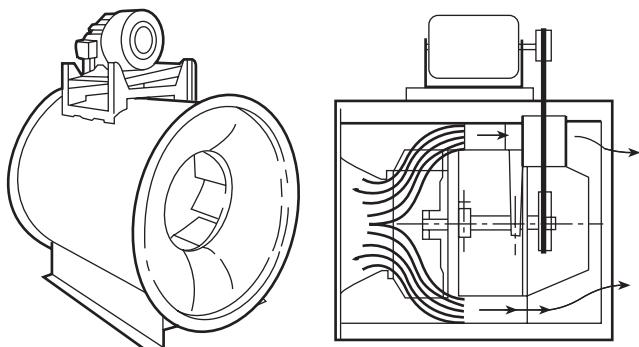


FIGURE A.8.1.2 In-line fan.

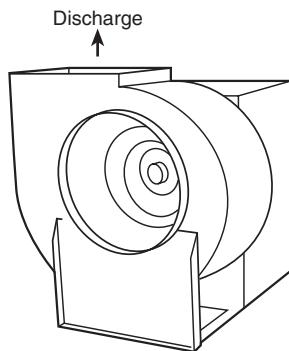


FIGURE A.8.1.3 Typical utility set fan.

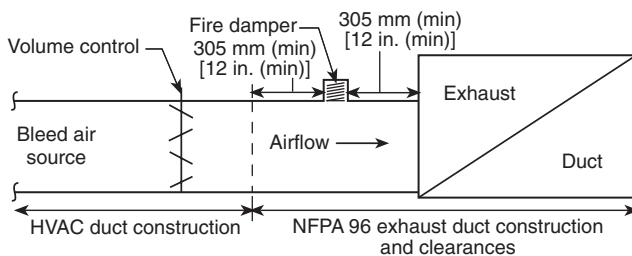


FIGURE A.8.4.1 System for introducing bleed air into a master exhaust duct.

**A.8.4.1** See Figure A.8.4.1.

**A.9.2.4** All wiring should be designed, specified, and installed with due regard to the effects of heat, vapor, and grease on the equipment.

**A.10.1.2** Examples of cooking equipment that produce grease-laden vapors include, but are not limited to, appliances such as deep fat fryers, ranges, griddles, broilers, woks, tilting skillets, and braising pans.

**A.10.2.3** *UL 300, Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, primarily addresses self-contained chemical extinguishing systems.

**A.10.2.9(4)** An approved weekly recorded inspection could consist of a mere log of entries that would display the date and time of the inspection and the initials of the persons conducting the visual inspection. Attaching the log onto a clipboard and mounting it near the valve in question serves as a convenient reminder of the need to conduct the inspection.

**A.10.9.2** Although training and qualification might be available elsewhere, the manufacturer of the equipment being installed should be considered an appropriate source of training and qualification.

**A.10.10.1** The system used to rate extinguishers for Class B fires (flammable liquids in depth) does not take into consideration the special nature of heated grease fires. Cooking grease fires are a special hazard requiring agents that saponify (make a soap foam layer to seal the top surface of the grease) for this application.

**A.11.2.1** It is recommended that such training and qualification be performed by the manufacturer of the equipment being inspected and serviced. The various electrical, mechanical,

and filtration components of the systems should be inspected and tested as required to ensure that they continue to function according to original design.

**A.11.2.4** The date of manufacture marked on fusible metal alloy-sensing elements does not limit when they can be used. These devices have unlimited shelf life. The intent of 11.2.4 is to require replacement of fusible metal alloy-sensing elements that have been installed for up to 1 year in environments that subject them to contaminant-loading, such as grease in restaurant hoods and ducts that could adversely affect their proper operation.

**A.11.4.2** Cleaning to bare metal does not mean removing the paint from a painted surface of an exhaust system.

**A.12.1.2.2** The effectiveness of an automatic extinguishing system is affected by the placement of the nozzles. For this reason, it is essential that cooking appliances be situated in the area in which they were when the extinguishing equipment was designed and installed. If an appliance is moved from under the equipment for cleaning or any other reason, it should be replaced to its original position prior to initiating a cooking operation.

When appliances are on wheels or casters for ease of cleaning, it is important that the appliance be placed in its design position to ensure the fire-extinguishing system will be effective. An approved method should ensure that the appliance is returned to its appropriate position before cooking takes place. Channels, markings, or other approved methods will assist in ensuring proper placement.

**A.14.2.2** The space or room shall be of ample size to permit adequate circulation of heated air.

## Annex B Informational References

**B.1 Referenced Publications.** The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

**B.1.1 NFPA Publications. (Reserved)**

**B.1.2 Other Publications.**

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

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

**B.1.2.2 Gypsum Association Publication.** Gypsum Association, 810 First Street, NE, Suite 510, Washington, DC 20002.

*Fire Resistance Design Manual*, 1992.

**B.1.2.3 UL Publication.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

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

**B.2 Informational References. (Reserved)**

**B.3 References for Extracts.**

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1999 edition.

NFPA 150, *Standard on Fire Safety in Racetrack Stables*, 2000 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2000 edition.

## Index

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### -A-

- Access panels** ..... 7.1.6, 7.4.3, 7.4.4.2, 11.4.9
  - Definition ..... 3.3.1
- Accessible, easily (definition)** ..... 3.3.19
- Air intakes** ..... 7.8.3.1
  - Definition ..... 3.3.2
- Air movement** ..... Chap. 8, A.8
  - Airflow ..... 8.2
  - Common duct (manifold) systems ..... 8.4
  - Exhaust fans for ..... *see* Exhaust fans
  - Multiple tenants, master duct systems for ..... 8.4
  - Recirculating systems ..... 13.1(4)
  - Replacement air ..... *see* Replacement air
  - Solid fuel cooking equipment ..... 14.6
- Air pollution control devices** ..... 9.3
  - Definition ..... 3.3.3
- Air velocity** ..... 8.2.1
- Air volume** ..... 8.2.2
- Airflow** ..... 8.2, 11.4.10
- Airflow switch** ..... 13.3.5
- Alarm signaling equipment** ..... 10.6 to 10.7
- Appliance flue outlet** ..... 6.2.2.1, 13.2.2, A.6.2.2.1
  - Definition ..... 3.3.4, A.3.3.4
- Application of standard** ..... 1.3, A.1.3.1
- Approved (definition)** ..... 3.2.1, A.3.2.1
- Appurtenance (definition)** ..... 3.3.5
- Authority having jurisdiction (definition)** ..... 3.2.2, A.3.2.2
- Automatic (definition)** ..... 3.3.6
- Auxiliary equipment** ..... Chap. 9, 13.1(5), A.9.2.4

### -B-

- Baffle plates** ..... 6.1.1, 6.2.2.2 to 6.2.2.4, 12.1.2.5
  - Definition ..... 3.3.7
- Bleed air duct** ..... *see* Ducts (duct systems)
- Broilers, upright** ..... A.6.2.2.1
  - Definition ..... 3.3.8.3

### -C-

- Classified (definition)** ..... 3.3.9
- Cleaning** ..... 11.4, A.11.4.2
  - Access for ..... 7.3, 7.4.2.1 to 7.4.2.2, 7.4.4.1, 8.1.5
  - Recirculating systems ..... 13.6.2 to 13.6.4
  - Solid fuel cooking equipment ..... 14.8
- Clearances** ..... 4.2, A.4.2
  - Ducts ..... 4.2.1 to 4.2.2, 4.2.4.4, 4.5, 7.6.3, 7.7.2.2, A.7.7.2.2
  - Enclosures ..... 4.3.4, 4.5, 7.7.2.2, A.7.7.2.2
  - Exhaust fans ..... 4.2.1, 8.1.5.2
  - Recirculating systems ..... 13.1(1), 13.2.12(3)
  - Solid fuel cooking equipment ..... 14.9.1
  - Terminations ..... 7.8.2.1
- Clearly identified (definition)** ..... 3.3.10
- Closed combustible construction** ..... *see* Construction
- Combustible material**
  - Clearances ..... 4.2.1, 4.2.4.4
  - Enclosures ..... 7.7.2.2.1
  - Solid fuel cooking equipment ..... 14.9.1.4 to 14.9.1.6
- Definition ..... 3.3.34.1, A.3.3.34.3, Table A.3.3.34
  - Rooftop terminations through ..... 7.8.4, A.7.8.4
- Concealed/confined space** ..... *see* Space
- Construction**
  - Closed combustible construction ..... 4.3.4.1(2)

- Definition** ..... 3.3.11.1, Fig. A.3.3.11
- Open combustible construction** ..... 4.3.4.1(1)
  - Definition ..... 3.3.11.2, Fig. A.3.3.11
- Continuous enclosure** ..... *see* Enclosures
- Continuous weld** ..... 5.1.2, 7.5.2.1
  - Definition ..... 3.3.12, A.3.3.12
- Control device, high limit** ..... 12.2
  - Definition ..... 3.3.30
- Cooking equipment**
  - Alterations to ..... 4.7
  - Approval ..... 12.1.1
  - Concessions ..... 4.1.9, A.4.1.9
  - Exhaust systems ..... *see* Exhaust systems
  - Fire protection ..... 10.1.2, 10.2.4, A.10.1.2
  - Installation ..... 12.1.2, A.12.1.2.2
  - Moving ..... 12.1.2.2 to 12.1.2.3, A.12.1.2.2
  - Operating controls ..... 12.2
  - Recirculating systems ..... 13.2.1 to 13.2.3, 13.2.5 to 13.2.7
  - Safety requirements ..... Chap. 12, A.12.1.2.2
  - Solid fuel ..... *see* Solid fuel cooking equipment
- Cooking fuel, solid** ..... *see* Solid cooking fuel

### -D-

- Dampers** ..... 9.1, 11.4.10
  - Definition ..... 3.3.13
- Fire-actuated**
  - Exhaust hood assemblies ..... 5.3.4, 7.3.4, A.5.3.4
  - Inspection ..... 11.2.2
  - Recirculating systems ..... 13.2.8 to 13.2.10
  - Restriction of openings by ..... 11.1.3
- Definitions** ..... Chap. 3, A.3
- Detection devices** ..... 10.7.2, 10.7.4, 10.8.2, 11.2.2, 11.4.7;
  - see also* Fusible links
  - Definition ..... 3.3.14
- Dips** ..... 7.1.4
  - Definition ..... 3.3.15
- Discharge (definition)** ..... 3.3.16; *see also* Duct terminations
- Doors, fire** ..... 7.7.4
- Draft ventilation systems** ..... 14.1.1, 14.1.4
- Duct terminations** ..... 7.8, A.7.8
  - Definition ..... 3.3.17
  - Rooftop ..... 7.8.2, 7.8.4, A.7.8.2(2)(a), A.7.8.4
  - Wall ..... 7.8.3, 14.4.4, A.7.8.2.2(b)
- Ducts (duct systems)** ..... 4.1.3(3), Chap. 7, A.7
  - Access panels** ..... *see* Access panels
  - Bleed air** ..... 8.4, Fig. 8.4.1
    - Definition ..... 3.3.18.1
  - Building and structural contact** ..... 4.4, 7.6.6
  - Cleaning** ..... 11.4.2, A.11.4.2
  - Clearance** ..... 4.2.1 to 4.2.2, 7.2, 7.6.3, 7.7.2.2, A.7.7.2.2
  - Connections** ..... 7.5.2.1 to 7.5.2.2, 7.5.5
  - Corrosion protection** ..... 4.4.2 to 4.4.3, 7.6.6
  - Dampers in** ..... 9.1
  - Definition** ..... 3.3.18
  - Electrical equipment/wiring in** ..... 9.2.1 to 9.2.2
  - Enclosures, clearances to** ..... 4.5
  - Fire protection** ..... 10.1.1, 10.2.4, 13.5.1, 14.7.3
  - Grease**
    - Definition ..... 3.3.18.2
    - Listed ..... 7.1.7, 7.4.3.4, 7.7.3.4
    - Rooftop terminations ..... 7.8.2.1(7)
    - Wall terminations ..... 7.8.3.1(6)

Other ..... 7.5, A.7.5.1  
 Installation ..... 7.5.2  
 Materials ..... 7.5.1, A.7.5.1  
 Horizontal ..... 7.4.1  
 Installation  
   Exterior ..... 7.6  
   Interior ..... 7.7, A.7.7.2.2  
 Master system for multiple tenants ..... 8.4, Fig. A.8.4.1  
 Multiple ducts in single enclosure ..... 7.7.5.2  
 Openings ..... 7.1.5, 7.3 to 7.4, 11.1.3  
 Oven flue to hood ..... 5.1.8.2  
 Penetrations ..... 7.5.2.3, 7.5.3 to 7.5.4  
 Solid fuel ..... 14.3.2 to 14.3.4, 14.4  
 Transition ..... 8.2.1.2  
 Vertical ..... 7.4.2

**-E-**

**Easily accessible (definition)** ..... 3.3.19  
**Electrical equipment and wiring** ..... 9.2, A.9.2.4  
 Exhaust fans ..... 8.1.6  
 In cleaning ..... 11.4.3, 11.4.11  
 Recirculating systems ..... 13.2.11, 13.2.12(4)  
**Electrostatic precipitators (ESP)**  
 Cleaning ..... 13.6.3  
 Fire-extinguishing system actuation device ..... 13.5.2  
 Performance sensors ..... 13.3.4  
 Power supply ..... 13.2.11  
**Enclosures, duct** ..... 4.3  
 Clearances ..... 4.3.4, 4.5, 7.7.2.2, A.7.7.2.2  
 Continuous ..... 7.7.1  
 Definition ..... 3.3.20.1  
 Fire resistance rating ..... 7.7.2.1  
 Factory-built grease ..... 4.3  
 Clearances ..... 4.3.4, 7.7.2.2.4 to 7.7.2.2.5  
 Definition ..... 3.3.20.2.1  
 Inspection ..... 4.2.4.2, A.4.2.4.2  
 Interior installation ..... 7.7.1.5  
 Field-applied grease ..... 4.3  
 Clearances ..... 4.3.4, 7.7.2.2.4 to 7.7.2.2.5  
 Definition ..... 3.3.20.2.2  
 Inspection ..... 4.2.4.2, A.4.2.4.2  
 Interior installation ..... 7.7.1.5  
 Fire resistance rating ..... 7.7.2.1  
 Individual duct system for ..... 7.7.5.1  
 Inspections ..... 4.2.4.2, A.4.2.4.2  
 Multiple ducts in single ..... 7.7.5.2  
 Openings ..... 7.7.4  
 Protection of coverings and materials ..... 7.7.3  
**Energy control equipment** ..... 4.1.3(6)  
**Equipment** ..... *see* Fire-extinguishing equipment; Solid fuel cooking equipment  
**Equivalency to standard** ..... 1.5  
**Exhaust fans** ..... 4.1.3(4), 8.1, A.8.1  
 Cleaning ..... 7.3.7, 11.4.2, A.11.4.2  
 Clearance ..... 4.2.1, 8.1.5  
 Housings ..... 8.1.4  
 In-line ..... 8.1.2, Fig. A.8.1.2, Figs. A.8.1.2.2(a) to (e), A.8.1.2.4  
 Openings for cleaning, servicing, and inspection ..... 8.1.5  
 Operation with activated extinguishing system ..... 8.2.3  
 Terminations ..... 7.8.1(1), A.7.8.1(1)  
   Rooftop ..... 7.8.2.1 to 7.8.2.2, 7.8.4, A.7.8.4  
   Wall ..... 7.8.3.1(7)  
 Upblast ..... 7.8.2.1(8), 8.1.1, A.8.1.1, Fig. A.8.1.1  
 Utility set ..... 8.1.3, A.8.1.3, Fig. A.8.1.3  
**Exhaust hoods** ..... *see* Hoods  
**Exhaust systems** ..... 4.1.1 to 4.1.5  
 Alterations to ..... 4.7  
 Cleaning ..... 11.4, A.11.4.2  
 Clearance ..... 4.2, 4.5, A.4.2  
 Drawings ..... 4.6  
 Inspection ..... 11.3

Nonoperational ..... 11.1.6  
 Operation ..... 11.1.1 to 11.1.3  
 Solid fuel cooking equipment ..... 14.1.3 to 14.1.4, 14.3.2 to 14.3.4, 14.4, 14.6  
**Extinguishers, portable fire** ..... 10.2.1 to 10.2.2, 10.10, A.10.2.2, A.10.10.1  
 Solid fuel cooking operations ..... 14.7.8 to 14.7.9, 14.9.2.11

**-F-**

**Factory-built grease duct enclosures** ..... *see* Enclosures, duct  
**Fans, exhaust** ..... *see* Exhaust fans  
**Field-built grease duct enclosures** ..... *see* Enclosures, duct  
**Filters**  
 Grease ..... 6.1, 6.2.3 to 6.2.5  
 Cleaning ..... 13.6.2, 14.8.5  
 Definition ..... 3.3.22.1, A.3.3.22.1  
 Fire protection ..... 13.5.1  
 Interlocks ..... 13.3.3, 13.3.5.1  
 Removed ..... 11.1.2  
 Solid fuel cooking equipment ..... 14.5.3  
 Mesh-type ..... 6.1.3  
 Definition ..... 3.3.22.2, A.3.3.22.2  
**Fire doors** ..... 7.7.4  
**Fire resistance rating** ..... 7.7.1, 7.7.2.1  
 Definition ..... 3.3.23  
**Fire walls** ..... 7.1.1, 7.7.1.1 to 7.7.1.3  
 Definition ..... 3.3.24  
**Fire-extinguishing equipment** ..... 4.1.3(5), Chap. 10, A.10;  
*see also* Extinguishers, portable fire  
 Air pollution control/secondary filtration equipment ..... 9.3.3 to 9.3.4  
 Alterations to ..... 4.7  
 Cleaning process, care during ..... 11.4.4 to 11.4.5  
 Definition ..... 3.3.21.1  
 Exhaust fan operation with ..... 8.2.3  
 Fuel shutoff for ..... 10.4  
 Hoods, sprinkler systems obstructed by ..... 10.8.1  
 Inspection ..... 11.2, 13.6.6, A.11.2.1, A.11.2.4  
 Installation requirements ..... 10.9.2, A.10.9.2  
 Manual activation ..... 10.5, 11.1.4, 11.2.2, 13.5.4 to 13.5.5  
 Nonoperational ..... 11.1.6, 11.4.4 to 11.4.5  
 Operating requirements ..... 10.3  
 Portable ..... 10.10, A.10.10.1  
 Recirculating systems ..... 13.1(6), 13.5, 13.6.1, 13.6.6  
 Review and certification ..... 10.9, A.10.9.2  
 Simultaneous operation ..... 10.3  
 Solid fuel cooking equipment ..... 14.7  
 Solid fuel storage ..... 14.9.2.9 to 14.9.2.11  
 Special design and application ..... 10.8  
 System annunciation ..... 10.6  
 System supervision ..... 10.7  
 Types of ..... 10.2, A.10.2  
 Water supply ..... 10.2.7.4, 10.2.8 to 10.2.9, A.10.2.9(4)  
 Water valve supervision ..... 10.2.9, A.10.2.9(4)  
 Water-wash, for fixed baffle hood ..... 10.2.7, 10.2.9, 10.7.4, A.10.2.9(4)  
**Fryers, deep fat** ..... 12.1.2.4, 12.2, 13.6.1, 14.9.4.5, A.6.2.2.1  
**Fuel shutoff** ..... 10.4, 10.7.3, 14.7.12  
**Fuel, solid cooking** ..... *see* Solid cooking fuel  
**Fume incinerators** ..... 9.3.1 to 9.3.2  
 Definition ..... 3.3.25  
**Fusible links** ..... 11.2.4 to 11.2.5, 11.4.7, A.11.2.4  
 Definition ..... 3.3.26

**-G-**

**Grease**  
 Definition ..... 3.3.27, A.3.3.27  
 Draining from/into traps ..... 7.8.2.1(4), 7.8.3.1(5)  
 Recirculating system, discharge from ..... 13.2.12(2)  
**Grease drip trays** ..... 6.2.4

<b>Grease duct enclosures</b> .....	<i>see</i> Enclosures, duct
<b>Grease ducts</b> .....	<i>see</i> Ducts (duct systems)
<b>Grease filters</b> .....	<i>see</i> Filters
<b>Grease removal devices</b> .....	Chap. 6, A.6.2.21; <i>see also</i> Filters
Cleaning .....	11.4.2, A.11.4.2
Clearance .....	4.2.1 to 4.2.2
Definition .....	3.3.28
Fire protection .....	10.1.1, 10.2.4, 14.7.3
Installation .....	6.2, A.6.2.2.1
Recirculating systems .....	13.1(3)
Solid fuel cooking equipment .....	6.2.1.2, 14.5
<b>Greasetight</b> .....	5.1.4, 7.4.3.2, 7.5.2.3, A.5.1.4
Definition .....	3.3.29

**-H-**

<b>Hazard area, single</b>	
Definition .....	3.3.39
Simultaneous system operation .....	10.3
<b>High limit control device</b> .....	12.2
Definition .....	3.3.30
<b>Hoods</b> .....	4.1.3(2), Chap. 5, A.5.1.4, A.5.3.4
Access panels .....	7.3.4
Assemblies	
Exhaust .....	5.3, A.5.3.4
Listed .....	5.4
Cleaning .....	11.4.2, 13.6.4, 14.8.5, A.11.4.2
Clearance .....	4.2.1 to 4.2.2
Construction .....	5.1, 5.3, A.5.1.4, A.5.3.4
Definition .....	3.3.31, A.3.3.31
Exhaust air volumes .....	8.2.2.1
Eyebrow-type hoods .....	5.1.8
Fire protection .....	10.1.1, 10.2.4, 10.2.7, 10.8.1, 14.7.3
Fixed baffle (with water wash) .....	10.2.7, 10.2.9, 10.7.4, A.10.2.9(4)
Definition .....	3.3.31.1
Grease removal devices .....	<i>see</i> Grease removal devices
Inspection .....	11.2.1, A.11.2.1
Insulation materials .....	5.1.9
Integrated supply air plenums .....	5.3, A.5.3.4
Lighting on .....	9.2.2 to 9.2.3
Listed .....	5.1.6 to 5.1.7, 11.1.5
Assembly .....	5.4
Inspection .....	11.2, A.11.2.1, A.11.2.4
Recirculating systems .....	13.1(2)
Size .....	5.2
Solid fuel cooking equipment .....	14.3
Spark arresters .....	14.1.6 to 14.1.7, 14.8.4
Types of .....	Fig. A.3.3.31

**-I-**

<b>Incinerators, fume</b> .....	9.3.1 to 9.3.2
Definition .....	3.3.25
<b>Inspection and testing</b> .....	11.2.1, A.11.2.1
Duct system .....	7.7.3.3
Recirculating system .....	13.6.5
Solid fuel cooking equipment .....	11.4, 14.8
<b>Insulation materials, hood</b> .....	5.1.9

<b>Interconnected</b>	
Definition .....	3.3.32
Fire-extinguishing systems, supervision of .....	10.7.3
<b>Interlocks</b>	
Recirculating system .....	13.2.12(5), 13.3, 13.6.5
Solid fuel cooking equipment .....	14.1.3, 14.6.3

**-L-**

<b>Labeled (definition)</b> .....	3.2.3
<b>Lighting</b> .....	9.2.2 to 9.2.3
<b>Limited-combustible material</b>	
Clearances .....	4.2.1, 4.2.3.3, 4.2.4.4
Enclosures .....	7.7.2.2.2
Solid fuel cooking equipment .....	14.9.1.5

Definition .....	3.3.34.2, A.3.34
Rooftop terminations through .....	7.8.4, A.7.8.4
<b>Liquidtight</b>	
Connections .....	5.1.2, 7.5.2.1
Definition .....	3.3.33
<b>Listed (definition)</b> .....	3.2.4, A.3.2.4

**-M-**

<b>Maintenance</b> .....	11.2.8
Recirculating systems .....	13.1(7), 13.6
Solid fuel cooking equipment .....	11.4, 14.8, A.11.4.2
<b>Makeup air</b> .....	<i>see</i> Replacement air
<b>Multiple tenancy applications</b> .....	4.1.7, 8.4, Fig. A.8.4.1

**-N-**

<b>Noncombustible material</b>	
Clearances .....	4.2.1, 4.2.3, 4.2.4.3
Enclosures .....	7.7.2.2.2
Definition .....	3.3.34.3, Table A.3.3.34
Ducts, contact with .....	4.4.1
Solid fuel cooking equipment, installation of .....	14.9.1.1 to 14.9.1.2

**-O-**

<b>Open combustible construction</b> .....	<i>see</i> Construction
<b>Operating procedures</b> .....	11.1
Recirculating systems .....	13.1(7), 13.6
Solid fuel cooking equipment .....	11.4, Chap. 14, A.14.2.2

**-P-**

<b>Pitched</b>	
Definition .....	3.3.35
Ducts .....	A.7.1.2
<b>Purpose of standard</b> .....	1.2

**-R-**

<b>Recirculating systems</b> .....	Chap. 13
Application restrictions .....	13.4
Components .....	13.1
Cooking equipment .....	13.2.1 to 13.2.3, 13.2.5 to 13.2.7
Definition .....	3.3.36
Design restrictions .....	13.2
Electrical wiring .....	13.2.11, 13.2.12(4)
Fire safety requirements .....	13.5, 13.6.1, 13.6.6
Inspection and testing .....	13.6.5
Interlocks .....	13.2.12(5), 13.3, 13.6.5
Location restrictions .....	13.4
Use and maintenance .....	13.6
<b>Referenced publications</b> .....	Chap. 2, App. B

<b>Removable</b>	
Definition .....	3.3.37
Interlocks, recirculating system .....	13.2.12(5)
<b>Replacement air</b> .....	8.3, A.8.3
Definition .....	3.3.38
Solid fuel cooking equipment .....	14.1.2, 14.6.2 to 14.6.3
<b>Retroactivity of standard</b> .....	1.4
<b>Rooftop terminations</b> .....	7.8.2, 7.8.4, A.7.8.2.2(a), A.7.8.4

**-S-**

<b>Safety requirements</b> .....	Chap. 12, A.12.1.2.2
Recirculating systems .....	13.1(8)
Solid fuel cooking equipment .....	14.9
<b>Scope of standard</b> .....	1.1, A.1.1.1, A.1.1.4
<b>Shall (definition)</b> .....	3.2.5
<b>Should (definition)</b> .....	3.2.6

<b>Single hazard area</b>	
Definition .....	3.3.39
Simultaneous system operation .....	10.3

<b>Solid cooking fuel</b>	
Ash removal	14.9.3
Definition	3.3.40
Handling	14.9.3
Storage	14.9.2
<b>Solid fuel cooking equipment</b>	4.1.6, A.4.1.6
Air movement for	14.6
Clearances	14.9.1
Definition	3.3.21.2, A.3.3.21.2
Duct systems	14.3.2 to 14.3.4, 14.4
Exhaust systems	14.1.3 to 14.1.4, 14.3.2 to 14.3.4, 14.4, 14.6
Fire-extinguishing equipment	14.7
Grease removal devices	6.2.1.2, 14.5
Hoods	14.3
Inspection and maintenance	11.4, 14.8, A.11.4.2
Location	14.2, A.14.2.2
Operating procedures	11.4, Chap. 14, A.14.2.2
Replacement air	14.1.2, 14.6.2 to 14.6.3
Safety requirements	14.9
Venting application	14.1
<b>Solvents</b>	11.4.6
Definition	3.3.41
<b>Space</b>	
Concealed spaces	7.7.1.1, 9.2.3, 9.2.3.4
Definition	3.3.42.1
Confined space (definition)	3.3.42.2
<b>Spark arresters</b>	14.1.6 to 14.1.7, 14.5.2, 14.8.4
Definition	3.3.43
<b>Standard (definition)</b>	3.2.7
<b>Supervisory alarms</b>	10.7.1
<b>-T-</b>	
<b>Terminations, duct</b>	<i>see</i> Duct terminations
<b>Testing</b>	<i>see</i> Inspection and testing
<b>Thermal recovery unit</b>	9.3.1 to 9.3.2
Definition	3.3.44
<b>Transducer</b>	13.3.5
<b>Traps</b>	7.1.4, 7.8.2.1(4), 7.8.3.1(5)
Definition	3.3.45
<b>-U-</b>	
<b>Upright broilers</b>	<i>see</i> Broilers, upright
<b>-V-</b>	
<b>Vent cleaning service</b>	11.4.12 to 11.4.13
<b>Ventilation systems</b>	14.1
<b>-W-</b>	
<b>Wall terminations</b>	7.8.3, 14.4.4, A.7.8.2.2(b)
<b>Water supplies</b>	14.9.3.7
<b>Water supply, fire extinguishing systems</b>	10.2.7.4, 10.2.8 to 10.2.9, A.10.2.9(4)
<b>Water valve supervision</b>	10.2.9, A.10.2.9(4)
<b>Water-wash system, duct</b>	10.2.7, 10.2.9, 10.7.4, A.10.2.9(4)
<b>Weld, continuous</b>	5.1.2, 7.5.2.1
Definition	3.3.12, A.3.3.12

Formal Interpretation

# **NFPA 96**

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**2001 Edition**

**Reference: 6-2.3, 6-2.4**

**F.I.**

**Question:** Is it the intent that filters must be locked, pin clipped, or spring clipped into place and that special top and bottom channels be provided?

**Answer:** The method of conformance to the requirement is a matter of proper design and therefore subject to approval by the authority having jurisdiction.

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