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NFPA 96 Vapor Removal from Cooking Equipment 1991 Edition

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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NFPA 96

Standard for the Installation of Equipment for the

Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment

1991 Edition

This edition of NFPA 96, *Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment*, was prepared by the Technical Committee on Venting Systems for Cooking Appliances and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 12-14, 1990 in Miami, FL. It was issued by the Standards Council on January 11, 1991, with an effective date of February 8, 1991, and supersedes all previous editions.

The 1991 edition of this document has been approved by the American National Standards Institute.

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.

Notice

Following issuance of this 1991 edition of NFPA 96, *Standard for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment*, by the NFPA Standards Council, an appeal was filed with the NFPA Board of Directors.

The appeal requests that new Exception No. 2 to 4-2.1 be deleted from the standard. The Exception allows the minimum vertical distance between the grease removal device and the cooking surface to be reduced to not less than 6 in. (152.4 mm) for cooking equipment without exposed flame and where flue gases bypass grease removal devices.

NFPA will announce the disposition of the appeal when it has been determined. Anyone wishing to receive automatically the disposition of the appeal should notify in writing the Secretary, Standards Council, NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

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 section 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 System for Cooking Appliances.

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

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

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NFPA 96

Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment

1991 Edition

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

Information on referenced publications can be found in Chapter 10.

Chapter 1 General

1-1* Scope. This edition of NFPA 96 covers basic requirements for the design, installation, and use of exhaust system components including (1) hoods; (2) grease removal devices; (3) exhaust ducts; (4) dampers; (5) air moving devices; (6) auxiliary equipment; and (7) fire extinguishing equipment for the exhaust system and the cooking equipment used therewith in commercial, industrial, institutional, and similar cooking applications. This standard does not apply to installations for normal residential family use.

1-2 Definitions.

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 removed by exhaust systems or to improve the quality of the inside air by providing a source of air having a lower concentration of odors, suspended particles, or heating content.

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

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

Approved. Acceptable to the "authority having jurisdiction."

NOTE: 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 or 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 concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

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

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

NOTE: 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, 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 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."

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

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

Clearly Identified. Capable of being recognized by a person of normal vision without causing uncertainty and indecisiveness as to the location or operating process of the item in question.

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

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

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

Continuous External Weld. A metal joining method without interruption as related to visibility and quality, located on the outside of the surfaces that directly contain and/or convey the grease-laden vapors of the cooking process(es). 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. Welding is

a fabrication technique for joining metals by heating the materials to the point that they melt and flow together forming an uninterrupted surface of no less strength than the original materials.

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

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

Dips. Depression or cup-like places in horizontal duct runs in which liquids could accumulate.

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

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

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

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

Fire Resistance Rating. A relative term, usually with a numerical rating or modifying adjective to indicate the extent to which a material or structure resists the effects of fire, e.g., "fire resistance of 2 hr as measured on the Standard Time-Temperature Curve."

Fire Wall. A wall having a fire resistance rating of not less than 4 hr, which separates buildings, restricts the spread of fire, is constructed of noncombustible or limited-combustible materials, and extends continuously from the foundation through all stories, to or above the roof.

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

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

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

Grease Ducts. A containment system for the transportation of air and grease vapors, designed and installed to reduce the possibility of the accumulation of combustible condensation and the occurrence of damage should a fire occur within the system.

Grease Extractors. 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.

Grease Filter. A component of the grease vapor removal system that deflects the air and vapors passing through it in a manner that causes the grease vapor concentration and/or condensation for the purpose of collection, leaving the exiting air with a lower amount of combustible matter.

Grease Removal Devices. Other components of the grease and vapor removal system that do not fit the definition of "grease extractors" or "grease filters" yet are designed, installed, and perform by removing vapor suspended grease particles from the exhaust air/vapor stream or are designed to assist other devices in the removal of such vapors or particles.

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

High Broiler. (See Upright Broiler.)

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

Hood. A device provided for a cooking appliance(s) to direct and capture grease-laden vapors and exhaust gases. It shall be constructed to withstand adverse conditions. It may be located over most or all of the cooking appliance(s), or it may be a fixed device located in close proximity to a cooking appliance(s). (*See 1-3.1.*)

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

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

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

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), which has a flame spread rating not greater than 50.

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

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

Listed. Equipment or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which 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.

Noncombustible Material. A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials that are reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, shall be considered noncombustible materials.

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

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

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

Salamander Broiler. (See Upright Broiler.)

Shall. Indicates a mandatory requirement.

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

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

Solvent. A substance (usually liquid) capable of dissolving or dispersing another substance. A chemical compound designed and used for the purpose of converting solidified grease into a liquid or semi-liquid state to facilitate a cleaning operation.

Termination. The concluding or intentional ending portion of a duct system that is designed and functions to fulfill the obligations of the system in a satisfactory manner.

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

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

Upright Broiler. An appliance used in the preparation of food by the exposure of the foods to intense radiant heat, and perhaps convective heat as well, with the food or the food and radiant source not being limited to a horizontal mode.

1-3 General Requirements.

1-3.1 Cooking equipment used in processes producing smoke or grease-laden vapors shall be equipped with an exhaust system complying with the following:

(a) A hood complying with the requirements of Chapter 2, and

(b) A duct system complying with the requirements of Chapter 3, and

(c) Grease removal devices complying with the requirements of Chapter 4, and

(d) Fire extinguishing equipment complying with the requirements of Chapter 7.

1-3.1.1 All solid fuel cooking equipment shall be served by hoods and duct systems that are separate from all other cooking exhaust systems.

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

1-3.2* Clearance. Hoods, grease extractors, and ducts shall have a clearance of at least 18 in. (457.2 mm) to combustible material, 3 in. (76.2 mm) to limited-combustible, and 0 in. to noncombustible material. See figures showing examples in Appendix A.

Exception No. 1: When the hood, duct, or grease extractor is listed for lesser clearances.

Exception No. 2: Clearance to combustible material may be reduced if the combustible material is protected as follows:

	Type of Protection	*Clearance to Combustible Material*
(a)	*0.013-in. (0.33-mm) (28 gage) sheet metal spaced out 1 in. (25.4 mm) on noncombustible spacers.*	*9 in. (228.6 mm)*
(b)	*0.027-in. (0.69-mm) (22 gage) sheet metal on 1-in. (25.4-mm) mineral wool bats reinforced with wire mesh or equivalent spaced out 1 in. (25.4 mm) on noncombustible spacers.*	*3 in. (76.2 mm)*

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

Exception No. 3: Clearance to limited-combustible material may be reduced to zero clearance when protected by metal lath and plaster, ceramic tile, quarry tile, or other noncombustible material or assembly of noncombustible materials acceptable to the authority having jurisdiction.

Exception No. 4: Materials and products that are listed for the purpose of reducing clearance. These materials shall be installed in accordance with the conditions of the listing and the manufacturer's instructions.

NOTE: The protection methods for ducts to reduce clearance are to be applied to the combustible or limited-combustible construction and not to the duct. The duct should not be wrapped directly with any materials as the duct cannot dissipate heat from a fire as intended. In the case of a severe fire the duct may fail. A duct may contact noncombustible floors, interior walls, and other noncombustible structures or supports, but it may not be in contact with these for more than 50 percent of its surface area per each lineal foot of contact length.

1-3.3 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.

1-3.4 Nothing in this standard is intended to prevent the use of methods or devices, provided that sufficient technical data is submitted to the authority having jurisdiction to demonstrate that the proposed method or device is equivalent in quality, strength, fire endurance, effectiveness, durability, and safety to that prescribed by this standard.

Chapter 2 Hoods

2-1 Construction.

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

Exception: Hoods or enclosures of listed grease extractors or listed automatic damper and hood assemblies, evaluated under the same conditions of fire severity as the hood or enclosure of listed grease extractors, shall be considered as complying with the material and construction requirements of 2-1.1 and 2-1.2.

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

Exception No. 1: Penetrations shall be permitted to be sealed by other listed devices that 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. (See definition of continuous external weld in Section 1-2.)

Exception No. 2: See exception to 2-1.1 above.

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

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

2-3 Exhaust Hood Assemblies with Integrated Supply Air Plenums.

2-3.1 The construction and size of these hoods shall comply with the requirements of Sections 2-1 and 2-2.

2-3.1.1 The construction of the outer shell or the inner exhaust shell shall comply with 2-1.2. If the outer shell is welded, the inner shell shall be of greasetight construction.

2-3.1.2* A fire-actuated damper shall be installed in the supply air plenum at each point where a supply air duct inlet or a supply air outlet penetrates the continuously welded shell of the assembly. The damper shall be constructed of at least the same gage as the shell. The actuation device shall have a maximum temperature rating of 286°F (141°C). Supply air plenums that discharge air from their 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 do not require a fire-actuated damper. See Figure A-2-3.1.2 for examples.

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

Chapter 3 Duct Systems

3-1 General.

3-1.1 Ducts shall not pass through fire walls or fire partitions.

3-1.2 All ducts shall lead, as directly as possible, to the exterior of the building.

3-1.3 Duct systems shall not be interconnected with any other building ventilating or exhaust system.

3-1.4 All ducts shall be installed without forming dips or traps that might collect residues.

3-1.5 All interior surfaces of ducts shall be accessible for cleaning and inspection purposes. Openings required for accessibility shall comply with Section 3-3.

3-1.6 A sign shall be placed on all access panels stating:
ACCESS PANEL—DO NOT OBSTRUCT

3-2 Clearance.

3-2.1 Clearance between ducts and combustible materials shall be provided in accordance with the requirements of 1-3.2.

3-2.2 For listed grease ducts, see Section 3-4.

3-3 Openings.

3-3.1 Openings shall be provided at the sides or at the top of the duct, whichever is more accessible, and at changes of direction.

Exception: Portions of the duct that are accessible from the duct entry or discharge.

3-3.2 For listed hoods with dampers in the exhaust collar, an access panel for cleaning and inspection shall be provided in the duct or the hood collar. This panel shall be as close to the hood as possible but not to exceed 18 in. (457.2 mm).

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

3-3.4 Openings shall conform to the following:

3-3.4.1 On horizontal ducts at least one 20 in. × 20 in. (508 mm × 508 mm) opening shall be provided for personnel entry. Where an opening of this size is not possible, openings large enough to permit thorough cleaning shall be provided at 12-ft (3.7-m) intervals.

3-3.4.2 In horizontal sections, the lower edge of the opening shall be not less than 1 1/2 in. (38.1 mm) from the bottom of the duct.

3-3.4.3 On vertical ductwork where personnel entry is possible, access shall be provided at the top of the vertical riser to accommodate descent. Where personnel entry is not possible, adequate access for cleaning shall be provided on each floor.

3-3.4.4 Access panels shall be of the same material and thickness as the duct. Access panels shall have a gasket or sealant that is rated for 1500°F (815.6°C) and shall be greasetight. Fasteners used to secure the access panels, such as bolts, weld studs, latches, or wing nuts, shall be carbon steel or stainless steel and shall not penetrate duct walls.

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

3-3.4.5 Openings for installation, servicing, and inspection of listed fire protection system devices and duct cleaning shall be provided in ducts and enclosures and shall conform to the requirements of 3-3.4 and 3-7.3. Enclosure openings required to reach access panels in the ductwork shall be large enough to remove the access panel.

3-4 Listed Grease Ducts. Listed grease ducts shall be installed in accordance with the terms of the listing and the manufacturer's instructions.

3-5 Other Grease Ducts. Other grease ducts shall comply with the following requirements.

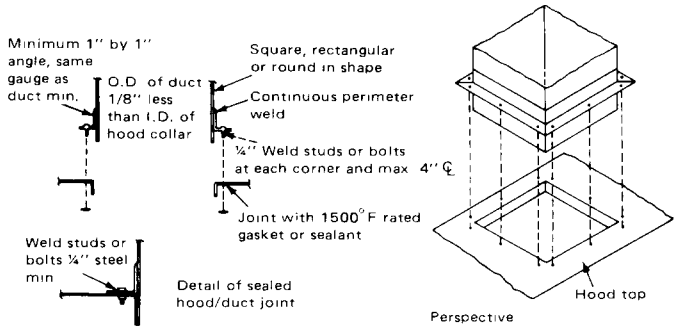
3-5.1 Materials. Ducts shall be constructed of and supported by carbon steel not less than 0.054 in. (1.37 mm) (No. 16 MSG) or stainless steel not less than 0.043 in. (1.09 mm) (No. 18 MSG) in thickness.

3-5.2 Installation.

3-5.2.1 All seams, joints, penetrations, and duct to hood collar connections shall have a liquidtight continuous external weld.

Exception No. 1: Duct to hood collar connections as shown in Figure 3-5.2.1 shall be permitted.

Exception No. 2: Penetrations shall be permitted to be sealed by other listed devices that 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.



For SI Units, 1 in. = 25.4 mm.

Figure 3-5.2.1

3-6 Exterior Installations.

3-6.1 The exterior portion of the ductwork shall be vertical wherever possible and shall be installed and adequately supported on the exterior of a building. Bolts, screws, rivets, and other mechanical fasteners shall not penetrate duct walls. Clearance of any vertical or horizontal ducts to combustible material shall comply with 1-3.2.

3-6.2 All ducts shall be protected on the exterior by paint or other suitable weather-protective coating or shall be constructed of noncorrosive stainless steel. Ductwork subject to corrosion shall have minimal contact with the building surface.

3-7 Interior Installations.

3-7.1 In all buildings more than one story in height, and in one-story buildings where the roof or roof-ceiling assembly is required to have a fire resistance rating, the ducts shall be enclosed in a continuous enclosure extending from the ceiling above the hood, through any concealed spaces, to or through the roof so as to maintain the integrity of the fire separations required by the applicable building code provisions. The enclosure shall be sealed around the duct at the point of penetration at the ceiling and vented to the exterior of the building through weather protected openings. The enclosure shall conform to the following:

3-7.1.1 If the building is less than 4 stories in height, the enclosure wall shall have a fire resistance rating of not less than 1 hr.

3-7.1.2 If the building is 4 stories or more in height, the enclosure wall shall have a fire resistance rating of not less than 2 hr.

3-7.1.3 Clearance from the duct to the interior surface of enclosures of combustible construction shall be not less than 18 in. (457.2 mm), and clearance from the duct to the interior surface of enclosures of noncombustible or limited-combustible construction shall be not less than 6 in. (152.4 mm). Provisions for reducing clearances as described in 1-3.2 are not applicable to enclosures.

NOTE: Noncombustible materials such as reinforced concrete floors or protected steel beams, which may protrude into an enclosure and cause reduced clearance, may be acceptable to the authority having jurisdiction if the installation and accessibility of the duct system are considered adequate.

3-7.2 For listed grease ducts, see Section 3-4.

3-7.3 If openings in the enclosure walls are provided, they shall be protected by approved self-closing fire doors of proper rating. See NFPA 80, *Standard for Fire Doors and Windows.*

3-7.4 Each duct system shall constitute an individual system serving only exhaust hoods on one floor.

3-8 Termination of Exhaust System.

3-8.1 The exhaust system shall terminate as follows:

3-8.1.1 Outside the building with a fan or duct.

NOTE: 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 amount of pressurized duct joints and cleanouts through which grease might leak more easily.

3-8.1.2 Through the roof as in 3-8.2 or through a wall as in 3-8.3.

3-8.2 Rooftop Terminations.

3-8.2.1 Rooftop terminations shall be as follows:

3-8.2.2 With a minimum of 10 ft (3.05 m) of clearance from the outlet to adjacent buildings, property lines, and air intakes. Where space limitations absolutely prevent a 10-ft (3.05-m) horizontal separation from an air intake, a vertical separation will be acceptable with the exhaust outlet being a minimum of 3 ft (0.92 m) above any air intake located within 10 ft (3.05 m) horizontally.

3-8.2.3 With the exhaust flow directed up and away from the surface of the roof and a minimum of 40 in. (1.02 m) above the roof surface.

3-8.2.4 With the ability to drain grease out of any traps or low points formed in the fan or duct near the termination of the system to a rainproof collection container or to a remote grease trap.

3-8.2.5 With a listed grease duct complying with Section 3-4, or with ductwork complying with Section 3-5, or

3-8.2.6 With a hinged up-discharge fan supplied with flexible weatherproof electrical cable and service hold-open retainer to permit proper inspection and cleaning and that is listed for commercial cooking equipment, provided the ductwork extends a minimum of 18 in. (457.2 mm) above the roof surface, and the fan discharges a minimum of 40 in. (1.02 m) above the roof surface (*see Section 5-1*), or

3-8.2.7 With other approved fan, provided (a) it meets the requirements of 3-8.2.4 and Section 5-1, and (b) its discharge or its extended duct discharge meets the requirements of 3-8.2.3. (*See Section 5-1.*)

3-8.2.8 If exterior fans are located outside the roofline, they shall be provided with safe access and work surface for inspection and cleaning.

3-8.3 Wall Terminations.

3-8.3.1 Wall terminations shall be as follows:

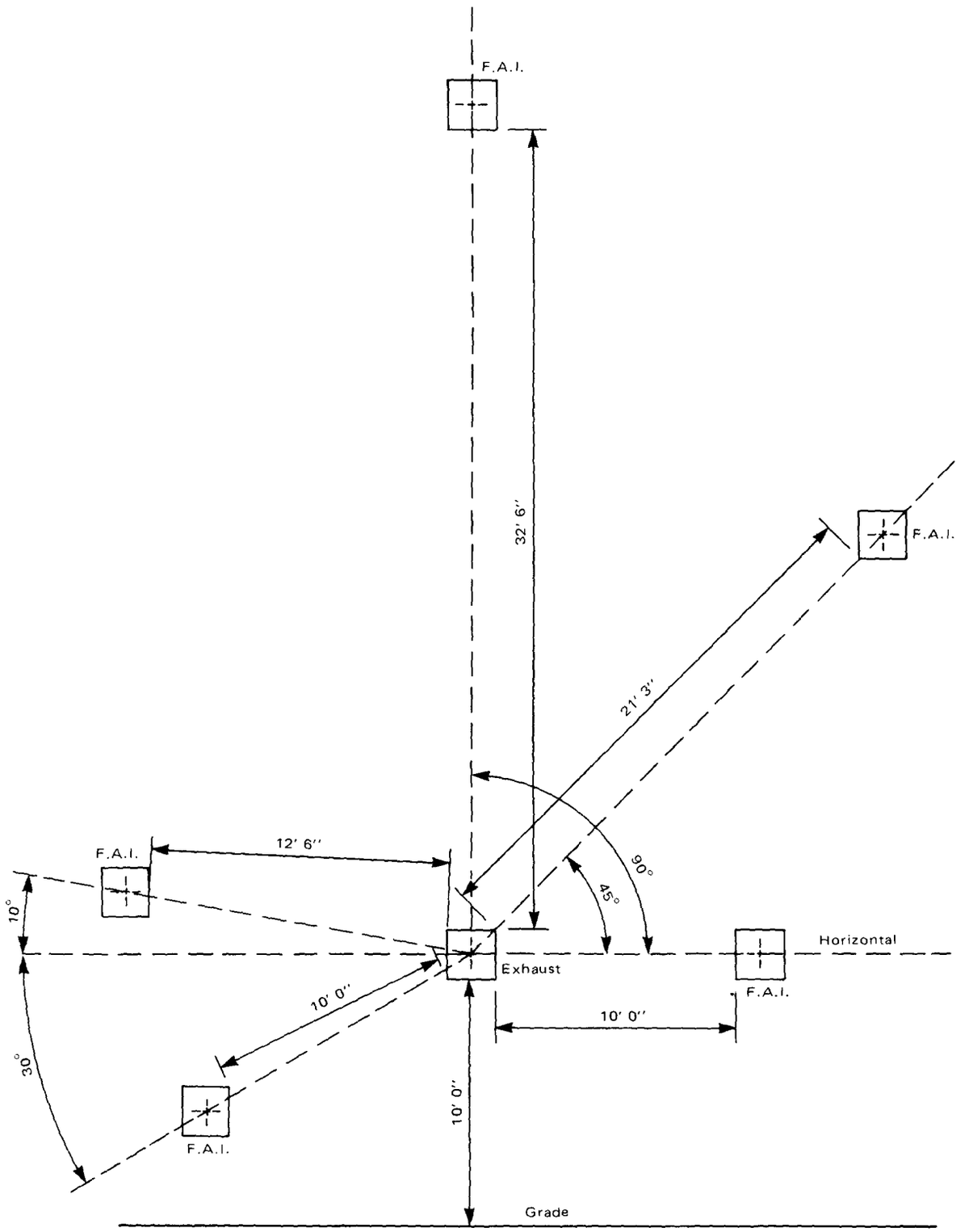
3-8.3.2 Through a masonry wall with a minimum of 10 ft (3.05 m) of clearance from the outlet to adjacent buildings, property lines, grade level, combustible construction, electrical equipment or lines, and the closest point of any air intake at or below the plane of the exhaust termination. The closest point of any air intake above the plane of the exhaust termination shall be a minimum of 10 ft (3.05 m) distant, plus 0.25 ft (0.076 m) per each one (1) degree from horizontal, the angle of degree being measured from the center of the exhaust termination to the center of the air intake. (*See Figure 3-8.3.2.*)

3-8.3.3 With the exhaust flow directed perpendicularly outward from the wall face or upward.

3-8.3.4 With all the ductwork pitched to drain the grease back to the hood(s), or with a drain provided to bring the grease back to a container within the building or to a remote grease trap.

3-8.3.5 With a listed grease duct complying with Section 3-4, or other ducts complying with Section 3-5, or

3-8.3.6 With an approved fan, provided it meets the requirements of 3-8.3.4 and Section 5-1.



Example:
F.A.I. is same plane as exhaust or lower: minimum of 10' between closest edges
F.A.I. above plane of exhaust: 10' + 0.25' per 1 degree between closest edges

Figure 3-8.3.2 Exhaust termination distance from fresh air intake (F.A.I.).

Chapter 4 Grease Removal Devices in Hoods

4-1 Grease Removal Devices. Listed grease filters, baffles, or other approved grease removal devices for use with commercial cooking equipment shall be provided. Mesh filters shall not be used.

4-2 Installation.

4-2.1 The distance between the grease removal device and the cooking surface shall be as great as possible. Where grease removal devices are used in conjunction with charcoal or charcoal-type broilers, including gas or electrically heated char-broilers, a minimum vertical distance of 4 ft (1.22 m) shall be maintained between the lower edge of the grease removal device and the cooking surface.

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

NOTICE: Following the issuance of this edition, an appeal was filed requesting the deletion of new Exception No. 2.

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

4-2.2 Grease removal devices shall be protected from combustion gas outlets and from direct flame impingement occurring during normal operation of cooking appliances producing high flue gas temperatures, such as deep fat fryers or upright or high broilers (salamander broilers) where the distance between the grease removal device and the appliance flue outlet (heat source) is less than 18 in. (457.2 mm). This protection may be accomplished by the installation of a steel or stainless steel baffle plate between the heat source and the grease removal device. The baffle plate shall be so sized and located that flames or combustion gases must travel a distance not less than 18 in. (457.2 mm) from the heat source to the grease removal device. The baffle shall be located not less than 6 in. (152.4 mm) from the grease removal devices.

Exception: See Exceptions No. 1 and No. 2 to 4-2.1 above.

4-2.3 Filters shall be tight-fitting and firmly held in place.

4-2.4 Filters shall be easily accessible and removable for cleaning.

4-2.5 Filters shall be installed at an angle not less than 45 degrees from the horizontal.

4-2.6 Filters shall be equipped with a drip tray beneath the lower edge of the filters. The tray shall be kept to the minimum size needed to collect the grease and be pitched to drain to an enclosed metal container having a capacity not exceeding 1 gal (3.785 L).

Chapter 5 Air Movement

5-1 Exhaust Fans for Commercial Cooking Equipment. Approved up-discharge fans with motors surrounded by the air stream shall be hinged, supplied with flexible weatherproof electrical cable and service hold-open retainers, and listed for this use. Other exhaust fans for this use shall be approved for continuous operation. (*See Section 3-8.*) Both shall be installed to comply with the following requirements:

5-1.1 All wiring and electrical equipment shall comply with NFPA 70, *National Electrical Code®* (*also see Chapter 6*).

5-1.2 Means shall be provided for inspections, servicing, and cleaning.

5-2 Airflow.

5-2.1 The air velocity through any duct shall be not less than 1,500 ft (457.2 m) per min.

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

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

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

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

Chapter 6 Auxiliary Equipment

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

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

6-2 Electrical Equipment.

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

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

Exception: Where specifically approved for such use.

6-2.3 Lighting units having steel enclosures mounted on the outer surface of the hood and separated from exhaust products by tight-fitting glass shall be permitted to be used.

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

Exception No. 1: Where part of a listed grease extractor.

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

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

6-3 Other Equipment. Fume incinerators, thermal recovery units, air pollution control devices, or other devices shall be permitted to be installed in ducts or hoods or located in the path of travel of exhaust products when specifically approved for such use and shall not increase the fire hazard. Downgrading other parts of the exhaust system due to the installation of these approved devices, whether listed or not, shall not be allowed.

Chapter 7 Fire Extinguishing Equipment

7-1 Where Required.

7-1.1 Approved fire extinguishing equipment shall be provided for the protection of grease removal devices and hoods.

Exception: If acceptable to the authority having jurisdiction, the portion of the fire extinguishing system covered by the provisions of 7-1.1 may be omitted when all cooking equipment is served by listed grease extractors containing a constant or fire actuated water system, and such water system is approved to extinguish a fire in grease removal devices and hood and does not adversely affect the operation of the fire extinguishing system for the duct and cooking equipment.

7-1.2 Duct systems and cooking equipment (such as deep fat fryers, ranges, griddles, and broilers) that may be a source of ignition of grease in the hood, grease removal device, or duct shall be protected by approved extinguishing equipment.

7-2 Types of Equipment.

7-2.1 Fire extinguishing equipment shall include both fixed automatic fire extinguishing systems and portable fire extinguishers.

7-2.2 Fixed automatic fire extinguishing systems required by 7-2.1 shall be either:

7-2.2.1 Automatic fire extinguishing systems specifically listed for the hazard installed in accordance with the terms of their listing, the manufacturer's instructions, and NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, or NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, **or**

7-2.2.2 Other automatic fire extinguishing systems installed in compliance with the provisions of the following standards where applicable:

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*

NFPA 13, *Standard for the Installation of Sprinkler Systems*

NFPA 16, *Standard on Deluge Foam-Water Sprinkler and Foam-Water Spray Systems*

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

7-3 Operating Requirements.

7-3.1 Fixed pipe extinguishing equipment shall be installed to conform with the following requirements:

7-3.1.1 A readily accessible means for manual activation of the fire extinguishing system shall be provided in a path of exit or egress and shall be clearly identified. Such means shall be mechanical and shall not rely on electrical power for actuation.

Exception No. 1: A sprinkler system shall not require manual activation.

Exception No. 2: Electrical power may be used for manual activation of the system if a reserve power supply is provided.

7-3.1.2 Fixed pipe extinguishing systems in a single hazard area (*see Section 1-2*) shall be arranged for simultaneous automatic operation upon actuation of any one of the systems.

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

Exception No. 2: A dry or wet chemical system may be used to protect common exhaust ductwork by one of the methods specified in NFPA 17 and NFPA 17A in lieu of simultaneous automatic operation.

7-3.1.3 The operation of any extinguishing system shall automatically shut off all sources of fuel and heat to all equipment requiring protection by that extinguishing system. Any gas appliance not requiring protection but located under the same ventilating equipment shall also be shut off. All shutdown devices shall be considered integral parts of the system and shall function with the system operation. This equipment shall be of the type that requires manual resetting prior to fuel or power restoration.

7-3.1.4 The operation of any extinguishing system applicable to this standard shall automatically signal any central station fire alarm signaling system serving the occupancy wherein the extinguishing system is located, when such alarm system is present. Power to operate the extinuishing system shall be monitored by a supervisory alarm.

7-4 Review and Certification.

7-4.1 If required, complete drawings of the system installation including the hood(s), exhaust duct(s), and appliances, along with the interface of the fire extinguishing

system detectors, piping, nozzles, fuel shutoff devices, agent storage container(s), and manual actuation device(s) shall be submitted to the authority having jurisdiction.

7-4.2 Installation of systems shall be made only by persons properly trained and qualified to install the specific system being provided. The installer shall certify to the authority having jurisdiction that the installation is in complete agreement with the terms of the listing and the manufacturer's instructions and/or approved design.

NOTE: It is recommended that such training and qualification be by the manufacturer of the equipment being installed.

7-5 Portable Fire Extinguishers.

7-5.1 Portable fire extinguishers required by 7-2.1 shall be installed in kitchen cooking areas in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, Table 3-3.1 for Extra (high) Hazard.

NOTE: The system used to rate extinguishers on 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 suitable for this application. Extinguishers containing sodium bicarbonate or potassium bicarbonate dry chemical and potassium carbonate solutions are considered suitable; others may not be due to agent characteristics. Manufacturer's recommendations should be followed.

7-5.2 Other fire extinguishers in the kitchen area shall be installed in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*

Chapter 8 Procedures for the Use and Maintenance of Equipment

8-1 Operating Procedures.

8-1.1 Exhaust systems shall be operated during all periods of cooking.

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

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

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

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

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

8-2 Inspection.

8-2.1 An inspection and servicing of the fire extinguishing system by properly trained and qualified persons shall be made at least every six months.

NOTE: It is recommended that such training and qualification be by the manufacturer of the equipment being inspected and serviced.

8-2.1.1 All actuation components including remote manual pull stations, mechanical or electrical devices, detectors, actuators, etc., shall be checked for proper operation during the inspection in accordance with the manufacturer's listed procedures. In addition to these requirements, specific inspection requirements in the applicable NFPA standard (*see 7-2.2.2*) shall also be followed.

8-2.1.2 Fusible links and automatic sprinkler heads shall be replaced at least annually or more frequently if necessary to ensure proper operation of the system. Other detection devices shall be serviced or replaced in accordance with the manufacturer's recommendations.

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

8-2.1.3 If required, certificates of inspection and maintenance shall be forwarded to the authority having jurisdiction.

8-3 Cleaning.

8-3.1 Hoods, grease removal devices, fans, ducts, and other appurtenances shall be cleaned to bare metal at frequent intervals prior to surfaces becoming heavily contaminated with grease or oily sludge. They shall be inspected at least every six months.

NOTE: Depending on the amount of cooking equipment usage the entire exhaust system, including grease extractors, should be inspected daily or weekly to determine if grease or other residues have been deposited within. When grease or other residues are in evidence as deposits within the hood, grease removal devices or ducts, or both, the system should be cleaned in accordance with Section 8-3.

8-3.1.1 When a vent cleaning service is used, a certificate showing date of inspection or cleaning shall be maintained on the premises. Areas not cleaned shall be noted.

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

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

8-3.4 Care shall be taken not to apply cleaning chemicals on fusible links or other detection devices of the automatic extinguishing system.

8-3.5 WHEN CLEANING PROCEDURES ARE COMPLETED, ALL ELECTRICAL SWITCHES, DETECTION DEVICES, AND SYSTEM COMPONENTS SHALL BE RETURNED TO AN OPERABLE STATE BY QUALIFIED PERSONNEL IN ACCORDANCE WITH 7-4.2. COVER PLATES SHALL BE REPLACED, AND DAMPERS AND DIFFUSERS SHALL BE POSITIONED FOR PROPER AIRFLOW.

Chapter 9 Minimum Safety Requirements for Cooking Equipment

9-1 Cooking Equipment.

9-1.1 Cooking equipment shall be approved based on:

(a) Listings by a testing laboratory, or

(b) Test data acceptable to the authority having jurisdiction.

9-1.2 Installation.

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

9-1.2.2 All deep fat fryers shall be installed with at least a 16-in. (406.4-mm) space between the fryer and surface flames from adjacent cooking equipment.

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

Chapter 10 Referenced Publications

10-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

10-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 1990 edition

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 1989 edition

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1989 edition

NFPA 16, *Standard on Deluge Foam-Water Sprinkler Systems and Foam-Water Spray Systems*, 1991 edition

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 1990 edition

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 1990 edition

NFPA 70, *National Electrical Code*, 1990 edition

NFPA 80, *Standard for Fire Doors and Windows*, 1990 edition

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 1987 edition

10-1.2 ASTM Publication. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E136-1982, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

10-1.3 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

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

Appendix A

This Appendix is not a part of the requirements of this NFPA document but is included for information purposes only.

A-1-1 The application of NFPA 96 is concerned with the potential fire hazard of cooking operations, irrespective of the type of cooking equipment used, whether used in public or private facilities.

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

A-1-2 See Table A-1-2.

A-1-3.2 See Figures A-1-3.2(a)–(f).

A-2-3.1.2 See Figure A-2-3.1.2.

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

TYPE OF WALL ASSEMBLY	Classification for determining hood and grease duct clearance * NONCOMBUSTIBLE	LIMITED-COMBUSTIBLE	COMBUSTIBLE
brick, clay tile, or concrete masonry products	✓		
plaster, ceramic or quarry tile on brick, clay tile or concrete masonry products	✓		
plaster on metal lath on metal studs	✓		
gypsum board on metal studs		✓	
solid gypsum board * *		✓	
plaster on wood lath or metal lath, on wood studs			✓
gypsum board on wood studs			✓
plywood or other wood sheathing on wood or metal studs			✓
TYPE OF FLOOR-CEILING OR ROOF-CEILING ASSEMBLY			
plaster applied directly to underside of concrete slab	✓		
suspended membrane ceiling			
a) with noncombustible mineral wool acoustical material	a) ✓		
b) with combustible fibrous tile			b) ✓
gypsum board on steel joists, concrete slab		✓	
gypsum board on wood joists			✓

* See clearance requirements in 1-3.2.

** Solid gypsum walls and partitions, 2" or 2 1/4" thickness, are described in the *Fire Resistance Design Manual* published by the Gypsum Association, Washington, DC.

Note 1: Wall assembly descriptions assume same facing material on both sides of studs.

Note 2: Categories are not changed by use of fire retardant treated wood products.

Note 3: Categories are not changed by use of type X gypsum board.

Note 4: See definitions of combustible, limited-combustible, and noncombustible in Section 1-2, Definitions.

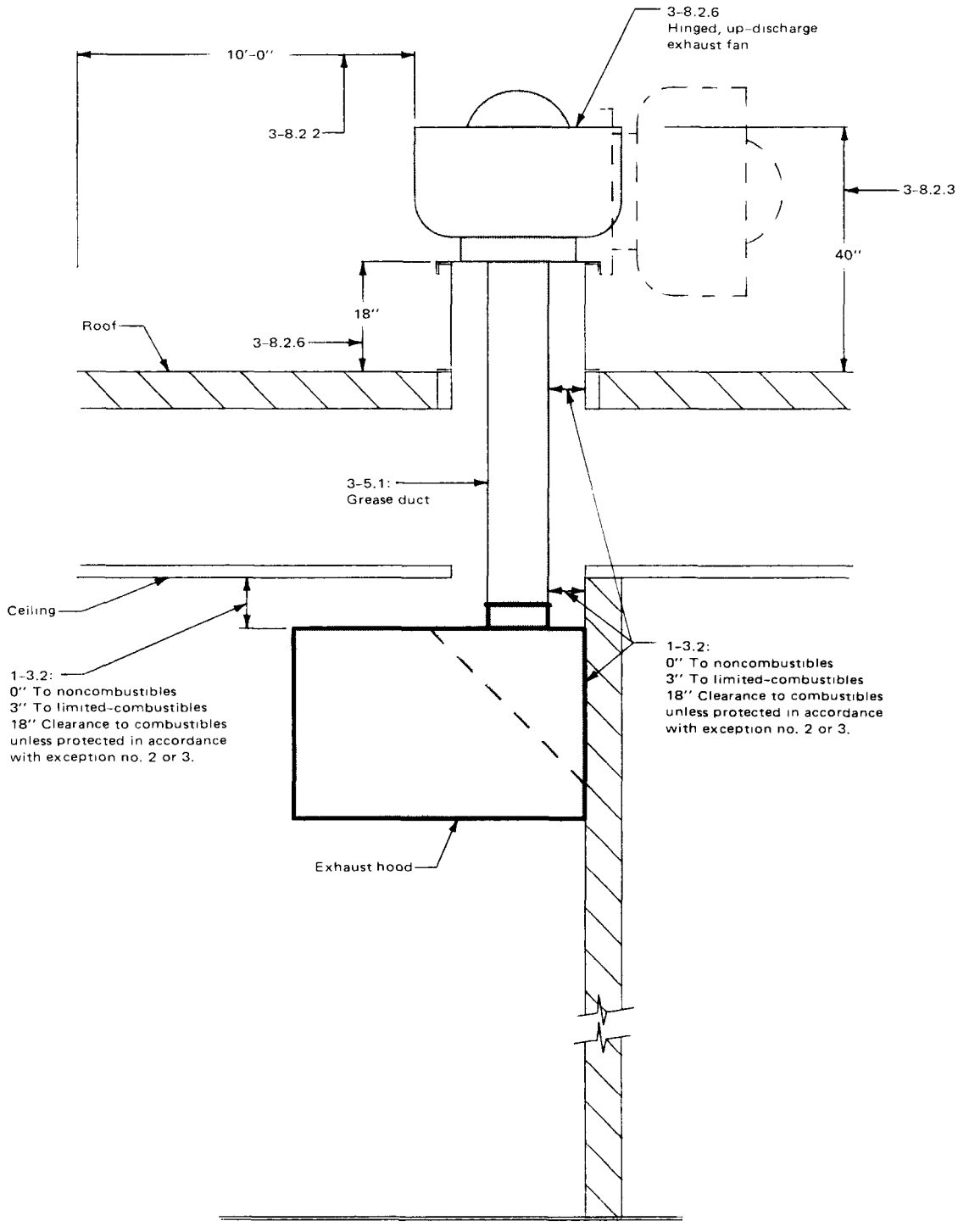


Figure A-1-3.2(a) Typical section view for one-story building without fire-rated roof-ceiling assembly.

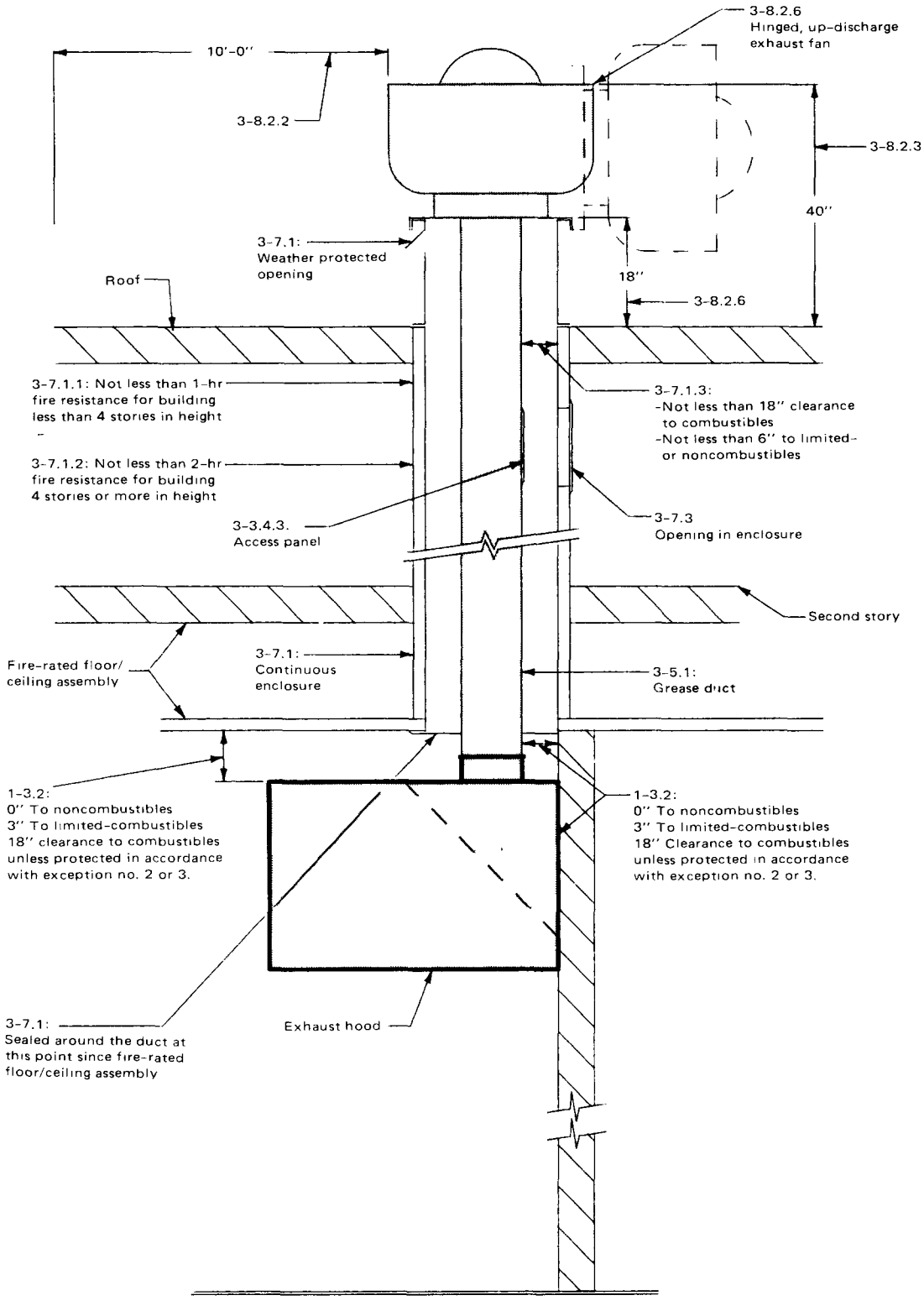


Figure A-1-3.2(b) Typical section view for building with two-stories or more with fire-rated floor-ceiling assembly.

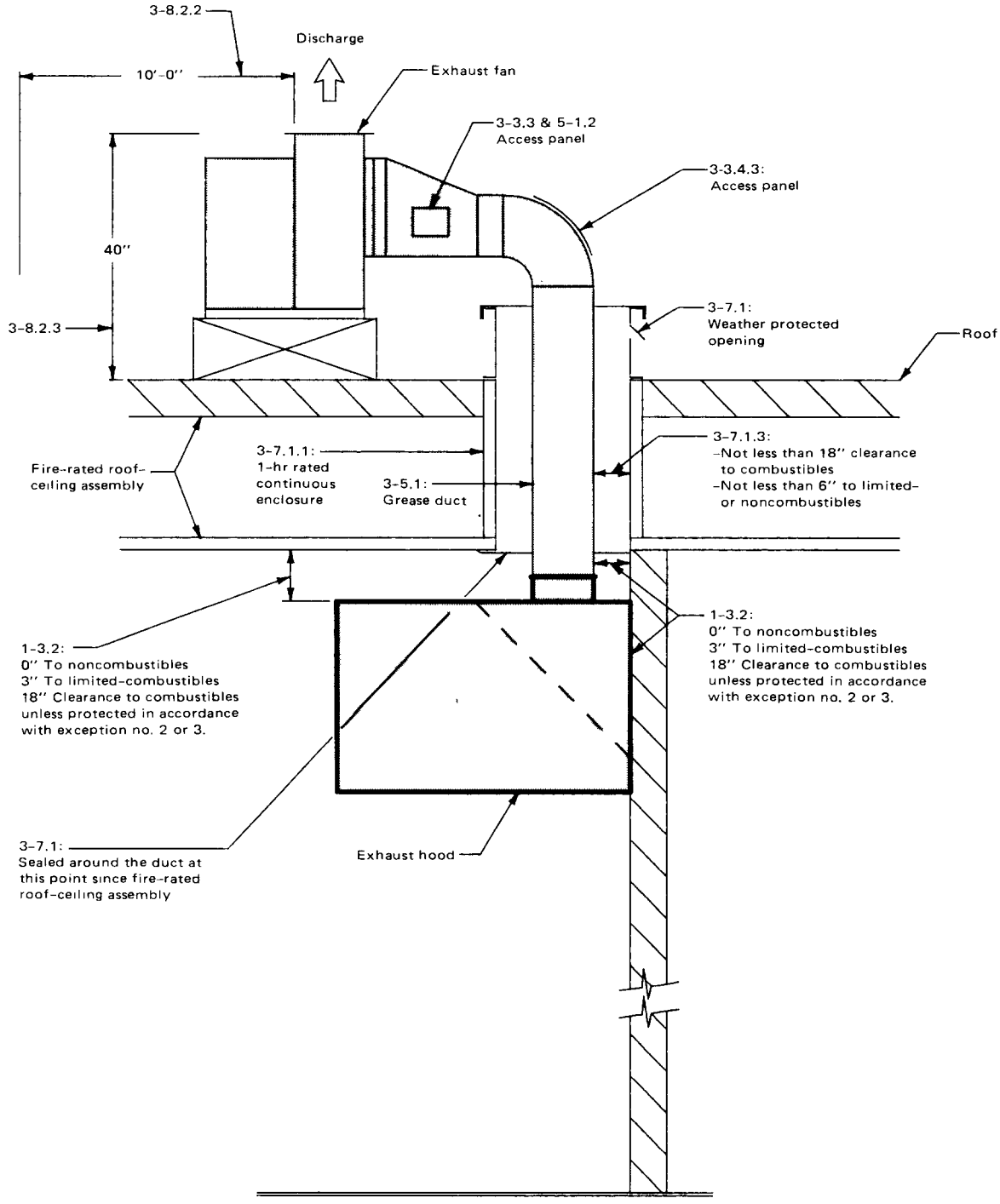


Figure A-1-3.2(c) Typical section view for one-story building with fire-rated roof-ceiling assembly.

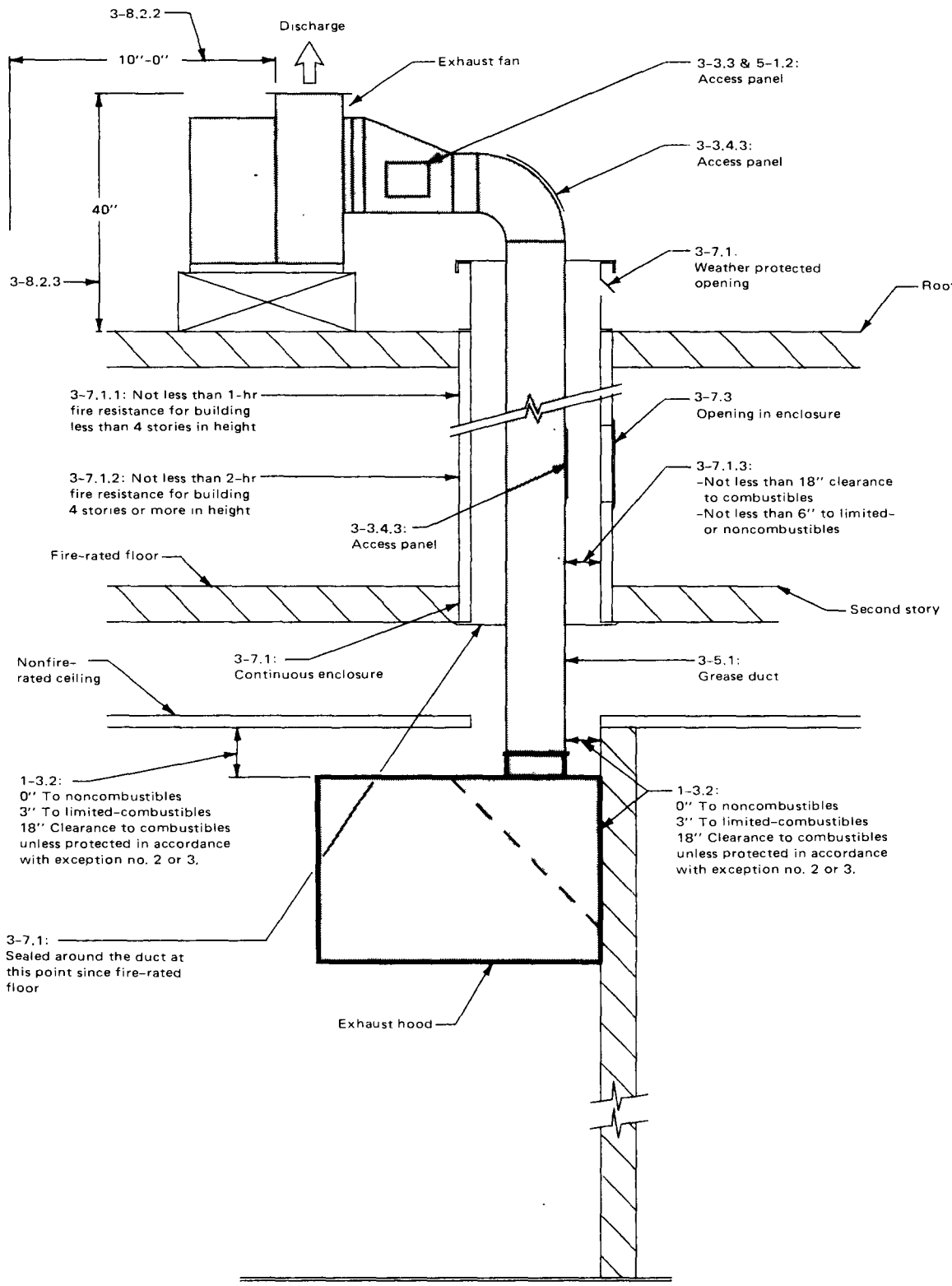


Figure A-1-3.2(d) Typical section view for building with two stories or more with nonfire-rated ceiling and fire-rated floor.

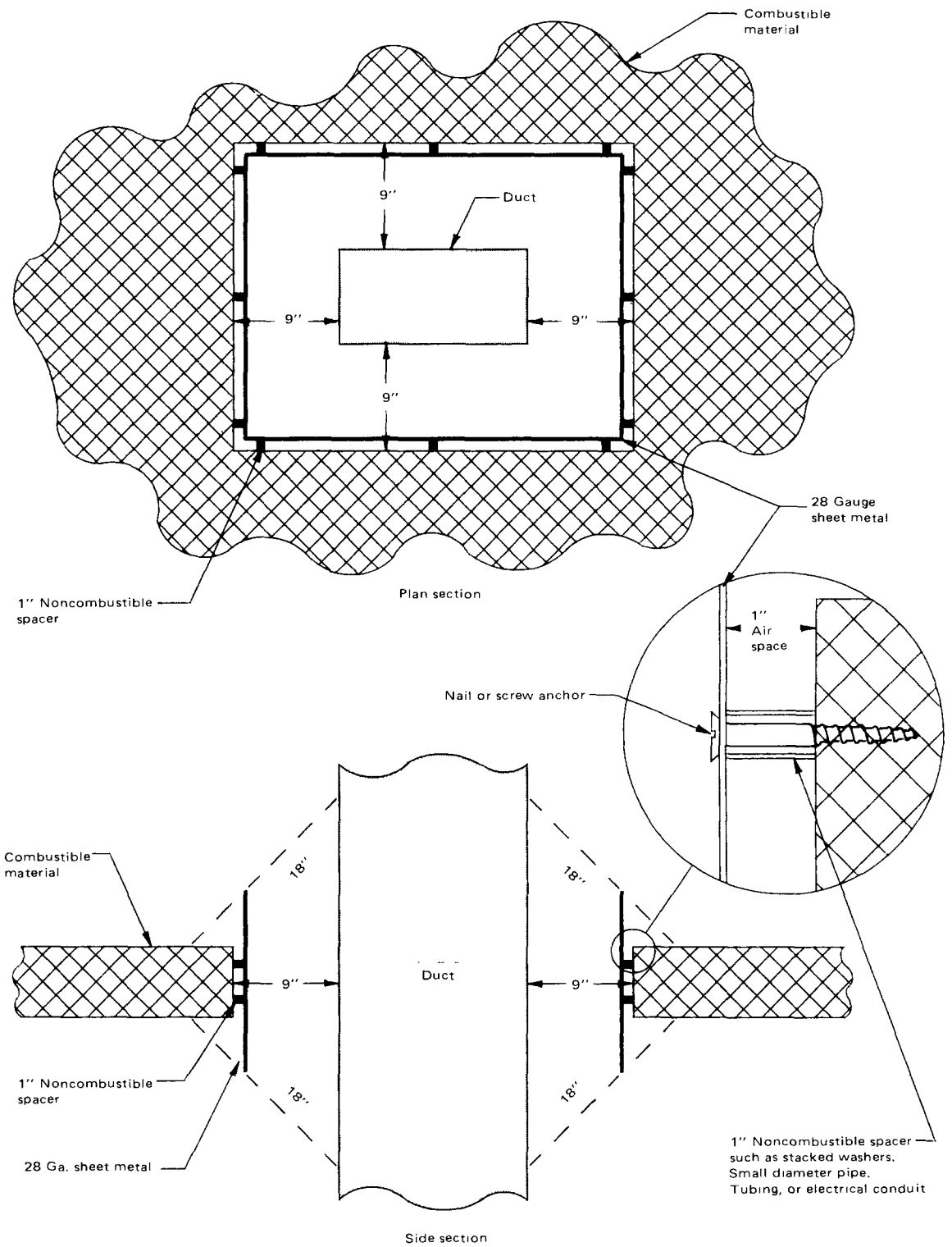


Figure A-1-3.2(e) Example of clearance reduction system (a); 9 in. clearance to combustible material.

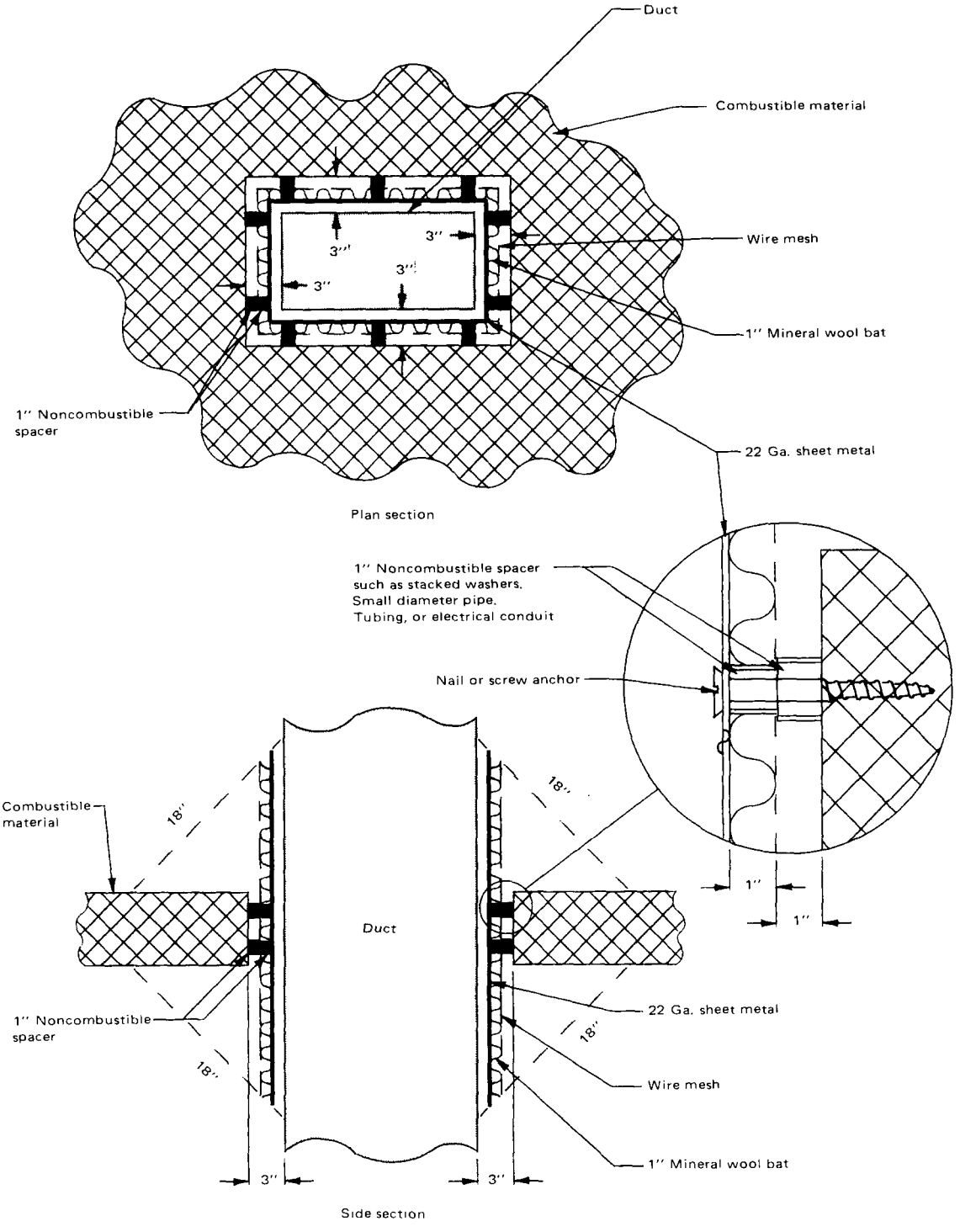


Figure A-1-3.2(f) Example of clearance reduction system (b); 3 in. clearance to combustible material.

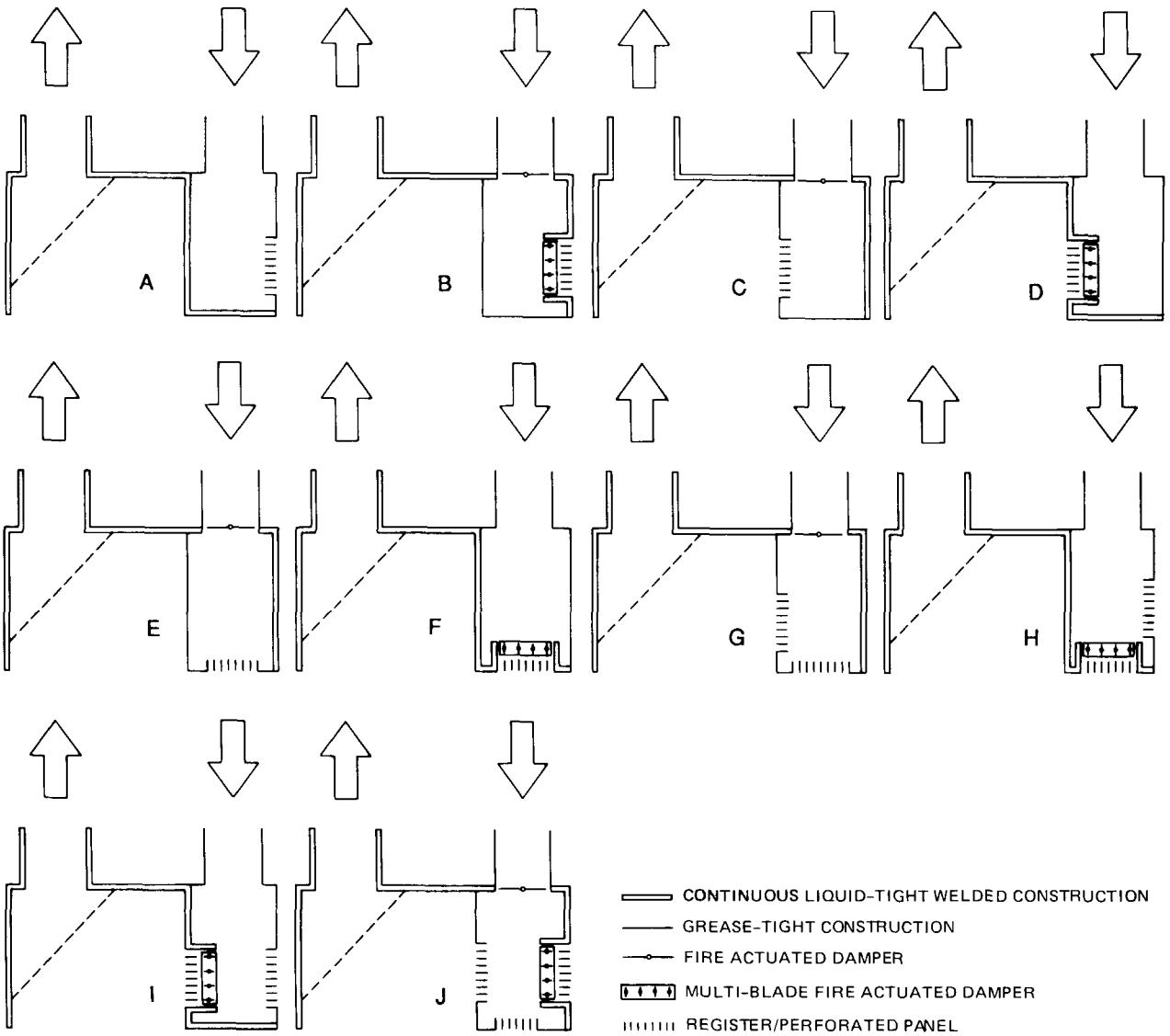


Figure A-2-3.1.2 Examples of exhaust hood assemblies with integrated supply air plenums. See requirements in Section 2-3.

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Tentative Interim Amendment

NFPA 96

Vapor Removal from Cooking Equipment

1991 Edition

Reference: Chapter 11
T.I.A. 91-1

Pursuant to Section 15 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 96, *Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment,* 1991 edition. The TIA was processed by the Venting Systems for Cooking Appliances Committee and was issued by the Standards Council on October 4, 1991.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a Proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Add definition to Section 1-2 as follows:

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

2. Add new Chapter as follows:

Chapter 11 Recirculating Systems

11-1 Recirculating systems containing or for use with appliances used in processes producing smoke or grease-laden vapors shall be equipped with components complying with the following:

(a) The clearance requirements of 1-3.2,

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

(c) Grease removal devices complying with Chapter 4,

(d) The air movement requirements of Chapter 5,

Exception: 5-2.1 and 5-2.3.

(Continued)

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

(f) Fire extinguishing equipment complying with the requirements of Chapter 7, Exception: references to ducts.

(g) The use, and maintenance requirements of Chapter 8,

(h) The minimum safety requirements of Chapter 9,

(i) All the special requirements of Chapter 11.

11-2 Design Restrictions. All recirculating systems shall comply with the following:

11-2.1 Only gas or electric fueled cooking appliances shall be incorporated. Gas fueled appliances shall not have the combustion flue outlet(s) directly connected to the recirculating system. Gas fueled appliances shall have a minimum 18 in. (457.2 mm) clearance from the flue outlet to the filter inlet in accordance with subsection 4-2.2 and shall meet the installation requirements of NFPA 54 or 58.

11-2.2 Recirculating systems shall be listed with a testing laboratory. There shall be no substitution or exchange of cooking appliances, filter components, blower components, or fire extinguishing system components that would violate the listing of the appliance.

11-2.3 A single recirculating system shall not use a fryer(s) exceeding a total cooking surface area of 400 square inches or exceed a total of 22 kW or 75,000 Btu/hr. input or use appliances that exceed a total of 55 kW or 187,700 Btu/hr input.

11-2.4 Open broilers and open conveyor-type ovens and broilers shall not be permitted.

Exception No. 1: Open conveyor-type ovens used for warming or baking products that do not produce grease-laden vapors.

Exception No. 2: Open conveyor-type ovens used exclusively for baking pizza.

11-2.5 A fire-actuated damper shall be installed at the exhaust outlet of the system. The damper shall be constructed of at least the same gauge as the shell. The actuation device shall have a maximum temperature rating of 286°F (141°C).

11-2.6 No electrical wiring is to be installed in the interior sections of the hood plenum that may become exposed to grease.

11-2.7 The power supply for any electrostatic precipitator (ESP) shall be of the "cold spark" ferro-ressonant type in which the voltage falls off as the current draw of a short increases.

11-2.8 Listing evaluation shall include the following:

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

(b) Grease discharge at the exhaust outlet of the system not to exceed an average of $5 mg/m^3$ of exhausted air sampled at maximum product capacity over a continuous 8 hour test per EPA Test Method 202, *Determination of Condensible Particulate Emissions from Stationary Sources.*

(Continued)

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

(d) Electrical connection in the field only with permanent wiring to an appropriately sized disconnect or junction box.

11-3 Interlocks. The recirculating system shall be provided with interlocks of all critical components such that if any of these are interrupted, the cooking appliance shall not be able to operate.

11-3.1 All closure panels encompassing airflow sections shall have interlocks to assure the panels are in place and fully sealed.

11-3.2 Each filter component (grease and odor) shall have an interlock to prove the component is in place.

11-3.3 Each ESP shall have a sensor to prove its performance is as designed, with no interruption of the power to exceed 2 min. This shall be a manual reset device or circuit.

11-3.4 An airflow switch or transducer shall be provided between the last filter component and the exhaust fan to ascertain that a minimum airflow is maintained. This device is to open the interlock circuit when the airflow falls a minimum of 10 percent below its listed minimum rating. This shall be a manual reset device or circuit.

11-4 Location and Application Restrictions. The location of recirculating systems shall be reviewed by the authority having jurisdiction. Items to be reviewed shall include, but not be limited to, life safety, combustibility of surroundings, proximity to air vents, and total fuel load.

11-5 Additional Firesafety Requirements.

11-5.1 In addition to the appliance nozzle(s), there shall be a fire extinguishing nozzle installed immediately before or after the first grease filter, and between the last grease or odor filtration unit and the blower.

11-5.2 In addition to any other fire extinguishing system actuation device, there shall be a fire extinguishing system actuation device installed downstream of any ESP.

11-5.3 If not covered by 7-3.1.4, there shall be a smoke or fire detector located above the recirculating system that will sound an alarm in the immediate vicinity and in the manager's office.

11-5.4 Requirements of Section 7-5 shall also apply to recirculating system locations.

11-6 Use and Maintenance.

11-6.1 Automatic or manual covers on cooking appliances, especially fryers, shall not interfere with the application of the fire suppression system.

(Continued)

11-6.2 The primary grease filter (the first filter in line) shall be cleaned a minimum of once per day.

11-6.3 Any ESP(s) shall be cleaned a minimum of once per week following the manufacturer's cleaning instructions.

11-6.4 The entire hood plenum and the blower section shall be cleaned a minimum of once every three months.

11-6 5 Inspection and testing of the total operation and all safety interlocks shall be performed a minimum of once per month in accordance with the manufacturer's instructions.

11-6.6 A signed and dated log of maintenance performed in 11-6.3 through 11-6.5 shall be available on the premises for the authority having jurisdiction.