



# ENGINEERING DATA

Aerovent • Twin City Fan & Blower • Clarage

## NFPA - 96

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

#### Introduction

This Engineering Data letter is a summary of the major points covered by the NFPA 96 standard and is not to be construed as a reprint of the standard. All the information contained in the standard and exceptions to the standard may not be fully covered in this summary. It will give you an overall view on what is required by this standard.

#### Origin and Development

The NFPA Committee on Blower and Exhaust Systems first considered the subject of the ventilation of restaurant cooking equipment. The committee developed material on the ventilation of restaurant cooking equipment and included it in NFPA 91, *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying*. In 1946 the Association adopted this and revisions were adopted in 1947 and 1949.

When the NFPA Committee on Chimneys and Heating Equipment was organized in 1955, the material on ventilation of restaurant cooking equipment in NFPA 91 was assigned to this new committee with the suggestion that it be revised and published as a separate standard. Over the years this new Committee made several revisions that were adopted by the Association through 1984 and in recent years the standard was published as NFPA 96.

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 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 the standard as it is known today.

#### General

NFPA 96 provides the minimum fire safety requirements related to the design, installation, operation, inspection, and maintenance of all public and private cooking operations except for single family residential usage. The 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 components or systems that are involved in the capture, containment and control of grease-laden cooking residue.

The provisions of this standard are considered necessary to provide a reasonable level of protection from loss of life and property from fire and explosion. This standard is intended to be applied as a whole. This standard cannot

provide safe design and operation if parts of it are not enforced or are arbitrarily deleted in any applications. The authority having jurisdiction (AHJ) shall determine compliance with this standard and authorize any deviations from it in all applications.

Cooking equipment that produces smoke or grease-laden vapors shall be equipped with an exhaust system that complies with all the equipment and performance requirements of this standard. All such equipment and performance also needs to be maintained per the requirements of this standard during all periods of operation. Specifically, the cooking equipment, hoods, ducts, fans, fire suppression systems and special grease collection or energy control equipment are to be kept in good working condition.

Airflows throughout all components of the system must be maintained at intervals necessary to keep the operating conditions of the equipment at the proper levels. All interior surfaces of the exhaust system shall be reasonably accessible for cleaning and inspection purposes.

Except where enclosures are required, hoods, grease removal devices, exhaust fans, and ducts shall have a clearance of at least 18 inches to combustible material, 3 inches to limited combustible material and 0 inches to non-combustible material. (See Fig. 1a - 1e.) This is only a guideline and there are several exceptions to these. Ultimately, the authority having jurisdiction (AHJ) has the final say in the acceptance or rejection of the installation.

In the event of a fire within the exhaust system, the system must be inspected by qualified personnel and approved by the AHJ to determine whether the system is structurally sound, capable of maintaining their fire protection function, and suitable for continued operation.

Clearances can be reduced by the installation of field applied or factory built grease duct enclosures. These must demonstrate that they provide sufficient mechanical and structural integrity, resiliency and stability when subjected to expected building environmental conditions, duct movement under general operating, and fire conditions.

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

#### Hoods

The hood or primary collection means designed for collecting the cooking vapors and residues must be constructed of and be supported by steel or stainless steel of a certain minimum thickness. Other approved materials of equivalent strength and fire and corrosion resistance may also be used.

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

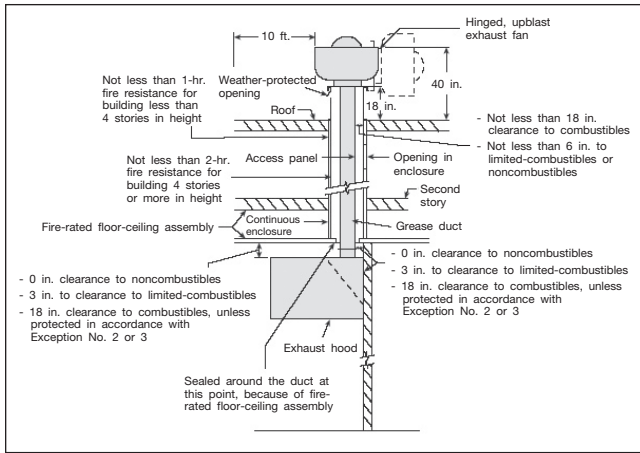


Figure 1d. Typical section view for one-story building without fire-rated roof-ceiling assembly

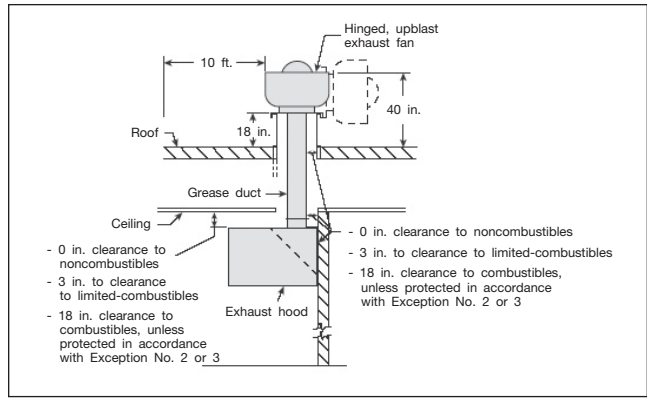


Figure 1b. Typical section view for one-story building with fire-rated roof-ceiling assembly

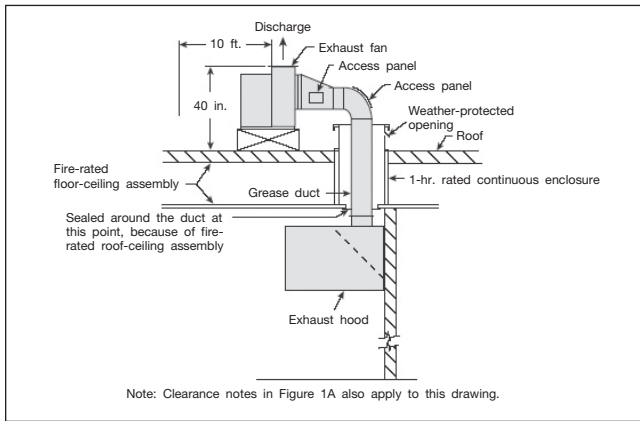


Figure 1e. Detail drawings showing hoods penetrating ceilings

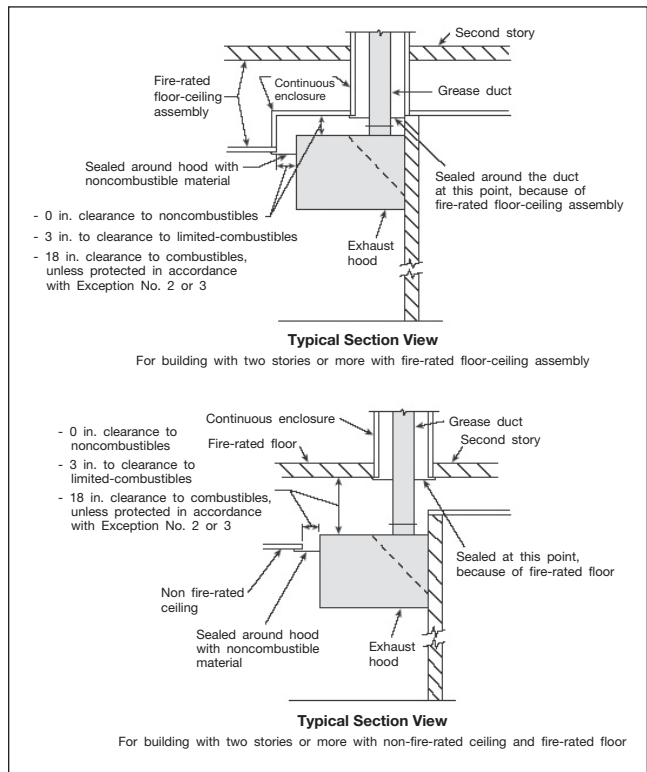
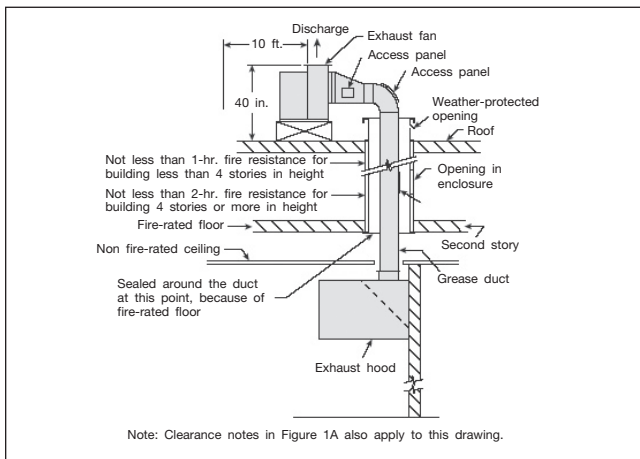


Figure 1c. Typical section view for building with two stories or more with non-fire-rated ceiling and fire-rated floor



The hood size must be of sufficient size and configured to capture and remove the grease-laden vapors. All seams, joints and penetrations of the hood must have a liquidtight continuous external weld on the lower outermost perimeter. Exhaust hood assemblies with integrated supply air plenums shall follow the same construction requirements.

A fire-actuated damper shall be installed in the supply air plenum at each point where a supply air duct inlet or supply air outlet penetrates the continuously welded shell. The actuation device shall have a maximum temperature rating of 286° F. Supply air plenums that discharge air from the face rather than from the bottom or into the exhaust hood and are isolated from the hood do not require a fire actuated damper.

All insulation materials, other than electrical insulation, must have a flame-spread rating of 25 or less in accordance with UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.

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

## Grease Removal Devices in Hoods

Listed grease filters, baffles, and other approved grease removal devices for use with commercial cooking equipment must be provided. Listed grease filters tested in accordance with UL 1046, *Grease Filters for Exhaust Ducts* must be used. Mesh filters are not permitted.

The distance between the grease removal device and the cooking surface must be as great as possible and not less than 18 inches. Where grease removal devices are used in conjunction with charcoal type broilers, a minimum of 4 ft. must be maintained.

Grease removal devices must be protected from combustion gases and direct flame impingement. This is accomplished by the installation of a steel or stainless steel baffle plate between the heat source and the grease removal device.

Grease filters must be listed and constructed of steel and or other listed equivalent material. These must be of rigid construction and must not distort or crush under normal operation, handling, and cleaning conditions.

The grease filters shall be easily accessible and removable for cleaning. They must be installed at an angle not less than 45 degrees from the horizontal. The filters must have a drip tray to collect grease and be pitched to drain into a metal container with a capacity not exceeding one gallon. Grease filters that require a certain orientation in order to drain grease must be clearly marked and constructed so that they cannot be installed incorrectly.

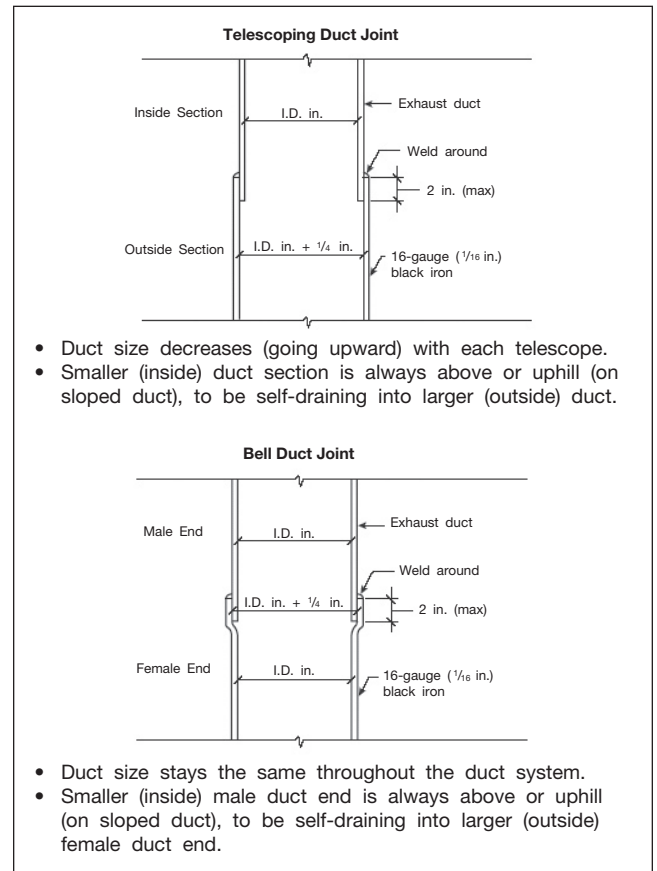
## Exhaust Duct Systems

Grease ducts shall not pass through a firewall but must lead as directly as possible to the exterior of a building. The duct systems cannot be interconnected with any other building ventilation or exhaust system. All ducts must be installed without forming dips or traps that may collect residues. In a common duct system with multiple inlets over several cooking appliances, the lowest end of the main branch must be connected flush on the bottom side with the branch duct.

Openings must be provided at the sides or top of a duct and at any changes in direction. Hoods with dampers must have an access panel for cleaning and inspection. Exhaust fans with ductwork mounted on both sides must have an access panel located within 3 ft of both sides of the fan. Horizontal ducts must have access panels located every 12 ft. These panels are to be 20" x 20" to allow for personnel to enter for inspection and cleaning. The panels must be grease-tight and use a gasket rated for 1500° F. The panels must be constructed of the same material and thickness as the duct. Each access panel in the duct system must have a sign stating "ACCESS PANEL - DO NOT OBSTRUCT."

Ducts must be constructed of and supported by carbon steel not less than 0.054 inches or stainless steel not less than 0.043 inches in thickness. All seams, joints, penetrations and duct to hood connections must have a liquidtight continuous external weld. Overlapping duct connections of either the telescoping or the bell type must be used for the field welded joints. Butt welded joints are not permitted. The inside duct sections must always be uphill of the outside duct sections. The difference between the inside dimensions of the two ducts to be joined must not exceed 1/4 inch and the overlap cannot exceed 2 inches. (See Fig. 2.)

Figure 2. Telescoping and Bell-Type Duct Connections



The exterior portion of the ductwork must be vertical wherever possible and be adequately supported to the exterior of the building with bolts, screws, rivets and other mechanical fasteners that do not penetrate duct walls.

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

In all buildings more than one story in height, and in one-story buildings where the roof or ceiling assembly is required to have a fire resistance rating, the ducts must be enclosed in a continuous enclosure. This enclosure must extend from the lowest fire-rated ceiling or floor above the hood through the roof so as to maintain the fire separation required by the applicable codes. The enclosure must be sealed all around the duct at the point of penetration of the lowest fire rated ceiling or floor above the hood. The enclosure shall be vented to the outside of the building through a weather protected opening.

If a building is less than four stories, the enclosure wall must have a fire rating of not less than 1 hour. In buildings four stories or more, the enclosure wall must have a fire rating of not less than 2 hours.

Clearance from the duct or the exhaust fan to the interior surface of the enclosure of combustible construction must not be less than 18 inches. The clearance from the duct to the interior surface of noncombustible or limited construction must not be less than 6 inches.

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

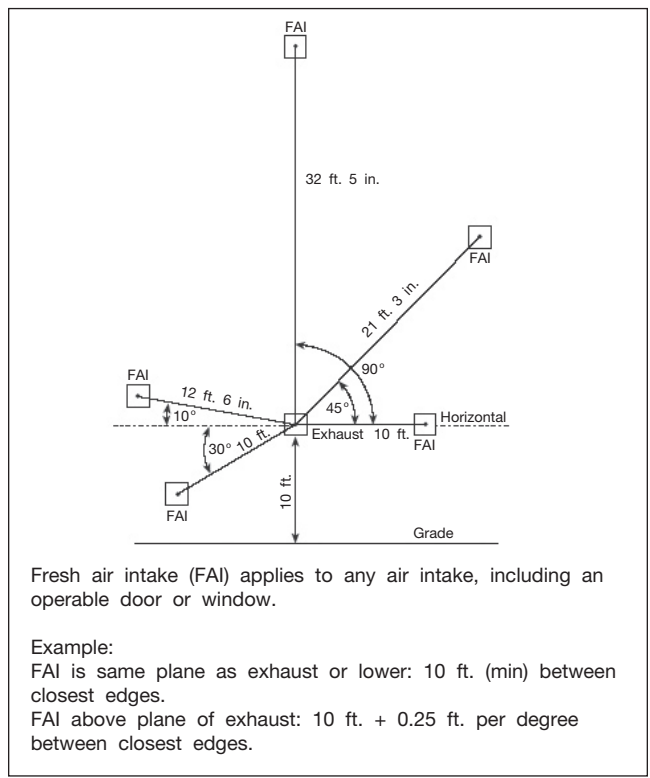
Rooftop terminations require a minimum 10-foot horizontal clearance from the outlet of an exhaust duct to any adjacent buildings, property lines, and air intakes. Where space is limited to prevent a 10-foot horizontal separation between, a vertical separation is permitted as long as the exhaust outlet is a minimum of 3 feet above any air intake located within 10 feet horizontally.

The exhaust flow must be directed up and away from the surface of the roof and have a minimum distance of 40 inches between the duct outlet and the surface of the roof.

The exhaust system must have a collection container to drain grease out of any traps or low points formed in the fan or duct near the discharge. The container must be non-combustible, closed, rainproof, structurally sound and not able to sustain combustion. The collection system cannot inhibit the performance of the fan. A hinged upblast exhaust fan is to be used on rooftops. This fan must be listed for use in commercial cooking applications. A safe access and work surface all around the fan must also be provided.

Installations with wall terminations on the outside of a non-combustible wall must have a minimum of 10 feet of clearance to any adjacent buildings, property lines, grade level, combustible construction, electrical equipment or lines. The closest point of air intake or operable door or window above the plane of the exhaust termination must be a minimum of 10 feet plus .25 feet for each 1 degree from horizontal, the angle being measured from the center of the exhaust termination to the center of the air intake. (See Fig. 3.)

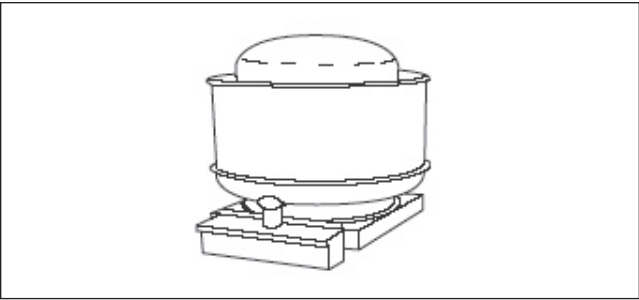
Figure 3. Exhaust termination distance from fresh air intake (FAI) or operable door or window



## Air Movement

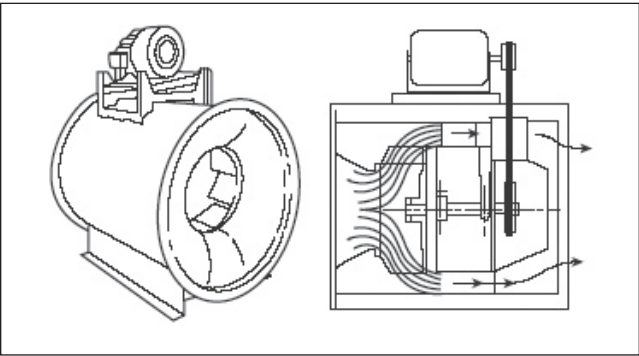
Upblast fans with the motors surrounded by the airstream shall be hinged, supplied with a flexible weatherproof electrical cable and a hold open retainer for servicing and cleaning, and be listed for this use. (See Fig. 4a.)

Figure 4a. Upblast fan



Inline fans shall have the motor located outside of the airstream and have the belts and pulleys protected from the airstream by a greasetight housing. (See Fig. 4b.) The fan must be securely bolted to the flanges of the exhaust duct using stainless steel bolts, nuts, lock washers and gasketing rated for 1500° F. Flexible connectors are not be used. (See Fig. 5b thru Fig. 5e.)

Figure 4b. Inline fan



If the design or positioning of the fan allows grease to be trapped, a grease drain directed to an accessible grease receptacle, not exceeding 1 gal, must be supplied. Inline fans shall be located in an easily accessible area to allow for service and removal.

Utility set exhaust fans (See Fig. 4c.), if installed at the rooftop termination point, shall meet the requirements for rooftop termination installations. If the fan is installed in a building, it shall be accessible for service and removal. The fan must be connected with flanges to the exhaust duct and securely bolted. Fans shall have a drain directed to a grease receptacle.

Figure 4c. Utility set fan

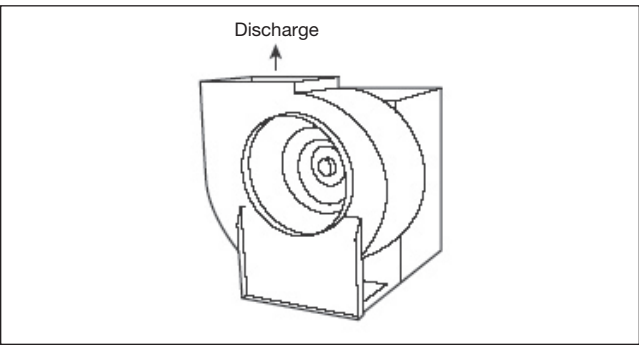


Figure 5b. Typical section of duct-to-fan connection — butt joint method

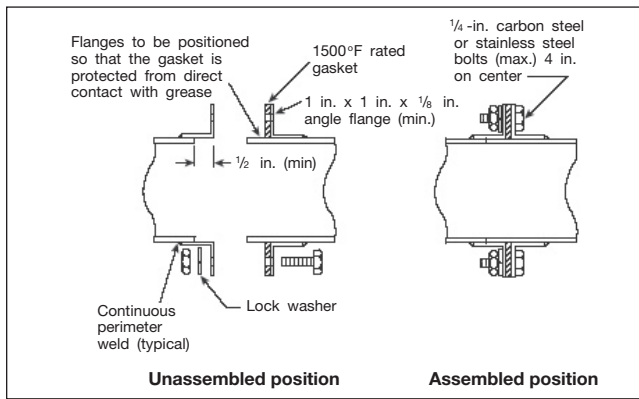


Figure 5c. Typical section of duct-to-fan connection — overlapping method

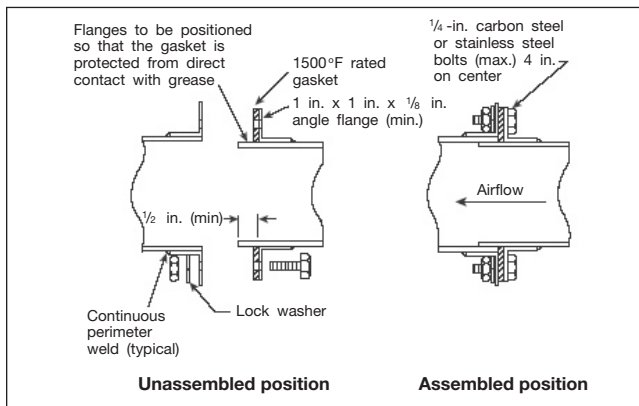


Figure 5d. Typical section of duct-to-fan connection — sealant method

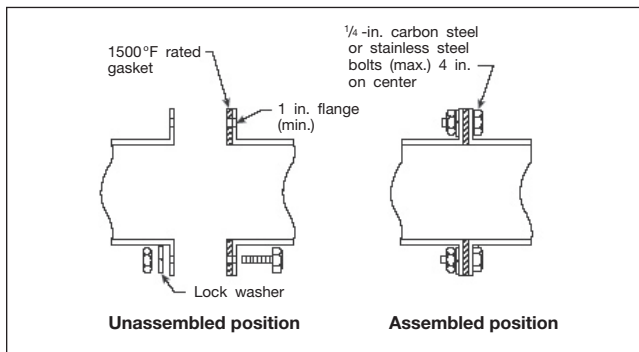
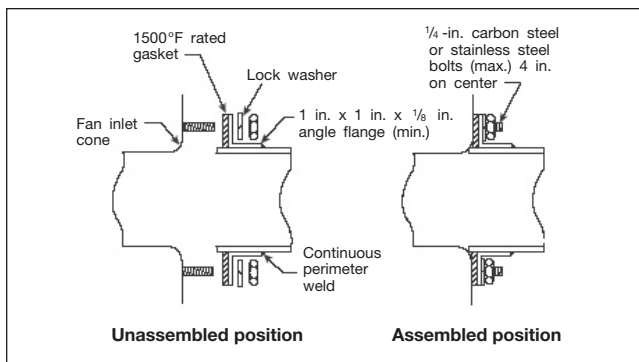


Figure 5e. Typical section of duct-to-fan connection — direct to fan inlet cone method



Exhaust fan housings shall be constructed of carbon steel not less than .054 inches thick or stainless steel not less than .043 inches thick or, if listed, constructed in terms of their listing. Openings for cleaning, servicing and inspection along with clearances must conform to the requirements of this standard if installed within an enclosure.

The air velocity through a duct may not be less than 1500 feet per minute. Exhaust air volumes for hoods must be of a sufficient level to provide for the capture and removal of the grease-laden cooking vapors.

The exhaust system in a hood must continue to operate after the extinguishing system has been activated unless a fan shutdown is required by a listed component in the ventilation system or by the design of the extinguishing system. It shall not be required to restart the hood exhaust fan when the extinguishing system is activated if the exhaust fan and all cooking equipment served by the fan had previously been shut down.

Replacement air quantity shall be adequate to prevent negative pressures in the cooking area from exceeding 0.02 inches water column.

Master kitchen exhaust ducts that serve multiple tenants shall include provisions to bleed air from the outdoors or adjacent spaces into the master exhaust duct in order to maintain the minimum air velocity required in the master duct. This bleed air duct shall connect to the top or side of the master exhaust duct and have a fire damper at least 12 inches from the exhaust duct connection. The damper must be adjustable in order to regulate the volume of air into the master duct. A bleed air duct shall not be used for the exhaust of grease-laden vapors. Unused tenant exhaust connections into the master exhaust duct that are not being used as bleed air connections are to be disconnected and sealed.

## Auxiliary Equipment

Dampers and wiring systems cannot be installed in exhaust ducts or exhaust systems. Motors, lights, and other electrical devices shall not be installed in ducts or hoods or located in the airstream unless they are specifically listed for such use.

Lighting units used in hoods shall be listed for use over commercial cooking appliances and installed per the terms of their listing. Lighting units on hoods shall not be located in concealed spaces unless they are part of the hood or specifically listed for such use.

Fume incinerators, thermal recovery units, air pollution control devices, or other devices are permitted to be installed in ducts, hoods and located in the path of travel if specifically approved for such use. Downgrading or modifying other parts of the exhaust system as a result of installation of these devices is not permitted.

Any equipment that provides secondary filtration or air pollution control and is installed in the airstream must be equipped with an approved fire extinguishing system. If the equipment can be a source of ignition, it must be equipped with an appropriate detection device able to trigger the extinguishing system.

## Fire Extinguishing Equipment

Fire extinguishing equipment for the protection of the grease removal devices, hood exhaust plenums, exhaust duct systems, and cooking equipment must be provided as part of the system. This equipment shall include both automatic fire extinguishing systems as the primary protection and portable extinguishers as the secondary backup. Each portable fire extinguisher located in the

cooking area must have a placard demonstrating the use of the extinguishers.

Automatic fire extinguishing systems shall comply with standard UL300, *Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, or other equivalent standards and shall be installed in accordance with the terms of their listing and per the manufacturer's instructions. They also must comply with the following standards where applicable.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*

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

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*

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

Grease removal devices, hood exhaust plenums, and exhaust ducts requiring protection can be equipped with a listed fixed baffle hood containing a constant or fire actuated water wash system. Each area not provided with a water wash system must be equipped with an appropriate fire suppression system. The water supply can come from the domestic water supply as long as the pressure and flow are in accordance with the terms of the listing for the fixed baffle. A low pressure switch must monitor the water to the baffle.

Upon activation of any of the fire extinguishing systems for the cooking operation, all sources of fuel and electric power that produces heat to all equipment requiring protection must automatically shut off. Steam supplied from an external source and solid fuel cooking operations are the exceptions. Any gas appliance not requiring protection, but located under the same ventilating equipment, shall also automatically shut off upon activation of any extinguishing system. All shutoff devices require a manual reset.

A readily accessible means for manual activation must be located between 42 inches and 60 inches above the floor that clearly identifies the hazard protected. The manual and automatic means of system activation external to the control head must also be separate and independent of each other so that a failure of one does not impair the operation of the other. The means for manual actuation shall be mechanical and shall not rely on any electrical power for actuation.

Upon activation of an automatic fire extinguishing system, an audible alarm or visual indicator must be provided to show that the system has been activated. Where a fire alarm system is serving the occupancy, the activation of the fire extinguishing system shall trigger the fire alarm signaling system. If electrical power is required to operate an automatic fire extinguishing system, it shall be monitored by a supervisory alarm with a standby power supply.

If required, a complete set of drawings of the system installation, including hood, exhaust duct, and appliances, along with the interface of the fire extinguishing system detectors, piping, nozzles, fuel shutoff devices, agent storage containers, and manual actuation devices shall be submitted to the authority having jurisdiction (AHJ).

Only persons properly trained and qualified to install the specific systems shall perform installation of the systems. The installers shall provide certification to the AHJ that the installation is in compliance with the terms of the listing and the manufacturer's instructions and/or approved design.

Portable fire extinguishers must be installed in cooking areas in accordance with NFPA 10. Such extinguishers

shall use agents that saponify upon contact with hot grease such as sodium bicarbonate and potassium bicarbonate dry chemical and potassium carbonate solutions. Class B gas type portables, such as CO<sub>2</sub> and halon, are not permitted in cooking areas.

## Procedures for Use and Maintenance of Equipment

Exhaust systems must be operated whenever cooking equipment is turned on. Filter equipped exhaust systems are not permitted to be operated with the filters removed. Openings provided for make up air through the ventilating equipment cannot be restricted by covers, dampers, or any other means that would reduce the operating efficiency of the exhaust system.

Instructions for manually operating the fire extinguishing system must be posted in a conspicuous location in the kitchen and be periodically reviewed with employees by management. Cooking equipment may not be operated while the fire extinguishing or exhaust system is non-operational.

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

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

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

If required, certificates of inspection and maintenance shall be forwarded to the authority having jurisdiction (AHJ).

Hoods, grease removal devices, fans, ducts, and other appurtenances shall be cleaned to bare metal and coated with powder or other substance at frequent intervals. A properly trained, qualified, and certified company or person acceptable to the AHJ shall inspect the entire exhaust system.

The frequency of inspections shall be as follows:

- Solid fuel cooking operations shall be inspected monthly.
- High volume cooking operations such as 24-hour, charbroiling or wok shall be inspected quarterly.
- Moderate cooking volumes shall be inspected semiannually.
- Low volume cooking operations such as churches, day camps, seasonal businesses, or senior centers shall be inspected annually.

If upon inspection, the system is found to be contaminated with deposits, the entire system shall be cleaned. When a cleaning service is used, a certificate showing the date of inspection or cleaning shall be maintained on the premises. A label is to be placed in the kitchen area by the cleaning contractor showing the name of the company and the date of cleaning.

Flammable solvents or other flammable cleaning aids shall not be used. At the start of the cleaning process, electrical switches that could be activated accidentally shall be locked out. Components of the fire suppression system shall not be rendered inoperable during the cleaning process. Care should always be taken not to apply

chemicals to fusible links or other detection devices of the automatic extinguishing system. When the cleaning operation is completed, all electrical and system components shall be returned to an operable state.

## Cooking Equipment

Cooking equipment shall be approved based on listings by a test laboratory or test data acceptable to the authority having jurisdiction (AHJ). All listed appliances shall be installed in accordance with the terms of their listings and the manufacturer's instructions.

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

All deep fat fryers must be installed with at least 16 inches of clearance between the fryer and surface flames from adjacent appliances. Deep fat fryers shall be equipped with a separate high limit control in addition to the adjustable thermostat used to shut off fuel when the fat temperature reaches 475° at 1 inch below the surface.

## Recirculating Systems

Recirculating systems that are used with appliances that produce smoke or grease-laden vapors must be equipped with components complying with the information in the following sections of this ED: *Hoods, Grease Removal Devices in Hoods, Air Movement, Auxiliary Equipment, Fire Extinguishing Equipment, Procedures for Use and Maintenance of Equipment, and Cooking Equipment*. They must also meet all the requirements of this section.

Only gas or electrically fueled cooking appliances may be used. Gas fueled appliances cannot have the combustion flue outlet directly connected to the recirculating system. They must have a minimum of an 18-inch clearance from the outlet to the filtered inlet in accordance with the installation requirement of NFPA 54, *National Fuel Gas Code*, or NFPA 58, *Liquefied Petroleum Gas Code*.

Recirculating systems must be listed with a testing laboratory and not be modified in any way during installation that would violate the terms of the listing. This would include cooking appliances, filter components, blower components or fire extinguishing equipment.

A fire actuated damper must be installed at the outlet of the system. As a minimum, the damper must be constructed using the same gauge of material as the shell. The maximum temperature rating shall be 375° F.

No electrical wiring can be installed in the interior of the hood that might be exposed to grease. Exceptions are permitted as long as they comply with NFPA 70, *National Electrical Code*.

The power supply of an electrostatic precipitator shall be of the "cold spark", ferro-resonant type in which the voltage falls off as the current draw of a short increases.

The recirculating system must be provided with interlocks of all critical components. All closure panels in the airflow section must have an interlock to ensure the panels are closed and fully sealed. Each filter component (grease or odor) must have an interlock to ensure that the component is in place. Each electrostatic precipitator shall have a sensor to prove its performance is as designed, with no interruption of power to exceed 2 minutes. This sensor must have a manual reset. An airflow switch must be provided after the last filter element to ensure that the minimum airflow is maintained. This switch will open the interlock circuit when the airflow falls to 25 percent

below normal or 10 percent below the listed minimum rating, whichever is lower. If any of these interlocks are interrupted, the cooking appliance shall not be able to operate.

In addition to the appliance nozzle, a recirculating system must be listed with the appropriate fire protection for the grease filters, grease filtration, odor filtration units, and ductwork. There shall be a fire extinguishing alarm device installed downstream of any electrostatic precipitators in the system.

Automatic or manual covers on cooking appliances, especially fryers, must not interfere with the fire suppression system. All filters must be cleaned or replaced in accordance with the manufacturer's instructions. All electrostatic precipitators must be cleaned a minimum of once per week per the manufacturer's instructions. The entire hood section and blower must be cleaned every three months. Testing and inspection of the total operation of the system must take place a minimum of once every six months. A signed and dated maintenance log must be maintained on the premises.

## Solid Fuel Cooking Operations

When a solid fuel cooking equipment manufacturer requires the unit to have a natural draft it must comply with the information in the *Exhaust Duct Systems* section of this ED whether it is duct or hood. Wall terminations are prohibited. A hood and an exhaust system must cover any cooking appliance that allows effluent to escape from the appliance opening.

If the solid fuel cooking equipment is located in a space with other vented equipment, all vented equipment must have an exhaust system interlocked with the make up air system.

Solid fuel cooking operations must have a spark arrester to minimize the passage of sparks and embers into the plenums and ducts. If no hood is provided, a spark arrester must be provided to minimize the passage of sparks and embers into the flues and ducts.

Every appliance must be located with respect to the building and other equipment so as to permit easy access to the appliance. The cooking appliance cannot be installed in a confined space. The space must provide adequate room to permit circulation of heated air. The appliances may not be installed where gasoline or any flammable vapors may be present.

Hoods shall be sized and located in a manner capable of capturing and containing all of the effluent discharging from the appliances. The hood and exhaust system must comply with the following sections of this ED: *Hoods, Grease Removal Devices in Hoods, Exhaust Duct Systems, Air Movement, Auxiliary Equipment, and Fire Extinguishing Equipment*. All solid fuel cooking equipment served by the hood and duct system shall be separate from all other exhaust systems.

Grease removal devices shall be made from steel or stainless steel or be approved for solid fuel cooking. If sparks or embers can be generated, spark arrestors shall be used prior to the grease removal device. Filters shall have a minimum of 4 feet above the cooking appliance.

Exhaust systems must comply with the *Air Movement* section of this ED for hooded operation or shall be installed in accordance with the manufacturer's recommendation for unhooded applications. A make up air system must be provided to ensure a positive supply of replacement air at all times. The make up air system shall be interlocked with the exhaust system and powered to prevent the space from attaining negative pressure while the solid fuel appliance system is in operation.

Approved fire extinguishing equipment shall be provided to protect all solid fuel burning cooking appliances, grease removal devices, hoods, and duct systems. Approved equipment shall comply with the *Fire Extinguishing Equipment* section of this ED and shall be comprised of water based agents.

All solid fuel appliances with a firebox of 5 cubic foot volume or less shall at least have a 2-A rated water type or wet chemical fire extinguisher in accordance to NFPA 10 in the immediate vicinity of the appliance. Two portable fire extinguishers of at least 1½ gal. each and containing potassium citrate, potassium acetate, or potassium carbonate solutions shall be permitted instead of one 2-A rated extinguisher.

Solid fuel appliances with fireboxes exceeding 5 cu. feet must be provided with a fixed water pipe system with a hose in the immediate vicinity of the appliance. The water system must have a minimum pressure of 40 psi and a minimum flow of 5 gpm.

Solid fuel cooking appliances must be cleaned in accordance with the procedures found in the *Procedures for Use and Maintenance of Equipment* section of this ED. The combustion chamber must be scraped clean back to the original surface once each week and inspected for any deterioration or defects that may have weakened the chamber or reduced its insulation capabilities. Any deterioration or defects must be repaired immediately.

The flue or chimney must be inspected weekly for residues that have begun to restrict the vent or create any additional fuel source. The flue or chimney must be cleaned before any of these conditions exist. Any corrosion or physical damage found during cleaning that may reduce the flue's or chimney's capability to contain the effluent must be repaired or replaced.

Spark arrester screens located at the entrance of the flue or in the hood assembly must be cleaned prior to becoming heavily contaminated. Filters and filtration devices installed in the hood shall also be cleaned.

Solid fuel cooking appliances must be installed on floors of a non-combustible material that extends 3 feet in all directions from the appliance. Combustible and limited combustible materials installed within 3 feet of the sides and 6 feet above a solid fuel cooking appliance must be protected in a manner acceptable to the authority having jurisdiction (AHJ).

Fuel storage shall not exceed one day's supply in the same room as the cooking appliance or in the same room as the fuel loading or cleanout doors. Fuel shall not be stored above any heat-producing appliance or vent or closer than 3 feet. Fuel shall not be stored in the path of the ash removal.

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

All fuel storage areas shall be provided with a sprinkler system meeting the requirements of NFPA 13, *Standard for the Insulation of Sprinkler Systems*, and acceptable to

the AHJ or with a fixed pipe system having a hose in the immediate vicinity of the storage area able to reach all parts of the area.

Solid fuel must be ignited with a match, approved built in gas flame or other approved ignition source. Combustible or flammable liquids may not be used in the igniting process. Matches or other portable ignition sources may not be stored in the vicinity of the solid fuel appliance.

Long handled tongs, hooks or other devices shall be provided to safely add fuel, adjust the fuel position, and control the fire without having to reach into the firebox. Ash, cinders, and other debris shall be removed from the firebox at adequately regular intervals in order to prevent interference with the draft to the fire. All ash must be removed a minimum of once a day.

Any ash must be sprayed adequately with water before removal in order to extinguish any hot ashes and to control dust when the ash is moved. For these purposes, and to cool a fire that has become too hot and to stop all fires before leaving the premises, a water supply with a hose must be provided at the solid fuel appliance. The nozzle must produce a fine to medium spray of adequate length to reach the entire cooking chamber and have a manual shutoff. A full flow or strong stream nozzle is not permitted.

A 16-gauge steel container with a cover shall be used for the removal of ash. It shall not exceed a 20-gallon capacity. The container must be easily handled by any employee and shall pass through all passageways to the outside of the building. The container must always be covered when moving through the building. Tools must be provided so that ash removal can be accomplished without reaching into the chamber. The ashes must be sprayed with water before removal from the chamber and put into the ash container. When any holes appear from corrosion or damage in the container, it shall be repaired or replaced immediately. The ash is to be carried out to a separate metal container or dumpster used exclusively for that purpose.

Site built solid fuel cooking appliances must be submitted to the authority having jurisdiction (AHJ) before being considered for installation. They must be installed, operated, and maintained in accordance with the approved terms of the manufacturer's instructions and requirements set forth by the AHJ.

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

No solid fuel cooking device of any type is permitted to be used for deep fat frying involving more than one quart of liquid shortening, nor is it permitted to be within 3 feet of any deep fat frying unit.



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