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Ventilation of

RESTAURANT COOKING EQUIPMENT

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National Fire Protection Association

International

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This is one of a large number of publications on fire safety issued by the Association. All NFPA standards and recommended practices, including this text, are prepared by the technical committees of the NFPA and adopted at an Annual Meeting of the Association. They are intended to prescribe reasonable measures for minimizing losses of life and property by fire.

This text and most other NFPA standards and recommended practices are published in the **National Fire Codes**, a compilation of NFPA's official technical material, issued in seven clothbound volumes. Full information on the availability of these Codes and other NFPA publications can be secured from the Association.

Official NFPA Definitions

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations, or that which is advised but not required.

APPROVED refers to approval by the authority having jurisdiction.

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters. One foot = 0.3048 meters. One inch = 25.40 millimeters. One pound per square inch = 0.06805 atmospheres = 2.307 feet of water.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The suitability of devices and materials for installation under NFPA standards is indicated by the listing of nationally recognized testing laboratories, whose findings are customarily used as a guide to approval by agencies applying these standards. Underwriters' Laboratories, Inc., Underwriters' Laboratories of Canada, the Factory Mutual Laboratories and the American Gas Association (gas equipment) test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

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VENTILATION OF RESTAURANT COOKING EQUIPMENT

NFPA No. 96 — 1961

This 1961 Edition of the Standard on Ventilation of Restaurant Cooking Equipment supersedes the 1959 Edition. It contains a revision to Paragraph 22 and a new Appendix C that were adopted by the National Fire Protection Association on May 18, 1961 on recommendation of the Committee on Chimneys and Heating Equipment.

History

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 a new Section 500, Ventilation of Restaurant Type Cooking Equipment, to be included in NFPA Standard No. 91, Blower and Exhaust Systems, and on recommendation of the Committee, Section 500 was adopted by the Association in 1946. Revisions to the Section were adopted in 1947 and 1949. Successive editions of NFPA No. 91 have been adopted and published by the National Board of Fire Underwriters. The 1949 edition of the Standard for Blower and Exhaust Systems was approved by the American Standards Association on August 31, 1950 (ASA 233.1 — 1950).

When the NFPA Committee on Chimneys and Heating Equipment was organized in 1955, Section 500 of NFPA No. 91 was assigned to the Committee with the suggestion that the Section be revised and published as a separate standard.

Standard for
VENTILATION OF RESTAURANT COOKING EQUIPMENT

NFPA No. 96

1. Where Required.

11. Restaurant cooking appliances such as ranges, deep fat fryers, grills and broilers shall be provided with exhaust ventilating equipment to carry away the grease laden vapor effectively in a safe manner.

2. System Design.

21. The system shall be so designed as to confine cooking vapors and residues within the hood or other primary collection means installed at the cooking appliance.

22. The hood or other portion of the system designed for primary collection of cooking vapors and residues shall be constructed of steel, stainless steel or copper with tight joints and shall have a clearance of at least 18 inches to unprotected combustible material unless protection is provided in accordance with Appendix B.

23. Duct systems should be designed to create a conveying air velocity in the exhaust ducts of not less than that specified in Appendix A.

24. Exhaust systems shall be provided with grease filters conforming to paragraph 25 or other means of grease extraction or with fire extinguishing equipment conforming to paragraphs 51 and 52. In large systems, it is recommended that grease filters or other means of grease extraction be provided in addition to fire extinguishing equipment.

25. Grease filters or other means of grease extraction, if used, shall be of noncombustible construction designed for the specific purpose. The height of lowest edge of grease filters located above the cooking surface shall be not less than:

a. No exposed flame (grills, French-fryers, etc.) . 2½ feet
b. Exposed charcoal and charcoal type fires . . . 4½ feet
c. Exposed fires other than item b. . . . . 3½ feet

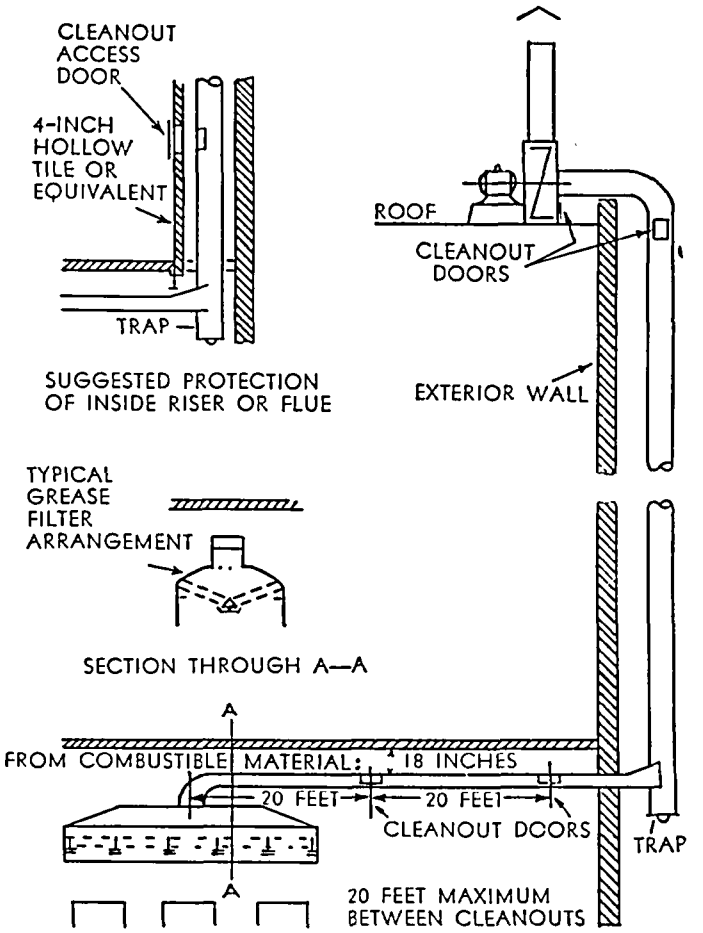

Fig. 1. Typical kitchen range exhaust system arrangement.

3. Ducts.

31. Ducts from hoods or other primary collection devices shall be constructed of No. 18 U. S. gage or heavier steel, or No. 20 U. S. gage stainless steel, with tight joints, and separated at least 18 inches from all unprotected combustible material

unless protection is provided in accordance with Appendix B. Inside laps in duct joints shall project in a direction against the air flow.

32. Ducts shall lead as directly as possible to outside.

33. Exhaust ducts shall constitute an independent exhaust system leading to the outside and shall not be connected with any other ventilating system.

34. Hand-holes, for inspection and cleaning purposes, equipped with tight-fitting sliding or swinging doors and latches, shall be provided in horizontal sections of exhaust ducts. Such openings should be at the sides of the horizontal run in order to prevent dripping of residue. Spacing of such openings shall not exceed 20 feet. Opening shall have a minimum dimension of 6 inches.

35. Vertical risers should be located outside of the building and adequately supported. If absolutely necessary to locate the riser inside the building, it shall be enclosed in a shaft preferably constructed of masonry at least the equivalent of 4-inch hollow tile, extending continuously from the first floor pierced and through the roof. Access openings shall be provided in the enclosure at each clean-out point. (See Fig. 1.)

36. At the base of each vertical riser a residue trap shall be provided, with provisions for cleanout.

37. Exhaust ducts shall not pass through fire walls. Where ducts pass through partitions or walls of combustible construction the clearance shall be 18 inches unless protection is provided in accordance with Appendix B.

38. Dampers shall not be installed in any portion of the exhaust system except under either of the following conditions:

a. Where a fixed pipe inert gas or dry chemical extinguishing system is provided, dampers may be installed at or near the outlet of the exhaust system to close automatically with the discharge of inert gas.

b. Where an approved arrangement of baffles or other means that effectively extracts grease is provided, dampers may be installed at the inlet of the exhaust system provided a fixed pipe inert gas or dry chemical extinguishing system is installed in the area where the grease is extracted.

39. Where dampers are installed as in paragraphs 38a and b they shall be installed to shut down the fan motor upon the automatic or manual closing of the damper. Dampers shall not be adjustable to any position except fully opened or fully closed. Dampers shall be readily accessible for inspection and cleaning.

4. Electrical Equipment and Control.

41. In addition to the fan motor control located near the fan, a remote control shall be installed near the cooking appliance. Automatic shutdown of the motor by means of one or more thermal operated units, located over the cooking appliance, is recommended.

42. All electrical equipment including lighting fixtures shall be installed in accordance with the National Electrical Code (NFPA No. 70), with due regard to the effects of fumes and grease on equipment located in the hood or otherwise in the path of fume travel.

NOTE: Grease, vapors and heat may have a deteriorating effect upon ordinary electrical insulation; excessive deposits on electrical fixtures and devices tend to increase operating temperatures above normal. "Vapor-tight" fixtures reduce the accumulation of grease deposits on internal electrical parts and insulation. Electrical equipment may be placed outside the path of fume travel by locating it on the outside of the hood with illumination through suitable glass panels in the hood.

5. Fire Extinguishing Equipment.

51. Approved fire extinguishing equipment of the following types should be provided:

a. Fixed pipe inert gas, dry chemical, or fine water spray systems, either manually controlled or provided with combined manual and automatic control; or

b. Portable inert gas or dry chemical extinguishers or portable water spray equipment.

52. The equipment shall be of such type and extent as to be acceptable to the authority having jurisdiction. (See Standard for Carbon Dioxide Extinguishing Systems; Standard for Water Spray Systems for Fire Protection; and Standard for Dry Chemical Extinguishing Systems appearing in National Fire Codes, Volume IV, Extinguishing Equipment, and NFPA Standards No. 12, 15 and 17 respectively. See also Standard for Portable Fire Extinguishers in National Fire Codes, Volume VII and published separately as NFPA No. 10.

6. Inspection and Cleaning.

61. The entire exhaust system shall be inspected periodically and cleaned as needed to remove deposits of residue and grease in the system. Thorough cleaning of ducts, hoods, and fans usually requires scraping, brushing, or other positive means.

62. Grease filters or other grease extraction means shall be cleaned whenever inspection indicates the need.

APPENDIX A

Methods for Determining Adequate Ventilation For Restaurant Cooking Equipment

Duct system should be designed to create a conveying air velocity in the exhaust ducts or not less than 1500 feet per minute and not more than 2200 feet per minute.

The following presents two methods for determining adequate air velocities or quantities of air to confine cooking vapors, convected heat and residues to the hood or other primary collection means installed at the cooking appliance.

A1. Ventilating equipment in commercial kitchens should be designed to provide 20 to 30 air changes per hour in the room where the appliances are located. In calculating the cubical content of the room over-all dimensions should be used with no deduction for the volume occupied by refrigerators, storage cabinets, appliances, etc.

A2. The average air velocity across the entire area of the hood opening of the exhaust system should be in the range of 50 to 100 feet per minute; or, the volume of air per lineal foot of cooking equipment should be in the range of 250 to 500 cubic feet per minute for hoods or other primary collection means installed at the cooking appliance.

A3. The selection of fan capacity should be based on the larger air volume obtained by these methods.

APPENDIX B

Where 18 inches clearance is required to unprotected combustible material, the clearance may be reduced to that indicated below when the combustible material is protected as follows.

Type of Protection	*Clearance*
(1) ¼-inch asbestos millboard spaced out 1 inch on noncombustible spacers	12 inches
(2) 28 gage sheet metal on ¼-inch asbestos millboard	12 inches
(3) 28 gage sheet metal spaced out 1 inch on noncombustible spacers	9 inches
(4) 28 gage sheet metal on ⅛-inch asbestos millboard spaced out 1 inch on noncombustible spacers	9 inches
(5) ¼-inch asbestos millboard on 1 inch mineral wool bats reinforced with wire mesh or equivalent	6 inches
(6) 22 gage sheet metal on 1 inch mineral wool bats reinforced with wire or equivalent	3 inches

APPENDIX C

Suggested Method of Cleaning Duct Systems

Manual scraping and steam cleaning have been found to be the most effective means of cleaning grease ducts. Steam may be used to loosen the grease and is particularly effective in cleaning inaccessible portions of a system. Flammable solvents or other flammable cleaning aids should not be used.

In the event a duct system is heavily contaminated with soft grease or oily sludge, cleaning can be facilitated by coating the interior by pneumatic blower process with a thick layer of a powder with saponifying qualities. Satisfactory results have been obtained with a powder compound consisting of one part calcium hydroxide and two parts calcium carbonate. This compound saponifies the wet grease or oily sludge, thus making it much easier to remove with hand scrapers.

All switches should be locked or sealed to prevent the accidental starting of fans. If a man is to work inside a duct or fan proper, another man should be stationed nearby outside as an additional safety factor. Where a man is working inside a duct or fan not near an open access panel, proper ventilation should be provided. Care should be taken to insure that all drop lights are protected against breakage.

Each access panel should be opened and by the means of hand scrapers and extension scrapers all grease, dirt, oily lint, sludge, and other contamination should be removed. Particular attention should be given to seams and other crevices which may be in the duct or fan housing where accumulations may be heaviest. The best scraping tools are paint scrapers, putty knives or spatulas — the width of the tool to be governed by the surfaces to be cleaned.

After the entire system from the openings in the hood to the final point of outlet, including fan blades and fan housing, have been thoroughly cleaned, all cover plates to the access panels should be replaced and securely affixed or fastened, all dampers and diffusers correctly positioned to induce the proper flow of air, and exhaust blower fan or fans placed in operation. The system may be coated or lined by pneumatic blower process with a layer of the calcium hydroxide — calcium carbonate compound previously mentioned. This will facilitate future cleaning. When the chemical coating on the interior surfaces of the system has become so impregnated with grease that it will no longer absorb grease, it is time to again thoroughly clean all interior surfaces.