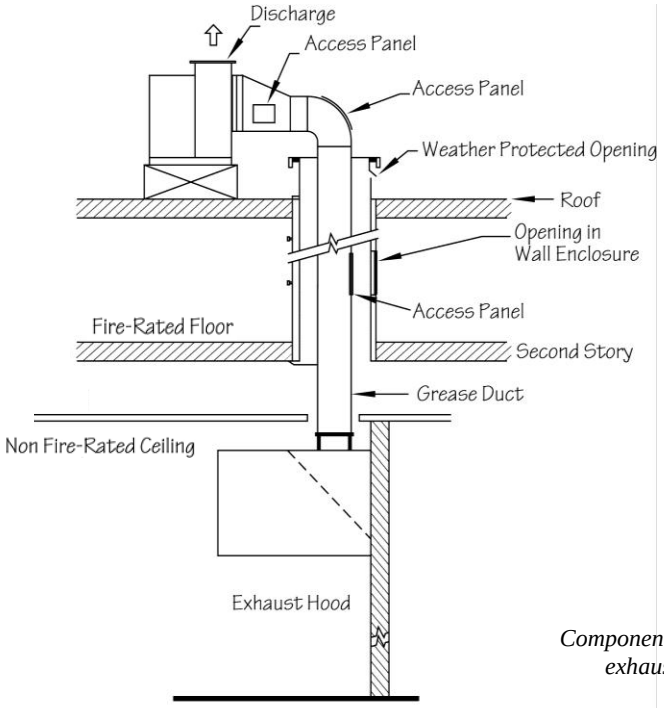
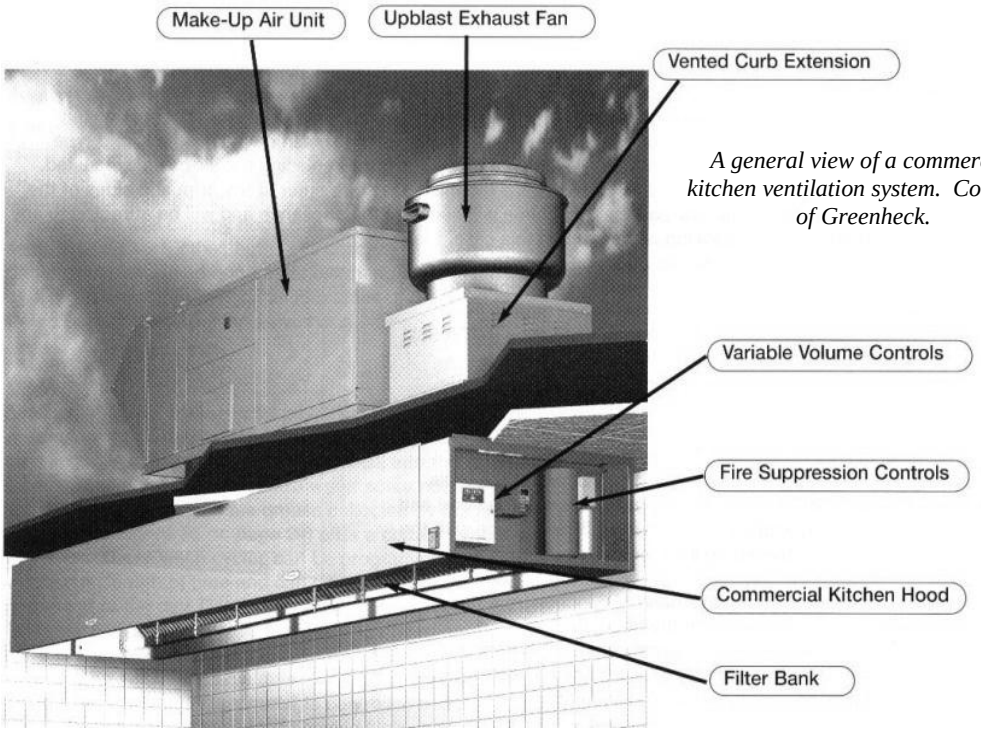
Chapter Two – Principles of Commercial Cooking



Components of a typical exhaust system



A general view of a commercial kitchen ventilation system. Courtesy of Greenheck.

Principles of Commercial Cooking

Commercial Kitchen Ventilation (CKV) is defined as the properly designed and balanced air removal (exhaust) and return (makeup) system over commercial cooking equipment.

Originally cooking ventilation was nothing more than a hole in the roof or chimney under which fire was used to cook food indoors. If it got hot from lack of air, a door or window was opened.

Gradually it was realized that more cooking appliances could be added and major cooking operations could take place by including a hood to capture the greasy air, a duct to direct it out of the building, and a fan to pull it through the duct. Resulting fires proved that simple air ventilation was not adequate.

Radiant heat and thermal energy from the convective plume created by the appliances is removed by the CKV system. Properly balanced (conditioned) ventilation ensures that the kitchen staff and other occupants are provided with clean (makeup) air to replace the contaminated cooking (exhaust) air.

Beyond healthy air movement, the removal of combustible grease contaminants from the cooking processes prevents fire conditions from developing within the system.

Because combustible grease vapors condense and accumulate within the exhaust system, it is necessary for the exhaust section of the CKV system to be constructed and installed in a way to withstand the possibility of an internal fire. Additionally, fire-extinguishing equipment is housed in the CKV to suppress potential fires that can take place on appliances and within the exhaust system.

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

Note: The expression "Commercial Kitchen Ventilation" or "CKV" defines the exhaust and the air makeup and/or return air -- Heating, Ventilation, Air Conditioning (HVAC) system. The primary focus of this manual is to provide information on the exhaust portions of the CKV system.

Exhaust System Configurations

A basic kitchen exhaust system consists of a hood, duct, and fan. For our purpose, an exhaust "system" is defined as one fan that may serve multiple hoods and ducts. Depending on the size of the cooking facility, there may be more than one system.

For example:

- Figure 1 shows appliances under one hood (under 3 meters or 12 feet) connected to a duct leading to a fan on the roof.
- Figure 2 shows two hoods, each with one duct coming out of the top then joining a horizontal duct that takes a 90-degree turn and leads to a fan on the roof.
- Figure 3 shows a long hood (over 3 meters or 12 feet) with three ducts coming out of the top leading to a horizontal duct, that exits the side of the building at a wall mounted fan (or to the roof as shown in the first two illustrations)

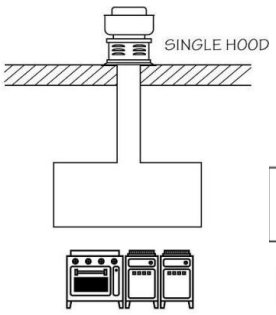


Figure 1

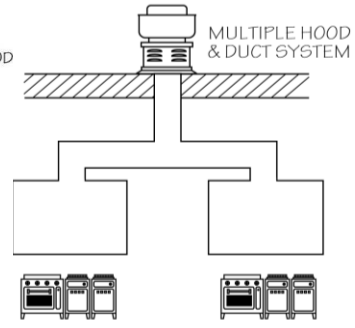


Figure 2

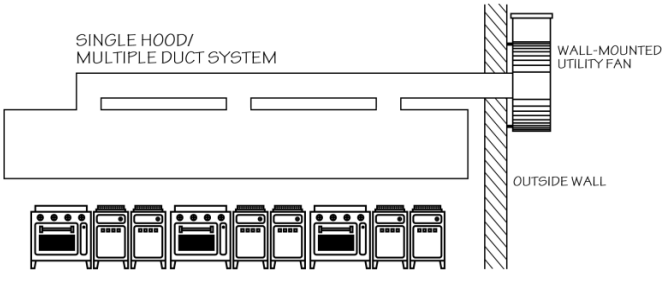


Figure 3

General Construction Requirements

NFPA 96, 17A and the *2012 International Mechanical Code* (IMC)[1] requirements are specific in the way these systems must be designed, constructed and installed.[2] The entire exhaust system must be able to withstand fire. These fire safety requirements mean that the exhaust system is more than just an air moving system. Large amounts of time and money have gone into testing and researching the best ways to construct and install these systems to ensure maximum fire safety.[3]

Cooking equipment producing smoke or grease laden vapors shall be equipped with an exhaust system that complies with all the equipment and performance requirements of this standard.[4]

Additional NFPA 96, Section 4.1 statements:

- All appliances and exhaust components must be kept in good working condition
- The system owner is ultimately responsible for the inspection, maintenance and cleanliness of the ventilation and fire protection equipment, unless the responsibility has been transferred in writing, to a management company, tenant, or other party
- All interior surfaces of the exhaust system shall be accessible for cleaning and inspection purposes
- Drawings of the exhaust system installation as well as operating instructions for subassemblies and components and electrical schematics shall be kept on the premise[5]
- The Authority Having Jurisdiction (AHJ) may require written notification of any alteration, replacement, or relocation of any appliances or components of the exhaust or extinguishing system

Metals

Steel

Most cooking appliances and kitchen exhaust hoods are constructed of stainless steel.

Hoods shall be constructed of steel not less than 1.09 mm (0.043 in.) (No. 18 MSG) thick. Ducts should be constructed of steel not less than 1.37 mm (0.054 in.) (No. 16 MSG) thick. For more information, see the Hoods Chapter, as well as the Ducts Chapter in this manual.[6]

Experience has determined that this thickness of metal (steel) will withstand the heat of a typical fire to maintain structural integrity.

Other characteristics of steel include:

- Steel will not melt in fires except under very unusual circumstances of extremely high temperatures for extended times
- Steel can be welded to create liquid-tight seams required by the codes
- Ordinarily, steel will be oxidized by fires, and the surface will be a dull blue-gray. The brown rust color does not appear until the steel item has been wet long enough to rust.
- In fires of short duration (typical of kitchen fires) the surfaces of polished or plated steel can show various color fringes, depending on the degree of heating
- After a fire, bare galvanized steel will have a whitish coating from oxidation of the zinc

[1] International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, D.C. 20001.

[2] See *NFPA 96, 3.3.39 Noncompliant*. Not meeting all applicable requirements of this standard.

[3] See *NFPA 96, 4.1.1*.

[4] *NFPA 96, A 4.1.1.1* states: Cooking equipment that has been listed in accordance with ANSI/UL 197 or an equivalent standard for reduced emissions shall not be required to be provided with an exhaust system.

[5] See *NFPA 96, 4.6 and 4.7*.

[6] See *NFPA 96, 5.1.1*

