

Chapter Ten – Fans

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Fire Inspectors taking Phil Ackland's Fire Inspector course

Fans

Terminations

In most cases it is superior to have the exhaust system terminate on the roof of the building, as opposed to the wall. The fan should be as close to the end of the ductwork as possible to reduce air pressure on the system.

Shorter distances from the hood to the fan (as in single story buildings) require less fan power. Multi-story buildings require more fan power because of the air resistance, length and sizing of the duct.



One of our inspection classes on a rooftop in Hawaii



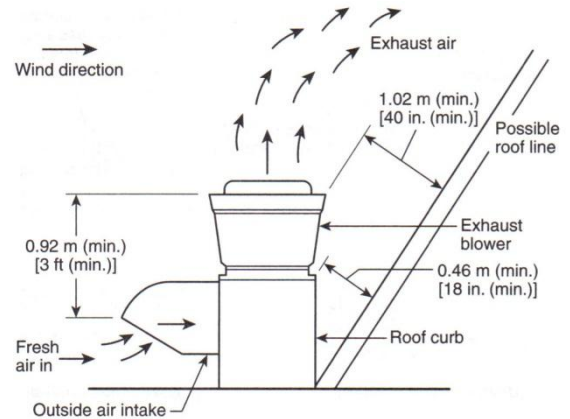
An upblast fan

Rooftop Terminations

Rooftop terminations of either the duct or fan shall comply with *NFPA 96, Section 7.8.2* and *IMC 506.3.13*.

- Clearance to combustibles must be maintained
- A minimum of 3.05 m (10 ft.) horizontally from outlet to adjacent buildings, property lines and air intakes
- A minimum of 1.5 m (5 ft.) from the outlet (the duct discharge or fan housing) to any combustible structure
- Have a vertical separation of 0.92 m (3 ft.) below any exhaust outlets for air intakes within 3.05 m (10 ft.) of the exhaust outlet
- The ductwork shall be a minimum of 0.46m (18 in.) away from any roof surface. On pitched roofs this measurement must be taken from the closest point between edge of fan/duct connection and the roof surface.
- Near the termination of the exhaust (whether fan or duct outlet) some form of grease collection must be provided
- The collection container must be noncombustible, closed, rainproof, and structurally sound for the service
- There must be safe access and work surface for the fan and termination. There are many locations where access and working conditions around the fan are unsafe. These fans are considered inaccessible.

NFPA 96, Section A.7.8.2.2 Appendix states that all roof fans should have access to all sides from a flat roof surface without a ladder, or be provided with safe access via stairs or walkway, or a portable ladder to a flat work surface on all sides of the fan.



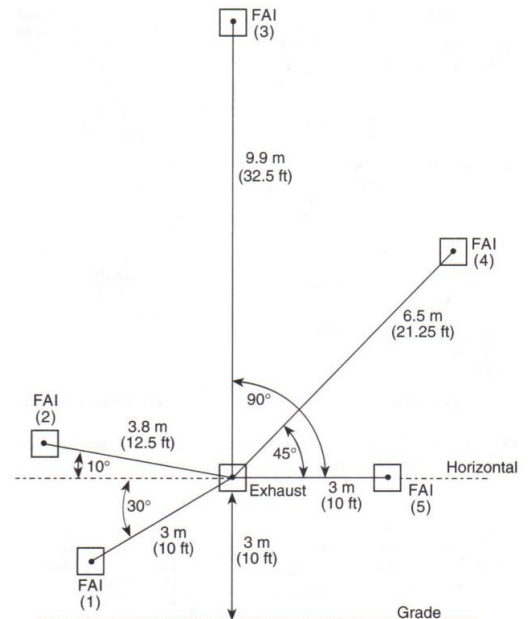
NFPA 96 drawing of various fan placement requirements

Wall Termination

Wall Terminations shall be in accordance with *NFPA 96, Section 7.8.3*.

- Wall terminations shall be through a noncombustible wall with a minimum of 3.05 m (10 ft.) of clearance from the outlet to adjacent buildings, property lines, grade level, combustible construction, electrical equipment, and the closest point of any air intake or operable door or window
- In secured areas, a lower height above grade may be permitted
- The exhaust flow shall be directed perpendicularly outward (straight out) from the wall or upward

NFPA 96, Section A.7.8.2.2 Appendix states that all through-the-wall exhaust fans should have ready access from the ground from no more than 1.8 m (6 ft.) step ladder or should be provided with a flat work surface under the fan that allows for access to all sides of the fan, accessible from no more than a 6 m (20 ft.) extension ladder.



NFPA 96 drawing of distances required to fresh air intakes



Two examples of wall terminations

Grease Collection

On wall terminations, some means of collection must be in place. Either the duct needs to be pitched back into the building (to the hood) or have a collection container or trap (in or outside the building).

General Fan Requirements

There are various types of fans available for exhausting the hot and contaminated air produced by the cooking process. *NFPA 96, Chapter 8* and *IMC 506.5* identify factors that need to be considered regarding fans:

- Fan selection should be based on its ability to overcome frictional, distance, airflow resistance and move appropriate amounts of air desired
- The high temperatures and grease content of the air encountered in these applications make it mandatory to select a fan with the motor out of the air stream. This will prevent grease buildup or excessive temperatures, which will cause motor burnout.
- Fans need to be designed to direct air away from the rooftop (or, in the case of wall termination fans, away from the building) to prevent roof and building damage
- Drains and collectors must be used to catch and contain any grease that may collect and drip from the fans¹
- Fans should be as close to the termination of the duct as possible. Termination should be at or above the roofline. Fans that exhaust on walls or in enclosures can have problems with air contamination, proximity to intake or windows and backdraft issues.
- There must be safe access and work surface for inspection and cleaning. When inspecting a restaurant, the only way to know if the fan is accessible is to go and see it.
- Fans must be situated at least 46 cm (18 in.) above the roof surface and air must exhaust at least 1 m (40 in.) above the surface²



Typical upblast type fan 18 in. requirement above the roof

Fan Types

Upblast Fan

The most common fan used over exhaust systems is an aluminum upblast fan. However, as this design is used for a number of other industrial air movement applications, fans over the kitchen exhaust must be listed for this specific purpose.

Upblast fans shall be installed in accordance with *NFPA 96, Sections 7.8.2.1*, list-points 4, 5, 8, and *8.1.1.1*.

Editorial Note: From outward appearance it is impossible to tell if an upblast fan is listed for the purpose. An inspector must read the listing label found in the motor housing. Fans must be:

- UL Listed for commercial cooking use³
- Able to drain grease out of any trap or low point into a non-combustible container or collection device. The collection system shall not inhibit the performance of the fan.
- Hinged and have a flexible weatherproof electrical cable to allow for cleaning⁴



Photo of properly installed, hinged aluminum upblast fan

¹ See the *Grease Containment Systems Section* later in this chapter.

² The duct must extend 18 in. above the nearest roof surface. The fan base will rest on the top of the duct.

³ The listing label on the fan indicates if the fan is listed for commercial kitchen exhaust. Be aware that the “upblast fan” design is also used for a number of other industrial air movement applications.