

KEY TO FIGURE

- a) Cooking area
- b) Cooker hood/canopy
- c) grease filter
- d) coarse pre-filter
- e) fine pre-filter
- f) activated carbon filters
- g) fan/motor unit
- h) lagging
- i) anti-vibration mounting
- j) noise attenuator (best located within the building)
- k) exhaust flue/stack

Source of Noise	How / Why Noise Arises
Extract/ supply fan	Fan Motor noise, fan impeller turning

Typical problems encountered with commercial kitchen ventilation systems;

netcen, with the assistance of the cieh, contacted a number of local authorities to review the types of problems encountered by council officers when dealing with odour and noise situations. A summary of this information gathering exercise is given in annex a. responses were received from metropolitan and rural authorities. Authorities from England, Northern Ireland, Scotland and Wales have been consulted.

Ventilation systems are used;
linear extract method: each linear meter of active filter length is assigned a vent rate depending on the vent canopy type.

Recommended canopy type:

Canopy type	Light duty	Medium duty	Heavy duty	Extra Heavy duty
Wall Mounted	0.23 - 0.31 (m³/s)	0.31- 0.46 (m³/s)	0.31- 0.62 (m³/s)	0.54 (m³/s)

The dimensions of a canopy are dictated by the size of the catering equipment that it is serving. The two criteria that have the most influence on the amount of air required for effective ventilation are the plan dimensions and height. Unless restricted by walls etc., the plan dimensions of the canopy should always exceed the plan dimensions of the catering equipment by a minimum of 200mm on each free side and by 300mm at the front and rear. Dimensions at the side may need to be increased where high output equipment is located at the end of the cooking line-up.

where combination steamer and certain types of baking ovens are used, the overhang at the front should be 600mm to cope with steam or fumes that arise when doors of appliance are opened.

the height of canopy is governed by the height of the ceiling and the underside if the canopy should be located between 2000 and 2100 mm above the finished floor level. The efficiency of canopies less than 400mm high are less than normal because the collection volume is reduced. in these situations, the face velocity may need to be increased to 0.5m/s to compensate. where the ideal flow rate cannot be achieved the size of the canopy may be increased to aid capture. the ideal distance between the lowest edge of the grease filter and the top of the cooking surface should be between 450mm to 1350mm. This is to avoid the risk of excessive temperatures or fire in the filter that could cause the extracted grease to vaporise and pass through to the ductwork. this dimension will vary with the type of cooking appliance and can be reduced where fire suppression equipment is installed, but should never be below 1350 mm where mesh filters are installed.

Types of system are available:

cassette systems: is an integrated system incorporating partitioned or dedicated extract and partitioned or dedicated supply. The systems are modular and contain a number of cassettes of proprietary design, which filter and separate grease from the air prior to its exhaust. the grease is normally collected in a non-drip integral or perimeter trough for removal and cleaning.

Materials of construction of canopy;
the food safety (general food hygiene) regulations (20) requires that in food preparation areas:

' ceiling and overhead fixtures must be designed, constructed and finished to prevent the accumulation of dirt and reduce condensation, the growth of undesirable moulds and the shedding of particles.' in relation to canopies, it is best practice to use stainless steel especially if the relevant surface comes directly into contact with food, typically canopies and other overhead fixtures are fabricated using ultra fine-grained stainless steel (grade 304) higher grades of stainless steel may also be specified.

other best practice guidelines included:

Where air must be equalised within a supply plenum of canopy 0.8 mm perforated stainless steel sheet should be used. in addition, care should be taken to ensure that the face velocity is about 0.7 m/s. noise generation increases when velocities of 0.9 m/s are exceeded.

- discharge grilles on make-up air system should be fabricated with 1 mm perforated stainless steel sheet.
- condensation should be avoided in canopies that are provided with supply plenum. where insulation is used it should;
- be a rigid foil faced non fibrous slab, with a class 1 spread of flame; and
- not be fibre based as this could contaminate food.

Fan ;

kitchen ventilation systems often have relatively high resistance against which a fan has to operate, therefore, fans need to be sized to cope with a design pressure of a minimum additional 10% pressure margin. care must be taken:

- to ensure operational changes e.g. build up of dirt on mesh filters are taken into account; and
- if changes are made to the ventilation system that may affect the operating pressure to overcome such changes variable speed control or balancing dampers may be used. a range of impeller designs is available as follows;
- backward curved centrifugal, mixed flow or axial flow impellers are preferred as they are less prone to imbalance and are easier to clean and maintain due to their open construction.
- fixed or adjustable metal impellers are recommended.
- lightweight multi-vane or plastic-type impellers can warp and are prone to collecting grease. Although plastic bladed fans can be used in non-grease, low temperature situations.

The fan must be able to operate at between 400 and 600 at 95% relative humidity. Motors should be rated to ip55. where fan motors sit within warm moist air streams, they should be upgraded to withstand more onerous conditions. To avoid excessive temperature build-up, temperature detectors should be fitted.

Drain holes should be provided at the lowest point in the fan housing to remove condensation, care needs to be taken to ensure that the drain hole does not downgrade the index of protection(ip) of the motor.

Dual or variable speed regulation are widely used, the fan must always operate at its design duty, especially when grease is being produced. A minimum extract level should be set within the speed regulator to ensure that, even at low speed, an adequate rate of ventilation is maintained. speed regulation should be applied to both make-up air and extraction air. speed regulation cannot be employed with water wash/cartridge systems as flow rates are fixed.

Make-up and extract fan operation should be interlocked with gas supply, so that gas supply is switched off if the fans fail, fans should be isolated when fire suppression system is activated.

The connection between ductwork and fan housing should be suitable for use in grease-laden atmospheres and at duct temperature, joints must be clamped or bonded to prevent air leakage, under fire conditions the material should have a minimum integrity of at least 15 minutes.

Fan type	Advantages	Disadvantages
Roof Extract Fans (Vertical jet Discharge with Centrifugal impellers)	Good temp. range when motor is outside of air stream. Easy removal for cleaning and maintenance. No space restrictions. Good external appearance. No discharge ductwork required.	Temperature limitations, but suitable for kitchen use. Required good roof access for maintenance. more expensive than inline/axial models.

Corse or Grease filtration

Filter type	Recommended Face Velocity (m/s)	Typical Efficiency	Advantages	Disadvantages
Cartridge	4.5 -5.5 (at entry)	90-95 %	Higher efficiency Non-Overloading pressure drop	High pressure drop special plenum fabrication required

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