Restaurant/Takeaway Odour Extraction/Control System

This guidance explains the key elements of a good extraction and ventilation system in all types of premises where hot food is prepared and describes the controls the council will be looking for and why. This guidance is not intended to be a comprehensive list and other matters may arise in particular circumstances.

If you are planning a new catering premises and you have an architect or agent, you may wish ask them to study this guide so that the necessary details can be built into your plans.

It is the applicant's responsibility to ensure that the ventilation system serving the respective premises is appropriate for the type and level of cooking undertaken and maintained and operated effectively. It is strongly recommended that the applicant seek advice from a reputable Ventilation/Heating Engineer with experience and knowledge of odour/grease control systems.

ODOUR CONTROL

The main elements of a grease and odour control system should include:

Filtration Equipment; a kitchen canopy incorporating primary grease filters followed by secondary filtration/odour control techniques.

Duct design & Extraction Motor; ductwork to final termination and an efficient extraction motor.

Dispersal; discharge at a height and velocity to ultimately disperse and dilute the residual odours.

It is essential that the grease/odour control system is used whenever food is being prepared or cooked on the premises and that nothing is done to affect the performance of such a system, i.e. open window and doors, or alter any part of the system that will have a detrimental effect on the operation of the system.

1. Filtration Equipment

Three stage filtration is generally necessary: grease filters, pre-filters and then carbon filters. Some manufacturers produce a module which includes all three filters in one prefabricated unit.

Grease Filters: Grease filters are sited directly over the cooker range. They are usually metal and are washable. A grease trap is often incorporated into the extractor hood. The cooker canopy should be sufficiently long and wide to cover all cooking ranges and should be of sufficient height to enable easy working on the ranges whilst low enough to trap all odours/steam generated by the cooking.

The canopy should be constructed from Stainless Steel to enable easy cleaning and the grease filters should be cleaned daily. Given the comparative cheap cost of these filters, it is recommended that a second set of filters is obtained and rotated daily, so that one set is always in use whilst the second set is being cleaned.

The whole system should be designed to ensure that the velocity of gases through these filters enables sufficient residence time to optimise grease removal whilst enabling 25-30 changes per hour of the kitchen air. Ventilation air inlets should be provided to the kitchen, designed to allow air ingress but located/designed to prevent the direct release of odours out of the kitchen. These can take the form of airbricks or vents in the wall(s) or door(s).

Pre-filters: Pre-filters trap any particulates which may have got through the grease filters. They are usually fabric-based and are disposable and can consist of a course filter to remove larger particles, followed by a

fine filter. They are intended to protect the relatively expensive carbon filters, thus increasing their life. Coarse and fine pre-filters should be changed every month. The pre-filters and carbon filters can be placed inside or outside the building and are located before the fan, however, they must be easily accessible for cleaning/maintaining.

Carbon Filters: The high efficiency activated carbon filters work by absorbing the odours produced. It is imperative that all grease is removed by the preceding grease filtration as grease contamination will reduce the life of the filters and increase costs.

The activated carbon filtration shall be located at a sufficient distance along the duct run to prevent the cooking heat from reducing the efficiency of the filtration, however, heating may need to be added when there is a high moisture content as excess moisture can reduce the effectiveness of the filters.

The filter housing should be designed to ensure ease of access for maintenance and to provide a good seal around the filters to prevent gases bypassing the filters, rendering them ineffective. It is essential that the Ventilation Engineer correctly specifies the filters fitted and designs the system and sets flow rates to achieve optimum performance.

Carbon Filters must be changed on a regular cycle, which will depend on the level of kitchen use and the manufacturer's instructions. Typically, activated carbon filters shall be replaced every six months, either by disposal or return to the manufacturer for rejuvenation. It is recommended therefore that consideration be given to obtaining a service contract with the manufacturers in order to ensure that regular cleaning and maintenance is carried out.

2. Duct design & Extraction Motor

Duct Design: Full details of the size and location of the duct should be shown on scaled drawings, together with full details of the arresting plant and equipment.

The duct must have a smooth internal surface and should not contain any acute right angle bends but easy bends to ensure the smooth flow of air through the ductwork at each change of direction of the duct. The ducting should be leak free to prevent air ingress or discharge of odours. The ducting should be well insulated to minimise heat loss, thereby maximising thermal buoyancy of the discharge.

Note: The flue should be positioned and fixed to minimise the generation and effects of vibration and noise. Such fixings should include anti-vibration mounts and incorporation of flexible couplings, silencers, etc. in the ductwork to control noise.

Extraction Motor: The extraction motor shall be correctly rated for the application and at the correct speed/flow rate to achieve optimum performance of the filtration. The extraction motor shall be cleaned and maintained in accordance with the manufacturer's specification. The motor controller shall be located in the kitchen and be of either a two-speed or variable speed design, adjusted so that the speed settings correlate to and achieve the optimum flow rates of the odour control. Noise control shall be implemented, where necessary, by either in-line acoustic absorbers or external acoustic insulation. If in-line absorbers are used, the effect of these on flow characteristics shall be taken into account.

3. Dispersal

The ducting should be as straight and short as possible to ensure that fumes are discharged as effectively as possible. Care should be taken when designing the route of ducting to avoid proximity to residential or office windows on neighbouring properties, which could give rise to complaint.

The duct material (usually galvanised steel) should have a smooth internal surface and its route out of the building should avoid sharp bends.

There will be a fan positioned within the ductwork to pull cooking fumes from the cooker hood to the point of discharge. To aid good dispersion of cooking fumes, the size of the fan motor must be adequate to ensure proper ventilation

Final discharge should be vertically upwards and should terminate at least 1m above the eaves. If there are buildings nearby which are likely to have an effect on the dispersion and dilution of odour, the flue should terminate at least 1m above the eaves of that building. Ground level or low level discharges should

generally be avoided. However, where high level fume dispersion is not appropriate, a suitably enhanced scheme of ventilation is required. The discharge should be unimpeded by flue terminals, although some terminations, such as accelerator cones and sleeves may be accepted.

Alternative Odour Abatement Techniques

Alternative odour control techniques are available, however, an applicant will need to clearly demonstrate the effectiveness of such systems.

- **Odour Masking/Neutralisation** involves the addition of chemical(s) which either modify the odour (masking) or change/breakdown the odour (neutralisation). The chemical agent used must be capable of modifying a range of odours, it is therefore essential to tailor the system to the type of business use proposed. Some systems ionise the gas flow to improve the effectiveness of the odour counteraction.

- **Wet Scrubbing/Absorption** using water or another liquid, such as oil, controlling odours by scrubbing the gas flow to remove the odours. The liquid absorbs the odorous compounds by the mechanisms of solubility or condensation; and may also employ reactive chemicals, in the liquid, to increase absorption/solubility or change the odour chemical to reduce its impact.

- **High Dilution High Velocity Extraction** utilises dispersion and dilution of the odours after leaving the premises to reduce their impact. Primarily grease filtration is used to remove up to 75% of the grease from the air flow, which is then ejected at a high velocity from a high discharge point to effect dilution and dispersion.

- **Ozonation** utilises ozone, a powerful oxidant, diluted and added to the odorous gas flow, which oxidises the odour to oxides and oxygen. The ozone is generated by a corona (electrical) discharge converting oxygen in the air feed to ozone. Packaged ozone generators, which are simple to maintain/operate, are available which require only an electrical feed, cooling water and an air feed; and pumps the ozone into the ductwork through a diffuser. In the gas flow the ozone mixes and oxidises the odours, mixing can be improved by fitting an ozone contact chamber to increase contact time.

NOISE CONTROL

When designing kitchen exhaust ventilation systems a competent person/engineer must examine noise characteristics and noise levels involved and employ appropriate measures to control noise. If you are in any doubt as to whether the noise from extract ventilation equipment complies with this guidance, you should seek advice from an acoustic consultant. A list of members of the Institute of Acoustics can be found at http://www.ioa.org.uk

The following points should be taken into account when designing a ventilation system to minimise vibration and noise emissions:

- The fan and its installation should be designed as a complete package for a specific task. Fans generally produce less noise if operated at the optimum efficiency relative to their characteristics with the correct selection of duct size and type.

- The fan and motor should be sited within the building's structure to minimise outdoor noise. The fan and motor unit should be fixed on anti-vibration mounts and be joined to ductwork using flexible couplings to prevent the transmission of vibrations either to the structure or along the ducting. The fan and motor unit should not be fitted on to walls or ceilings adjoining residential premises.

- The extract ducting should be rigid in construction and installed with anti-vibration mountings. Large section ducts may need bracing or stiffeners to prevent drumming.

- Lined or lagged ducts, including bends, elbows or spigots, may be required if additional noise reduction is necessary.

- Silencers may be required where additional attenuation is necessary. A range of silencers is available and it may be necessary to insert in-duct silencers both upstream and downstream to prevent radiation of fan noise through the ductwork. These should be fitted as close to the fan as possible (but not so close as to lead to a non-uniform air-flow velocity across the face of the silencer). Where this is not possible, the intervening ductwork should be acoustically lagged. It may also be necessary to enclose or lag the fan.

- Acoustic louvers on exhausts and inlets can greatly reduce environmental noise. However, their performance can sometimes increase back pressure or the velocity of the air flow leading to increased noise.

Data on the noise produced by the system as a whole should be provided with the

Planning Application e.g.

- Sound power levels or sound pressure levels at given distances (the assumptions to this calculation must be clearly stated);

- An octave band analysis of the noise produced by the system should also be provided, where possible;

- Hours of operation of the ventilation system (where this differs from the hours of opening); and

- Specific background levels at the premises both during the day and night from Commercial Kitchen Exhaust Systems.

Reviewed Feb 2022