Ventilation of kitchens in catering establishments

Catering Sheet No 10

Introduction

This guidance provides the information a caterer will need to assess whether existing ventilation installations are adequate, as well as guiding caterers and building owners when planning a new or refurbished kitchen. It advises on management as well as design and performance issues, specific to catering.

The importance of kitchen ventilation

The Health and Safety in Catering Liaison Committee considers the lack of adequate kitchen ventilation to be a major problem in catering. Based on their widespread experience of kitchens, and industry surveys, around 65% of kitchens may have inadequate ventilation. It considers that adequate ventilation is fundamental to achieving control of health and safety risks in kitchens as well as general hygiene control and food safety. Until now no suitable guidance has been available; hence the Committee considers this information sheet to contain some of the most important guidance it has produced.

This guidance is particularly important when using gas-fired appliances because of the risks from incomplete combustion and inadequate flueing, but most aspects also apply when other energy sources are used.

Ventilation objectives

Catering brings an exceptional concentration of heat and fumes into a small area. There are particular objectives which the ventilation has to achieve. Problems occur all too often in catering because these objectives are not met . The objectives include the following:

- The general ventilation through the kitchen has to introduce sufficient clean, cool air and remove excess hot air for the occupants to breathe adequately and remain comfortable. The stressful working conditions caused if this is not achieved can contribute to safe systems of work not being followed, as well as high staff turnover.

- The general ventilation has to provide sufficient air for complete combustion at burning appliances, otherwise chronic debilitating carbon monoxide poisoning could occur.

- The general and local ventilation has to dilute and remove products of combustion from gas and oil-fired appliances.

- The general and local ventilation has to dilute and remove odours, vapours and steam from the cooking processes. Local ventilation has to protect against particular hazards to health arising from some cooking fumes, such as those involving direct application of heat to the food.

- The local ventilation has to be capable of being kept clean from fat residues to avoid loss of efficiency and fire risks.

- The system has to be quiet and vibration free and have clean incoming air which is neither too hot nor too cold for the staff to keep it switched on.

Overall, the caterer has to match the ventilation to the cooking load, to the amount of equipment used and to the numbers of staff and customers. The caterer and installer have to know how to utilise the information on ventilation requirements which suppliers now have to give with new gas appliances.

Features of an effective kitchen ventilation system

Existing systems should be assessed and new systems planned to meet these ventilation objectives. The guidance given below indicates the design features and criteria which have been found suitable and effective in catering kitchens.

Canopies: design

Air needs to be removed at a constant rate from cooking and subsidiary areas, to take away combustion fumes and cooking odours as close to source as possible.

It is advisable that the bulk of extraction from the kitchen is via hoods above gas-fired and all other appliances capable of generating heat, water vapour, fumes and odours.

The plan dimension of the canopy is recommended to exceed the plan area of cooking appliances. An overhang of 250-300 mm all round for island canopies is normally adequate. Wall-mounted canopies normally have a front overhang of 250 mm at the front and 150 mm at the ends. Greater overhangs may be required at some appliances. Canopies should not be so low as to form an obstruction.

Canopies and ductwork need to be constructed from non-combustible material and fabricated so as not to encourage accumulations of dirt or grease, nor allow

condensation to drip from the canopy. The ductwork needs suitable access for cleaning and grease filters need to be readily removable for cleaning/replacement. Experience will indicate how frequently cleaning is needed.

The design and performance of canopies need to be effective in removing cooking fumes from source and, as far as possible, preventing them from passing through the breathing zone of the cook.

Canopies: performance

The amount of air to extract via the canopies is best calculated from the information supplied with the appliances within the kitchen, and not by simply using general advice on air changes alone. For example, the air velocities over the hood face specified for individual items can be added up to give the total air movement.

Where the ventilation requirements of cooking equipment are not available, an approximate air flow rate in litres per second (L/S) can be calculated from the total hood size and the following minimum hood face velocities: 0.25 m/s, for light; 0.4 m/s for medium and 0.5 m/s for heavy duty cooking.

Ventilation rates are best specified as air velocities into the canopy rather than standard air changes per hour. Where canopies are not used (eg ventilated ceilings) the ventilation rates needed can be calculated by a competent designer taking account of room sizes and usages. As a guide, a ventilation rate of not less than 17.5 L/S per square metre of floor area and not less than 30 air changes per hour (ACH) is advisable. A lower ACH figure (eg 10) may be needed to avoid discomfort from draughts where the kitchen is subdivided into separate rooms (eg wash-ups, vegetable preparations).

Replacement air

Air to replace that extracted and used by combustion needs to be replaced. Typically 85% of the total air needed is supplied by a mechanical ventilation system together with 15% make up air drawn from adjoining areas.

This arrangement keeps the kitchen under negative pressure to prevent escape of cooking odours.

In smaller kitchens sufficient replacement air may be drawn in naturally via ventilation grilles in walls, doors or windows.

Where such incoming air is drawn in naturally some means of control over pest entry is usually required. If a fine mesh grille is used this will restrict the ventilation, but a larger overall grille size can compensate.

However, for larger installations this would require a grille so large that a mechanical system using a fan and filter would be more suitable.

The air needs to be drawn from an adjacent area where it is clean. Where smoking is allowed (eg in an adjoining dining room) it is advisable not to draw this air into the kitchen as make up air.

Where make up air is drawn via serving hatches or counters it is recommended the air velocities do not exceed 0.25 m/s to avoid complaints of draughts. However, higher velocities may be tolerated or desirable at hot serving counters. The incoming air from the ventilation system needs to be arranged so as not to adversely affect the performance of the flue at any open flued gas appliances.

The make up air can be drawn in through permanent grilles, but they need to allow for between 1.0 and 1.5 m/s air flow velocity.

Cooling air

The effective balancing of incoming and extracted air, together with removal at source of hot vapours as above should help prevent the kitchen becoming too hot. The replacement air inlets from any mechanical ventilation systems can be positioned to provide cooling air over hot work positions.

If this is still not enough, some form of overhead air outlet discharging cool air or air conditioning may be required.

Local freestanding fans are not recommended. They may spread micro-organisms or set up air currents or turbulence affecting the efficiency of the designed ventilation systems. They also introduce other hazards such as tripping and electric shock hazards from the trailing cable. As part of a balanced ventilation system fans fixed to the structure could be considered.

Discharge

High level discharge of extracted air with discharge velocities of about 15 m/s are often needed to prevent nuisance to neighbouring properties. ‘Chinaman’s hats’ on discharge stacks are not recommended as they encourage down draught and re entry of fumes into the building.

New ventilation systems

The Caterer

Changes in catering processes will probably require ventilation changes or new systems. Competent advisors will often be needed and the caterer will need to provide detailed information for both the designer and the installer.

The caterer can tell them the maximum demands likely to be placed on the ventilation (eg to cope with peaks of activity): the amount and type of kitchen equipment; the menu; the number of meals; the number of staff.

The caterer should take all reasonable steps to ensure those appointed as advisors, suppliers and installers are competent with respect to health and safety. The caterer can check to see they will take the factors identified in this guidance into account and that they will refer to the technical guidance available (see later section) when designing the system.

The caterer should also consult with the safety or employee representatives in good time about any significant changes.

Finally, after installation, the caterer is advised to keep records of design criteria, performance test, maintenance requirements and test and inspection. These can facilitate future maintenance, modification and testing against the original specification.

The building owner or controller

In some cases the owner or controller of the building provides the facilities such as equipment and ventilation which the caterer uses. In such cases they can follow the above advice in respect of ensuring adequate ventilation is provided. They can see the caterer provides the usage information and selects a competent design team as below.

The designer/design team

The redesign of a kitchen will require a range of information, specialist knowledge and skills to ensure the interactions between usage, equipment, premises, ventilation and installation are fully taken into account. The various parties (owner, caterer, designer, supplier, installer etc) will need to fully discuss their respective information needs and what information they can supply. This forms the design team.

The building services or ventilation design engineer will need to take account of:

- kitchen usage information (as above) from the caterer;
- equipment information from the caterer or supplier eg cleaning requirements, and the amount of air required for complete combustion and the performance of the existing installation;
- the requirements or specifications for air cleaning systems, eg for grease removal at the canopy and also before final discharge to outside atmosphere;
- the limitations of the building, eg the available room may influence the sites and routes for air inlets or discharges;
- food hygiene requirements, eg identify a suitable source for clean make up air, prevent pest entry, avoid grease accumulations and ensure easy cleaning of the system;
- heat control and waste energy recovery to maximise energy efficiency;
- consider interlocking the ventilation power supply to the gas supply to ensure it will be used in practice.

Designers would then normally refer to industry technical guidance, eg The Chartered Institution of Building Services Engineers (CIBSE) and American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) publications. The Heating and Ventilation Contractors' Association is also preparing DW/1712, Specification for kitchen ventilation systems.

The equipment installer

The equipment installer will need to know the performance and capacity of the ventilation system. They can then ensure the supply and extract air will be capable of meeting the demands of the new item they are installing. This information could be available from the system designer, (or for existing systems, from the caterer or building controller).

Where this information is not available (eg at some existing systems), measurement of the actual performance of the ventilation system may be required. That can often be provided by a heating and ventilation specialist. Or the manufacturer of the ventilation grille could give information on air flow capacity where make up air enters via such grilles.

Before installing a gas-fired appliance the installer will need to know the specific air inlet requirements. The manufacturer of new catering appliances has to provide this under The Gas Appliances Directive. The installer can then check that these requirements are met by the ventilation system provided, taking into account the other existing, appliances. Information on the ventilation requirements of the existing appliances to enable this calculation to be done could be obtained from the caterer's records, from the manufacturers concerned or by using the general standards in this guidance.

Notes

This guidance has been agreed by the Health and Safety in Catering Liaison Committee consisting of trade and professional associations, unions and enforcement authorities. It is intended that it will be copied through member associations to reach catering establishments.

Further infomation

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA. Tel: 01787 881165 Fax: 01787 313995.

HSE priced publications are also available from good booksellers.

For other enquiries ring HSE's InfoLine Tel: 08701 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ.

HSE home page on the World Wide Web: http://www.hse.gov.uk

This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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