



Catering extract ventilation: a fire risk assessment by the responsible person



InFiReS



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Introduction

The Regulatory Reform (Fire Safety) Order 2005 introduced the role of 'responsible person' and has shifted the onus of fire safety in England and Wales from the prescriptive approach (overseen by the fire authority) to a new approach based on risk assessment, where the person responsible for the premises needs to decide how to address the risks.

Every business which employs people must carry out a fire risk assessment, if you employ five or more people then you must record it. The significant findings of the fire risk assessment and any persons at special risk must be documented. An assessment of fire risks should form part of the risk assessment for the premises as a whole.

This Fire Risk Assessment should be conducted by a *responsible person* and will help you identify potential hazards associated with kitchen extract ventilation, principally those created by the excessive build-up of cooking oil deposits. You should evaluate the *risks*, record the findings and keep the assessment under review, particularly if there are any changes made to the ventilation system.

By following all of these measures, you will make your workplace a much safer and more comfortable place to work. Also bear in mind that if you do not take suitable precautions, then in the event of personal injury or death resulting from a fire associated with a poorly maintained system, charges of corporate liability or manslaughter may be brought against the kitchen operator.

The Responsible Person

The responsible person is the employer and any other person who may have control of any part of the premises, such as the occupier or the owner. If there is more than one responsible person for the premises, such as multi-tenure, and contract caterers, the relevant people must take reasonable steps to work together.

The responsible person's duties will include:

- carrying out a fire risk assessment
- producing a policy;
- developing procedures;
- providing staff training;
- organising fire drills;
- providing and maintaining clear escape routes and exits, with appropriate emergency lighting;
- ensuring the necessary compartments and doors to reduce the spread of fire;
- providing appropriate signs and notices to aid evacuation;
- providing fire detection and alarms; and providing and maintaining extinguishers and any other equipment.

Essentials of Risk Assessment

- identify hazards
- remove if possible
- replace if possible
- reduce if possible
- manage the residual risk

Background

Different **cooking styles** will create different *grease* residues:

- Oriental cooking creates a very sticky, syrup-like grease that can become firmly attached to metal surfaces. The surface tension cannot be broken by normal scraping or with general purpose cleaning chemicals.

- Solid fuel cooked/charbroiled meat creates large quantities of grease. A first layer of grease will bond to metal surfaces, and then additional layers of thick, heavy black carbon will build up, containing ash and grease from the cooking process.

- Deep frying creates a grease similar to translucent creosote. Frozen foods containing large quantities of water create a hard shiny layer of grease.

There is no difference in the risk posed by different types of **cooking oil** or fat although the following should be borne in mind:

- Safe cooking with oils and fats is usually at temperatures below 200°C. Flammable vapours are given off at 200/300°C and spontaneous ignition occurs at 310–360°C.

- The *flashpoint* of cooking oil is reduced by progressive oxidation through repeated use

- Deposits of some mixtures, such as chicken fat and vegetable oil, ignite quite readily.

An important issue to bear in mind is if staff are tired, overworked and undervalued this can create risks. Long hours and late finishes could tempt staff to skimp on cleaning or to leave it until later, while a feeling of being undervalued can lead to indifference and poor performance. By following this assessment and reducing the identified hazards, you will:

- Keep to an acceptable minimum, the build-up of grease deposits within the kitchen extract ventilation

- Reduce the risk of spreading fire

- Reduce the growth of bacteria and odour

- Improve airflow through the kitchen

- Reduce fire risks which will avoid the associated business loss and liabilities in the event of a fire

- Find it easier to get affordable insurance.

System components and terms

A kitchen extract system serves three separate and distinct functions:

- To act as a fire-protection device by removing the fuel source for fire, namely grease
- To remove smoke, heat, vapours and odour from the cooking area.
- To provide safe and comfortable conditions for the kitchen staff

Kitchen *extract ventilation* operates in the following way: A percentage of cooking oil is formed into vapour, which travels upward, propelled by thermal currents where the draw of the extract fan pulls the air through a grease-removal device (filters) and the remainder of the system (*ducts*) thus expelling cleaner air, into the environment. The key components of a system include:

- Hood or canopy
- Filters
- Ducts
- Fans

For an explanation of correct system design refer to the Heating and Ventilating Contractors' Association (HVCA) *Specification for the design, installation and operation of kitchen ventilation systems*⁽¹⁾



Terminology

- Access Door** A door providing access into ducts for maintenance or inspection
- Air Plenum** The space in the canopy normally after the grease filters but before the ducts
- Class F fires** Fires in cooking appliances involving cooking fats and oils
- Cleaning Schedule** A document containing information on how and when cleaning is carried out and what equipment and chemicals are used
- Competent contractor** A specialist contractor possessing the necessary skills to certify their own work
- Competent person** Someone who has the necessary knowledge, training, experience and abilities to effectively carry out the work or manage others
- Detergent** Substances which on their own or in combination with others, in water, assist cleaning
- Duct** A circular or rectangular metal enclosure which connects the extract canopy, hood or grille with the outside of the building
- Extract ventilation** Ventilation by which the air is discharged to atmosphere
- Flash point** The minimum temperature at which material gives off a vapour which will ignite on exposure to an ignition source under specific test conditions
- Grease** The residue of by-products from cooking. A variable mix of animal fats/oils, vegetable oils, water vapour, ash, carbon, dust, flour and other particles
- Hazard** Substances, equipment or methods of work with the potential to cause harm, such as death, injury, damage or loss
- Hood** A metal box containing filters, intended to collect contaminated air from above a cooking appliance
- Responsible person** A person named in writing who will be held to account for ensuring that fire risk is properly managed and who must ensure the safety of employees and anyone else who could be affected by the fire
- Risk** The chance, high or low, of harm occurring.

References

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- ²*Requirements for the LPCB approval and listing of the fire performance of kitchen extract systems.* Loss Prevention Certification Board, LPS1263, BRE Certification, 2003
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- ⁴*Guidance and the Standard Specification for Ventilation Hygiene.* BSRIA 1997 ISBN 0 86022 454 6
- ⁵*Requirements and testing procedures for the LPCB certification and listing of fixed fire extinguishing systems for catering equipment.* LPS1223. Issue 1, BRE Certification, 2005
- ⁶ *Specification for portable fire extinguishers for use on cooking oil fires (class F)* BS 7937. BSI 2000. ISBN 0580 33088 5
- ⁷*Health and safety in kitchens and food preparation areas.* HS(G)55. HMSO 1991 ISBN 011 885 427 5

Further reading

- Ackland P, *The kitchen exhaust cleaning and certification manual.* Phil Ackland Holdings Ltd ISBN 0 9681760 3 8 (Available from BSRIA)
- Hospital main kitchens. Fire Practice Note 4* Department of Health, HMSO 1994 ISBN 011 3217 137
- Dillon M & Griffith C, *How to clean, a management guide.* MD Associates 1999 ISBN 1 900134 11X
- Fire safety. An employers guide* HSE 1999 ISBN 01134 12290
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- Specification for installation of gas-fired catering appliances for use in all types of catering establishments* BS6173: 2001. ISBN 0580332756

STAGE I: Identifying ignition hazards



Many cooking appliances represent a potential source of ignition. Such appliances include gas-fired equipment with an immediate source of flame, deep fat frying apparatus, as well as electric appliances such as toasters, fryers and griddles.

Fuel is available in a number of forms including:

- Oil/fat and food products
- Combustible materials adjacent to exhaust ducts
- The power supply to the apparatus eg gas supply.

Air is supplied in large quantities by the inlets of the ventilation system and extract ducts can act as chimneys, increasing the intensity of any fire.

The primary fire hazards in a kitchen

- Cooking equipment left unattended during operation.
- Individual equipment not switched off, especially at the end of a cooking session
- Poor maintenance of all equipment and systems
- Flames, sparks or hot gases from cooking can ignite combustible deposits inside extract ducts
- Overheated oils lead to spontaneous ignition
- Fan-motor failure or overheating caused by hardened grease when restarting in seasonal catering establishments, or non-24 hour operations
- Thermostats not working correctly, and the absence of a second high level safety thermostat
- Metal extract ducts are good conductors of heat and can ignite adjacent materials or litter
- Catalytic converters decompose grease, but operating at 1000 °C are a potential source of ignition
- Solid fuel cooking equipment (such as barbecues)
- Tandoori ovens without igniters/pilot lights lit by burning pieces of paper
- Absence of flame failure or safety shut off device in appliances
- Gas torches used to brown some dishes

Additional risk factors

- Lack of a *competent person* on site
- Human error
- Combustible food debris trapped in the grease filter
- Lack of knowledge about the extract ventilation
- Faulty or non-tested electrical appliances
- Design aspects of the extract ventilation, such as length of ducts, length of horizontal ducts, type of fan, type and number of duct access panels
- Cleaning contracts may only cover hoods and easily accessible visible areas eg only those areas inside the ducting which are within arm's reach
- Level of *competence of cleaning contractor*
- Remnants of paper napkins or other combustible waste oddments which may have been inadvertently left in cooker hoods or inside the extract ducting etc
- Poor siting or maintenance of fire suppression system
- Poor cleaning maintenance practice may compromise fire protection cladding or fire rated access panels on ducts
- Extract ducts are often completely inaccessible eg in older buildings some duct systems may be routed inside masonry chimney breasts
- Unsuitable ductwork for kitchen environment
- Insufficient number of access doors in ductwork to permit effective inspection and cleaning
- Grease filters left out during cooking.

STAGE 2: Risk assessment

This stage suggests a relative ranking to help you rate fire risk as either low (L), normal (N) or high (H). The scores in each section should not be compared as the subjects are quite different. The ranking is indicative to help you through the process to reduce the risks. As far as possible you should try to improve the number of (L) scores that apply to your premises.

Cooking style and equipment

The following ranks the risks associated with type of cooking and equipment.

- Boiling with no risks of vapour (L)
- Conventional frying or processes emitting steady vapour flow (N)
- Open flame grilling, flame cooking and sudden emissions of hot vapour (H)

Competent persons

Is a competent person on site at all times?



- Yes (L)
- Some time (N)
- No (H)

A competent person is considered to be someone who, by reason of theoretical or practical training or by practical experience is able and authorised to perform a task or assume responsibility.

Staff knowledge and training

Staff will feel valued if they are well trained

How many of your staff understand the systems and processes they are working with?

- All staff (L)
- Shift leader (N)
- No staff (H)

Your training should include the following:

- Understanding the risks of grease and other cooking deposits in ductwork
- Understanding how grease atomises
- Knowing how to handle and use commercial cleaning chemicals
- Familiarity with drawings showing the routing of extract ducts
- Knowing how to isolate the extract fan
- Knowing the correct method and frequency for cleaning grease filters

- Knowing that grease filters should not be removed while the extract ventilation is operating
- Knowing that all appliances should be switched off individually and not at the mains
- Instructing staff to report faulty controls, sensors and indicating devices
- Understanding of how to fight cooking fires and including fire suppression, especially those involving deep fat frying
- Fire detection and extinguisher systems knowledge
- Safe handling of cooking oils and fats
- Safe operation of cooking appliances
- Knowing how to switch off the power supply to cooking apparatus in an emergency

Training should be given and repeated as necessary, and records kept of the training given.

Inspections

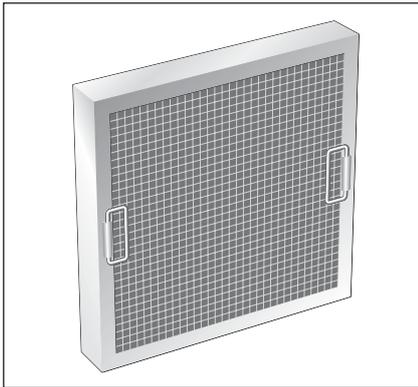
- How frequently are regular visual checks of the whole extract ventilation system made by a competent person?
 - Monthly (L)
 - Six-monthly (N)
 - Annually or never (H)

Grease filters

The primary purpose of grease filters is to reduce the amount of grease passing through into the ductwork. Better filters may therefore reduce the frequency and extent of cleaning.

- Are grease filters in place?
 - Yes (L)
 - No (H)
- Do the filters comply with the recognised performance standards such as LPS1263⁽²⁾?
 - Yes (L)
 - No/Not known (N)

Different types of grease filters may be used within the cooker hood:



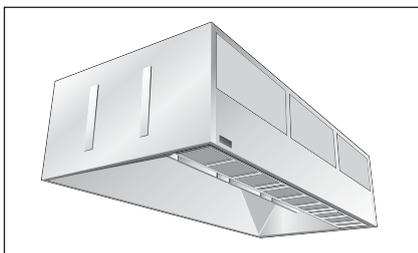
Example of a mesh filter.



Example of a baffle filter.



Example of a cartridge filter.



Example of a water wash filter.

■ Mesh filters are low cost and contain a number of layers of material in a stainless steel or aluminium housing. Grease is deposited on the mesh and such filters are only suitable where low quantities of grease are produced. They have a limited life and need to be cleaned daily. Having no flame protection they should not be used where there is a high risk of fire.

■ Baffle filters comprise a number of interlocking vanes, which form a two-pass grease removal device and a barrier in the event of a flash fire. Grease-laden air passes through the filter by a series of forced changes in direction and speed, the grease becomes separated in the air stream and is deposited on the vertical vanes. Deposited grease is drained off into a collection drawer which has to be regularly cleaned.

■ Cartridge filters have a slot opening onto a series of baffles which cause multiple direction changes to the air flow. Trapped grease falls through a drain to a grease tray.

■ Water wash systems are the most efficient (although expensive). They clean by spraying the interior of the canopy extraction chamber with pressurised hot water automatically injected with a predetermined amount of detergent. Some have continuous cold water spraying to change the characteristics of the grease so that it drops into a drainage system. They can reduce fire risk in solid fuel appliances where hot embers could be drawn up into the hood.

The table below indicates the relative safety scores.

Type	Risk
Mesh	High (H)
Baffle	Normal (N)
Cartridge	Normal (N)
Water wash	Low (L)
Cold water mist	Low (L)

■ If you want continuous running of the system, do you have two sets of grease filters to enable a clean filter to be fitted when the dirty one is removed for cleaning?

- Yes (L)
 No (H)

How accessible are the ducts?

■ Can ducts be easily and safely reached?

- All (L)
 Some (N)
 None (H)

■ Are there other services beneath the ductwork that would hinder easy access?

- Yes (H)
- Some (N)
- None (L)

Although there are systems that can clean ductwork remotely, thus reducing the need for access, greater flexibility in cleaning methods is available if the ductwork is easily accessible.

Unless remotely controlled cleaning has been used, it is reasonable to assume that inaccessible ductwork has not been cleaned and is therefore dirty.

Duct access doors

■ Are there enough access doors throughout the length of all ducts to reach all parts of the interior of the duct?

- Yes (L)
- No (H)

■ Are they quick release fixing?

- Yes (L)
- No (N)

■ Are they leaking grease?

- Yes (H)
- No (L)

Access doors should be as large as possible (to a maximum size of 460 x 610mm in most circumstances) and made to the same acoustic, thermal and fire insulation properties as the ductwork. They should be fitted to the side of ductwork, not the base, to prevent grease leaking out, at a maximum of 3m centres and positioned either side of any internal equipment, and at changes of direction.

How dirty are the ducts?

■ How is cleanliness/dirtiness established or measured and compared with published good practice benchmarks?⁽³⁾

- Physical measurement (L)
- Internal visual inspection (N)
- External visual inspection (H)

Route of the ducts

■ Do you have vertical extract ducts more than 4m high?

- Yes (N)
- No (L)

■ Are bends in ductwork accessible?

Yes (L)

No (L)

■ Is there any ductwork installed outside the building?

Yes (H)

No (L)

■ Is there non-combustible easily cleanable protection to the roof covering at the duct termination?

Yes (L)

No (H)

■ For larger buildings, do you have drawings depicting the extract ventilation?

Yes (L)

No (N)

■ Are the drawings available if needed by the local fire service?

Yes (L)

No (N)

To minimise the risk of grease building up, ductwork should be taken by the shortest and most direct route to atmosphere with a minimum number of bends. A schematic drawing of the installed ductwork, showing access doors, should ideally be held by the kitchen operator to aid the cleaning process and to help the fire services in the event of a fire.

Kitchen extract ductwork must remain separate from other ventilation systems. Where kitchen extract ducts have to pass through other parts of the building they should be contained within a separate outer duct having the same standard of fire resistance as the kitchen, or the parts of the building through which it passes, if these are higher.

The length of ductwork installed outside the building should be kept to a minimum because the effect of cold weather will increase the rate of grease and fat condensing and solidifying inside the duct. Where this is unavoidable, ducts should be vertical and insulated.

Fire-resisting dampers must not be installed in kitchen extract ductwork. Grease deposits will prevent damper operation and the dampers will prevent proper cleaning.

Catering equipment is usually cleaned before cooking begins or, preferably, at the end of the working day so that the equipment is left clean overnight. Staff may be tired at the end of their working day, however, and tempted to take shortcuts, so close supervision will be necessary⁽⁷⁾.

Ventilation system cleaning regime

■ Are there enough access doors to enable the entire length of the internal and external surfaces of the ductwork to be inspected and cleaned?

- Yes (L)
- No (H)

■ Does your kitchen have a cleaning schedule?

- Yes (L)
- No (H)

■ Are your staff trained to regularly clean grease and oil from the hoods, filters and greasetrays etc.

- Yes (L)
- No (H)

■ Do you employ a competent contractor to clean the extract ventilation system?

- Yes (L)
- No (H)

■ Is a post cleaning report produced?

- Yes (L)
- No (H)

■ Have you inspected the cleanliness of the ducts via the filter housings and access doors to check on the effectiveness of a contractors' clean?

- Yes (L)
- Obtained photographic evidence (N)
- No (H)

The following checklist should form part of an operating and maintenance schedule that will keep your system in a safe condition.

Some of these tasks may be performed by competent kitchen staff, otherwise a competent contractor should be employed. In any case the following best practice should be used:

Daily

- Check detergent container and fill if necessary
- Clean parts of hood visible from within the kitchen
- Check the grease drip tray, drain and clean as required

Weekly

- Remove and clean grease filters (more frequently under heavy operation).
- Soak filters in a detergent solution and rinse with a pressure washer or clean in a dishwasher. Note that baffle filters must

be replaced with the baffles running vertically.

- Check the grease tray for build-up and clean out using rags. Check for other debris.

- Remove access doors on hood and inspect the interior with a torch. Visible deposits should be removed as far as possible (but note that this is not a substitute for regular cleaning of the entire system).

Monthly

- Where fitted, inspect fire suppression operating mechanisms for grease build-up.

- Check all water nozzles for blockages.

Quarterly

- Clean the extraction fan blades.

Annually

- Call a ventilation engineer to test and inspect the hood and fan for proper operation and air flow.

- Call a competent contractor to check the internal condition of ductwork by measuring grease thickness and provide a report.

Good Housekeeping

- The frequency of local visual inspections (ie just behind grease filters) will depend on the cooking process and hours of operation, but should be at least weekly.

- All metal surfaces should be checked for accumulated grease or dirt.

- It is ineffective to create so-called “fire breaks” by cleaning small areas around access panels

- The insides of all filter housing and grease collection trays should be cleaned weekly.

- Baffle filters and grease collection trays should be cleaned at least twice a week.

- Extract ducts should be cleaned by a competent cleaning contractor⁽³⁾

- Only suitable metal cleaning products should be used. Caustic or abrasive materials may damage metal surfaces and provide a breeding ground for bacteria.

- Where removable filters are fitted, they should only be

removed when the system has been shut down, to prevent unfiltered air entering the ducts. These filters may be put in a dishwasher or hand washed to remove grease.

■ Cartridge filters have an *air plenum* as part of the design and grease collected in this area should be removed by regular cleaning at least twice a week.

The frequency of cleaning the internal surfaces of the entire length of the extract ductwork should be based on a considered risk assessment. The best way of doing this is by measuring the quantity of grease deposited on the duct surface and establishing the rate of fouling.⁽³⁾

Where this is impractical, then initial cleaning frequency should depend on the level of use, as indicated below. Thereafter, "before and after" dirtiness and cleanliness measurements will permit the frequency to be adjusted to suit the actual observed *hazard*.

Frequency of cleaning

■ How frequently do you clean the whole system?

■ How frequently do you clean parts of the system?

■ How is complete cleanliness verified?

Factors affecting frequency of system cleaning

■ The level of use of the cooking equipment:

Heavy use (12-16 hours per day): 3 monthly cleaning suggested

Moderate use (6-12 hours per day): 6 monthly cleaning suggested

Light use (2-6 hours per day): 12 monthly cleaning suggested⁽³⁾

■ Vulnerability to ignition

■ Hygiene, vermin and mechanical hazards

■ Seasonal catering establishments should have the system cleaned at the end of the season. It is particularly important to ensure fans do not become jammed against solid grease. It is advisable to check systems before restarting at the commencement of the season.

Regular cleaning will also reduce the likelihood of grease deposits baking and hardening on duct surfaces. In addition to regular ductwork cleaning you must remember to clean every day, the hoods, filters and associated drains and traps, in accordance with manufacturers' recommendations.

Fire suppression systems

A properly designed and installed fire detection and suppression system can help prevent the spread of fire into a duct, and thereby prevent secondary fires from breaking out elsewhere. If good means of escape and other fire precautions are provided, the primary purpose of an automatic fire suppression system will be to reduce property damage. Nevertheless, a risk assessment of the specific circumstances might indicate that an automatic fire suppression system would also help to protect people in the kitchen or in rooms through which ductwork passes.

During any cleaning process, care should be taken not to damage fire suppression operating mechanisms such as fusible links located in the ductwork.

Liquid type fire suppression systems and portable fire extinguishers are preferable since they give a greater level of cooling, seal the oil surface and prevent reignition.

Care in cleaning is necessary to protect nozzle covers while ensuring that any blockages are removed.

Dry powder systems are unlikely to work with deep-fat fryers, but can be used for shallow frying/grilling.

Carbon dioxide systems are suitable in only a few special circumstances and should not normally be fitted.

Special water mist systems are available. However, under no circumstances should any other water system be used.

A maintenance contract should be in accordance with manufacturer's instructions.

■ Is fire suppression fitted to the extract ventilation?

Yes (L)

No (H)

■ What kind of fire suppression system is installed?

Dry chemical agent system (N)

M Water mist (L)

Wet chemical (L)

■ Has the liquid chemical agent system approved under a recognised performance standard? ⁽⁵⁾

Yes (L)

No (H)

■ Do you have portable fire extinguisher(s) suitable for use on cooking oil fires?⁽⁶⁾

Yes (L)

No (H)

■ Do you have a maintenance and testing contract for the fire suppression system and portable fire extinguishers?

Yes (L)

No (H)

You must decide whether enough has been done to reduce the hazards by evaluating the adequacy of existing fire safety measures.

STAGE 3: Evaluate the hazards

Identify all the hazards
Remove where possible
Reduce if possible
Replace with a safer alternative
Manage the remaining hazards.

STAGE 4: Keep records

STAGE 5: Review and revise the assessment



■ Can your extract system be upgraded to meet the specification of DW172?⁽¹⁾

- Yes (L)
 No (H)

■ Do you have an emergency plan to protect the lives of staff and others within the building?

- Yes (L)
 No (H)

■ Do you keep training and maintenance records?

- Yes (L)
 No (H)

It is recommended that you keep in a safe place, records of system layout, risk assessments, inspection and cleaning reports. Without these, it will be impossible to assess the necessary frequency and extent of cleaning, particularly if new equipment or processes are introduced.

In addition, you have a legal responsibility to maintain staff training records. Should there be a fire or an accident, all these records may provide the only defence against criminal prosecution.

Records may also be helpful to demonstrate to an insurance company that the measures required in their insurance policy have been complied with: without them, and depending on the circumstances of a loss, any insurance claim may be repudiated.

It is a requirement to regularly review and revise the fire risk assessment and especially when changes are introduced to the kitchen. frequency and extent of cleaning, particularly if new equipment or processes are introduced.

■ Have you checked your insurance policy for specific conditions relevant to cooking?

- Yes
 No

■ Do you comply with these conditions?

- Yes
 No

