7 Specific considerations for kitchen extract systems

7.1 Kitchen extract (exhaust) systems are particularly affected by the deposition of grease and oil on internal surfaces from the canopy, including any ductwork, through to the fan and discharge, since no filter can be 100% effective. Varying efficiencies of filtration in effect vary the rate of fouling. Likewise other (non-catering) industrial cooking processes can result in accumulation of grease and oil hidden inside ventilation systems.

7.2 Under certain circumstances flame, or high temperature within the duct, can ignite the grease causing fire to spread rapidly through the duct. Flame and heat within the duct can ignite surrounding materials at various points along the ductwork path and transfer fire in ways that are difficult to predict and control by designers, installers and ultimately fire fighters. There are many cases where a small kitchen fire has been propagated by grease laden extract systems, causing major building destruction well beyond the confines of the kitchen.

7.3 Accumulated grease also provides a hygiene hazard and can lead to foul odour, pest infestation and in some cases unhygienic 'backwash' of air into the cooking area. Leakage of oil from damaged or poorly-installed ductwork can spread these hazards to building areas such as ceiling voids and service shafts.

7.4 Fire Services and forensic fire investigators report frequent instances of kitchen extract ventilation being the source or propagation route of fire. For this reason insurers have given increased attention to the "fryers' warranty" and often specify specific cleaning frequencies and proof of careful cleaning maintenance. Claims may be repudiated by insurers in cases of failure to comply with the terms of the insurance policy.

7.5 The introduction of the Regulatory Reform (Fire Safety) Order 2005 has created the legal requirement for all buildings to have a Fire Risk Assessment undertaken. To comply with the legislation, any identified fire hazard must be minimised, controlled or removed where possible. Table 13 sets out guidance on maximum surface grease deposit limits.

7.6 Grease extract systems must be regularly inspected & cleaned to ensure that any fire hazards are removed in compliance with the Regulatory Reform (Fire Safety) Order. Health & Safety Executive, BSRIA, FPA insurance guidance and regulations (see Appendices B &

E) stipulate that kitchen extract systems should be kept clean to minimise fire and other risks.

This guide to good practice includes assistance on identifying the appropriate frequency of cleaning, based on risk assessment.

7.7 Kitchen extract ventilation systems are defined here as the extract systems intended to capture and remove contaminants as well as heat and moisture from cooking appliances and to protect personnel as required by COSHH regulations (See also **DW/172**). A kitchen extract system would typically consist of the following components:

- **Canopy** - Also referred to as hood, canopy hood, extraction hood, cooking hood, cooker hood, cooking canopy or extraction canopy. This would most likely include a vertical canopy skirt running around the perimeter of the canopy. A 'U' channel on the bottom edge of the skirt; a canopy roof sitting horizontally on the top of and joining the skirts; a grease filter housing assembly (with grease filters and traps) hanging within the boundary of the skirts.

- **Canopy/Extract plenum** - This is typically the area immediately behind the grease filter housing and below where the ducting commences.

- **Ducting** - Beyond the canopy/extract plenum, extraction ductwork would be connected, typically constructed of galvanised steel or heavy duty fire rated steel, which may have additional fire protection. This may involve short transition ducts connected directly to the suction side of an extract fan or could include many linear metres of horizontal and/or vertical ductwork. Vertical ductwork, also referred to as riser may pass through many levels of a building. Contained within the ducting there may be attenuators, flow control dampers, fire dampers, air turning vanes and sensors.

- **Extract fan** - To create extraction from the canopy an extract fan would be connected to the ductwork, some extract fans (roof mounted) discharge directly to atmosphere via a cowl.

- **Discharge duct** - On the exhaust side of the fan a discharge duct would direct extract air out of the building via an outlet. This outlet point may include weather louvres and mesh to prevent the ingress of weather and vermin.

- **UV systems** - Where a UV or similar system has been installed within the grease extract canopy and ductwork system, the rate of grease accumulation may be reduced but full system inspection

will still be required to determine the need for any cleaning.

- **Carbon filtration** - Typically installed prior to discharge to minimise odour release in compliance with local planning requirements.

- **Electrostatic precipitation filters** ('**ESP**') - Some systems may include electrically charged filter banks to minimise system atmospheric discharge, the filters will require regular laundering to maintain efficiency.

7.8 Some systems may include ventilated ceilings with ceiling plenum void extract or directly ducted extraction such as those connected to pizza ovens and fish frying ranges and are also subject to the same cleaning considerations.

7.9 Other extraction systems serving the cooking area such as pot wash/dish wash systems, general extraction, etc may also be affected by grease deposits and if so, similar considerations will apply.

7.10 It is important that the person responsible for implementing cleaning regimes clearly understands the component parts of the system so that any cleaning regime is compliant with the terms of property insurance relevant to the kitchen extract maintenance.

7.11 Supply or make-up ventilation systems should be maintained in hygienic condition as detailed in this Guide.

7.12 Due to the accumulated grease within extract systems, the majority of the ductwork cleaning will be by manual rather than mechanical methods. At the time of system survey, a detailed schematic or system description should be provided, highlighting any known areas which are currently inaccessible and therefore, will remain un-cleaned. The client must be advised of any known inaccessible areas, the reason for their inaccessibility and, if possible, the likely cost to provide full and free access. Initial system inspection prior to the first clean may not fully identify all of the inaccessible areas which may only become apparent during the cleaning exercise. It is the client's responsibility to facilitate access to any third party buildings if any part of the ductwork system is located in third party property. It is also the duty of the client's responsible person to highlight any inaccessible/un-cleaned areas to their insurer or other relevant third party, such as a landlord.

7.13 This section of the Guide provides specific advice on how to clean and

maintain kitchen extract systems, but similar consideration will apply to non-kitchen areas that might be affected by grease and/or oil deposits.

Design and access to the internal surfaces of the kitchen extract system

7.14 Advice is provided in HVCA *DW/172: Specification for Kitchen Ventilation Systems* (2005).

7.15 Internal surfaces of kitchen extract systems should be free of irregularities, all of which make grease accumulation more likely and cleaning more difficult.

7.16 It is essential that a kitchen extract ductwork system, and canopy/extract plenum, is provided with access panels of sufficient number, quality and size to enable unrestricted access for regular cleaning and inspection of the internal surfaces and in-line components. All panels shall be in accordance with the requirements of DW/144 & DW/172.

7.17 Location of access to the internal surfaces of a kitchen extract system is dependent on a number of design and operational considerations:

(a) Design and location of ductwork

(b) Building design and construction materials

(c) Location of kitchen within the building

(d) Location of extract fan and accessibility for maintenance

(e) Accessibility to physically reach the ductwork

(f) Any building modifications and current uses that may restrict access

(g) Location and number of system components requiring access.

7.18 Access panels should be suitable for the purpose for which they are intended. The panels and frames should be constructed of the same material as the ductwork. As a minimum they should incorporate quick release catches, sealing gasket and thermal, acoustic and fire rated insulation properties equal to that of the duct to which they are fitted. Particular consideration must be given to maintaining the fire integrity of fire-rated ductwork. The recommendations of the

manufacturer or specialist fire protection adviser should be followed where appropriate.

7.19 Access panels should be as large as the duct size permits to a maximum of 460 mm x 610 mm without weakening the structure of the system. Openings should not be obstructed by other building services, stored equipment or by the fabric of the building. The panel and aperture should be free of any sharp edges.

7.20 Access panels should ideally be fitted at the side of the duct, a minimum of 10 mm above the base to minimise the risk of grease leakage. Exceptionally, they may be fitted on the top or underside of the duct, but due consideration should be given to the accessibility of the panel. Where access panels must be fitted to the underside of a duct, particular care must be taken to ensure a leak-free fit and notice should be affixed warning of the risk of oil being released on opening the panels. In designing systems due consideration should be given to providing physical unobstructed access to all access panels.

7.21 Access panels should be fitted on either side of in-line components, as detailed in Table 10, to allow physical entry to clean these intricate surfaces. This Table includes components, such as fire dampers and attenuators, which are not normally recommended to be installed, but are often found in practice.

Table 10 Location of access panels for cleaning and inspection purposes

Volume control dampers	Both sides
Fire dampers	Both sides (see note 7)
Attenuators	Both sides
Changes in direction	Both sides
Filter sections	Both sides
Horizontal ducts	Generally 3 m centres (see Note 2)
Risers	Maximum 3 m centres (see Note 3)
Extract fans	Both sides (see Note 4)
Discharge grille/mesh	One side (see Note 6)

Notes to Table 10

1 Additional builders work hatches may need to be fitted in ceilings/walls in existing installations, or provided for in new constructions. These would not be provided by the cleaning contractor unless a separately specified cost is provided.

2 Access openings for cleaning purposes are generally required at a maximum of 3 m centres and/or at each change of direction where head and shoulder access is possible. This distance should be reduced where the size of the duct prevents adequate cleaning by hand, where there are several changes in direction or where other external features restrict the positioning of panels.

3 Internal kitchen extract risers often require access panels fitted at maximum 3 m centres on each floor level so that all internal surfaces can be reached and fire dampers, where fitted, cleaned and checked. In some buildings this may require additional builders works (eg, hatches through brickwork) to reach the riser ducts (see note 1 above and 7.17). The exception to this may be if abseil cleaning is practicable, where specialist advice should be sought. In such cases it may be possible to reduce the required quantity of access panels.

4 Extract fan design should allow thorough cleaning of impellor blades and internal surfaces without the need for dismantling, ie ductwork with access panels should be provided immediately upstream and down- stream. Larger fans should be designed with panels in the casing. Similarly, attenuators or other in-line fittings likely to obscure cleaning activity should be provided with access on both sides.

5 Guideline access frequency given above may be reduced where safe personnel entry can be adequately applied. However, in all instances every section of ductwork should be capable of verification inspection.

6 Design consideration should be given to the provision of safe access to the down-stream side of discharge grilles, bird guard mesh and louvres.

7 Fire dampers should not be fitted in new installations in accordance with BS5588, but may still be found in older systems.

7.22 During cleaning maintenance it is essential to ensure that the mechanical and any fire integrity of access provision are maintained. Access panels should be identified and marked on a schematic sketch (see Verification of cleanliness below). The number of access panels removed at any one time should be kept to a minimum. It is the cleaning contractor's responsibility to ensure that all access panels are properly replaced after cleaning. Fire protection removed for cleaning (eg, cladding board) must be re-fitted. The repair and replacement of any previously broken/damaged fire cladding shall not be the responsibility of the cleaning contractor unless specifically agreed.

Cleaning methods

7.23 This Guide is not intended to be definitive in relation to the method of cleaning, as there are many existing methods that can be applied in tandem, and emergent new technologies. Examples of cleaning methods are listed in Table 11.

7.24 To conform to this Guide, the actual method or methods must be capable of achieving the required results, ie post-clean verification, not only on the internal surfaces of the extract duct but also on system components.

7.25 When choosing the cleaning method, consideration should be given to operative safety and also to effects on the surrounding environment, particularly where using wet cleaning methods, since grease/moisture can leak from the ductwork components and damage the surrounding fabric.

Any cleaning method must be demonstrably capable of meeting the standard for post-clean verification.

Table 11 Examples of cleaning methodology

Generic name	Energy source	Removal method
Hand wipe	Manual	Wiping the surface of the ductwork
Hand scrape	Manual	Removing heavy deposits by hand scraping
Chemical	Manual	Softens or dissolves deposits making them suitable for hand scraping
Steam cleaning	Electrical	Hot vapour expelled at high pressure from lance to dislodge/dissolve deposits

Notes to table 11

1 Remote cleaning methods are not generally used for cleaning grease extract ductwork systems. The reason for this is the type of grease that is typically deposited within kitchen extract systems will not be released by remote mechanical means.

2 Steam cleaning and high pressure water washing are not recommended for ductwork that is situated above false ceilings or in sensitive areas, due to possible leakage of contaminants from the duct, unless specifically designed for wet cleaning.

3 After applying wet cleaning methods care should be taken to ensure that any condensed vapours and cleaning fluids are removed from all parts of the system.

4 The use of chemical cleaning agents should only be considered where a risk/COSHH assessment has been carried out (See Section 10), the details recorded and the effects of the applied chemicals have been assessed on the material construction, environment and for hazards to cleaning personnel.

5 It should be noted that it is not normally economically practicable to clean kitchen extract systems to a "like new" bright metal condition due to substrate staining.

Frequency of cleaning

7.26 The following factors have an impact on the frequency of cleaning:

- **Type of usage** - The type of cooking and volume of catering clearly impact on the level of grease accumulations within an extract ductwork system.
- **Volume of catering** - The number of covers catered for within the size of the catering facility impacts on the volume of grease particulates.

- **Type of cooking** - The levels of grease that is produced will depend on the type of cooking carried out for example kitchens that produce high levels of fried or chargrilled food will produce much higher grease levels than those using less intensive cooking methods such as baking and boiling.

Frequency of cleaning - risk assessment

7.27 All operational grease extract ductwork systems will require cleaning annually as a minimum unless a fire risk assessment recommends otherwise.

7.28 The frequency of cleaning should be sufficiently frequent that grease deposit limits are not exceeded. In the absence of data on measured levels of cleanliness, time-and-usage-based methods are often used to estimate required cleaning frequency (see Table 12). Pre-cleaning micron readings should be taken to enable cleaning frequency to be confirmed as suitable or adjusted accordingly.

7.29 Clearly, many installations will need a higher frequency of cleaning based on hours and type of usage.

Table 12 below will assist in assessing the required frequency of cleaning.

Table 12 Kitchen grease extract systems

Perceived level of grease production	Typical example	Cleaning intervals (months) Daily usage			
		Up to 6 hours	6-12 hours	12-16 hours	16+ hours
Low	No significant production of grease laden aerosols during normal daily food production operations	12	12	6	6
Medium	Moderate production of grease laden aerosols during normal daily food production operations	12	6	4	3
High	Heavy, significant or continual production of grease laden aerosols during normal daily food production operations	6	3	3	2

Notes to Table 12

1 Commercial liability/property insurance policies invariably contain conditions and warranties that stipulate a minimum cleaning frequency for grease extract ductwork systems under the insurance which can be a higher frequency of cleaning than TR/19 recommendations. Failure to comply with such requirements will invalidate the property insurance policy.

2 The canopy and canopy/extract plenum is an area of higher fire risk and consideration should be given to more frequent cleaning in accordance with insurers' requirements.

3 Periodic specialist cleaning should be accompanied by daily or weekly cleaning of canopies, filters and associated drains and traps in accordance with manufacturers' recommendations, typically carried out by the kitchen operator, in compliance with the property insurers' requirements.

7.30 Any cleaning regime should be justified by a considered risk assessment. (The latest Fire Precautions Workplace, and Management of Health & Safety at Work Regulations apply.)

Post-clean verification of cleanliness

7.31 The primary method of assessment is visual. For cleaned system verification, the surface should be visibly clean and capable of meeting the level of cleanliness specified in 7.33 below.

7.32 Verification of cleanliness should be by means of the DTT or WTT, as detailed in System Testing (Inspection/Monitoring) at paragraph 7.35.

7.33 Following cleaning all post clean wet film thickness tests shall not exceed 50 µm and shall be representative of the system.

7.34 On completion a report shall be issued including the following:

- The system(s) cleaned
- Pre-clean measurements
- Post-clean measurements
- Pre and post clean photographic records
- Additional works carried out (if any)
- COSHH data on any chemicals used
- Recommendations for future cleaning requirements
- A sketch or schematic of the system indicating access panel and testing locations and highlighting any un-cleaned/inaccessible areas with an explanation as to why the area could not be accessed/cleaned (see paragraph 7.12)
- A certificate summarising the cleaning works completed.

7.35 The Post-Clean Verification of Cleanliness Report should assist to serve as evidence of system status to insurance assessors, Environmental Health Officers, landlord's agents, etc.

System testing (inspection/monitoring)

7.36 B&ES's Ventilation Hygiene Branch has investigated a variety of methods for testing ductwork system internal surfaces to measure grease deposits and recommends the WFTT measurement method. This method is described in Appendix D.3.

7.37 The DTT, as described in Section 5 and Appendix D, may also be used and may be necessary in the case of extremely hard- baked, carbonised, deposits. It is however less reliable for soft or liquid deposits and the finding of hard-baked deposits would normally indicate a requirement to clean or in the case of cleanliness verification a requirement to re-clean.

7.38 The testing methods provide an objective, repeatable and verifiable measurement of grease deposits, and overcome the subjectivity of visual inspection alone.

7.39 To verify frequency of cleaning based on micron measurements, it is recommended that inspections be carried out at regular intervals. Depending on the type and duration of cooking undertaken, this may be as frequent as monthly but, not exceeding 6 monthly(refer to FPA RC44 for risk assessment guidance). Inspection shall be carried out by the Responsible Person or a Competent Person. Records of regular inspections shall be kept to comply with Insurance Company requirements and /or Regulatory Reform (Fire Safety) Order Risk Assessments. Following inspection a decision on the frequency for cleaning shall be made using the recommendations set out in Table 13.

7.40 Micron measurements should be taken at the following locations where practicable:

- Canopy/Extract plenums behind filters
- Duct 1 m from each canopy
- Duct 3 m from each canopy
- Duct midway between canopy(ies) and fan
- Fan
- Duct upstream of fan
- Discharge duct downstream of fan.

7.41 Table 13 sets out guideline maximum levels of grease deposit and actions recommended. The actual recommended action timing will depend on the rate of accumulation, the risk vulnerability of the system and site and any particular warranties imposed by the property insurers.

Table 13 Surface grease deposit limits

WFTT measurement	Recommended action
200 µm as a mean across the system	Complete cleaning required
Any single measurement above 500 µm	Urgent localised cleaning required (notes 4 & 5)

Notes to Table 13

1 In the absence of, and the likely theoretical difficulties of, an absolute measure of the flammability of various quantities of grease deposit, the surface grease deposit limits are given in Table 13 and paragraph 7.32. These levels were determined by extensive field testing to measure at what levels good practice employers, or operators of systems, carry out system cleaning and what levels of cleanliness are normally achieved by specialist duct cleaners using available cleaning and measurement technology within reasonable economic bounds.

2 The deposit limits refer to the degree of grease deposition within the ductwork consistent with good practice. Other factors such as cooking methods, potential ignition sources, and other combustible debris will affect the risk of fire.

3 The mean measurement is calculated by dividing the total of the test results by the number of testing locations.

4 The second category of any single measurement above 500 µm is provided to cater for local "hot spots" which should be cleaned even where the whole system does not require complete cleaning. Examples might be immediately local to a canopy or at a fan.

5 The extent of urgent local cleaning precipitated by the presence of grease deposits above 500 µm shall be subject to reasonable appreciation of the extent of fouling and risk posed.

7.42 The surface grease deposits limits should not be confused with the level set for post-clean verification which is far more stringent and detailed in paragraph 7.33.

System performance testing

7.43 Those employers/duty holders who have concluded in their risk assessment that there is exposure to substances hazardous to health, and engineering control is needed to adequately control the hazardous substances, and that the engineering control required is Local Exhaust Ventilation, should refer to HSE Publication HSG258.