

TR/19 HVCA Guide to Good Practice

Internal Cleanliness of Ventilation Systems

SECTION 7

Specific Considerations for Kitchen Extract Systems

7.1 The kitchen extract system presents particular hazards due to the potential for the accumulation of grease. Accumulated grease within an extract system forms a hidden combustion load. Under certain circumstances flame or very 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.

7.2 Kitchen extract ventilation systems are defined here as the extract systems intended to collect and remove contaminants, heat and moisture from cooking appliances (See also DW/172). A kitchen extract system would typically comprise 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 "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. 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. Other systems such as ventilated ceilings and directly ducted extraction are also used. It is important that the person responsible for implementing cleaning regimes clearly understands the breakdown of the system so that any cleaning regime is compliant with the terms of buildings insurance relevant to the kitchen extract maintenance.

7.3 Other extraction systems serving the cooking area, such as potwash/dishwash systems, general extraction etc. may also be affected by grease deposits and similar considerations will apply.

7.4 Kitchen extract systems are liable to internal fouling by grease and oils. It is usual for the systems to be protected by grease filters, but these differ widely in terms of efficiency of grease removal and of barrier to flame. Total grease removal is not normally feasible and therefore fouling of systems downstream will occur to a greater or lesser degree.

7.5 Grease deposits within systems also pose hygiene, odour, vermin and mechanical efficiency hazards. Poorly designed and installed or damaged ductwork can leak grease, thus extending the fire risk, hygiene, odour and vermin hazards. Also, where ductwork distorts under fire conditions, burning grease can leak out and spread the fire to duct surroundings.

7.6 Supply or make-up ventilation systems should be maintained in hygienic condition as detailed in this Guide. Due to the accumulated grease within extract systems, the majority of the duct - work cleaning will be by manual rather than mechanical methods. At the time of system survey, a detailed schematic should be provided, highlighting any areas which are inaccessible and therefore, will remain uncleaned. The client must be advised of any inaccessible areas, the reason for their inaccessibility and, if possible, the likely cost to provide full and free access. It is the clients responsibility to highlight this to their insurer or other relevant third party, if required, who must confirm whether an exception to the total cleaning in accordance with TR/19 is acceptable.

7.7 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

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

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

7.10 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.

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

- Design and location of ductwork
- Building design and construction materials
- Location of kitchen within the building
- Location of extract fan and accessibility for maintenance
- Accessibility to physically reach the ductwork
- Any building modifications and current uses that may restrict access
- Location and number of system components requiring access.

7.12 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.

7.13 Access panels should be as large as the duct size permits to a maximum of 460mm x 610mm 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.

7.14 Access panels should be fitted at the side of the duct, a minimum of 10mm above the base to minimise the risk of grease leakage. Exceptionally, they may be fitted on the top 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.

7.15 Access panels should be fitted on either side of in-line components, as detailed in Table 8, 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 8: Location of Access Panels for Cleaning and Inspection Purposes	
Volume Control Dampers	Both sides
Fire Dampers (see Note 7)	Both sides
Attenuators	Both sides
Changes in Direction	Both sides
Filter Sections	Both sides
Horizontal Ducts	Generally every 3 metres (see Note 2)
Risers	Top and bottom as a minimum (see Note 3)
Extract Fans	Both sides (see Note 4)
Discharge grille/mesh	One side (see Note 6)

Notes to Table 8

1. Additional builders work hatches may need to be fitted in ceilings/walls in existing installations, or provided for in new constructions. Consideration should also be given to safe high level access to external ductwork.

2. Access openings for cleaning purposes are generally required at a maximum of 3 metre centres and/or at each change of direction. 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 doors fitted on at least each floor level so that all internal surfaces can be reached and fire dampers, where fitted, cleaned and checked. In older buildings this may require additional builders works (e.g. hatches through brickwork) to reach the riser ducts (see 7.6).

4. Extract fan design should allow thorough cleaning of impellor blades and internal surfaces without the need for dismantling, i.e. ductwork with access panels should be provided immediately upstream and downstream. 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 remote cleaning methods and 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 downstream side of discharge grilles, bird guard mesh and louvres.

7 Fire dampers are not fitted in new installations, but may still be found in older systems.

7.16 During cleaning maintenance it is essential to ensure that the mechanical and any fire integrity of access provision is maintained. Access panels should be identified and marked on a schematic sketch (see Verification of Cleanliness below). Control procedures should ensure that all access panels are properly replaced after cleaning, and that any fire protection removed for cleaning (e.g. cladding board) is properly re-fitted both at the duct and at any builders work. The number of access panels removed at any one time should be kept to a minimum. All panels should be replaced at the end of the working shift.

7.17 Designers, installers or specialist cleaners should define and justify the number of access panels to be fitted to an installation in line with this Guide.

System Testing (Inspection/Monitoring)

7.18 The Health & Safety Executive and industry and 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 now provides a method of measuring and defining cleanliness and dirtiness as a benchmark for good practice.

7.19 The HVCA Ventilation Hygiene Group Branch has investigated a variety of methods for testing ductwork system internal surfaces to measure grease deposits and recommends the Wet Film Thickness Test (W.F.T.T.) measurement method. This method is described in Appendix D.3.

7.20 The Deposit Thickness Test (D.T.T), as described in Section 5, may also be used and may be necessary in the case of extremely hardbaked, 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 reclean.

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

7.22 It is recommended that testing be carried out at intervals not exceeding 12 months. Monitoring of grease deposits may need to be carried out more frequently if it is necessary to establish a precise definition of required cleaning frequencies. The cleaning frequency required should be estimated

by a specialist service provider and/or client on initial inspection or assessment and subsequent pre-clean testing will confirm whether the initial predicted frequency is correct or requires adjustment.

7.23 Measurements should be taken at the following locations where practicable:

- Canopy/Extract plenum behind filters
- Duct 1 metre from canopy
- Duct 3 metres from canopy
- Duct midway between canopy and fan
- Duct upstream of fan
- Discharge duct downstream of fan

7.24 Table 9 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 building insurers.

Table 9: Surface Grease Deposit Limits	
Wet Film Thickness Test Measurement	Recommended Action
200 $\hat{1}\frac{1}{4}$ m as a mean across the system	Complete cleaning required
Any single measurement above 500 $\hat{1}\frac{1}{4}$ m	Urgent local cleaning required

Notes to Table 9

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 9 and paragraph 7.42. 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 500um 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 500um should be subject to reasonable appreciation of the extent of fouling and risk posed.

7.25 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 7.42

7.26 Stand-alone, regular or post-clean testing can usefully be combined with inspection of other kitchen extract system safety issues. If specified by a client, a service provider should provide evidence of competence to carry out such inspection. Such inspection should include, but not be restricted to:

1. Adequacy of filters and their regular maintenance
2. Adequacy of regular cleaning of canopy, and associated drains and traps
3. Existence and visual condition of any fire suppression or detection system
4. Damage to fire protection
5. Ductwork grease leakage
6. Ductwork damage
7. Damage to or inappropriate ductwork fixtures
8. Visual/audible check of fan operation
9. Rubbish/debris adjacent to system
10. Visual assessment of any special filtration
11. Discharge condition, including grease splatter/staining

7.27 Such inspection should not be regarded as a substitute for proper maintenance of plant such as fans and fire suppression or detection systems.

Cleaning Methods

7.28 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 10.

7.29 To conform with the Guide, the actual method or methods must be capable of achieving the required results, i.e. Post-Clean Verification, not only on the internal surfaces of the extract duct but also on system components.

7.30 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.

Table 10: 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
High pressure water wash (steam)	Electrical or compressed air	Vapour or liquid expelled at high pressure from lance to dislodge/dissolve deposits
Blasting (remote or direct) using suitable medium as appropriate	Compressed air	Blasting medium dislodges contaminant from duct and component surfaces to be removed via vacuum techniques or high volume filtered extraction.

7.31 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.

7.32 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.

7.33 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.

7.34 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

7.35 The need for specialist cleaning of extract systems will depend on the level of usage of the cooking equipment, types and quantity of cooking and other risk factors such as vulnerability of the system to ignition and of the building and its occupant/users to system fire, hygiene, vermin and mechanical hazards. Typical cleaning intervals are shown in Table 11:

Table 11: Frequency of Cleaning		
Heavy Use	12-16 hours per day	- 3 monthly
Moderate Use	6-12 hours per day	- 6 monthly
Light Use	2-6 hours per day	- 12 monthly

Note to Table 11

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 (see 7.39)

7.36 The frequency of cleaning should be adjusted by means of system testing (inspection/monitoring) - see paragraph 7.23, so that surface grease deposit limits in Table 9 are not exceeded. The buildings insurance company should be consulted to ensure that the cleaning regime is compliant with the terms of their specific warranty.

7.37 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).

7.38 Regular cleaning will result in an improved mean standard and reduce the costs of cleaning as deposits are not allowed to bake and harden.

7.39 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.

Post-Clean Verification of Cleanliness

7.40 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.

7.41 Verification of cleanliness should be by means of the Deposit Thickness Test or Wet Film Thickness Test as detailed in System Testing (Inspection/Monitoring) at paragraph 7.23.

7.42 The level of cleanliness is that no single measurement should exceed $50\frac{1}{4}\mu\text{m}$

7.43 On completion a report should be provided containing the following:-

- The system(s) cleaned
- Pre-clean measurements (as per System Testing)
- Post-clean measurements
- Photographic records
- Additional works carried out (if any)
- COSHH data on any chemicals used
- Recommendations for future cleaning requirements
- Observations on the condition of the ductwork system
- A sketch or schematic of the system indicating access panel and testing locations and highlighting any uncleaned areas with a written explanation as to why the area could not be accessed/cleaned (see paragraph 7.6)

7.44 If specified, additional kitchen extract safety issues should also be reported (as outlined in paragraph 7.26).

7.45 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.

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