GREASE — Part 1

Part 1: GREASE (Kitchen Extract)

Legal Standards and Guidance applicable to the risk management of the fire and grease levels within commercial kitchen extract systems to EC852:2004

1. INTRODUCTION TO KITCHEN GREASE EXTRACT SYSTEMS

For over four decades the importance of grease capture and removal has grown in significance. Initially, it was assumed that vent to atmosphere was acceptable, but the massive increase in takeaways and surge in eating out, has led to an exponential increase in food outlets across the UK. Equally there has been steps over the past decade to try and restrict the amount of pollutants and particulates being vented to atmosphere. Advanced filtration, improved maintenance, and new products, such as ductless recirculation systems are improving emissions to the environment.

NAADUK believes it is just as important that Commercial Kitchen Users are aware of the rules and regulations as given in various guidance documents, such as FPA (Fire Protection Association) RC44, Recommendations for fire risk assessment of catering extract ventilation as to what their responsibilities are in reducing the risk of fire. **See Appendix 1 Page 59.**

2. PURPOSE OF A KITCHEN GREASE EXTRACT SYSTEM

A grease extract system uses mechanical means to:

- Remove fats, oils and grease generated from cooking food
- Reduces the risk of fire in a Kitchen Grease Extract system
- Remove Steam
- Remove Heat
- Remove gaseous grease
- Produce the best possible safe working environment for catering staff

3. LAW & GUIDANCE FOR COMMERCIAL KITCHEN GREASE EXTRACT SYSTEMS

3.1 GENERAL

This flow chart depicts the legal requirements and guidance that is available for Commercial Kitchen Grease Extract Systems in the UK. All buildings are governed by EC852:2004 (Food Standard Agency FSA) and H&S 1992 Section 5 & 6 L24.

In addition, it is imperative that adhering to the regulations and guidance documents is a requirement by many insurance companies. A full explanation of the various regulations, guidance and standards referred to in this flow chart is shown below.

Table No. 1. Law & Guidance for Commercial Kitchen Grease Extract Systems

LAW	**EC852:2004**	**Regulatory Reform (Fire Safety) Order 2005**	**H&S Policy (Rev 2013) L24 Section 5 & 6**	
GUIDANCE	**RC44**	**LPS 2084:1**	**NAAD21**	**BESA DW172 & TR19 Grease**

3.2 LEGAL REQUIREMENTS

There are three main standards which relate to Kitchen Grease Extract systems as shown in the chart previously and a short synopsis is given of each is given below. NAADUK expect and check to see that all NAADUK members adhere to these standards.

3.2.1 Regulation EC852/2004 Enforcement of Regulation on the Hygiene of Foodstuffs - Annex II, Chapter 1 paragraph 5

This regulation states that, "There must be suitable and sufficient means of natural or mechanical ventilation. Mechanical airflow from a contaminated area to a clean area must be avoided. Ventilation systems must be so constructed as to enable filters and other parts requiring cleaning or replacement to be readily accessible."

This regulation ratified by the European Union and translated into the local languages of member states has potential far reaching consequences to the design, construction and installation of kitchen grease extract ductwork in relation to maintenance and cleaning. Mr. Nick Laverty, of The Food Standards Agency, has confirmed that under European treaty this forms part of British law. Since 1st January 2006. As ductwork is a component part of a kitchen ventilation system, it falls under the requirements of EC852/2004 Annex II Chapter 1 paragraph 5. Many Environmental Offices enforce under this Regulation.

3.2.2 Regulatory Reform (Fire Safety) Order 2005

This Order requires the appointment of a responsible person to assess fire risk and consideration on the methods of prevention. A grease extract ductwork system should be included in this assessment identifying risk, hazards and control measures to ensure protection and the prevention of fire risk. This document is under review by the Government.

3.2.3 L24 Workplace Health, Safety and Welfare Regulation 1992 (Revised 2013)

Approved Code of Practice and guidance

Regulation 5 Maintenance of workplace, and of equipment, devices and systems Paragraph (1) states:-

"The workplace and the equipment, devices and systems to which this regulation applies shall be maintained (including cleaned as appropriate) in an efficient state, in efficient working order and in good repair."

Paragraph (3) states:-*" (b) mechanical ventilation systems provided pursuant to regulation 6 (whether or not they include equipment or devices within sub-paragraph (a) of this paragraph); and (b)"*

Regulation 6. Ventilation

Paragraph (1) states:- "*Effective and suitable provision shall be made to ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air"*

ACOP 47 "Enclosed workplaces should be sufficiently well ventilated so that stale air, and air which is hot or humid because of the processes or equipment in the workplace, is replaced at a reasonable rate."

ACOP 52 "Mechanical ventilation systems (including air-conditioning systems) should be regularly and adequately cleaned. They should also be properly tested and maintained to ensure that they are kept clean and free from anything which may contaminate the air."

3.3 GUIDANCE DOCUMENTS

These guidance documents are not a legal requirement but are generally adopted to ensure competence and best practice.

3.3.1 Recommendations for Fire Risk assessment of catering extract ventilation

This publication is a best practice guidance document that provides for a fire risk assessment of extract ventilation in catering kitchens together with supporting explanation and guidance. It is aimed principally at the person responsible for ensuring that such an assessment is performed. It explains the legislative background to the need to carry out and record the findings of fire risk assessments.

3.3.2 Loss Prevention Standard 2084 – Issue 1—Standard for Inspection, Cleaning & Maintenance of Ductwork Systems

This standard defines the requirements for the LPCB approval of companies carrying out inspection, cleaning and maintenance of ductwork systems that may be contaminated with combustible deposits. The standard ensures that companies engaged in the above activities, meet the requirement of the client contract, document and report correctly, identify and record areas of limited access where inspection, cleaning and maintenance are impractical and communicate these limitations to the client and give recommendations for access improvements to better facilitate the ongoing cleaning and maintenance of the ductwork system. Full details of this document are shown in **Appendix 1 Page 59.**

NAADUK approves of the LPS 2084 standard for grease extract cleaning under BRE's Loss Prevention Certification Board (LPCB). This body have set their standards independently with no self-interest from owning training or cleaning companies in this field. Thus ensuring the best possible standards through impartial and comprehensive monitoring and auditing of its certified members in the UK. A completely impartial and the comprehensive monitoring and auditing of its certified members.

Whether a member or not, we recommend all parties to accept these standards as the absolute minimum.

3.3.3 NAAD21— Part 1 Grease (Kitchen Extract) - Legal Standards and Guidance requirements applicable to the risk management of the fire and reduction of grease levels within commercial kitchen extract systems to EC852:2004

3.3.4 BESA TR19 Grease—Fire Risk Management of Grease Accumulation within Kitchen Extraction Systems.

3.3.5 BESA DW 172—Specification for Kitchen Ventilation Systems

See Appendix 1 Page 59, for full details of regulations and guidance standards for Commercial Kitchens.

3.4 INSURANCE REQUIREMENTS

Insurance companies will normally recommend a minimum frequency of extract ductwork cleaning, together with any terms and conditions to comply with the buildings insurance requirement. This should include an assessment of business resilience. The Client has a "Duty of Care" to their clients, their employees and members of the general public under Health & Safety Regulation requirements.

Insurers define cleaning to a "good standard", and this can be proven that works have been carried out to the recommended cleaning frequencies and **WFTG Test**. For frequency of cleaning and WFTG Test see table and information on **Page 11 to 14.** Insurance companies use this as a threshold.

Adherence to regulations and recognized guidance documents would be expected by an insurance company.

It is the Clients responsibility to keep records and photographs of when the system was last cleaned. The Report to the Client must advise them if there are any Advisory Notes, any additional work has been carried out and any COSHH chemicals used. If the Client is a tenant of a building, they should be advised to forward Reports and Advisory to the owner/landlord of the building.

The Cleaning Report must contain pre and post clean photographs taken from the same place and deposition measurements which can subsequently be used to determine increased frequencies and identify any issues with system inaccessibility.

In addition to the above requirements, insurance companies will expect that a Fire Risk Assessment has taken place and evidenced, as recommended in FPA RC44—Recommendation for fire risk assessment of catering extract ventilation.

Insurers recommend that third-party auditing of cleaning is undertaken as an overarching audit check. The audit should be independent from cleaning companies or Associations i.e. BRE LPCB LPS 2084, and carried out by a qualified auditor.

Insurers would expect that Cleaning Timetables are enforced and followed by a verifiable and relative cleaning process that is acceptable.

In the event of any fire loss, Insurers will require proof and written records of the cleaning procedures that were enforced and that these had been followed prior to the loss. If these have not been complied with, then insurers could reject the client's claim.

3.5 COMPETANCY IN CLEANING KITCHEN GREASE EXTRACT SYSTEMS

It is recommended that technicians should be compliant with BSEHV11—Clean industrial and commercial ventilation systems, kitchen hoods and grease filters.

4. KITCHEN GREASE EXTRACT SYSTEM CLEANING FREQUENCY

4.1 FREQUENCY OF CLEANING FOR NEW BUILDS & 1st CLEAN

The following chart is for **newly** installed and **first** clean only. Thereafter it is recommended to refer to historical information which can be gathered or collated from the Client.

Refer to the **Table 3** for full details of frequency cleaning on existing building

Table No. 2. Initial Cleaning Frequency Chart or 1st Clean

No. of Hours of Daily use	LOW Very little production of grease laden air in food preparations	MEDIUM Moderate levels of grease laden aerosols	HIGH Heavy and contami-nant amounts of grease laden aerosols
6 hours	Once a year 12 monthly	Once a year 12 monthly	Twice a year 6 monthly
6.-12 hours	Once a year 12 monthly	Twice a year 6 monthly	4 times a year 3 monthly
12-16 hours	Twice a year 6 monthly	Three times a year 4 monthly	4 times a year 3 monthly
16+ hours	Twice a year 6 monthly	4 times a year 3 monthly	6 times a year 2 monthly

The table above is for guidance only and consideration should be taken into account for a change of the menu, foodstuffs being cooked or changes of use.

NAADUK recommend the Three Word Test Method as detailed on Page 12 for existing systems.

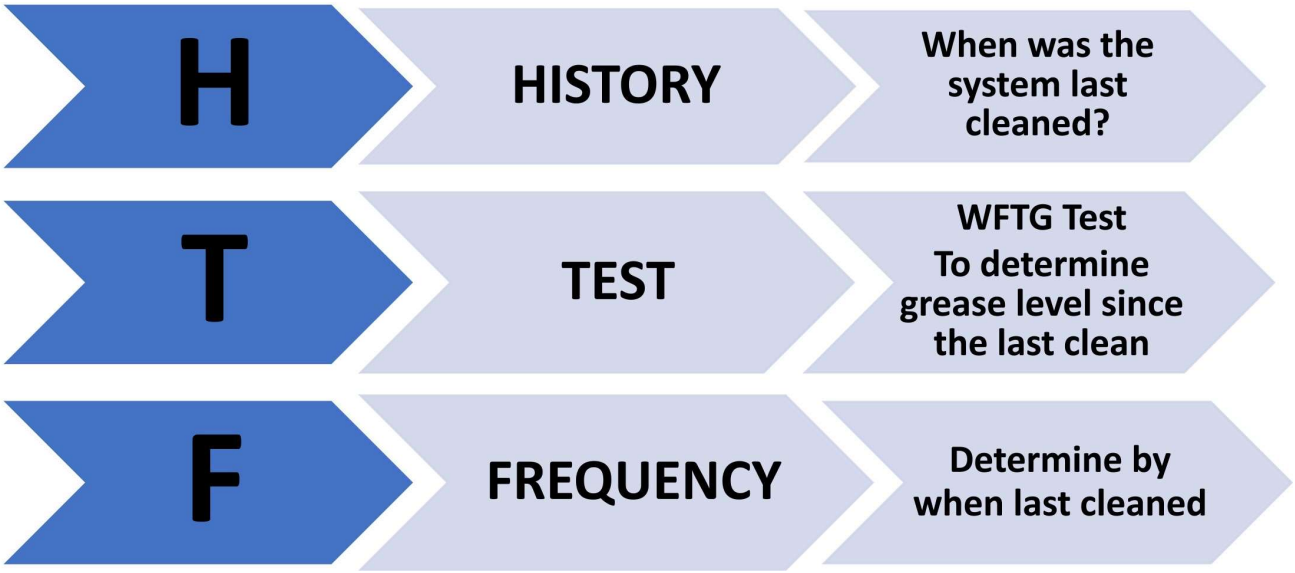
4.2 ESTABLISHING CORRECT CLEANING FREQUENCY FOR AN EXISTING KITCHEN GREASE EXTRACT SYSTEM

After the first clean, in accordance with the Initial Cleaning Frequency Chart on **Page11**. NAADUK do not promote fixed charts for cleaning guidelines as these could be misleading and inaccurate. This could lead to increased risks due to the incorrect interpretation by the users.

Strict adherence through the use of fixed charts increases the risk to insurers and other building users. These charts where designed for rough guidance purposes only and not to be followed to the letter. Consideration should be given for local conditions, seasonal changes to the menu, and types of foodstuffs cooked.

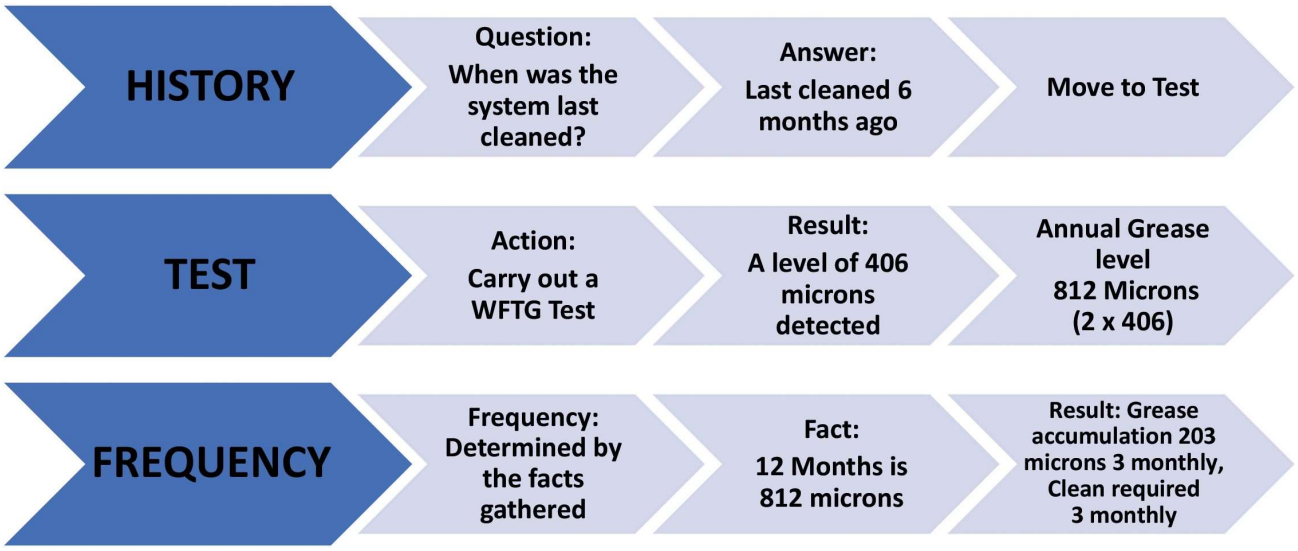
NAADUK recommends the **Three-Word Test.** This requires establishing the History, Test & Frequency (HTF) on the system and is explained below:-

Table No. 3. History, Test, Frequency (HTF)



To show how this works in practice, an example is given below. The Example demonstrates that the system would require cleaning every 3 months due to actual usage.

Table No. 4. Example of methodology of HTF in practice



Alternatively, depending on commercial viability remote sensor could be fitted to give automatic warning at the 200 micron level.

5. WET FILM THICKNESS GAUGE (WFTG) TEST

5.1 HOW TO TAKE A WET FILM THICKNESS GAUGE (WFTG) TEST

Correct at 90° angle

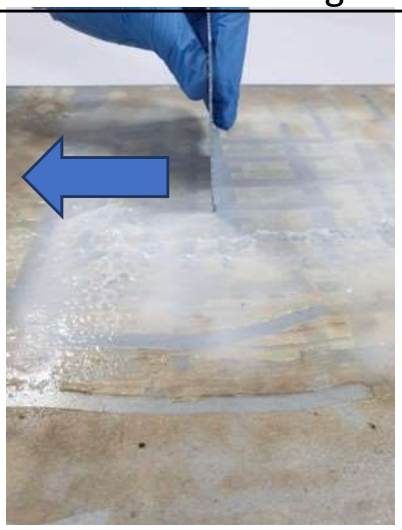


Fig No. 1. Example of Correct Sampling

NOTE— Scrape 100mm

INCORRECT

Fig No. 2. Example of Incorrect Sampling

This Photo by

INCORRECT

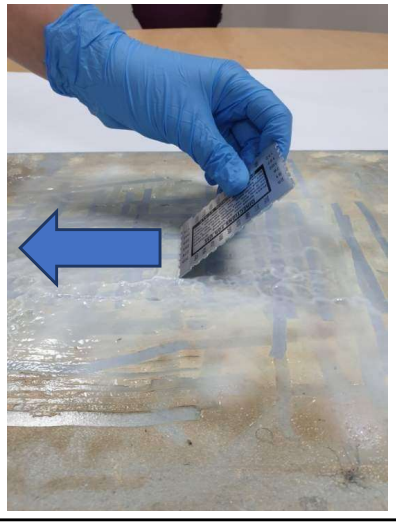


Fig No. 3. Example of Incorrect Sampling

This Photo by

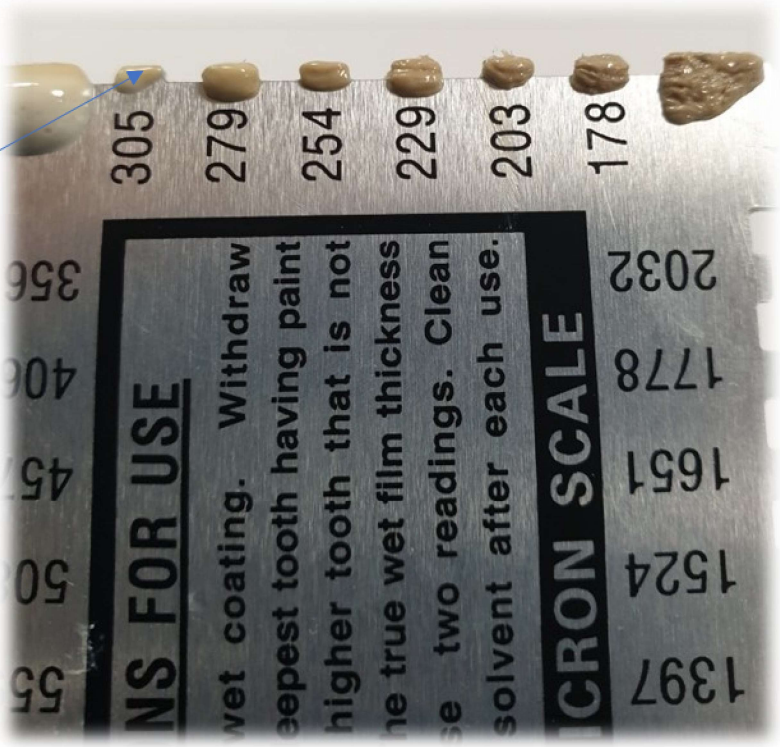
5.2 HOW TO READ A WET FILM THICKNESS GAUGE (WFTG)

Fig No. 4. WFT Gauges demonstrating reading markers

Wrong place to take the reading

Correct place to take the reading – The tip point is the measurement

Fig No.5. WFT Gauge with grease



The last tip with grease adherence is the depth of the reading.

Rotate the gauge to use all measurements

5.3 INDUSTRY STANDARD ACCEPTED PRACTICE

An acceptable level of cleanliness of a system is recognised in the within the industry as 200 microns. It is recommended to clean the whole system if an average reading exceeds 200 microns. For example, if two WFTG readings are taken, add them together and divide by two for the average. Likewise if 4 readings are taken, add them together and divide by four. If the individual reading exceeds 500 microns then urgent cleaning is required for that one area. These may be in areas such as sills behind the grease filters, header duct above canopy, base of riser and fan. This list is not exhaustive and all components of the ductwork can be affected.

6. CLEANING METHODS FOR CONTRACTORS

6.1 General

There are many varied cleaning methods that contractors may use to clean a system . Some of the most common manual methods are as follows:-

Table No. 5. Cleaning Methods and Contamination

Most Common Manual Methods	Type of Contamination
Hand wiping: wiping grease from surface with a cloth	Light contamination
Scraping: removing grease by hand scraping	Heavy contamination
Steam cleaning: hot water under pressure to dissolve grease **(NAADUK do not recommend the use of steam –see CAUTION)**	Burnt on
Rotary brushing with chemical: brush & spraying to remove grease	Burnt on
Hot chemical foam: spray foam to hang and dissolve grease	Burnt on and heavy
Chemical: to soften grease for easier removal	Burnt on and heavy

CAUTION:

1) **When using pump or trigger sprays technicians must wear personal protection including respiratory protection, as long-term effects of inhaling some chemicals on internal organs are not yet known.**

All the above methods have been used generally by the industry for several decades, however new equipment and methods are continually being developed.

The main priority is to ensure you meet the requirements of the post clean verification required by law and using current guidelines.

If you have to use wet methods, ensure all wet and damp cleaning fluids are removed from the system before handover.

When using chemical cleaning agents, ensure all Control of Substances Hazardous to Health (COSHH) assessments are measured not only for the effects on materials but also for its disposal to minimise any effects on the environment. COSHH assessment should include the potential health effects on personnel and precautions to be implemented to ensure safe use, storage and handling.

It is not normally possible to clean an old system to shiny new condition, because of long term staining in the substrate. Unless a brand-new system is kept clean regularly, then some staining must be expected. This does not affect the quality of the clean.

When scraping or brushing fan casing and other parts of extraction power units, care must be taken not to remove paint and other protective coatings.

On fire Resisting systems check with manufacturers and the Association for Specialist Fire Protection (ASFP) for recommendations. A joint research project between National Association of Air Duct Specialist UK (NAADUK) and the Association for Specialist Fire Protection (ASFP), tested various methods and chemicals, and conclusion can be found in the report. **See Appendix 3 Page 62.**

Do not just use standard industry approved chemicals as damage will occur on seals and other intumescent screw seals. Only use a solution that is less than 8% caustic strength.

All technicians should be trained to minimum standards i.e. National Association of Air Duct Specialist UK (NAADUK), Construction Industry Training Board (CITB), and National Occupational Standards (NOS), to ensure awareness of requirements.

Before commencing cleaning a WFTG measurement should be taken, in accordance with method in **5.1 Page 13** and assessed in line with **Table 4 Page 12.**

6.2 SUMMARY ADVICE TO CLEANING CONTRACTORS

Before undertaking any cleaning please note the points below:-

6.2.1 The system is not under any special warranty / service contract that prohibits the direct / internal cleaning of the unit. Advice can be sought from the client and the manufacturer.

6.2.2 Seek advice from the manufacturer on internal cleaning particularly if the unit contains any sensors or monitoring equipment or fire Resisting sensors to avoid potential damage and costly repairs.

6.2.3 Report any high level accumulates / contamination observed at the point of entry or exhaust from such units as part of your normal reporting procedures.

6.2.4 Agree what is and is not to be cleaned with the client in writing and obtain written agreement prior to any works being undertaken.

6.2.5 Use the **Checklist of Cleaning Contractors Responsibilities** as a guide, see **Page 17**

CAUTION:

Some chemicals are very aggressive, so all persons carrying out these cleans must wear full PPE Including FFP3 masks. Long-term effects on internal organs from breathing in vapour when spraying on chemicals are not yet known.

6.3 CHECKLIST OF CLEANING CONTRACTORS RESPOSIBILITIES

A Cleaning Contractor has the responsibility of carrying out the cleaning works in a safe and responsible manner. The Checklist below will aid you in reminding you of the tasks that should be completed, this list is not exhaustive.

Table No. 6. Checklist of Cleaning Contractors Responsibilities

√	CHECKLIST OF CLEANING CONTRACTORS RESPONSIBILITIES
	Tape or zone off working areas
	Make or update schematic of duct location of existing panels, canopies, filters, etc – See template guide on **Pages 19 & 20**
	Ensure catering equipment has cooled and isolate if necessary
	Cover area/equipment with protective covering
	Measure all areas with WFTG (Wet Film Thickness Gauge) and photograph gauge and duct
	Remove filters and if not previously cleaned, clean. (Remind the client that these should be cleaned weekly by them)
	Clean plenum area rear of filters, taking care not to activate the fire suppression system
	If necessary fit access panels in the system, max 3m apart, closer if other components require
	Clean ductwork using COSHH approved chemicals and equipment that can be utilised to carry out a full clean
	Every effort must be made to access all areas, if any areas are inaccessible then you must issue an advisory note. If inaccessibility is due to a solid ceiling, advise the client to install a ceiling type access panel as shown on **Page 47**. Ceiling access panels must be of the same integrity as the existing ceiling
	When applying chemical, score the grease first and allow the chemical to dwell for 10 minutes
	Then brush or scrape to remove all grease and wipe clean
	All waste to be disposed of in correct containers by licensed operators, or licenced waste carriers
	If inaccessible areas cannot be reached by hand, then rotary brush methods should still be used to reduce amounts of grease in these areas to minimum levels possible
	Although the grease will be removed there may be some substraight staining on the duct-work. This does affect its compliance. Take final WFTG Test and record readings

Contractors should be NAADUK approved to ensure they can perform necessary works safely

TIP:

Create an "At Risk Register " which can be used to produce formal letters to the Client warning them of the potential risk of fire where remedial works have not been carried out.

7. A CLIENT'S GUIDE TO GOOD HOUSEKEEPING

7.1 CLIENT'S RESPONSIBILITIES TO HELP LOWER THE RISK OF FIRE

If you can see grease, so can fire. Keep the two as far apart as possible

To reduce the risk of a fire starting in a Kitchen Grease Extract System it is best practise to create a checklist with tasks that should be completed daily and weekly. These need to be signed by a responsible person as part of a Fire Risk Assessment, as stated in Regulatory Reform Fire Safety Order 2005.

7.1.1 Ensure that all appliances are serviced annually by qualified engineers.

7.1.2 **Refer to Pages 11 & 12** to determine frequency of use of ductwork and associated equipment to be cleaned by competent people

7.1.3 Ensure all staff working in kitchen area are aware of procedures in an event of a fire

7.1.4 Ensure all staff working in kitchen area are aware of how to use fire extinguishing equipment, manual or automated

7.1.5 Display the Schematic drawing provided to you by your Cleaning Contractor.

7.1.6 Ensure the insurer is updated on an on going basis with any system findings that may change the frequency of cleaning of any issues that may prohibit access.

The above points are from RISCAuthority/FPA document RC44.

RECOMMENDATIONS FOR FIRE RISK ASSESSMENT OF CATERING EXTRACT VENTILATION

Table No. 7. An Example of a Checklist for Client's Use

CHECKED √	CHECK DAILY
	Clean all visible kitchen surfaces
	Clean parts of hood visible to kitchen staff
	Check grease drip tray and clean as required
	Check that the filters are in place during any cooking or catering activity.
CHECKED √	**CHECK WEEKLY**
	Remove and clean filters or baffles from hood dependent on use, more frequently if necessary, clean all corners and crevices – Insurers may specify a minimum
	Wipe grease from inside of filter housing
	Remove filter, check grease in the plenum chamber and wipe if necessary, twice if required (Check for sign of damage to filter(s))
	Remove access panel from hood if safe to do so and wipe away all local areas of grease within reach
	Ensure catering equipment is wiped and cleaned daily, before or after use
	Ensure area around catering equipment i.e. walls/floors are also cleaned
	Do not store old, used or new oil in the kitchen area
	Flammable solvents or other flammable solutions must not be used
	Check any visible exhaust grills for signs of accumulate / grease drips

Prevention is best—
Ensure all the above is adhered to and you will lower the risk of fire

8. KITCHEN GREASE EXTRACT SCHEMATICS

8.1 CRITERIA FOR A SCHEMATIC

A Schematic is required to be enclosed within the report for the Client. The Schematic should be placed in a visible position near an Entrance Door, to enable Fire Officers to view the layout of the Kitchen Grease Extract in the event of a fire. It should also be placed in the Kitchen Area and in the O & M manuals.

This list below is not exhaustive but includes some common elements necessary to complete a meaningful Kitchen Grease Extract Schematic for the Client. Schematic drawings can be drawn up with the assistance of the client. This would assist with the initial access and familiarisation of the system for both parties.

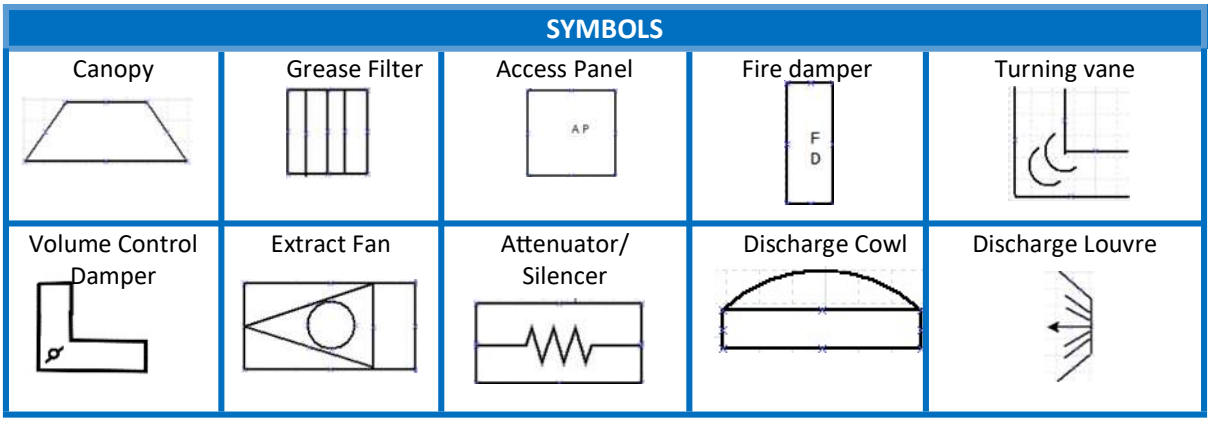
Table No. 8. Suggested details to be noted on a Schematic

IDENTIFY THE BUILDING TYPE	♦ Building Name & Room No. ♦ Site contact & Details/Occupiers ♦ Right of access details ♦ Type of floor & ceiling: Concrete/Tiles etc ♦ Location of door entrances ♦ Areas requiring additional access requirements
IDENTIFY AREAS BY COLOUR CODING	♦ **GREEN** **Accessible Ducting** ♦ **BLUE** **Ducting that is Inaccessible at present** ♦ **RED** **Fire Resisting Ductwork** ♦ **BROWN** **Walls & Interior Dividing Walls** ♦ **BLACK** **Access Panels** ♦ **PURPLE** **Additional Access Panels Required**
IDENTIFY PARTS OF THE VENTILATION SYSTEM **FROM EXTRACT CANOPY TO FAN & OUTLET**	♦ Access obstructed ♦ Access panels fitted ♦ Access panels required ♦ Airflow ceiling ♦ Attenuators ♦ Canopy ♦ Ceiling Hatches ♦ Ducting/Spigots/Risers ♦ Fan ♦ Fan Fire curtain ♦ Fire Dampers ♦ Terminal Point ♦ Trion/ESP ♦ Volume Control Dampers
ESSENTIAL DETAILS	♦ Schematic should be in at least 2D ♦ Show the direction of duct travel ♦ Limited or poor access to allow cleaning ♦ Routes to access ducting location. ♦ Circular/Rectangular Duct ♦ Lagged Ducting ♦ Access Fitted ♦ Access Required ♦ Access Fitted but Obstructed ♦ Specialist Equipment to Access ♦ Type of Access Doors – RD, Circular, Bolted, Toggle. ♦ Specific Safety warnings (i.e.) Harness required for roof. ♦ Key Locations

8.2 SYMBOLS TO USE ON A SCHEMATIC DRAWING

When drawing a Schematic you should use basic symbols that others will recognise. We have listed a few here—see full list **Part 2 Appendix 5 Page 63.**

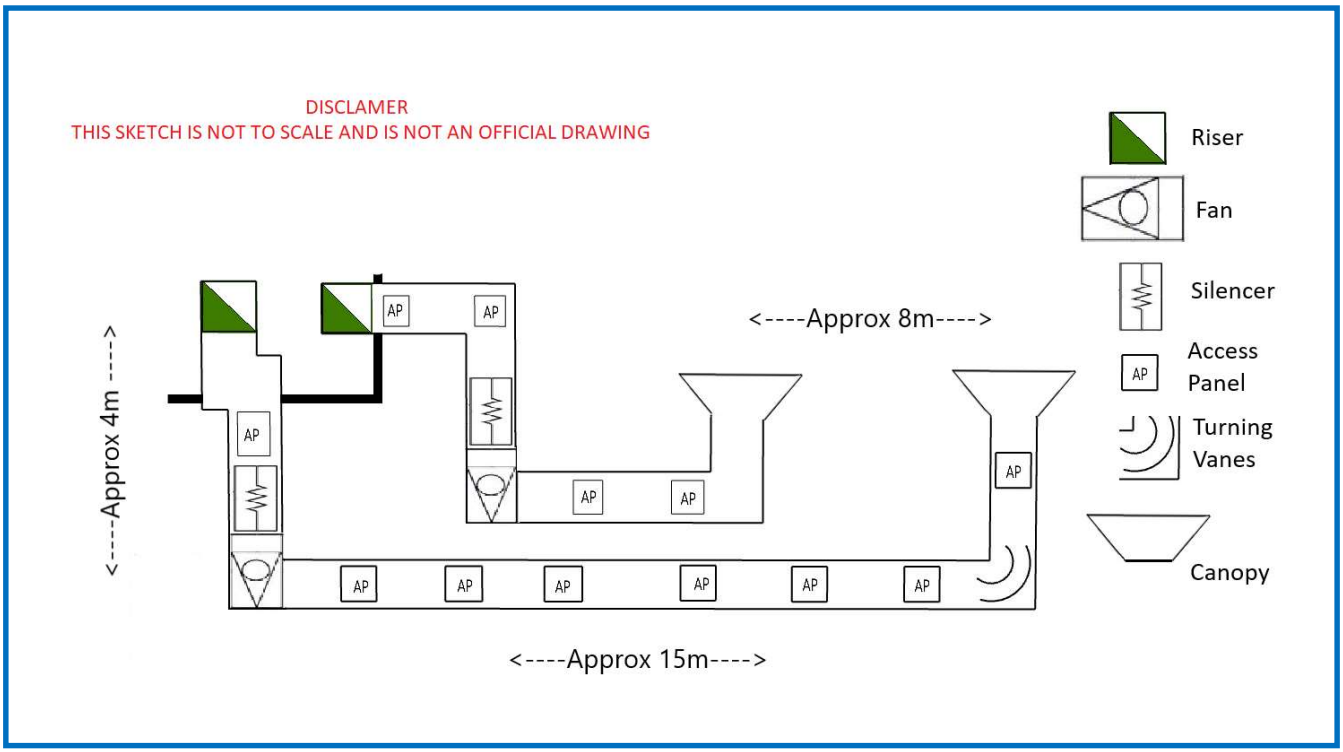
Fig No. 6. Basic Symbols to be used on a Schematic drawing



8.3 DRAWING A SCHEMATIC

A Schematic should be drawn on graph paper or on specialist software. All schematics should carry a disclaimer by the author and NAADUK suggest as shown in the example below.

Fig No. 7. Example of a Kitchen Extract Schematic



9. KITCHEN FIRE SUPPRESSION SYSTEMS

9.1 GENERAL

A kitchen extinguishing system should be approved by the USA Certification Body, Underwriters Laboratories (UL) to the UL 300 fire testing standard for testing of fire extinguishing system for the protection for restaurant cooking risks or to standards such as LPS1223 in compliance with BAFE SP206 certification scheme. The following points highlight some of the important factors when this type of system is in place. Also, in future ductless systems these will become even more important to prevent damage from fire, to building fabric outside of the kitchen area.

9.1.1 The system actuation should provide both a **manual** and **automatic** operation of the protection system to the cooking equipment.

9.1.2 Discharge nozzles are to be strategically situated above all cooking appliances e.g. frying ranges, overhead canopies and ducting system and this is to include wall mounted grilles such as Salamander grilles.

9.1.3 Installation and subsequent servicing is to be undertaken by a company approved by the manufacturer of the extinguishing system.

9.1.4 The extinguishing system can be accepted as a recognised solution for fire protection when the selected fire protection system is:

9.1.5 Is approved, certified or listed by a recognised testing laboratory i.e. LPCB—Redbook

9.1.6 Passes an acceptable test protocol (such as UL300 test protocol)

9.1.7 Is installed in accordance with a fire protection standard, such as the National Fire Protection Association (NFPA) 17A Standard

Fig No. 8. Example of a Fire Suppression system

Most common systems accredited to the UL300 standard are the Ansul R 102 and Amerex KP Systems. A system which is not listed by UL as having passed the UL300 criteria may be acceptable only if independent test data has been provided to demonstrate that the system has passed all of the UL 300 criteria but has not been specifically submitted to UL for official listing.

Some fire suppression systems are designed to protect the catering equipment and **not** the grease extract system.

It is recommended that duct cleaning companies have a clear written procedure in relation to working around fire suppression systems and a disclaimer for the accidental discharge of same.

Fig No. 9. A photograph of a kitchen fire suppression system.

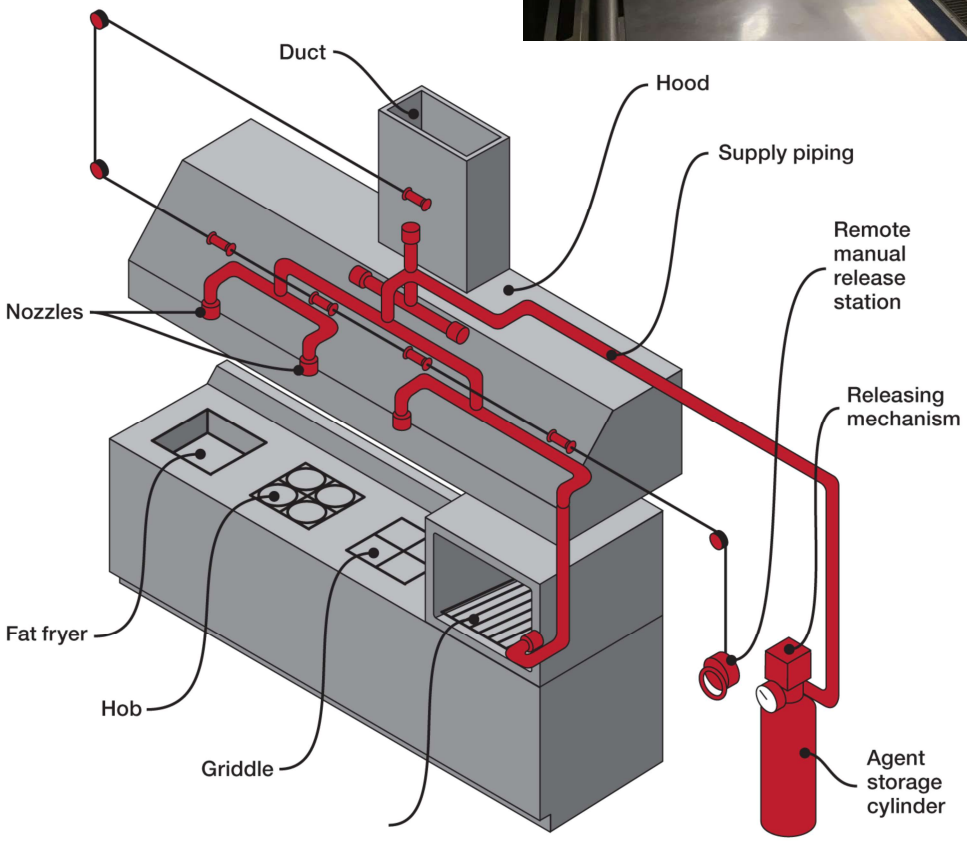


Fig No. 10. Typical layout and components of a kitchen fire suppression system.

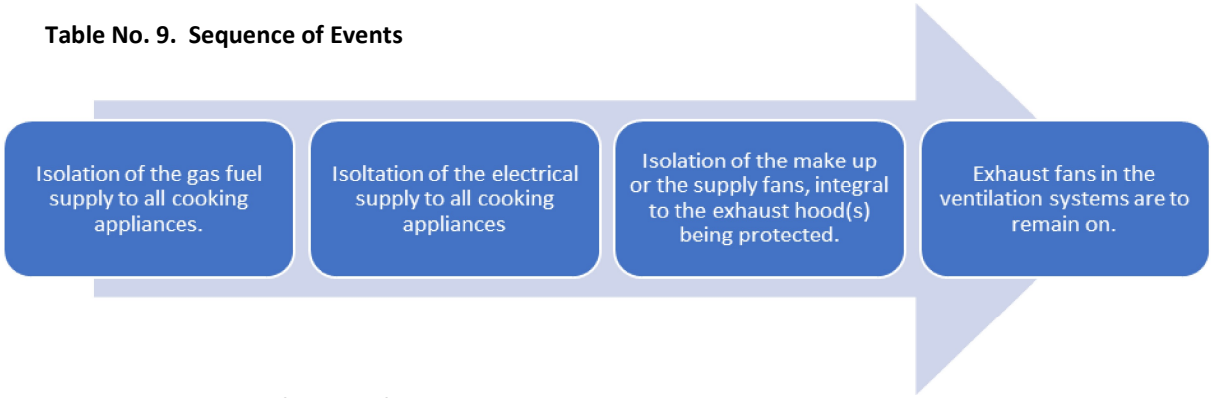
TIP: If a fire suppression system limits access to the ductwork then a note should be made stating the reasons on the advisory note.

9.2 EXTINGUISHING SYSTEM CAUSE AND EFFECT (SEQUENCE OF EVENTS)

Where kitchen extinguishing systems are to be installed the configuration of the cause and effect sequence of events need careful consideration at the design stage. Where systems are being installed the cause and effect (sequence of events) on-site installation/configuration can often be inconsistently applied.

A written cause and effect matrix is to be provided and affixed to the front of the extinguishing system control panel. This is to show clearly and unambiguously the configuration of the interlocks/cause and effect set up (sequence of events), upon activation of the extinguishing system, typically the fire protection system is configured as follows:

Table No. 9. Sequence of Events



It is important to verify these factors when assessing proposed or existing systems:

9.3 BUILDING FIRE ALARM SYSTEM CONFIGURED AS THE MEANS OF ISOLATION OF THE FUEL SUPPLIES

Alternatively; the automatic fire alarm may be configured as the trigger to provide means of isolation for the extinguishing system. Where the fire alarm is the means of isolation for the fuel supplies to the cooking equipment it is important to verify that the sequence of events does in practice immediately isolate the gas/and electrical fuel supplies to all cooking equipment.

Fig No. 11. Example of automatic gas isolation valve

9.4 CONCLUSION

Extinguishing systems selected for the protection of cooking risks are an acceptable solution when the elected system is a recognised solution for the specific application of protecting kitchens. Additional operational requirements may apply (such as power supply connections, water supply, and test facilities) to achieve a system acceptable for property insurance purposes.

Always refer to specific manufactures'' manual for final guidance.

10. REDUCING ODOURS IN A KITCHEN GREASE EXTRACT SYSTEM

10.1 GENERAL—VARIOUS APPLICATIONS

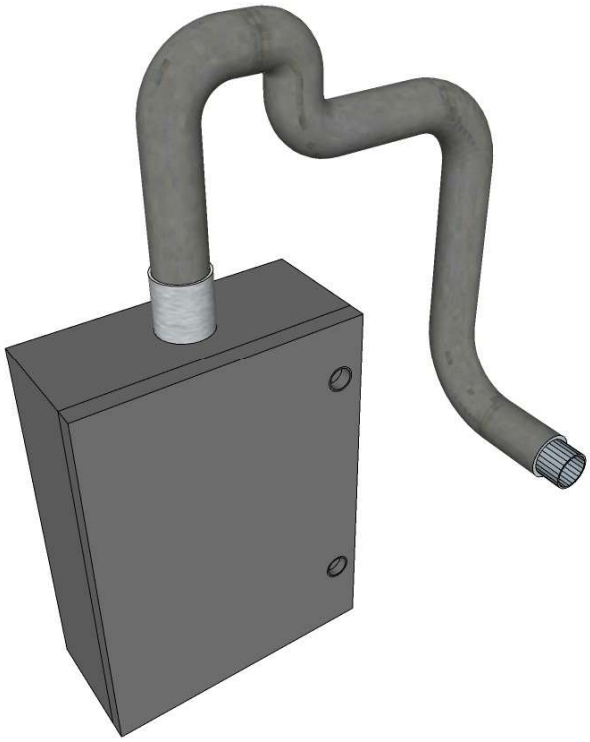
Please note: not all odour reduction solutions are suitable for all cooking methods. In all the cases below, grease filters must also be installed.

Here we have identified three of the most common types:-

10.2 ODOUR NEUTRALISATION

This is the application of a spray of odour neutralising chemical into the air stream as it passes along the ductwork. A typical unit can be installed adjacent to the extract duct in order to facilitate routine servicing, near to the discharge, but still on the negative pressure side of the duct. A neutralising mist is fed via a delivery tube into the duct from a typical unit. The housing can contain a reservoir of neutralising agent.

Fig No. 12. Example of a typical Ozone Control Unit



10.3 ACTIVATED CHARCOAL FILTERS - MOST COMMON TYPES

This type of filter, is the most common and filters out the majority of the cooking odour. Most often these filters are disposable and will last for around 6 months to a year subject to usage. Many manufacturers will specify the specific filter that is to be used in their system.

Fig No. 13. Charcoal Filter

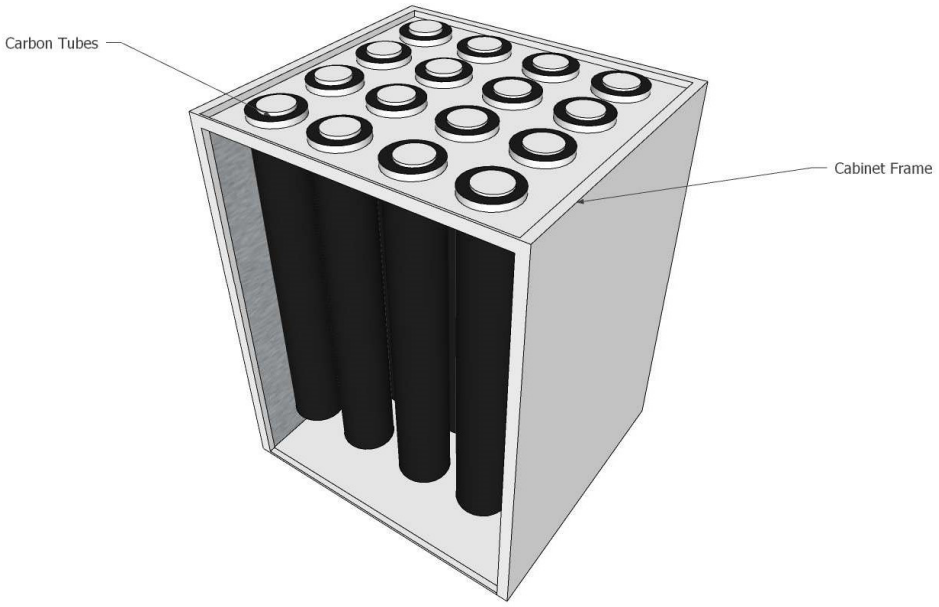


Fig No. 14. Roller Charcoal Filter

11. HEALTH AND SAFETY

11.1 GENERAL

The basic fundamentals of safe working are:-

11.1.1 Risk assessments and method statements for the work, and approved by the Client prior to work commencing.

11.1.2 Always ensure **FANS ARE FULLY ISOLATED, LOCK ISOLATOR AND LABELLED BEFORE WORK COMMENCES.**

11.1.3 COSHH Risk assessments – control of substances hazardous to health include preparations, storage, chemical compositions, restrictions of use and health and safety. These are issued to every team leader to be held in the company vehicle for reference.

11.1.4 Team review Site specific risk assessments and walkthrough the job, identifying any workplace hazards.

11.1.5 Fully detailed site surveys including system drawings and explanatory text should be available. These are all combined with service instruction and site specific risk assessment.

11.1.6 Appropriate PPE (Personal Protective Equipment) as provided and as specified in the Risk Assessment must be worn at all times. All PPE must be selected by a competent person as suitable for purpose and must fit the individual technician properly L24 Health and Safety Regulations 1992). **See Appendix I Page 59** and **Caution Notice** on **Page 16**.

11.1.7 Team leaders are responsible for ensuring PPE and safe systems of working are utilised. Remedial replacement or repair requirements are to be reported to the relevant named person before any technicians are put at risk. Check HSE for full standards.

11.1.8 Safety signs warning others of cleaning work in progress must be used at ALL times during the cleaning operation.

11.1.9 An identified rescue plan for any working at height or working in confined spaces should be preplanned and all technicians understand the building emergency procedures, including fire exits and muster points.

11.1.10 All individuals are responsible for their own safety

11.2 ACCESS TO THE DUCTWORK

If a duct system has no access panels then it is unlikely to have been cleaned.

A grease extract system post 2005 without access panels is in contravention of the legal regulation EC852:2004, **see Appendix 1 Page 59.**

11.3 CAUTION: GOLDEN ADVISORY RULES

11.3.1 Never fit a standard access panel into fire Resisting ductwork as this will invalidate any warranty and change the fire rating of the system

11.3.2 Where possible try not to fit access panels on the underside or the base of the sides of ductwork to avoid liquid grease seepage. However, this may be necessary due to restricted duct access or shallow duct section.

11.3.3 Determine and agree in advance the type of door required. It may be necessary to get fire Resisting access doors fitted by the original installer as defined methods of installation and competency are often required.

11.3.4 Avoid sharp edges which may cause injury. Always install a framed access door with progressive cam closing device on flat ductwork.

11.3.5 Do not install access doors on the top surfaces outdoors as they can be penetrated by rain if not sealed correctly.

12. BASIC COMPONENTS OF A KITCHEN GREASE EXTRACT SYSTEM

This section deals with all the different types of components that can be found in a Grease Extract system.

12.1 GENERAL

The components that make up a Kitchen Grease Extract System are:-

Table No, 10. Components of a Kitchen Grease Extract System

COMPONENTS	SECTION NO.
Filters	12.5
Plenums	12.6
Extract Ductwork	12.7
Fire Resisting Ductwork	12.8
Fan Systems and Fans	12.9
Access Panels	12.10
Exhaust Grilles	12.11
Attenuators/Silencers	12.12
Turning Vanes	12.13
Ancillary Components	12.14

The diagrams on **Pages 29 to 30** show in detail the layout and components that can be found within a standard Kitchen Grease Extract System.

When marking drawings and creating schematics, it is recommended to use the following colour coding chart for ease of identification.

Table No. 11. Colour Coding Chart

COLOUR CODING:	
GREEN	Accessible Ducting
BLUE	Ducting that is Inaccessible at present
RED	Fire Resisting Ductwork
BROWN	Walls & Interior Dividing Walls
BLACK	Access Panels
PURPLE	Additional Access Panels Required

These diagrams depict an example of a general layout of a standard grease extract system including components.

Fig No. 15. FPA RC44 Fig 1 Typical detail showing cooker extraction system

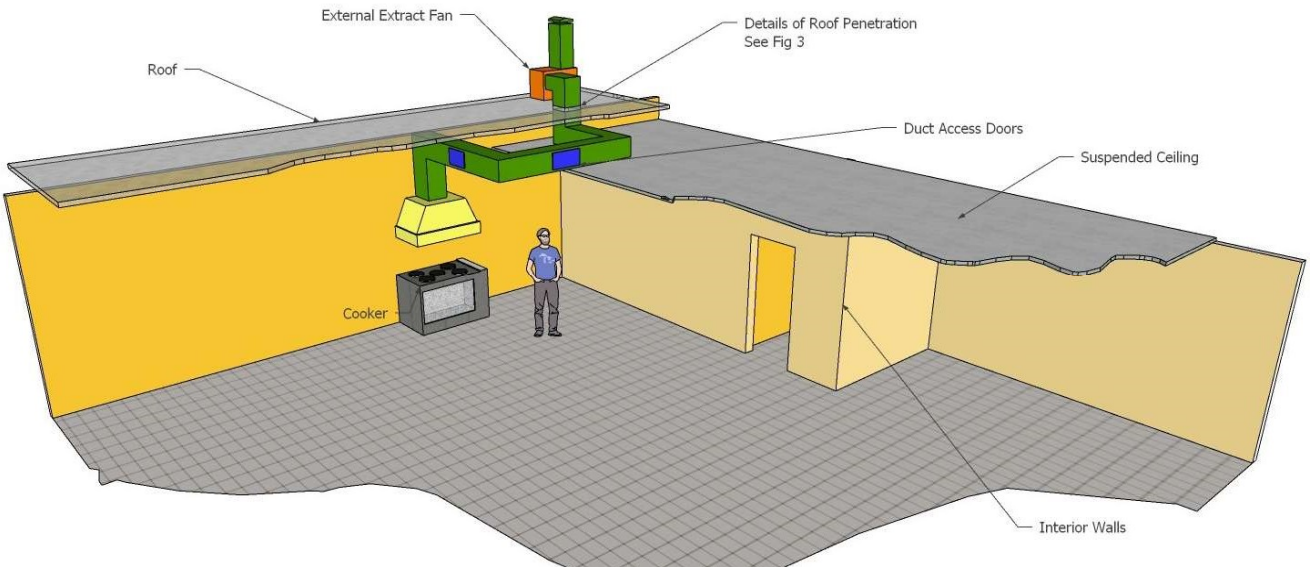
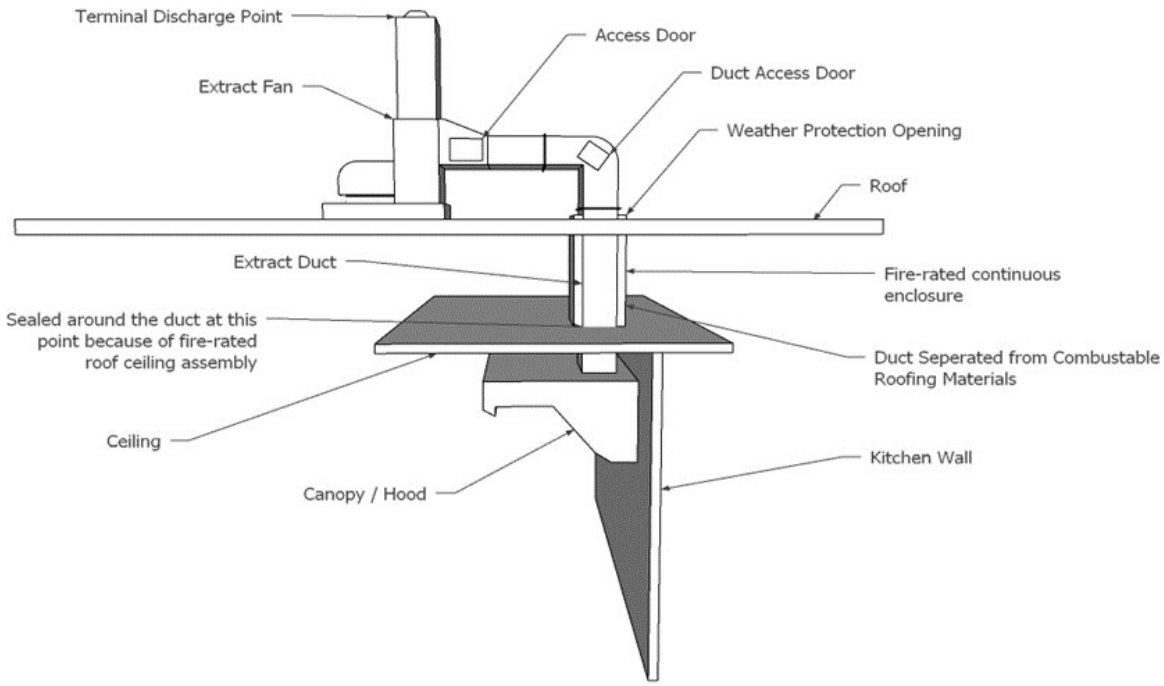


Fig No. 16. Side view of cooker extraction system



12.2 COMPONENTS OF A KITCHEN GREASE EXTRACT SYSTEM

Fig No. 17. A full kitchen grease extract system with components

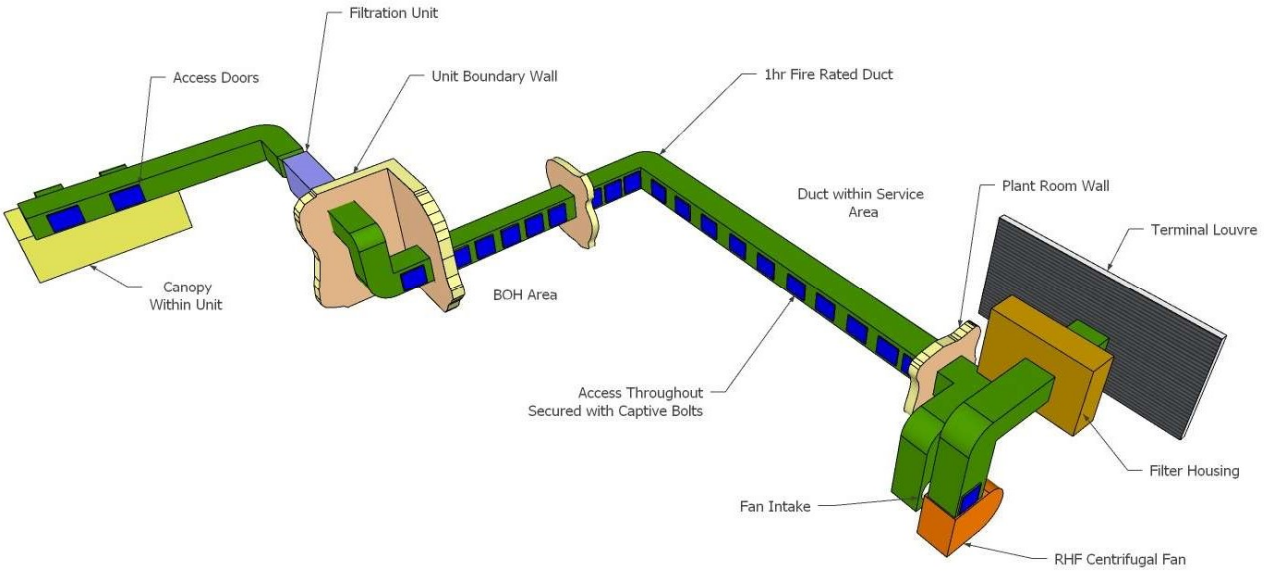
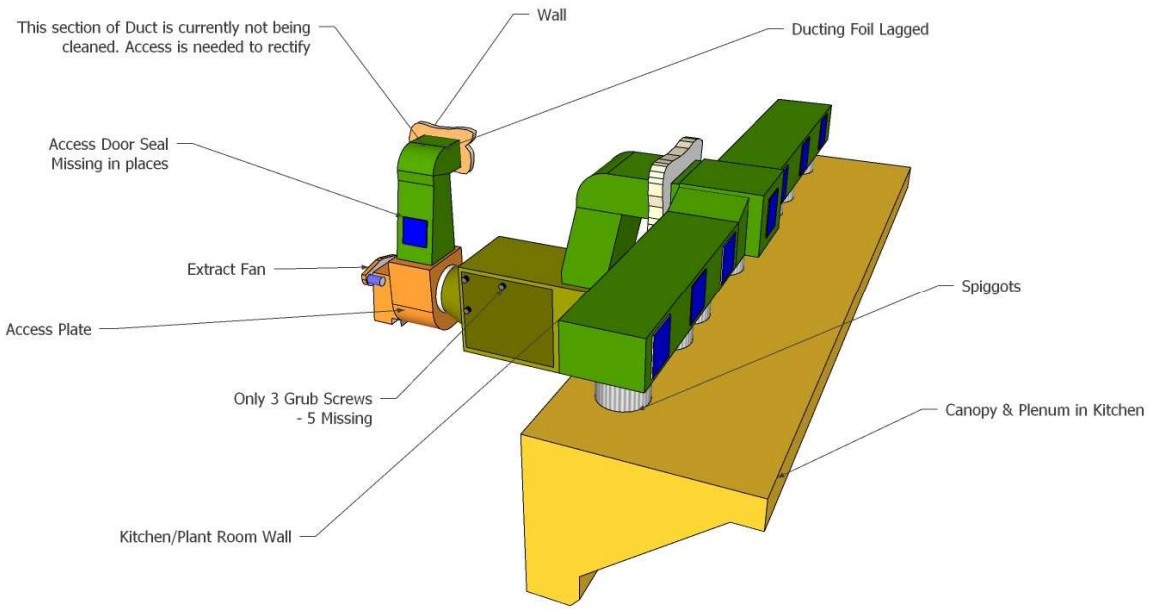


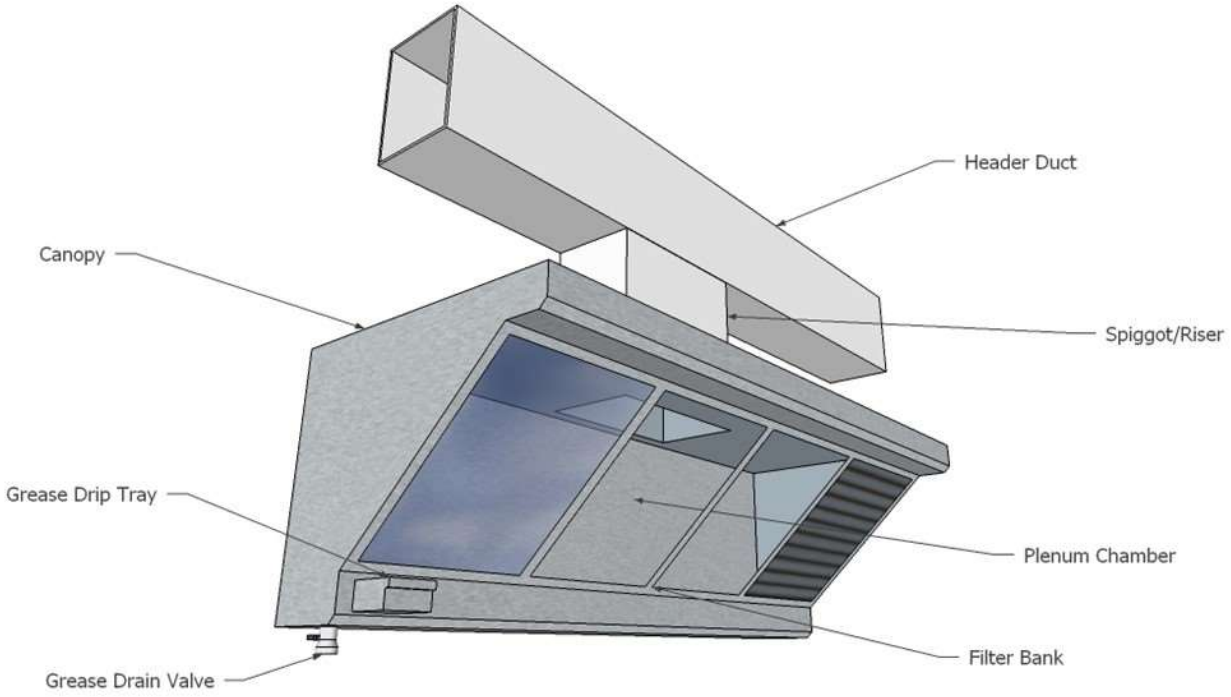
Fig No. 18. Example of a small kitchen grease extract system with components



12.3 COMPONENTS OF A HOOD OR CANOPY

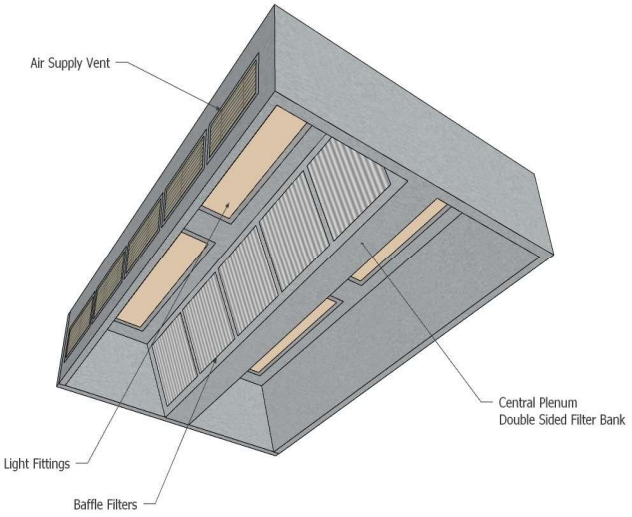
Normally located over catering equipment and designed to remove airborne grease associated with food production. Further removal of fumes, steam, heat and smoke is also facilitated through the hood utilizing filtration and air extraction. The canopy hood can be found in various shapes including square, circular or ridge type.

Fig No. 19. Canopy Hood



Double Canopies have a slightly different components. Please refer to Manufacturer's User Manuals.

Fig No. 20. Double Canopy



12.4 FILTRATION IN KITCHEN GREASE EXTRACT SYSTEMS

Filters installed in canopies are the first line of defence to protect ductwork from excessive grease buildup. Poor installation, incorrect selection and lack of maintenance can all lead to excessive buildup of grease in the ductwork and can increase the risk of fire considerably.

Filters must fit into frames correctly leaving no gaps and they must be installed in the correct orientation. Advice on cleaning frequency is addressed under client responsibilities.

It is important to remember:

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 insurer's requirements.

Periodic specialist cleaning should be accompanied by daily or weekly cleaning of canopies and filters which is typically carried out by the kitchen staff.

These are designed as the first stage of grease / contaminant removal. Currently the most commonly used filters are a baffle type, but mesh and cartridge can also be found or a combination of the three. Filters are normally housed within the canopy hood .

Safety advice: Please ensure that any UV system is isolated prior to any filter removal—UV is harmful to human health.

The most common standards are:-

- **DIN 18869-5 -** Equipment for commercial kitchens - Components for ventilation Part 5:Aerosol separators, requirements and testing—Average Aerosol Efficiency 77.6%
- **DW172**– Specification for Kitchen Ventilation Systems—All systems should be compliant to this specification.

The next pages illustrate some common filters i.e.

Fig 21—Standard Construction Baffle Style Grease Filters with Aluminium Frame

These filters are designed for use in commercial kitchens and ventilation from food preparation areas, where their primary function is to reduce flame from travelling from the cooking area up into the extract duct.

They are manufactured by rolling Aluminium to create a series of baffle plates which are welded onto a sub frame. The sub frame is then wrapped with the outer frame. These must be cleaned regularly.

Fig 23 –Mesh Style Grease Filters with 45mm Thick Aluminium Frame and Galvanised Steel Mesh

These style grease filters are designed for use in commercial kitchens and ventilation from food preparation areas where their primary function is to reduce grease carry over from the cooking area. Rated at 1.5m/sec where the pressure drop is 15Pa for 45mm filters and less than 10Pa for 20mm filters. Construction involves rolling an Aluminium frame which holds a series of expanded and corrugated Galvanised Steel layers. These layers create an impingement barrier which catches grease from the extract air.

Fig 25—Duo Grease Filter. Baffle Mesh Combination. All Stainless Steel Construction

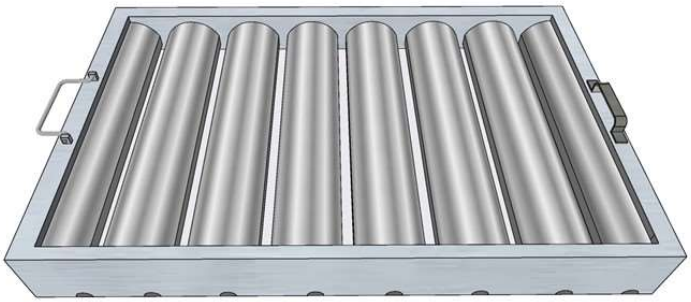
These filters are designed for use in commercial kitchens and ventilation from food preparation areas where their primary function is to reduce flame from travelling from the cooking area up into the extract duct.

The extra mesh layers improve grease collection rates over standard baffle filters. These filters are manufactured by rolling Stainless Steel to create a series of baffle plates which are welded onto a sub frame.

The sub frame is then wrapped with the outer frame. To the rear are located layers of expanded fine mesh which improve filter efficiency without sacrificing flame stopping performance. This gives the best of both worlds.

12.5 FILTER TYPES

Fig No. 21. Baffle Filters

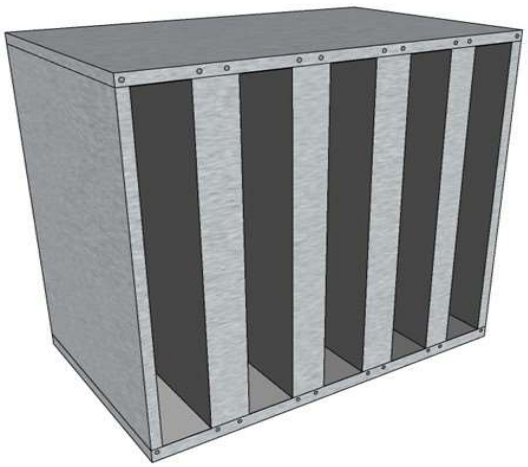


BAFFLE FILTERS

Two-way grease removal via interlocked vanes which work by changing the air velocity and direction. Grease becomes separated through this process and is collected in drip trays via weep holes at the bottom of the filter.

TIP: Report on your post clean report any unprotected gaps between the filter and the housing which leaves the ductwork exposed to fouling.

Fig No. 22. Carbon Filters Unit



CARBON FILTER UNITS

These filters are manufactured for ease of installation and incorporation into ducted air systems. They can be used on both supply for purifying air, and can be used on the extract to remove toxic gasses and odours generated within a process

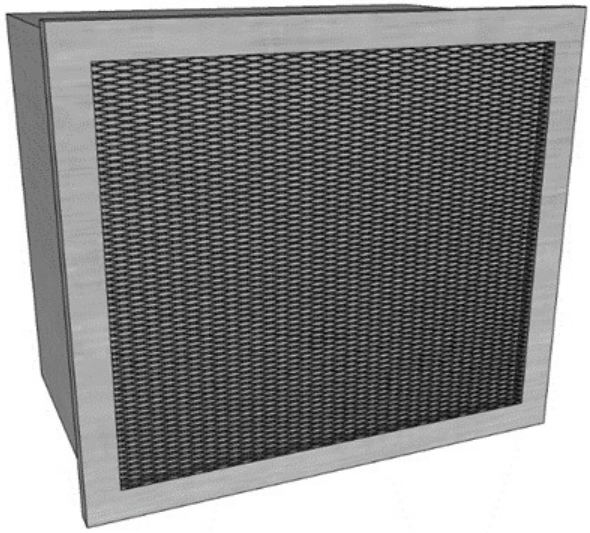
Fig No. 23. Mesh Filters

MESH FILTERS

Layers of stainless steel or non-corrosive galvanized mesh screens which collect grease, accumulate on the mesh surface.

These tend not to be used as first stage filtration in canopy hoods as grease and accumulation can be concentrated across the whole surface area, and create a potential ignition source. However, manufacturers use them as part of a second stage or hybrid solution combining with other types.

Fig No, 24. Compact Filter



COMPACT FILTERS

Designed for use in high temperature applications.

Typically used in Kitchen Extract systems, however it is a versatile and robust filter which can be used in all situations.

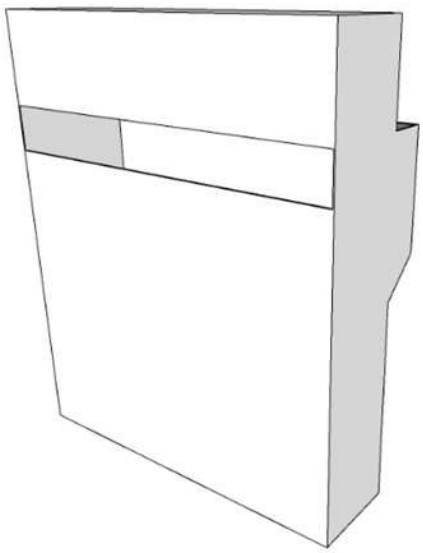
Fig No. 25. Duo Grease Filter

DUO GREASE FILTER. BAFFLE MESH COMBINATION

These filters are the best of both worlds. These filters are designed for use in commercial kitchens and ventilation from food preparation areas where their primary function is to reduce flame from traveling from the cooking area up into the extract duct. The extra mesh layers improve grease collection rates over standard baffle filters.

Please note: Fans may need uprating.

Fig No. 26. Cartridge Filter



CARTRIDGE FILTERS

Installed to form a high velocity opening for a number of baffle filters. These cause the air to change direction four times over at a lower pressure than baffle filters and installed in a sloping assembly over the full length of the canopy hood. Liquid grease is collected into a grease drawer.

12.6 PLENUMS

This void is inside the canopy, normally after the filters and prior to the start of the ductwork. It is designed to facilitate air circulation. It should be readily accessible for cleaning and maintenance. Please note: In some system plenums access can be restricted by fire suppression detection systems. Any restrictions to access should be recorded and reported in the post clean report.

Fig no. 27. Air flow through the plenum

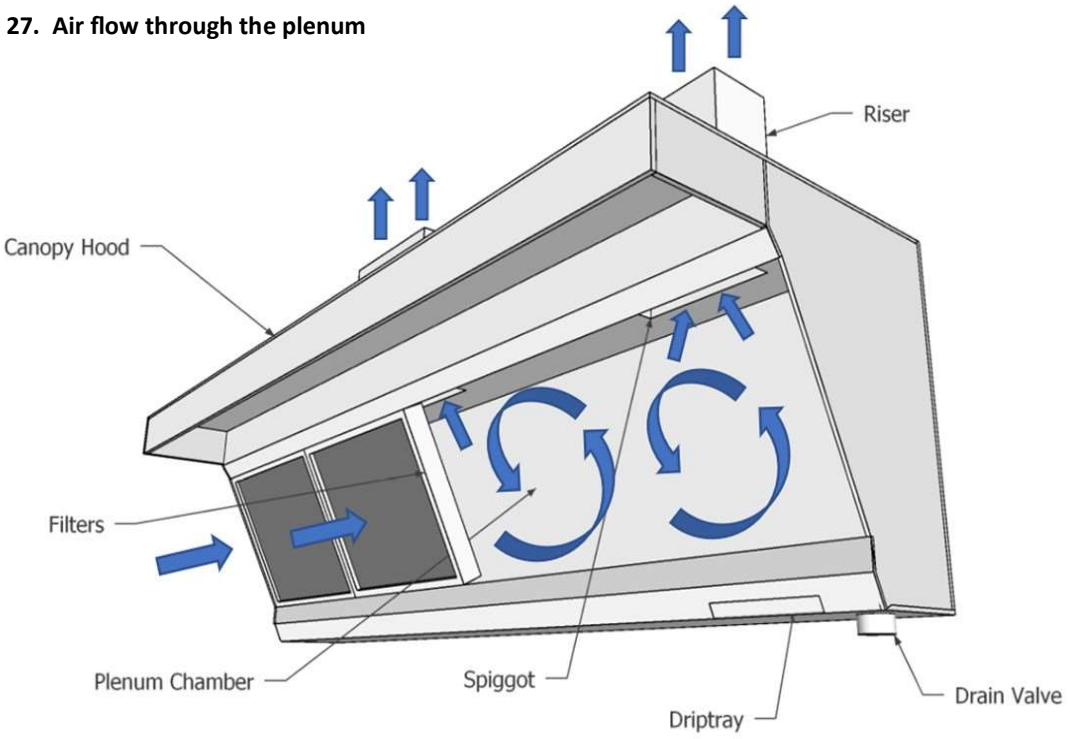
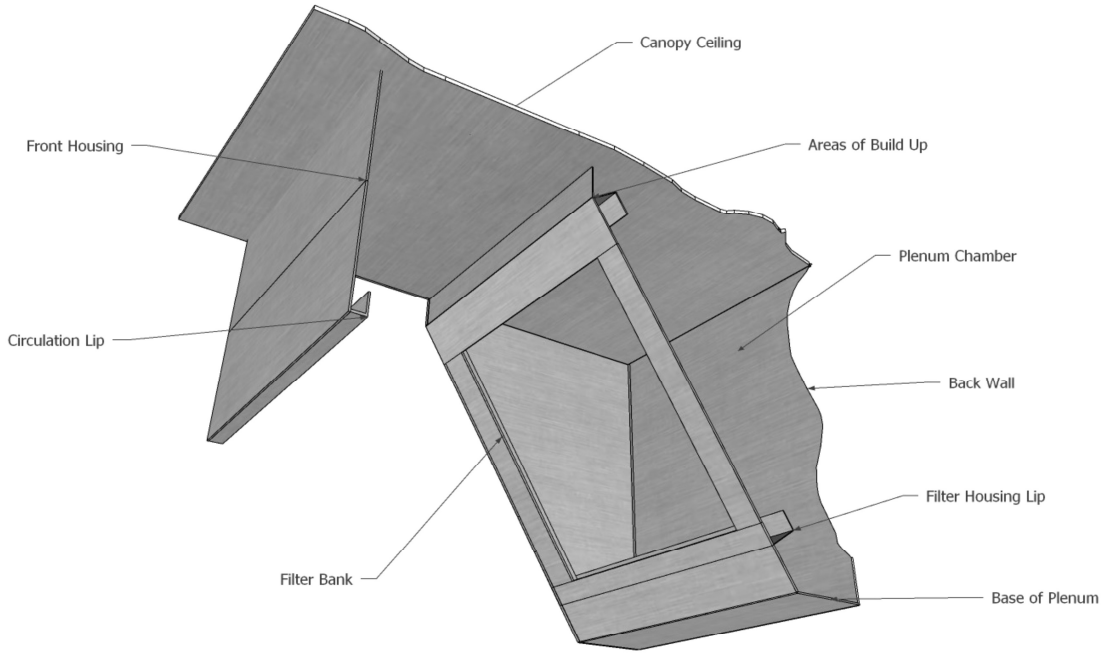


Fig No. 28. Filter housing & plenum chamber



12.7 KITCHEN GREASE EXTRACT DUCTWORK

Ductwork is conduits conveying grease aerosol or fumes, in this case from the kitchen, to the fan and the point of exhaust

Fig no. 29. Rectangular Ducting

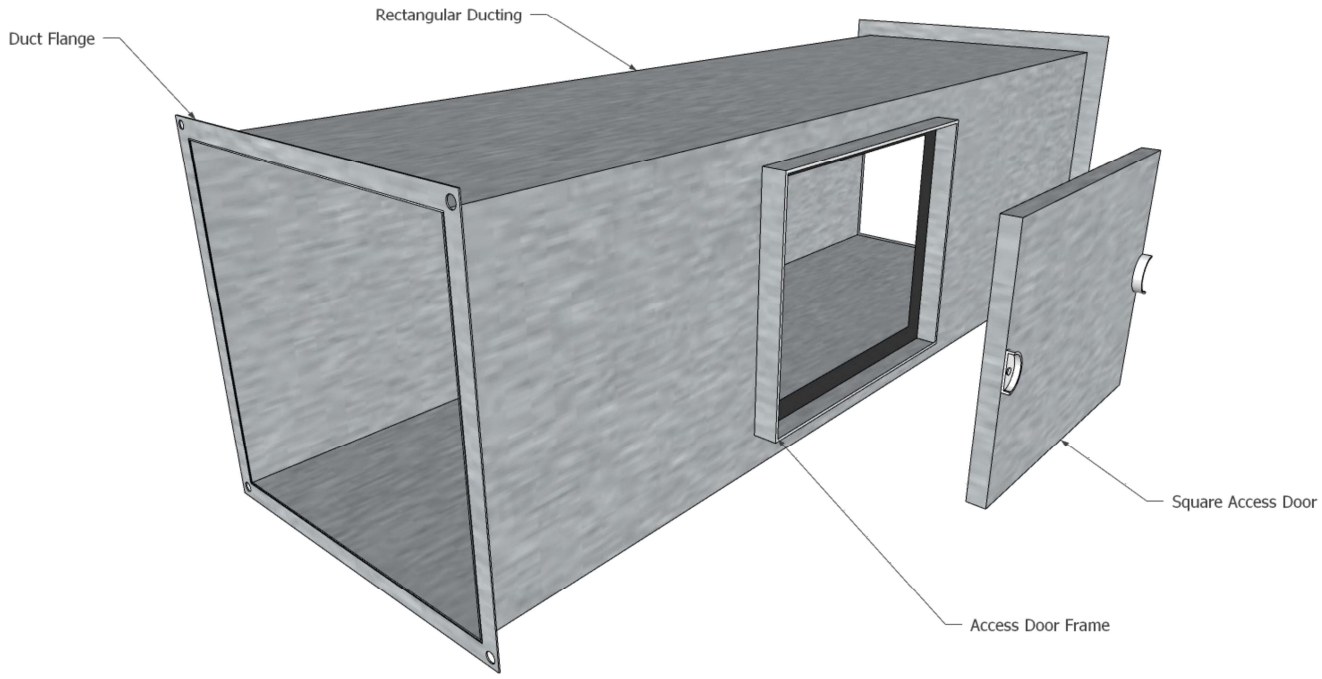
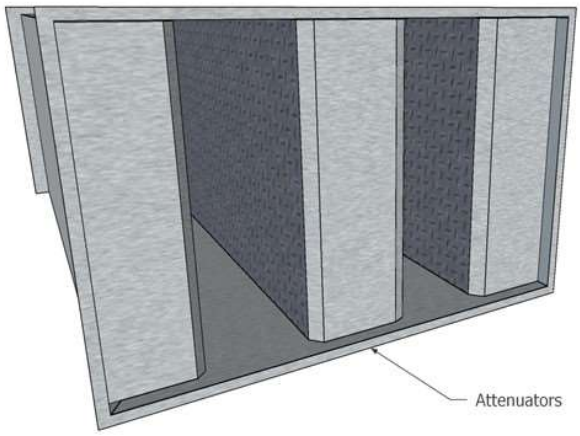


Fig No. 30. Grease Extract Ductwork—Attenuators



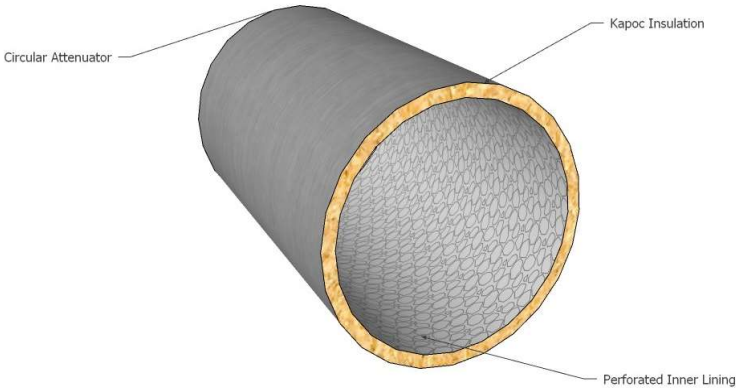


Fig no. 31. Perforated Inner Lining of an circular Attenuator

12.8 FIRE RESISTING DUCTWORK

12.8.1 THE IDENIFICATION OF TYPES OF FIRE RESISTING DUCTWORK

The market place for fire resisting ductwork is constantly changing and the table below shows information that's indicative at the time of publication and thus subject to change and amendment. The fire resistance periods given below are based on website statements by the manufactures. However, care should be taken that fire stopping methods are incorporated to insulated ductwork as it passes through walls or other fire compartmentations.

Fire resisting ductwork is not always labelled and can appear very similar to standard ductwork.

Table No. 12. Types of Fire Resisting Ductwork

NAME	DESCRIPTION	DETAIL
Flame bar BW11	Fire resisting ductwork. Fabricated galvanised sheet steel is degreased and then sprayed with a specially formulated compound. Coating tends to be a natural buff or sandy white colour with pits / indentations to surface.	Can also be supplied in circular, four sided or flat oval shapes. Prescribed fire resistance in terms of insulation, integrity and stability for between 30 to 240 minutes.
FirePro Fire duct systems Rock-wool	Fire resisting duct system with reinforced aluminium foil on one side. These can take the form of a slab, duct section or high-density slab with machined grooves around circular ducts.	Can be supplied in rectangular or circular ducts. Fire resistance stated at 0.5, 1, 1.5 and 2-hour periods. 'Kitchen extract' ducts are subject to separate BS 476–24 requirements and are additionally covered for 0.5 and 1-hour protection periods
CASWELL FIRESAFE®	Heavy duty fire Resisting non-coated ductwork for passive fire protection. Silver in colour with red flame symbols on the exterior of the duct.	Can be supplied in rectangular or circular ducts. Fire resistance periods up to 240 minutes for stability, integrity and insulation.
Safe4	Fire resisting non-coated silver coloured duct-work. May be manufactured from sheet metal. Newer installs have a picture of a side ways flame with the words safe4 printed below.	Can be supplied in rectangular or circular ducts. 4-hour fire rated ductwork.
Durasteel fire ducts	Lightweight fire resisting ductwork constructed to various sizes with configurations of 1 to 4 sides. Appears perforated in a number of colours including silver and black.	Configurations include rectangu-lar ducts. 4-hour fire rated ductwork. WARNING—Pre 1978 contains Asbestos Post 1978 Do not con-tain Asbestos Information from AIC (Asbestos Information Cen-tre)
Firemac	A specially woven glass fibre cloth applied to steel ductwork at the point of fabrication.	The range includes a non-combustible fire protection board made up of a central cementitious core that is faced on both sides with specially designed, mechanically bonded, galvanised steel.

TIP:
Engineers are advised to obtain clarification of any fire resisting ductwork system from the client's hand over documents.

12.8.2 PICTORIAL EXAMPLES OF FIRE RESISTANT DUCTWORK

An few pictorial examples of fire resisting ductwork in rectangular and circular configurations.

Fig No. 32. Flamebar BW11 Fire Resistant Ductwork

FLAMEBAR BW11 FIRE RESISTANT DUCTWORK

Fabricate from galvanized sheet steel to an enhanced standard. It is then degreased and sprayed with a coating using a specially formulated water based compound. The coating contacts selected mineral filters in a low permeability finished product which has been successfully tested for international use under Cellulosic Fire Conditions for 4 hours duration.

The unique BW11 coating has a number of distinct benefits: The provision of in excess of 2 hours insulation when handling internal gas temperatures of 400°C A reduction in base duct construction thickness or gauge Reduction in duct reinforcement

ROCKWOOL STONE WOOL

Tolerate temperatures of up to 1000°C. Kitchen extract ducts, which are subject to separate BS 476-24 requirements, are additionally cover for ½ and 1 hour protection periods.

Fig No. 33. ROCKWOOL Stone Wool

Fig No. 34. CASWELL FIRESAFE® Rectangular and circular

Fig No. 35. Safe4 Fire Duct Systems

THOR DUCT (FORMELY SAFE4 ®) COMPLETE FIRE DUCT SYSTEMS

Thor Duct (Safe4 ®) is a complete fire ductwork system, that has been tested to the latest EN standards. It provided CE marking on products where harmonized standard exists.

Smoke Extraction
Pressurisation
Passive Scenarios
Kitchen Extraction

CompartmentationSafe4® Kitchen Extract is insulated using a calcium magnesium silicate blanket which maintains the duct temperature below 180°C and prevents grease igniting and causing fire to spread throughout the building.

Safe4 ® is installed with two wraps of insulation, each wrap with a depth of 38mm.

Fig No. 36. Durasteel Fire Resistant Ducting

DURASTEEL®

Offers high levels of blast and fire resistance

DURADUCT® is ideal for particularly onerous conditions e.g. where high impact strength is required or for use in aggressive environments.

30-340 minutes fire resistance

WARNING—Pre 1978 **contains** Asbestos
Post 1978 **Do not** contain Asbestos
Information from AIC (Asbestos Information Centre)

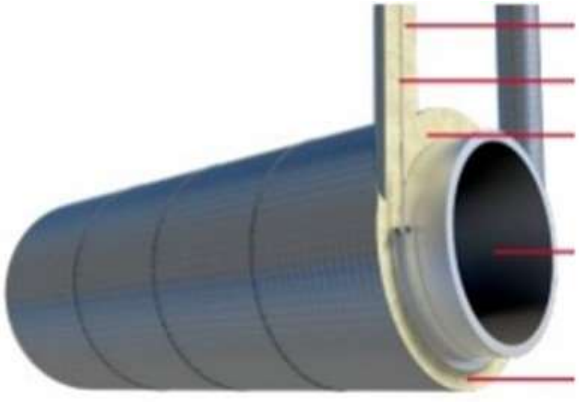


Fig No. 37. FIREPRO Fire Duct Systems

FIREPRO ® FIRE DUCT SYSTEMS

Fire Duct Section must be glued with ROCKWOOL FIREPRO® Glue at the joints and in the grooves. Steel bands or wired must be fitted circumferentially to the system at 300mm nominal centres to hold all joints and grooves tightly closed while the glue cures.

Fig No. 38. Firmac ducting

FIREMAC

Product is a self-adhesive glass fibre fabric, bonded both physically and mechanicaly onto steel ductwork to give the required fire resistant. The fabric is applied directly to your ductwork by our workshop engineers, there is no curing time, and the finish is neat and aestheically pleaseing while still achieving the required fire resistance period. By using Ventilation Design Services to bring you your Fire Rates Ductwork you have the following benefits.

Self-adhesive fabric so no need for sprays or chemical No tack or cruing time Lightweight but extremely robust and flexible Environnental benefits

Testing is required to prove compliance with fire compartmentation requirements for fire Resistant ductwork and to check their retnetion of cross sectional area or smoke extracts requirements. In the UK British Standars BS476: Part 24: 1987/EN1366 are used for this purpose.

CAUTION:

For Fire Resisting ductwork do not attempt to fit standard access doors as these will fail in the event of a fire. It will also invalidate the client's insurance.

Always refer to the manufacturer's instruction for the installation of access doors and fixing, as they may differ from each product.

See BESA DW172 for further information. See Appendix 1 Page 59.

12.9 FAN SYSTEMS

12.9.1 FAN WITH HOUSING

An integral part of the grease extract system designed to draw air or vapour though a ductwork system. In a grease system the fan is used to extract fumes towards the point of exhaust. There are many types of fans utilized and these will be detailed in later sections of this guidance. Safety advice: The fan housing is normally labelled with two numbers that indicate if wet cleaning methods can be used. It should be readily accessible for cleaning and maintenance under British and European law.

12.9.2 FAN MAINTENANCE

Fans, motors and drives may be heavily contaminated especially if oil or grease has leaked. Impellers may have heavy deposits on the blades. Fans must be kept clean and dust-free. The windings of a motor are closely wrapped and separated only by a thin layer of insulating lacquer. This lacquer can deteriorate due to age, weather changes and heat. The insulation generally lasts a life cycle but can lose its properties more quickly if there is a lot of grease, dirt and dust. Kitchen extract fans operate under increased strain and are therefore particularly prone to burn-out due to the heat, grease-laden and oily environment they operate within. The likelihood of this occurrence increases with age. This is particularly so where there is a significant build-up of heat modified oil due to a lack of regular cleaning. A clean motor will dissipate heat more effectively than a dirty motor, therefore lasting longer. Regular cleaning can prevent imbalance which leads to increased vibration.

It is essential to ensure fans are electrically isolated and locked off before carrying out inspection or cleaning works.

For full in-situ cleaning, partial dismantling and, possibly, the creation of extra access panels in fan casings, subject to manufacturer approval, may be required. Fans can vary in size greatly. The types typically found within ventilation plant are axial flow, centrifugal or bifurcated.

CAUTION:

Cleaning may knock off fan blade balancing weights and lead to excessive vibrations

12.9.3 SELECTING A FAN FOR KITCHEN GREASE EXTRACT

Taking time to install the correct fan and maintaining it properly, e.g. by proper cleaning, minimises a variety of operating problems. Axial fans and centrifugal fans are more suited for extracting clean air at normal operating temperatures i.e. up to 100°C. Contaminated air, such as in a kitchen, necessitates using an extract fan where the motor is isolated from the airstream.

Bifurcated, MUB and KBT fans are more suitable for kitchen extract because they can withstand high temperatures i.e. up to 200°C. These fans, having motors out of the airstream, prevent grease build-up and provide easier access for cleaning and maintenance.

NB The cleaning of fans in kitchen/restaurant ventilation which are not suited to the high temperatures and grease-laden environment in kitchen extract carry a risk associated with cleaning. They can be subject to burn-out as described previously and centrifugal fans can also be prone to imbalance causing vibration if not cleaned fully – **Do not partially clean.**

We strongly recommend that design engineers specify that all fan housings should have large removable cleaning plates installed in the fan casings for cleaning of impellers and internal housings. These plates could be double skinned, so the inner skin sits flush with the inner housing. On bifurcated fans, a panel is required on both sides.

12.9.4 IP RATING

IP stands for Ingress Protection. Electrical equipment such as motors in fans often have an IP rating which tells you how Resisting it is to foreign bodies such as dust, fluid, moisture. The IP Rating is a simple encoding that covers a range of international standards. See **Appendix 4 Page 63 for full explanation.**

12.9.5 DIFFERENT FAN TYPES

Fig No. 39. MUB (Multibox) Fan

MUB (MULTIBOX) FANS

MUB fans can handle the demanding requirements of a kitchen/restaurant environment. Panels on all sides can be easily disassembled for inspection, cleaning and maintenance. This fan generates higher static pressure and the motor is located out of the air stream. IP54 rating.

Fig No. 40. Bifurcated Fans

BIFURCATED FANS

Bifurcated are inline axial flow fans specifically developed to meet the need for an axial fan which can handle atmospheres normally detrimental to the life of the fan motor. They are ideal for extracting: hot; greasy; dusty; corrosive or contaminated air applications as the motor must be isolated from the air-stream. By isolating the motor from the system airstream, the bifurcated fan can handle a wide variety of saturated and dust-laden atmospheres, heated air and hot gases. The motors are specially selected to operate at higher temperatures. They are suitable for medium to high volume applications with low pressure development. IP55 rating.

Fig No. 41. KBT Fan

KBT FANS (SWING OUT FANS)

KBT fans also have motors located outside the air stream as well as a swing-out door for easy inspection, cleaning and maintenance. The direction of the door opening can easily be changed from left to right at site. To protect the motors from overheating the KBT fans have integral thermal contacts with external leads for connection to a motor protection device. IP54 rating.

Fig no. 42. Centrifugal Fan

Fig No. 43. Standard Curve Fan

Fig No. 44. Axial Flow

CENTRIFUGAL FAN

Centrifugal fans are by far the most prevalent type of fan used in the HVAC industry today and are better served in a clean air environment. They are usually cheaper than axial fans and simpler in construction. They are also used commonly in central heating/ cooling systems and are designed to move air over longer distances. Impeller balancing is done by small weights on a balancing machine. The centrifugal fan is used where the principal requirement is for both flow and higher pressures.

The impeller and internal surfaces of the fan casing should be periodically inspected for deposits which can adhere, reducing efficiency and possibly causing imbalance and vibration. Any such deposits should be carefully removed, but on no account should the impeller be subjected to harsh treatment, which will result in damage to the surface finish, airflow surfaces and disturbance of the balance. Cleaning procedures are dependent upon the degree and type of contamination. The minimum amount of cleaning is therefore recommended.

Standard backward or curved centrifugal fans are preferred, as they tend to be self-cleaning. See **Fig 43.**

NB Centrifugal fans can be subject to imbalance, causing vibration. Care must therefore be taken regarding the balancing weights whilst cleaning the impeller.

AXIAL FLOW FAN

This type of fan is used in a wide variety of applications. In general, axial fans are used where the principal requirement is for a large volume of flow and is designed to move air over short distances.

Under normal circumstances handling clean air, axial fans will require cleaning only about once a year. However, axial fans in kitchen extract may need more regular cleaning. See **Table 2 Page 11** for more information.

The following diagrams show location of a fan in an extract system and air flow.

Fig No. 45. Fan Airflow Sensors

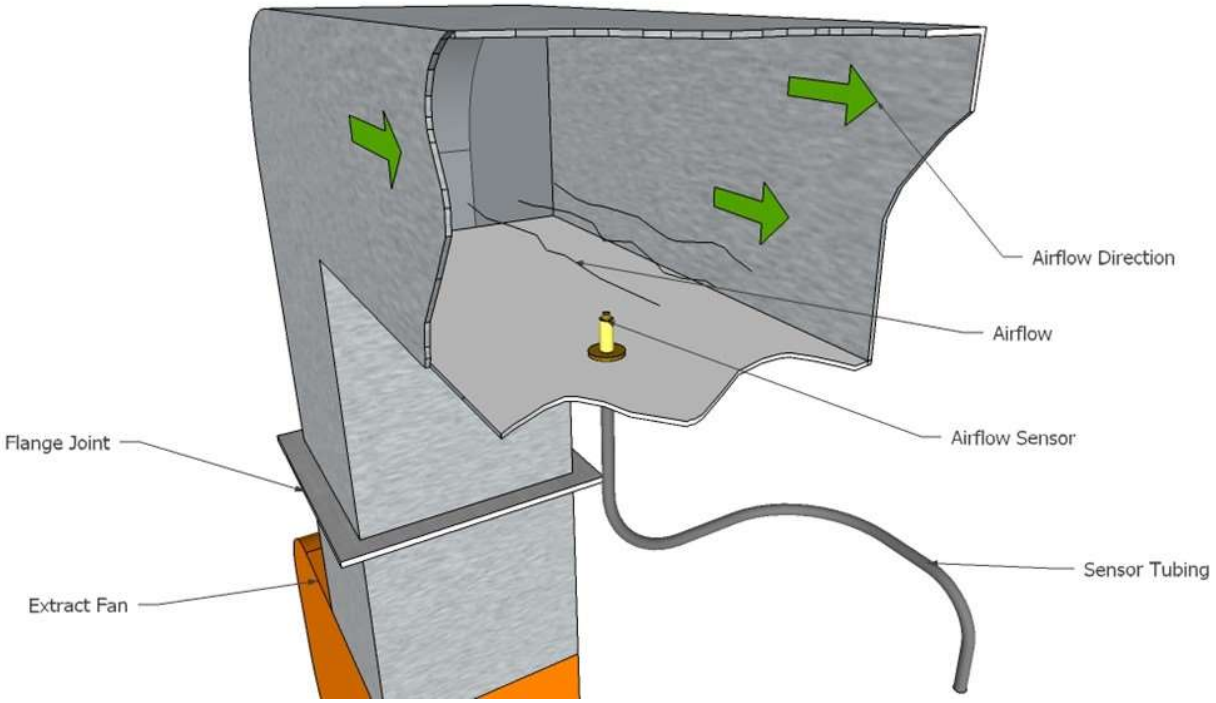


Fig No. 46. Airflow inlet & Discharge

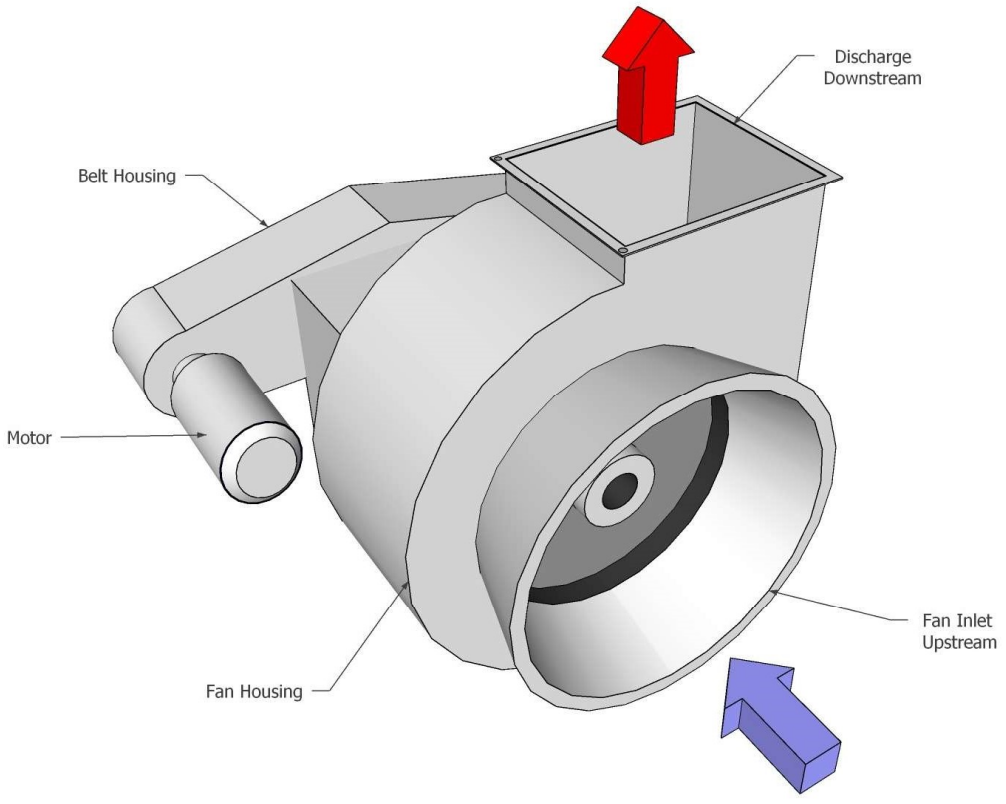
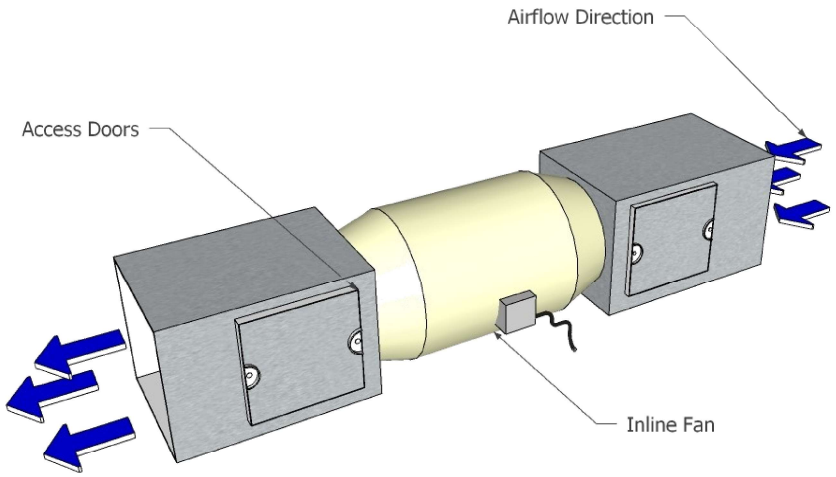


Fig No. 47. Fan Access Panel Installation



As shown in the drawing, access panels must be sited so as to allow cleaning from either side. Some fans are constructed so that additional access is provided from the fan housing.

TIP:

If the construction or siting of the fan provides limited access it may advantageous for the client to arrange for a service engineer to remove the fan to provide greater access for cleaning. Always remember to isolate, lock and sign the fan isolator prior to commencing any work.

CAUTION:

Care must be taken not to get cleaning chemical onto the motor electrics as this could lead to electrical injury and cause motor failure.

12.10 ACCESS PANELS

12.10.1 GENERAL - ACCESS PANELS

Hatches fitted into the duct which provide access for cleaning and maintenance. They are either curved for round duct, although saddles can be fitted, and rectangular doors installed or square for square duct. They must be airtight and to the same integrity or fire rating as existing ductwork.

Fig No. 48. Ceiling Tile Access Panel

12.10.2 FIRE RESISTING ACCESS PANELS

Fire Resisting access panels must only be fitted by approved and competent contractors in accordance with the manufacture's instructions.

Fig No. 49. Fire Resisting Access Panel

12.10.3 ACCESS PANEL INSTALLATION

When installing access panels into a grease extract system, they should be fitted at intervals not exceeding 3metres, unless adequate load testing has been carried out on the ducting itself. As per the recommendations BS EN 15780 at the time of this publication. This is for both horizontal and riser ducts.

CAUTION:

For Fire Resisting ductwork do not attempt to fit standard access doors as these will fail in the event of a fire. It will also invalidate the insurance.

Always refer to the manufacturer's instruction for the installation of access doors and fixing, as they may differ from each product.

See BESA DW172 for further information.

12.11 EXHAUST GRILLES

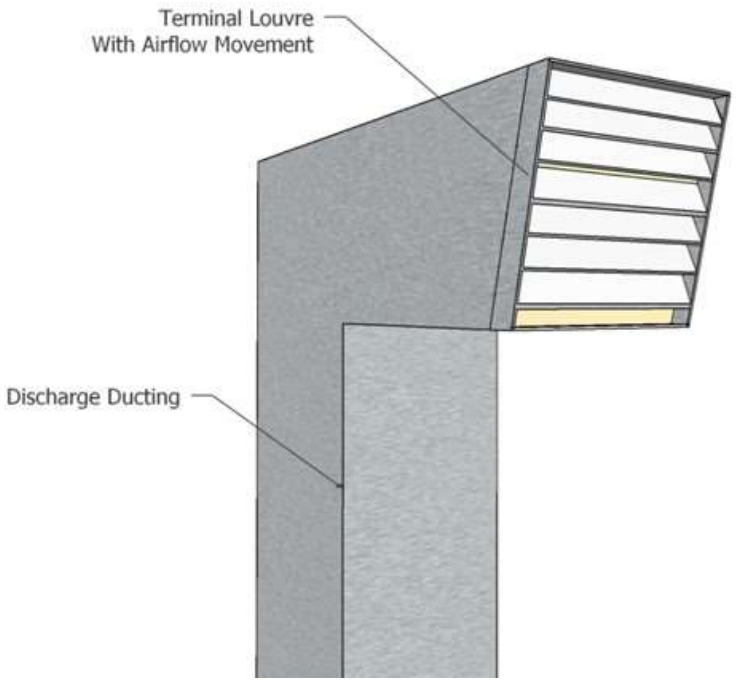
12.11.1 GENERAL

These are, the last point of exit of expelled air, fumes, or vapour from a kitchen grease extract system. They can be a sign of fouling within the ductwork if they show signs of heavy accumulate.

Some grilles are riveted and without replacement screws may prohibit some cleaning. At least one access panel should be fitted prior to the grille for cleaning subject to distance from fan.

TIP: Deposits on the exhaust grille may give an indication of grease / accumulate fouling further back into the ductwork system

Fig No. 50. Exhaust grille/Terminal Point



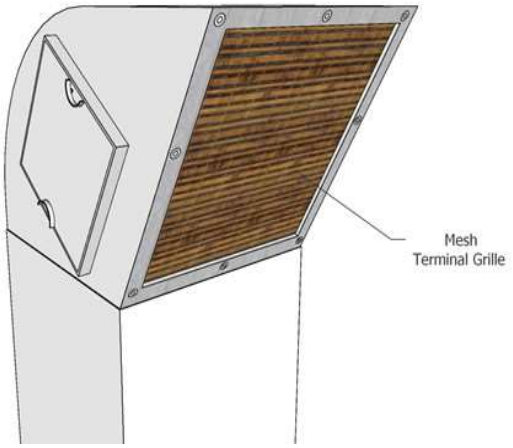


Fig No. 51. Exhaust Grille

12.12 ATTENUATORS/SILENCERS

12.12.1 GENERAL

This is where the external size of the ductwork increases for that section. Normally found near the fan the main principle of the attenuator is to reduce sound. The sound absorbing material may be fiberglass or rock wool. Access panels cannot be fitted in an attenuator

As shown in the drawing the minimum requirement for cleaning is from either side of the attenuator. It must be noted that in many cases the outer or second skin of the attenuator may not be accessible but may still accumulate grease.

Fig No. 52. An Attenuator

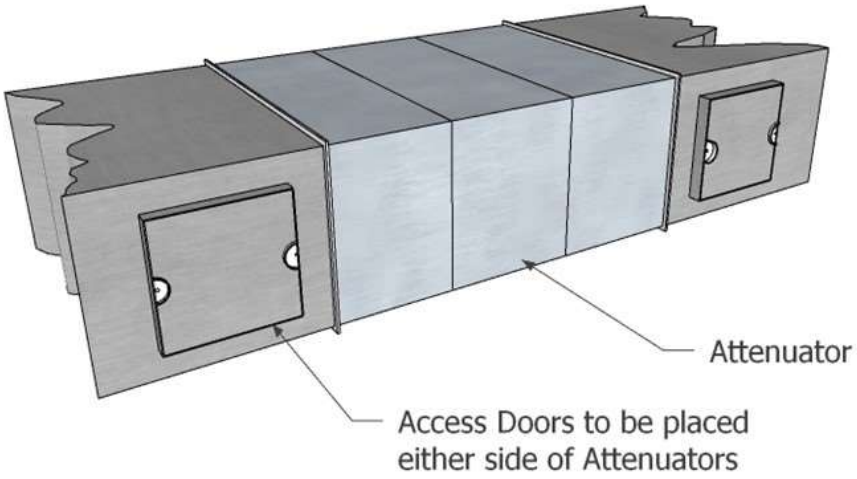
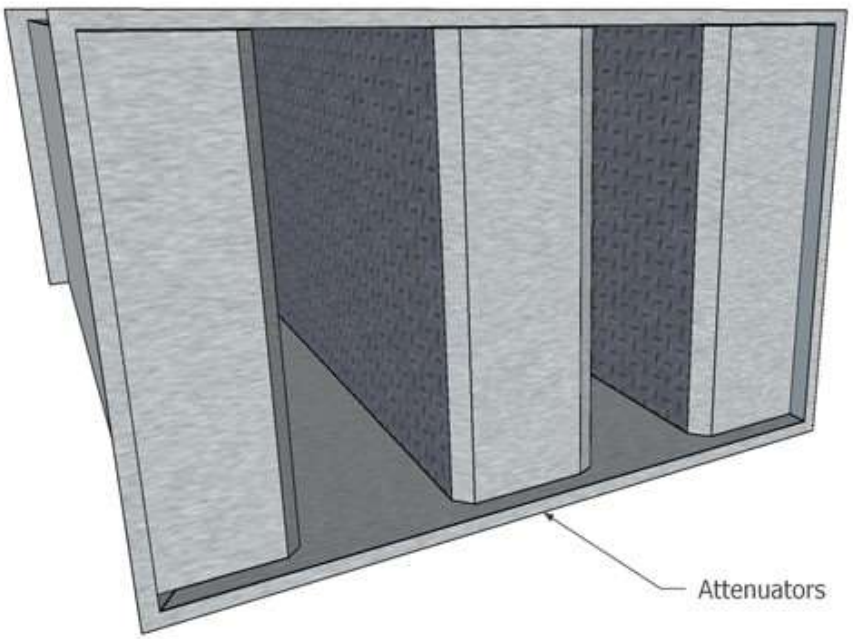


Fig No. 53. Attenuators



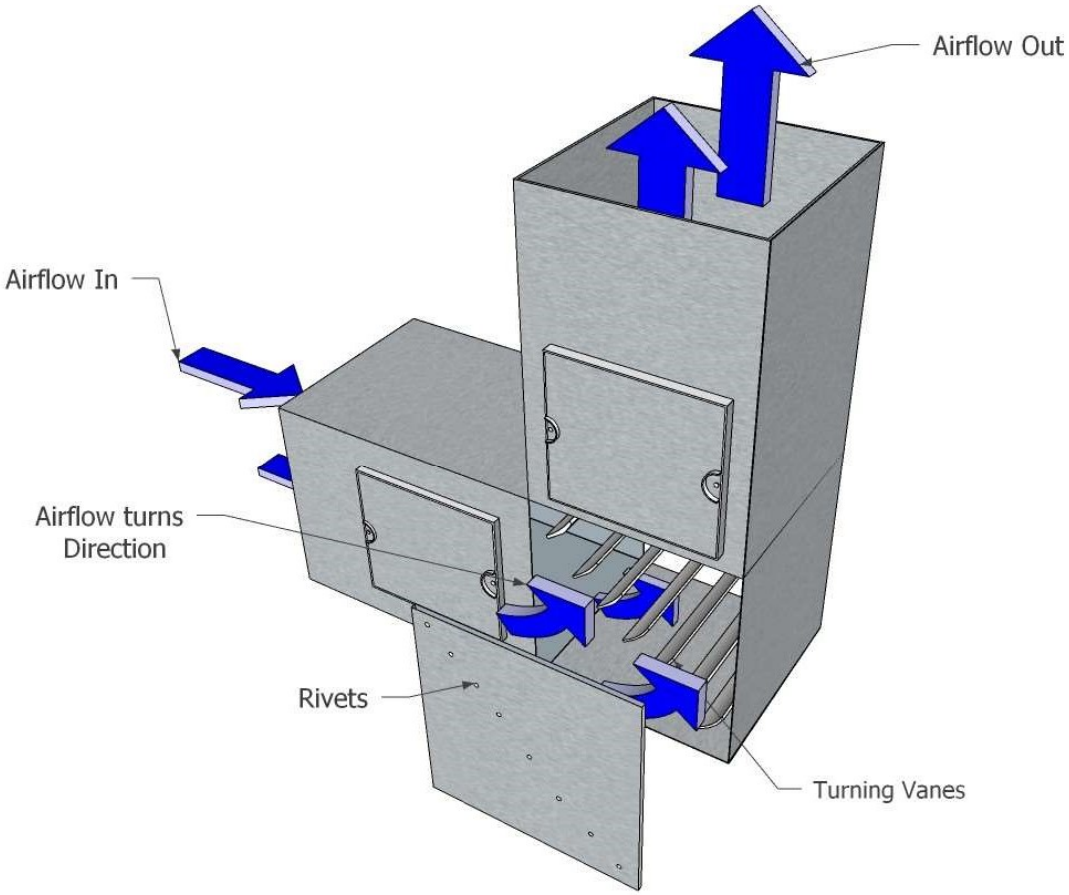
TIP: Bang on the outside of ductwork to make sure it is hollow and does not contain an attenuator

12.13 TURNING VANES

Marked by rivets on the outer surface of the ductwork. These vanes are used to change the direction of air flow and can prevent the installation of access doors, these areas are prone to blocking with grease.

Turning vanes are only found on square or rectangular ductwork.

Fig No. 54. Turning Vanes & Airflow



12.14 ANCILLARY COMPONENTS

12.14.1 WATER WASH/MIST SYSTEMS

The plenum or extract system chamber is sprayed with hot water under pressure that is collected and flows through a drainage channel. These systems have various degrees of automation. Continuous mist systems operate in a similar way using a spray of cold water which runs continuously capturing grease-laden air. They are designed to extinguish any embers or sparks.

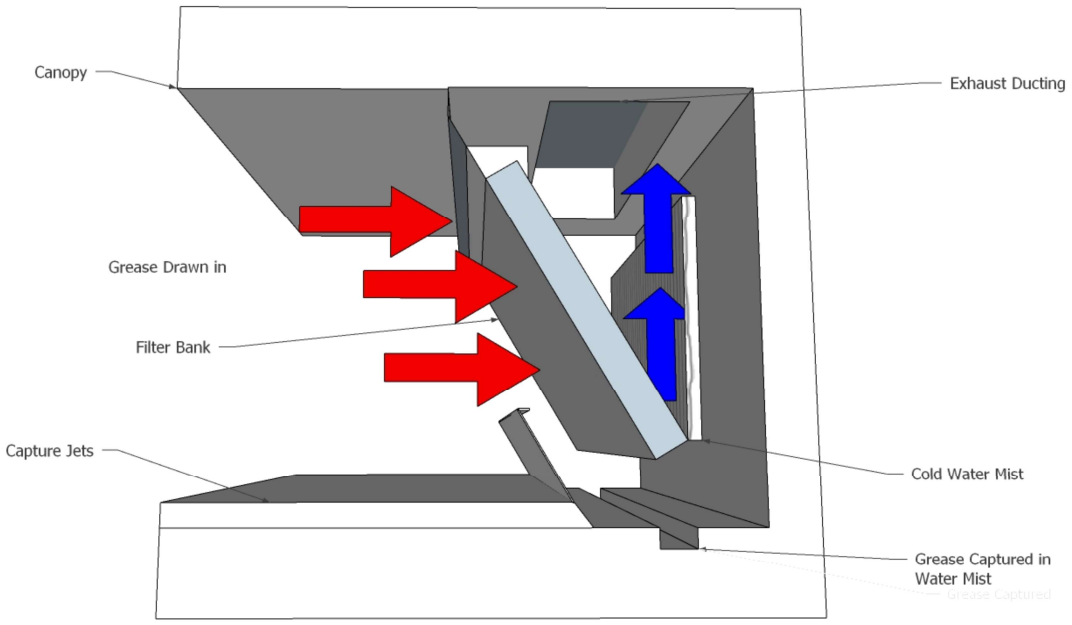


Fig No. 55. A Water Wash/Mist Systems

12.14.2 FIRE DAMPERS

A fire damper is a component that makes up part of the duct defenses. When triggered it closes to stop hot air or flame passing through further sections of duct. Normally found in the plane of structural and fire barriers such as walls and floors. These are not installed in Kitchen Grease Extract Systems.

However, Fire Dampers may be found in Kitchen Extract systems which may be obsolete. Please refer to **Part 2—Air (IAQ)** for full details and description of fire dampers.

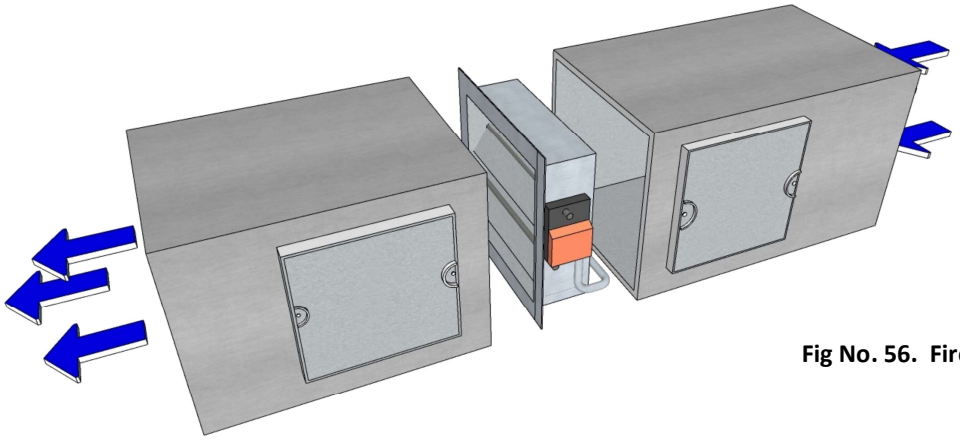
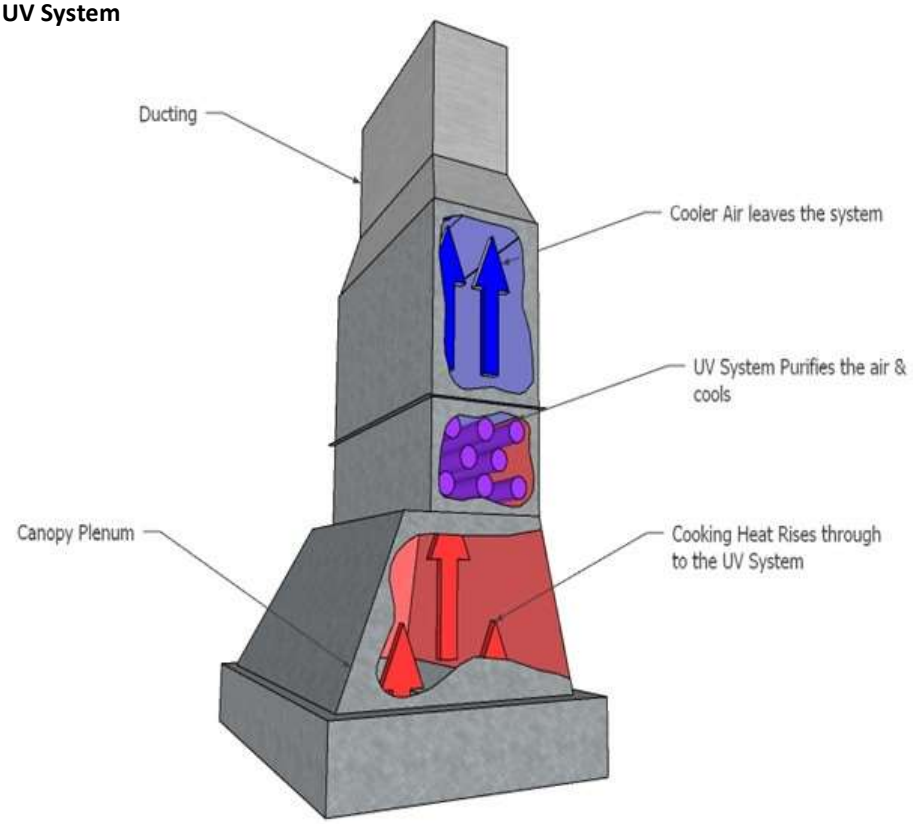


Fig No. 56. Fire Damper

12.14.3 UV-C/OZONE SYSTEMS

These systems use UV-C lamps located in the plenum and work by introducing oxygen or ozone ions. These inline oxidation systems neutralize contaminants using chemically bonded ions which are then drawn to the system exhaust via the grease extract fans.

Fig No. 57. UV System



CAUTION

Key Safety Note The UV-C light can cause damage and must be switched off before the removal of the filters.

CAUTION

Key Safety Note Before removing any access panels the ozone must be expelled from the ductwork by running the fans with the UV system switched off for at least 5 to 10 minutes.

TIP: On a pre-clean toolbox walkthrough please ensure the UV-C light cannot be seen through the filter or the housing during normal operation. If the technician can see UV-C light escaping, please ensure a safety note is recorded on the post clean report or advisory note.

12.14.4 HIGH TEMP DUCTS PIZZA OVEN

Pizza & solid flue systems normally require more aggressive and more frequent cleans. Check with manufacturers for standard maintenance, to ensure they are within the Catering Equipment Distributors Association (CEDA) guidelines. Anyone cleaning this type of duct should ensure they are fully aware of the difficulty in fitting access panels to it and the action of specialist chemicals to clean these ovens.

Fig No. 58. Special High Temp Ducts (Twin wall systems)

13 THE FUTURE OF KITCHEN GREASE EXTRACT SYSTEMS

13.1 LEGAL CHANGES AHEAD

Looking to the future, it is inevitable that the landscape will change due to environmental and economic challenges. NAADUK highlights some of the changes that will take place in the future, due to Government directives and legal requirements.

One of the major changes is reducing the use of gas operated equipment and eventually a total ban.

In Feb 2019 a BBC News reported in an article "Will my gas hob be taken away?" That the Committee on Climate Change are recommending that "no new homes are connected to the gas grid by 2025 at the latest. Government advisers want gas hobs to be banned from being installed in new homes within six years." The article goes on to say that " the Dutch government introduced regulations which prevent new homes connecting to the gas grid. It wants all residential buildings to be off gas by 2050, reducing CO2 emissions from all residential buildings. Large cities like Amsterdam, Rotterdam and Utrecht have signed a Green Deal, hoping that over the next few years gas-less neighbourhoods will emerge." https://www.bbc.co.uk/news/uk-47320673

Modern day environmental standards and the various cooking procedures today, raise many problems for users and Environmental Officers around the UK. When standards were first set, Restaurants were not working to the capacity that they are today. The proliferation of restaurants, takeaways, and fast food outlets, mean that hundreds of tons of carbonic and other pollutants are discharged to atmosphere every year. If this continues to rise at the present rate, this will add significantly to Air Pollution problems. In the future this will not be tolerated, in fact, changes are already here and will lead to less duct cleaning . These changes will also obviously reduce the risk of fire.

Any future Pandemics and other mass infections, will lead to more reliance on takeaways or factory produced food being sent directly to many takeaways, thus reducing restaurant market share, as we are already seeing on our sites.

13.2 OTHER FUTURE TECHNOLOGIES IN THE MARKEPLACE

Hood sensors automatically detecting a maximum set temperature then automatically reduce the temperature of cooking equipment to avoid flash fire.

Sensors in the filtration equipment determine the condition of the filters and the housing. These sensors are sometimes combined with processes which automatically shut down the fan and catering equipment where cleaning frequencies are breached. In addition, the sensors may be linked to the internet to communicate accumulate level data and to automatically schedule service maintenance and cleaning.

TIP: BIOTECHNOLOGY: Where there are multiple outlet sources of high levels of aerosol content this will result in undertaking many cleans, i.e. every one or two months, the use of a biological technology such as Ecofix/Provent or similar should be considered. This would be beneficial by saving on costs, and reducing the fire risk. This type of technology should be considered if the extract ductwork cannot be replaced with a ductless system.

13.3 DUCTLESS KITCHEN EXTRACTION AND FREE-STANDING SELF-CONTAINED RECIRCULATION UNITS

The use of ductless kitchen extract systems is increasing. Units in the marketplace provide improve filtration in kitchens with no external ventilation. This has obvious advantages for where a kitchen is located in a building. Most units are suitable for electric equipment only which counters any gas regulations. The manufacturers claim that ductless ventilation hoods and recirculation units can be used where planning permission is difficult to obtain.

Fig No. 59. Ductless System

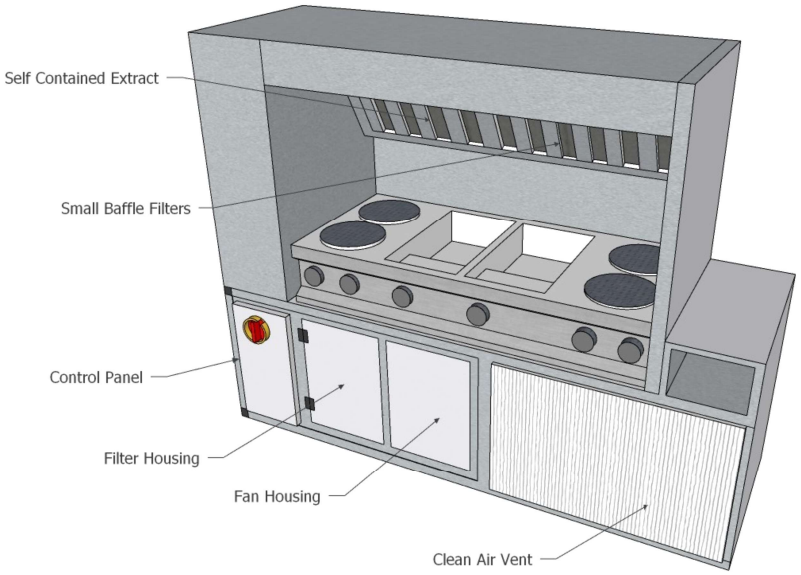


Fig No. 60. Single Reco-Air Unit

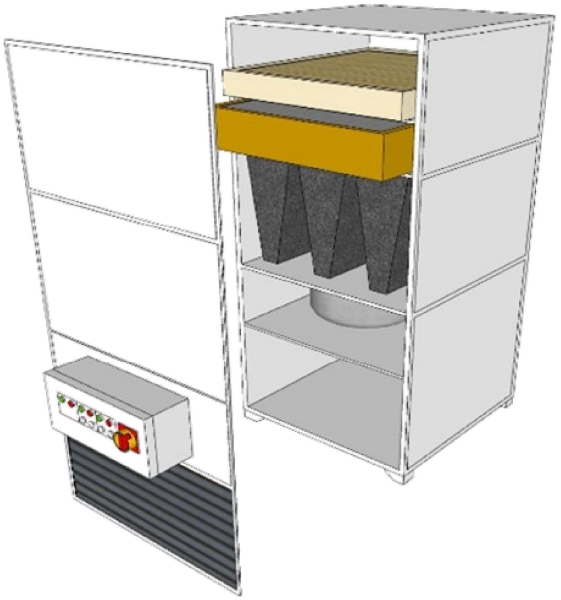
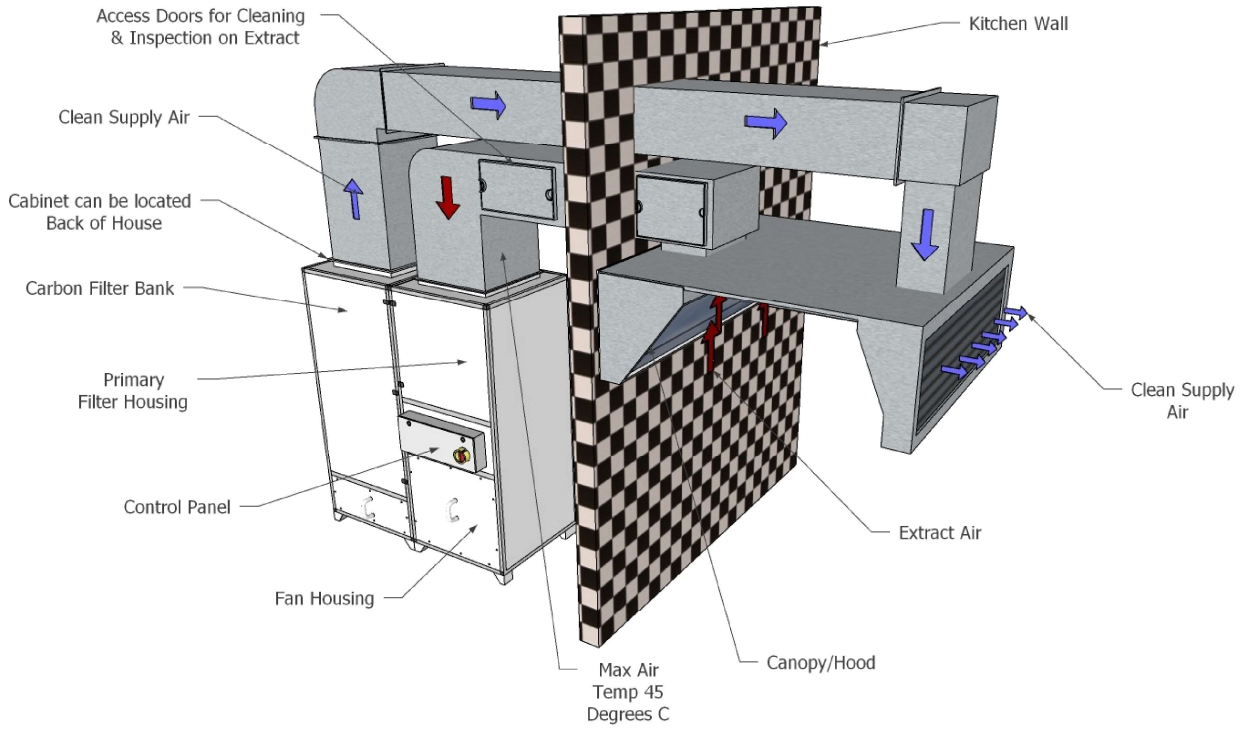


Fig No. 61. Double Full Reco-Air self Contained unit



Potential benefits of such system are:-

Table No. 13. Benefits of a ductless kitchen extraction and free standing self-contained recirculation units

BENEFITS
The reduction of ductwork to atmosphere
Self-contained recirculation unit to increase capacity in existing kitchens
Enable the creation of a new cooking area
Enable Menu changes
A multiple stage filtration process to remove fine particulate, smoke, grease and smells
The capture of contaminants that would normally be expelled to atmosphere
Systems utilising a filtration tower normally include a filter's module, fan and motor,
Some configurations can be fitted with fire suppression equipment
Some solutions can be retro fitted, for example cooling coils.

Table no. 14. Considerations for installing ductless kitchen extraction and free-standing self-contained recirculation units

CONSIDERATIONS
Many units do not control air temperature, so consideration for alternative methods of room temperature control should be considered. It must be stated that some service
To be used with electrical catering equipment, as most units do not remove carbon
Variable fan speeds to maintain a constant rate of extraction
Whilst some units do not require a direct duct connection to exhaust to atmosphere,
Any filters, other than the baffle filters, will need replacement (subject to operators manual specific instructions). Some manufacturers state that the frequency of filter changes will depend on the intensity and type of cooking. They further state that if a filter change is needed it can be determined easily by visual inspection as part of general maintenance checks. Other systems use sensor technology with full servicing
Filters found in these systems are likely to include baffle filters, grease filters, HEPA
System configurations may vary

The potential is almost unlimited when locating these types of systems/products as they can be installed almost anywhere. For example, in such locations as:-

- Airports
- Listed buildings
- As an alternative to locating ductwork through a fire break in order to reduce fire risk.
- Railway stations
- Basement kitchens.
- Areas where planning consent has been restricted.
- Any commercial kitchen requiring increased production without extensive modification.

CAUTION:

Some manufacturers include a warranty period which could be invalidated if filter media, housing interiors and sensors are damaged during the cleaning period. Multi layered filtration produced by some companies, contain pressure tube sensors, which could be damaged as a result of cleaning. Furthermore it is argued that layers of filtration which may include G4 (typically this standard will remove 80% of the air-borne particles larger than 10 micron size and may be made from replaceable synthetic material), M6 (High performance fine grade filter(s) and HEPA filters (fine mesh made of borosilicate glass fibres or plastic fibres bound together with up to 5% acrylic binder) will protect the fan from accumulates and hence stop the need for cleaning. Such systems have a further layer of filtration, post fan, made of food grade carbon /activated charcoal media to remove smells prior to exhaust / returning air back to the workspace.

Fig No. 62. The drawing below shows an integrated recirculation system. (relates to Fig 63)

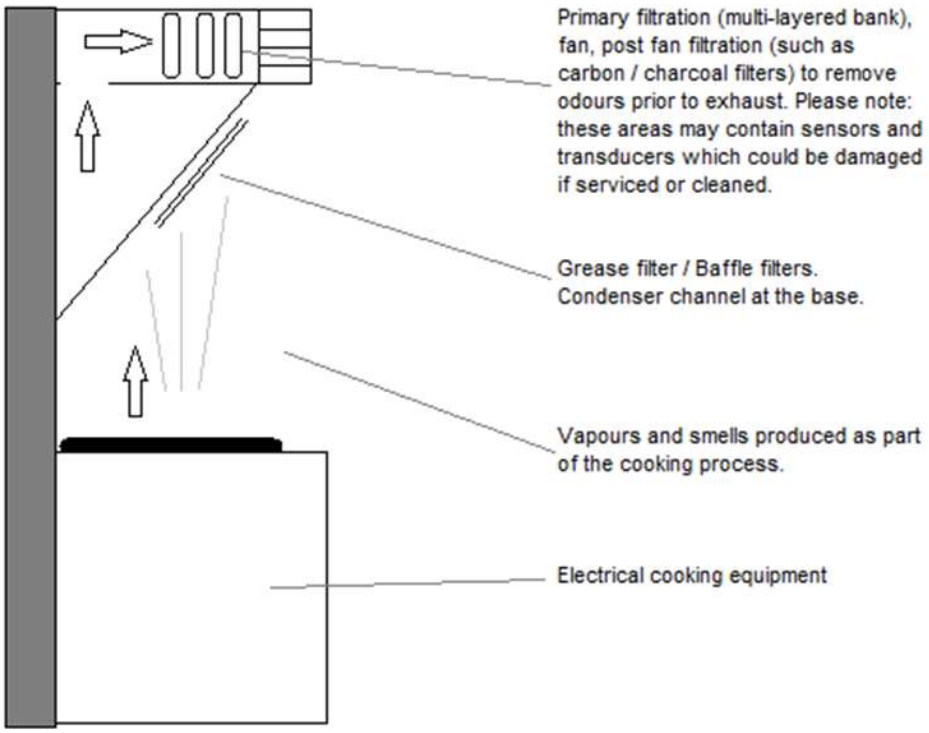


Fig No. 63. The picture below shows a separate recirculation unit. In this case the model shown is manufactured by Reco-Air. (www.reco-air.com)

APPENDIX 1

REFERENCE OF REGULATIONS/STANDARDS/GUIDANCE PERTAINING TO COMMERCIAL KITCHEN EXTRACT SYSTEMS

A brief overview of the regulations, standards and good practices recognised in the UK. in relation to ventilation system and IAQ. A reference list of the various organisations who have produced the documents are catalogued.

REGULATION/LAW	SOURCE	TITLE
EC852/2004 *	Leg Gov	Industry Guide to Good Hygiene Practice. Catering Guide. Regulation ISBN 9780955595394
L24 * Regulations 5 & 6	HSE	Workplace Health, Safety and Welfare Regulations 1992. Approved Code of Practice and guidance. Revised 2013 ISBN 9780717665839
COSHH Reg 2002	HSE	The Control of Substances Hazardous to Health ISBN 978 0 7176 6582 2
RFRO 2005 *	Leg Gov	The Regulatory Reform (Fire Safety) Order 2005 1541 PT 2 17
STANDARDS	**SOURCE**	**TITLE**
LPS 2084: Issue 1	bre LPCB	Standard for Inspection, Cleaning & Maintenance of Ductwork Systems
LPS1223 Issue 2.3	bre LPCB	Requirements and testing procedures for the LPCB certification and listing of fixed fire extinguishing systems for catering equipment
UL300 Standard	Underwrites Laboratories (UL)	Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment ISBN 978-1559899406
17A	NFPA	Standard for Wet Chemical Extinguishing Systems
DIN18869-5	DIN	Equipment for Commercial Kitchens—Components for ventilation—Part 5: Aerosol separators, requirements and testing
BAFE Scheme SP206 V1 Rev) Sep 2018	BAFE	For the Design, installation, Commissioning, Recharge & Maintenance of Kitchen Fire Protection Syatems
GUIDANCE	**SOURCE**	**TITLE**
FPA RC 44	RISC Authority	Recommendations for fire risk assessment of catering extract ventilation
FPA RC 68 V1 2020	FPA/BSRIA/ InFires	Recommendations for fire safety in catering establishments
NAAD21	NAADUK	Grease (Kitchen Extract) Regulation Standards and Legal Requirements Guidance applicable to the risk management of the fire and reduction of grease levels within commercial kitchen extract systems.
TR19 Grease	BESA	Guide to Fire Risk Management of Grease Accumulation within Kitchen Extraction Systems ISBN 0-903783-29-0
DW172	BESA	Specification for Kitchen Ventilation Systems ISBN 0-903783-29-0
	CEDA	Guidance on the safe installation, operation, and maintenance of Solid Fuel Fired Catering and Food Service Equipment.
Catering Information Sheet No 10	HSE	Ventilation of kitchens in catering establishments (rev3) 07/17
March 2017	Eurovent	Air Filters for General Ventilation

A list of regulations, standards and guidance for Air can be found in Part 2

APPENDIX 2

LPS 2084: ISSUE 1 STANDARD FOR INSPECTION, CLEANING & MAINTENANCE OF DUCTWORK SYSTEMS

(EXTRACT TAKEN FROM LPS 2084 *WITH PERMISSION)*

1. Scope

- Meet the requirements of the client contract:
- Document and report correctly
- Identify and record areas of limited access where inspection, cleaning and maintenance are impractical and communicate these limitations to the client:
- Give recommendations for access improvements to better facilitate the ongoing cleaning and maintenance of the ductwork system

2.6 The Company

A company that meets the requirements of this standard

2.7 Workmanship

The ability to carry out the activity within the stated tolerances specified to meet performance requirements

3.1 Records and supporting documentation

The LPCB approved company shall maintain documentation and records of the activities that fall under the requirements of this standard. The purpose of these records is to demonstrate that:

a) The requirements of this standard have been met and:

b) The procedures employed are such that the contract requirements have been met.

Specifically, the company shall maintain (at least) the following records:

i) Client

ii) Site address

iii) Unique reference for the job of work

iv) Names of the individuals undertaking the work

v) Project supervisor's name (where applicable)

vi) Contract review

vii) The requirements of the contract

viii) Details of in-process inspections/checks carried out prior to, during and after the contract

ix) Details of problems and any additional work carried out

x) Details of recommendations for improvements

xi) Certificate of conformity

3.10 Certificate of conformity

The company shall issue an LPCB certificate of conformity for each contract covered by the standard. A copy shall be supplied to the client on completion of the works, a copy shall be retained by the company, and a copy forwarded to BRE Global Ltd

Appendix A – Kitchen Extract Ductwork must comply with Regulation EC852:2004 & TR19 or NAAD 21 Guidelines.

Kitchen extract ductwork has been shown to be a contributory factor in the spread of fire due to the build-up of grease and oil deposits during use. This is also an important factor when considering compliance with European Regulation 852/2004 of Hygiene of Foodstuffs chapter 5. Because of this it is particularly important that a planned maintenance and cleaning program is in place, in order to keep the build-up of grease and oil within accepted industry guidelines such as BESA TR19 or NAAD 21 Duct Cleaning – Guide to good practice.

Cleaning Process

Initial inspection report of kitchen extract ductwork system shall include:

- Survey of level of grease present throughout ductwork, in line with accepted industry guidance, including photographic evidence
- Status of filters
- Details of existing cleaning/maintenance regime
- Typical usage levels of ductwork system
- Identification of fire suppression systems and their maintenance regime
- Identification of restricted access areas
- Proposal to address restricted access, in order to improve future cleaning and maintenance of the ductwork system

Post Cleaning Report of Kitchen extract ductwork system shall include:

- Survey of the cleaned ductwork system, in line with accepted industry guidance, to include photographic evidence
- Status of cleaned filters
- Detailed schematic of the ductwork system, showing areas of restricted access
- Suggested remedies for areas of restricted access, in order to improve the ongoing cleaning/maintenance regime
- Details of the agreed on going cleaning/maintenance regime in line with industry guidance

APPENDIX 3

RESEARCH PROJECTS

THE IMPACT OF DUCTWORK CLEANING ON A FIRE RESISTING KITCHEN GREASE EXTRACT SYSTEM

Detailed below is research project carried out by **NAADUK** in collaboration with the Association for Specialist Fire Protection – **ASFP** on the effects of chemicals on intumescent seals. The cleaning process and chemicals used can have a profound effect on the fire rating of a system.

The testing was carried out scientifically with materials supplied from various manufacturers. Products were unmarked, so that the testing was unbiased.

Items tested

10 x type of fire Resisting ductwork test

12 x Intumescent seals tested

Method of Testing

All seals were applied to test plates for 3 months before testing took place. Initially standard 3mm bristle brushes were used, but these were found to be too aggressive for surface mounted sealants.

Special 2mm + 1mm brushes were made and all testing took place using these. It was observed from the twelve sealants tested, a third showed signs of softening and was starting to deteriorate.

It must be noted that not all specialist caustic users would allow their products to be used. It was concluded that the levels of caustic is likely to be far higher than the max 8% strength used by the general public.

Chemicals application was between 10- 20 minutes, to simulate 3 years general clean on panels and ductwork, kindly supplied by 3 manufacturers. From the testing cleaning solutions containing 5% - 8% caustic all caused damage to the galvanising, if left in contact without thorough rinsing with cold water.

It was assumed that much higher levels of caustic, which some cleaners used, may affect more sealants, because of safety issues our lab technician was not happy to use these higher levels, as he felt these levels could cause serious burns to the user.

Conclusion

NAADUK would recommend that a maximum of 8% caustic with thorough rinsing or better still a detergent chemical used more frequently should be recommend by the manufacturers.

NEW AND ON-GOING PROJECTS

Investigation and testing of foam based products and ductwork

Feasibility of access panels in foam products and ducting

Testing and evaluation of Fire Extract Valves

APPENDIX 4
IP RATING FOR FANS

What Does it Mean?
IP stands for Ingress Protection. Electrical equipment such as motors in fans often have an IP rating which tells you how Resisting it is to foreign bodies such as dust, fluid, moisture. The IP Rating is a simple encoding that covers a range of international standards.

IP Rating Code
The rating code commonly consists of 2 numbers (e.g. IP54). Each digit represents the degree of protection against an environmental factor. The first indicates the level of protection against solid objects and the second describes the level of protection from liquids.

What the Numbers Mean

IP First Number—Protection against solid objects

0	No special protection
1	Protected against solid objects over 50mm e.g. accidental touch by persons hands
2	Protected against solid objects over 12mm e.g. persons fingers
3	Protected against solid objects over 2.5mm (tools & wires)
4	Protected against solid objects over 1mm (tools, wires and small wires)
5	Protected against dust limited ingress (no harmful deposit)
6	Totally protected against dust

IP Second Number – Protection against liquids

0	No protection
1	Protected against vertically falling drops of water e.g. condensation
2	Protected against direct sprays of water up to 15o from the vertical
3	Protected against direct sprays of water up to 60o from the vertical
4	Protected against water sprayed from all directions – limited ingress permitted
5	Protected against low pressure jets of water from all directions – limited ingress
6	Protected against temporary flooding of water e.g. for use on ship decks – limited ingress permitted
7	Protected against the effect of immersion between 15cm and 1m
8	Protected against long periods of immersion under pressure

TIP: What Rating for Kitchen Extract Fans
A rating of IP54 or greater will ensure the fan is suitable for the cleaning process using spray applications. Care should be taken not to flood the fan with water as malfunction can be caused due to ingress of too much water.

APPENDIX 5

REFERENCE OF TABLES— PART 1: GREASE

BLANK FOR YOUR OWN NOTES:

Part 1: GREASE (Kitchen Extract)

END