THE AUSTRALIAN INSTITUTE OF REFRIGERATION, AIR CONDITIONING AND HEATING

BEST PRACTICE GUIDE

COMMERCIAL KITCHEN EXHAUST MANAGEMENT

AIRAH

Preface

One of the most common places for a fire to occur in a building is in the kitchen. This is particularly true for restaurants and commercial kitchens, where most fires start at the cooking surface and spread into the kitchen exhaust hood ventilation system. When a fire enters a kitchen exhaust system it can escalate and spread rapidly due to the accumulation of grease and other debris inside the system.

The risk (likelihood and consequence) of a kitchen exhaust system fire is directly related to the accumulation of grease and other flammable debris inside the system. Grease filters and other exhaust air treatments reduce the amount of grease entering the exhaust system. For ongoing safe performance, maintenance protocols must include periodic inspection and follow-up cleaning (removal of the grease deposits) where required.

This manual highlights the common accessibility issues that are encountered, often inhibiting inspection and cleaning. Kitchen exhaust system maintenance contractors and other health and safety assessors regularly relate the horror stories of kitchen exhaust systems that have been either installed incorrectly or have been compromised since installation, systems that do not comply with minimum safety standards and that cannot or have not been maintained – resulting in years of grease accumulation and high fire and health risks. A so-called "accident waiting to happen". It is clear that many in the commercial kitchen industry do not fully appreciate the importance and risks of kitchen exhaust maintenance.

This Best Practice Guide steps through a best-practice approach to managing fire risks associated with commercial kitchen exhaust systems. The starting point is a review of the relevant design and installation standards such as hood design, grease filtration, duct construction and most importantly access to facilitate future inspection and maintenance. This approach acknowledges the role of standards for minimum inspection and maintenance and outlines a best practice evidence-based approach to inspection and cleaning. It relates the inspection and maintenance frequencies to observed and measured grease thickness levels within the system.

This evidence-based approach provides the basis on which to determine ongoing inspection frequencies and provides a verification method for post-cleaning assessment. It provides a cost-effective management approach for commercial kitchen exhaust systems to minimise fire and health risks, maintain compliance and optimise performance.

This Best Practice Guide has been prepared by the AIRAH Commercial Kitchen Exhaust special technical group (STG) and is a must-read for anyone involved in the selection, installation, commissioning, certification, operation, or maintenance of commercial kitchen exhaust systems.

Vince Aherne

Technical Editor

Intent

This document has been prepared to assist mechanical engineering designers and maintenance engineers with their day-to-day tasks, and the discharge of their duties. This manual seeks to set down knowledge of the art and current best practice in the design and management of commercial kitchen exhaust systems, as at the date of publication. The document will also be of use to all those engaged in the safety, design, construction, operation, servicing, and management of kitchen exhaust systems in commercial buildings.

Review and Revision

Users are encouraged to make known their experience in using this Best Practice Guide and to notify any additional information which they can provide or to which reference can be made. This information should be forwarded to the office of AIRAH.

Acknowledgments

This is the first edition of this guide and it has drawn on some parts of the overseas standards and guidelines produced by the Building Engineering Services Association (BESA TR19 Grease) and the International Kitchen Exhaust Cleaning Association (IKECA C10, I10 and M10).

AIRAH wishes to acknowledge the many people who have contributed to the preparation of this document by way of technical development, or review and comment including:

- **Vincent Aherne,** F.AIRAH
- **Graeme Williamson,** Affil.AIRAH (STG Chair)
- **Sven Bolomey,** M.AIRAH
- **Jarrad Brown,** Affil.AIRAH
- **Martin Ryan,** M.AIRAH
- **Marcel Heijnen,** Affil.AIRAH
- **Martin Barry,** Affil.AIRAH
- **Matthew Lamb,** Affil.AIRAH
- **Alexandre Stubert**, Affil.AIRAH
- **Bill Sinclair,** Affil.AIRAH
- **Carl Madden,** M.AIRAH
- **Mitchell Cousins,** Affil.AIRAH
- **Warren Makings**

The assistance from these people is very much appreciated.

Disclaimer

The information or advice contained in this document is intended for use only by persons who have had adequate technical training in the field to which the The information or advice contained in this document is intended for use only by persons who have had adequate technical training in the field to which the Application Manual relates. The document has been compiled as an aid only and the information or advice should be verified before it is put to use by any person. Reasonable efforts have been taken to ensure that the information or advice is accurate, reliable and accords with current standards as at the date of publication. To the maximum extent permitted by law, the Australian Institute of Refrigeration Air Conditioning and Heating Inc., its officers, employees and agents

(a) disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs, whether direct, indirect, consequential or special you might incur as a result of the information in this publication being inaccurate or incomplete in any way, and for any reason; and

(b) exclude any warranty, condition, guarantee, description or representation in relation to this publication, whether express or implied.

In all cases, the user should also establish the accuracy, currency and applicability of the information or advice in relation to any specific circumstances and must rely on his or her professional judgement at all times.

ISBN: 978-0-949436-56-6

First edition published 2022

AIRAH BEST PRACTICE GUIDE
Commercial Kitchen Exhaust Management

Editor: **V J Aherne** BSc(Hons)Eng, MEnvMgt, DipBSEng, Cert. Eng, F.AIRAH

Contents

1 Scope and introduction

1.1 Introduction

Welcome to the AIRAH Best Practice Guide on the design and management of commercial kitchen exhaust systems.

Commercial kitchen exhaust systems extract the heat, smoke, particulates, grease, and water vapour generated by cooking operations in kitchens and discharge them safely outside. These systems become contaminated with grease and other cooking by-products. Over time, accumulations of these combustible contaminants create a fire safety hazard within the system.

When a system is poorly designed, installed or maintained the accumulation of contaminants complete the fire triangle – fuel, air, and ignition – to significantly increase the fire risk within the system and escalate the potential consequences of a kitchen fire.

Accumulated grease and moisture also create a hygiene hazard within the system that can lead to issues such as unpleasant odours, mould growth, bacterial contamination, and pest infestation.

Leakage of grease, oil, and water from damaged or poorly installed ductwork can spread the hazards to food preparation areas, or other areas of the building such as ceiling voids, service shafts and roof spaces.

Commercial kitchen exhaust systems that extract grease laden air must be inspected, tested, and cleaned regularly to ensure ongoing mitigation of these fire hazards and health and safety risks. This guide was developed to assist stakeholders to better understand and manage the fire safety and health risks posed by commercial kitchen exhaust systems. Although targeted at designers, builders, installers, operators, and owners of systems it can be used by all individuals who have duties to ensure the safety of people using a building or premises that contains a commercial kitchen exhaust system.

References in this Best Practice Guide are made to various Australian Standards, and it also draws on elements of various overseas guides to support the application of this best practice approach.

1.2 Scope

This Best Practice Guide has been designed to provide a best practice approach to managing fire and health risks associated with commercial kitchen exhaust systems.

It applies to commercial kitchen exhaust system designed and installed in compliance with building regulations. It does not apply to kitchen exhaust systems in residential homes.

While it is noted that there can be impacts on neighbours, the public and the surrounding environment, from smoke, odour, and noise due to the operation of commercial kitchen exhaust systems, these issues are generally site-specific and are outside the scope of this guide.

1.3 Purpose

The purpose of maintaining (inspecting and cleaning) a commercial kitchen exhaust system is to remove contamination deposited from the cooking processes to:

1. Reduce the fire risk presented by the system
2. Reduce the potential for health and safety issues
3. Maintain system performance and operating efficiency
4. Ensure continued ventilation of the surrounding ancillary areas, and
5. Provide safe and comfortable conditions for the occupants.

The purpose of this guide is to provide the information and tools to help users comply with the relevant health, hygiene and fire safety regulations and their building insurance conditions. It can be used for new systems in new or existing buildings, for system upgrades, and for ongoing operation and maintenance of existing kitchen exhaust systems.

The guide supports existing minimum standards by documenting a best practice approach that directly relates the fire risk of grease accumulation within the system, to system inspection and cleaning frequencies.

1.4 Application

This guide covers kitchen exhaust systems found in commercial premises and facilities where employees and/ or members of the public are present and potentially at risk. The purpose of this guide is to enhance public and worker safety by reducing the potential fire hazards associated with commercial kitchen exhaust systems. The guide is not intended cover residential kitchen exhaust systems in premises.

The guide provides:

1. A management process for controlling the risk of grease related fires associated with operating commercial kitchen exhaust systems.
2. A summary of the requirements for the correct design, installation, and access of kitchen exhaust systems.
3. The minimum requirements for inspecting kitchen exhaust systems and system components for mechanical conditions, structural integrity, fire safety, and cleanliness levels.
4. A methodology to determine the frequency and necessity for physically cleaning a kitchen exhaust system, through defined inspection procedures and a set of performance standards.
5. Acceptable methods for cleaning exhaust systems and components.
6. A set of standards used to verify acceptable post-clean cleanliness.
7. The acceptable methods that can be used to operate and maintain kitchen exhaust systems by end users in the interim periods between professional system cleaning services.

2 Fire risk in kitchen exhaust

2.1 Section introduction

This section outlines why the conditions inside a kitchen exhaust system can increase fire risks, by increasing the likelihood of a fire and exacerbating or intensifying the consequences of a fire.

2.2 Kitchen exhaust fire hazards

Kitchen exhaust systems provide the perfect conditions for fire – ignition, fuel, and air – called the fire triangle, see Figure 2.1.

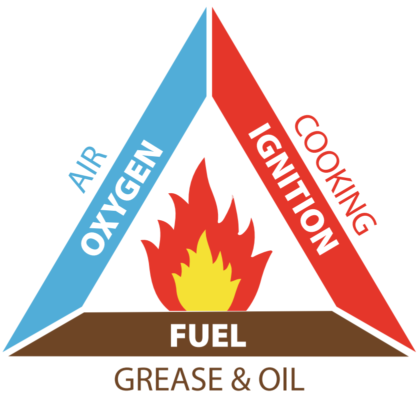

Figure 2.1 The Fire Triangle

2.2.1 Ignition

The first element of the fire triangle is the ignition.

There are many ignition sources within commercial kitchen environments, generally associated with the cooking processes. These include:

- Open flame cooking devices
- Flaming cooking techniques
- Sparks and soot from wood or charcoal burners.

Flare-ups from cooking equipment are the dominant cause of ignition of kitchen exhaust fires.

Some cooking appliances can provide enough heat energy to auto-ignite hot grease without a spark, which then only needs a supply of oxygen to continue burning.

2.2.2 Fuel

The second element required for a fire to proceed is fuel.

The fuel within the system is the grease, oil and other combustible contaminants generated by the cooking processes which enter the system with the exhaust air. Grease filters capture a percentage of this, depending on their performance efficiency, installation quality, and cleanliness management. No filter captures 100% of the grease, and the portion that penetrates through or around the filters can build-up on the internal exhaust plenum, the downstream duct and fan surfaces.

Grease can accumulate in low points and bends in the ductwork to provide reservoirs of combustible fluids that, when heated emit flammable vapours with a high risk of ignition. Solid fuel cooking can produce volatile gases created by the incomplete combustion of wood and other fuels. These gases condense in the exhaust duct and mix with water vapour to form a combustible tar-like creosote substance that sticks to the duct and other components.

2.2.3 Oxygen

The third element required for a fire to occur is oxygen.

The primary purpose of the kitchen exhaust ventilation ductwork is air movement, so there is more than enough air and oxygen available within the duct system to support a large fire.

Once combustion commences the duct can act as a chimney, channelling smoke out and air in to further ventilate the fire. If this occurs in the reverse direction to the normal direction of airflow, large amounts of hot toxic smoke can enter the kitchen area and building, via the kitchen exhaust hoods.

2.3 Fire risk in kitchen exhaust

In Australia, kitchens are reported as the number one source of fires in buildings, 25% of all structural fires and up to 50% of all fires in commercial buildings.

Fire statistics from Australia, the UK and the United States show that fires in restaurants predominately occur in kitchens. The ignition of cooking materials accounts for almost half of all commercial kitchen fires and almost all these fires (more than 90%) get into the kitchen exhaust system. Unattended cooking is the number one source of fires in kitchens, and these fires typically occur directly below the kitchen exhaust hood.

Fire services and forensic fire investigators report many cases where, a small kitchen fire has been spread well beyond the original source of the fire due to grease laden exhaust systems, causing major property damage and leading to significant business interruption. Many businesses never re-open after suffering a fire loss. Insurance policies may exclude claims where compliance with the terms of the insurance policy cannot be demonstrated.

Note: refer to the AIRAH Technical Bulletin, *Fire Safety – Kitchen Hood Exhaust Systems.*

2.4 Fire spread in kitchen exhaust

A fire within the duct system generally occurs due to the ignition of flammable material that has built-up at the grease removal device (filters).

Kitchen exhaust fires can spread in several ways. A fire that originates within the kitchen that gets past the hood's primary grease filters can quickly spread through the ductwork if fuel (oil and grease) is present. Duct fires can be intense and reach temperatures of 1,000°C within minutes. The temperature is hot enough to ignite nearby combustible materials outside of the duct, via radiant heat transmission. A duct fire can also ignite any grease that has leaked out of duct seams, spreading the fire into the building. This can also occur at the roof fan or exhaust discharge point, setting the roof of the building on fire or damaging other roof-mounted services.

Because fire dampers are not allowed to be installed on kitchen exhaust ductwork, fire spread within and between ducts can compromise a building's passive fire protection, such as the fire-rated compartmentation. Kitchen exhaust ducts must be fire-isolated to maintain the integrity of the required fire resistance level (FRL) of the building fire compartmentation.

3 Design and installation requirements

3.1 Section introduction

This section provides an overview of the specific design and installation requirements for kitchen exhaust systems relevant to the ongoing maintenance and management of the system. The design and installation of a commercial kitchen exhaust system can significantly reduce the overall fire hazards and health and safety risks of a building or premises by:

1. Complying with relevant codes, standards, regulations, and best practice guides to minimise the risk of fire ignition, to reduce fire spread and to suppress any fire event quickly and safely.
2. Allowing for the optimal maintenance of the exhaust system for ongoing safe operation and continued performance.

3.2 Codes and standards

The National Construction Code (NCC) Volume One (Building Code of Australia – Class 2 to 9 buildings) explains the various compliance pathways for complying with the governing requirements and the performance requirements of the NCC, through either a deemed-to-satisfy or performance solution. The NCC defines the performance requirements for kitchen local exhaust ventilation and identifies the buildings that require such systems.

At the time of publication, the NCC 2022 refers to Australian Standards AS 1668.1:2015 (including Amendment 1) and AS 1668.2:2012 (including Amendments 1 and 2), for a deemed to satisfy solution for kitchen exhaust systems.

AS 1668.1 outlines the fire and smoke control requirements for kitchen exhaust systems in Section 6 of the standard and AS 1668.2 provides the design and installation requirements for kitchen exhaust systems, which are identified as a type of local exhaust in accordance with Section 3 of the standard. Design and installation requirements for kitchen hoods are provided in AS 1668.2 Appendix E.

AS/NZS 5601.1 outlines requirements relating to the design, installation and commissioning of gas installations that are associated with the use or intended use of natural gas, LP Gas or biogas.

Note: Designers and installers should refer to AS 1668 parts 1 and 2 and the AIRAH Technical Bulletin, *Fire Safety – Kitchen Hood Exhaust Systems, for full details of the design and installation requirements.*

3.3 Kitchen exhaust systems

Kitchen exhaust systems are typically made up of several components:

1. Kitchen exhaust hood
2. Kitchen exhaust hood grease filters
3. Kitchen exhaust ductwork
4. Kitchen exhaust effluent treatment equipment
5. Kitchen exhaust energy control equipment
6. Kitchen exhaust fans
7. Kitchen exhaust discharge
8. Fire extinguishing systems
9. Fire detection systems.

Not all commercial kitchen exhaust systems will have all these components, (see Figure 3.1).

When any change to the exhaust system, tenancy, cooking equipment or cooking style is made, consideration must be given to airflow design and responsibilities for cleaning and safety to ensure the system remains fit for purpose. This is particularly important where a fan may serve multiple hoods and tenancies, for example at a shopping centre.

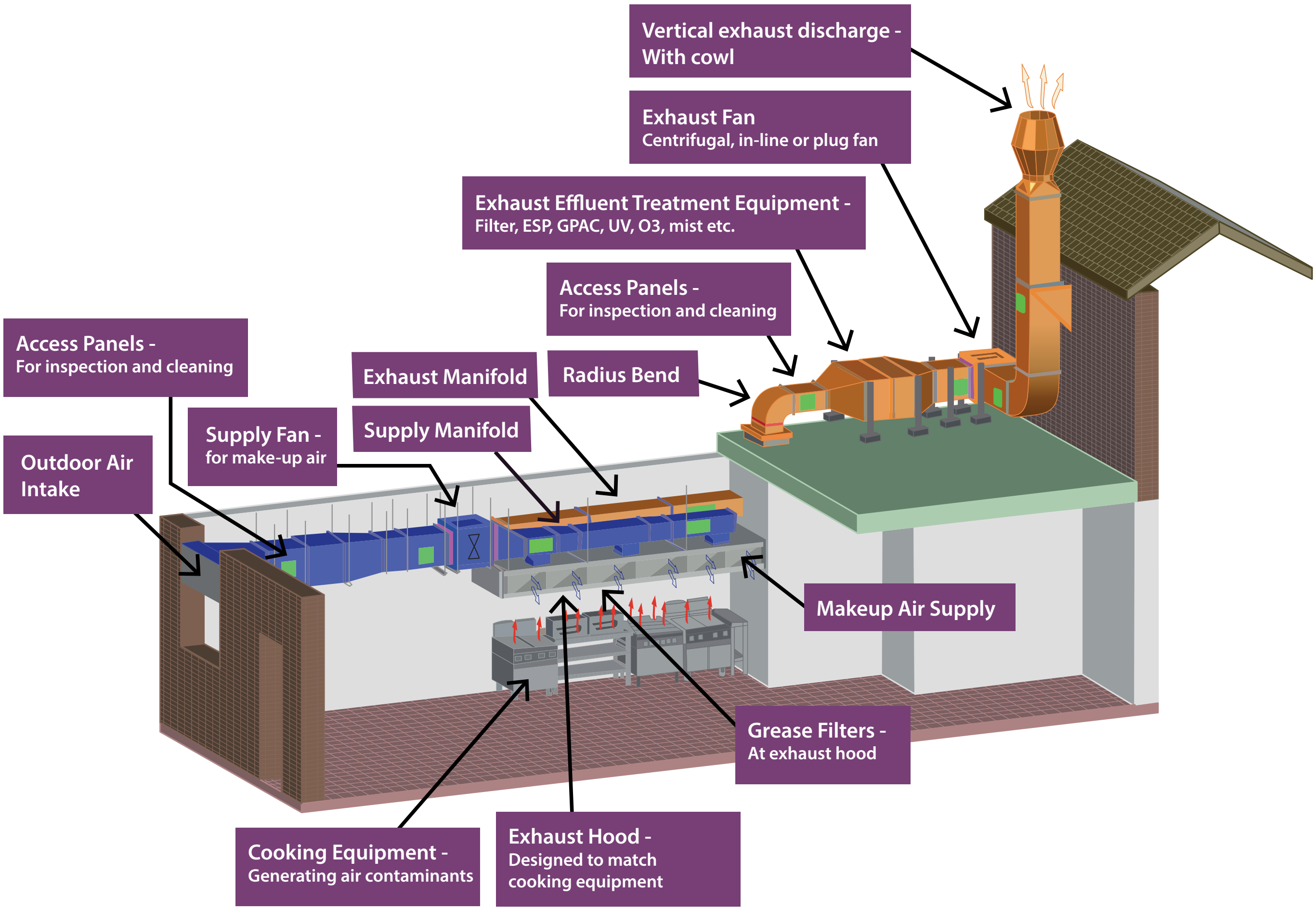

Figure 3.1 Typical Kitchen Exhaust System

3.4 Kitchen exhaust hoods

3.4.1 Design

Kitchen exhaust hoods are designed and installed for the purpose of collecting and removing cooking effluent including heat, smoke, particulates, grease, gasses, and water vapour. They are used over cooking appliances that produce grease-laden vapour such as griddles, ranges, deep fat fryers, grills, broilers, ovens, tilting skillets, woks, etc.

Clauses 3.4, 3.5, and 3.6 of AS 1668.2 set out the requirements for the design of kitchen exhaust hoods. Clause 3.5 sets out a prescriptive procedure for hood design and Clause 3.6 sets out a detailed procedure for hood design. Appendix E of AS 1668.2 sets out the requirements for hood construction and subsequent installation. Alternative exhaust hood designs may be used if the performance is demonstrated to be at least equivalent to the performance of the hoods described in the standard clauses.

Every kitchen exhaust system design must consider the exhausted air and the replacement or make-up air that needs to be drawn into the enclosure by the exhaust fan or be supplied mechanically as make-up air. Achieving and maintaining the correct make-up airflow can be critical to the system performance.

3.4.2 Hood styles

Styles of commercial kitchen exhaust hoods include but are not limited to:

- Island canopy hoods
- Wall-mounted canopy hoods (sidewall)
- Corner mounted canopy hoods
- Double-island canopy hoods
- Back shelf or low proximity hoods (low sidewall)
- Eyebrow and pass-over hoods.

A variety of hood styles are illustrated in AS 1668.2 Appendix E.

3.4.3 Cooking processes and hood types

Clause 3.4 of AS 1668.2 categorises commercial kitchen exhaust hoods into seven hood types and categorises cooking processes into seven process types.

3.4.4 Minimum exhaust airflows

The kitchen exhaust airflow requirements are calculated using either the prescriptive procedure set out in Clause 3.5 of AS 1668.2 or using a procedure for hood design that recognises more detailed tested and proven calculation methods as set out in Clause 3.6 of AS 1668.2.

Airflow requirements must be reviewed for any proposed equipment change under existing exhaust hoods. The calculation methods determine the minimum exhaust airflow required through the hood to capture, contain, and exhaust the effluent from the cooking processes.

3.4.5 Hood overhangs

Exhaust hoods designed using the Clause 3.5 prescriptive method for calculation of minimum airflow rate must have the listed minimum hood overhangs for each cooking process, to capture and contain cooking effluent. Proprietary kitchen exhaust hoods must have the minimum overhangs defined in the proven and tested standard used for the detailed calculation method of Clause 3.6.

3.4.6 Cooking appliance layout

Hoods need to be installed as designed, in accordance with the cooking equipment layout for which they have been designed, and the operators must maintain alignment between the cooking equipment and the exhaust system to ensure ongoing performance and compliance.

If operators subsequently change a cooking appliance (post hood design), they must ensure the required overhangs, calculated minimum airflows, separation distances and fire safety requirements continue to be met by the new arrangement.

To assist review of any future cooking process changes, and to facilitate ongoing maintenance, the hood specifications should be kept in the maintenance records, and each hood should be clearly identified.

3.4.7 High-risk cooking processes

Kitchen exhaust systems serving high fire risk cooking processes must meet higher performance requirements, including proven engineered fire suppression, and must be maintained strictly in accordance with cleaning and maintenance documentation. Such systems include:

1. Cooking processes that might result in open flames. Open flames can ignite grease in filters or penetrate primary filters to ignite grease inside the ductwork system. Hoods serving these processes are required to have UL 1046 classified filters.
2. Cooking processes that generate excessive heat. These hoods may need additional exhaust air, over and above the AS 1668.2 minimum airflows, to dilute the heat and reduce the temperature to safe levels.
3. Cooking processes using solid fuel. Solid fuels can create embers that may penetrate into the exhaust system to ignite grease. These hoods should have ember barriers or wet scrubbers before the entry to the ductwork system.

3.4.8 Hood information

Exhaust hoods should be supplied with hood specifications, installation requirements, the operation and maintenance manuals, and the exhaust hood data sheet detailing the hood design parameters and constraints. This should detail the power and airflow requirements, the cooking appliances and/or cooking process types, the grease filters, and the cleaning requirements.

3.5 Kitchen exhaust ductwork

The design and installation of the kitchen exhaust ductwork system can impact fire risk in several ways:

1. Risk of ignition of a fire
2. Risk of propagation of fire from the kitchen into the ductwork system, and
3. Risk of spread of fire from the ductwork to the rest of the building.

To minimise these risks, the design and installation of kitchen exhaust ductwork systems must meet the compliance requirements of Clause 6.2.3 of AS 1668.1 which provides additional requirements and requires ductwork to be constructed in accordance with the AS 4254.2 standard for rigid duct.

When sizing the ductwork the designer needs to optimise the balance between air velocity and fan static pressure (duct resistance).

3.6 Kitchen exhaust hood grease filters

Kitchen exhaust hood grease filters are the primary defence against grease, flames and other contaminants entering the system. These filters should separate a large mass of the moisture and grease particulates from the exhaust air before it enters the ductwork system. Systems must be designed so that any grease and moisture draining from filters is collected and disposed of safely. Filters are not 100% efficient at removing grease from exhaust air so there is always some potential for grease deposition within ductwork systems. Refer to sections on inspection and cleaning for further information.

The quantity, size and type of filters must be designed such that the airflow rate and air temperature through each filter is within the manufacturer's design limits. There is a relationship between pressure drop, air flow and grease removal efficiency to be considered in the system design and selection of filters. Designers should contact grease filter suppliers to obtain efficiency and pressure drop information.

Common grease filters found in the Australian market include:

1. Mesh filters are constructed of woven metallic layers of various densities and thicknesses. The mesh forms a labyrinth of pathways for the grease-laden airstream to pass through. Larger grease particles inertially impact and intercept with the surface area of woven mesh and stick to the media. National standards such as VDI 2052, VDI 3676 and NFPA96 identify that mesh filters should only be used as a secondary filter, positioned behind a primary filter that prevents flame propagation.
2. Honeycomb filters utilise a foil strip which is incorporated into a series of double compound curves which form a non-nesting system of smooth-walled honeycombs. The honeycomb construction divides the air as it is drawn through the filters causing the grease-laden air to change directions. The inertia of the grease causes it to condense and stick to the media.
3. Baffle filters function by forcing grease-laden air to change direction quickly and repeatedly as it rises through the filter. Because grease droplets cannot change direction as rapidly as the air, they impact the metal blades and subsequently drain into the filter tray.
4. Cyclonic filters have multiple cyclone chambers or spiralled coils to centrifuge the particles from the airflow. The separated grease impacts the inclined metal surfaces and drains to the collection tray.

The fire risk and the resistance to airflow through honeycomb or mesh filters increases as they become loaded with grease and cooking contaminants, requiring regular cleaning.

Some exhaust systems include a cartridge system, which is a removable housing incorporating a filtration method (reversing baffles or spiralling coil packs), and these also require regular cleaning.

Other filter types maintain more constant resistance to flow as the separated contaminants drain from the filter for safe collection and disposal.

Grease filter design and installation must comply with Appendix E of AS 1668.2 which requires filters to be positioned such that the distance between the filter and the cooking surface is not less than the regulated requirement (see Figure 3.2). Filters must be well sealed in their housing.

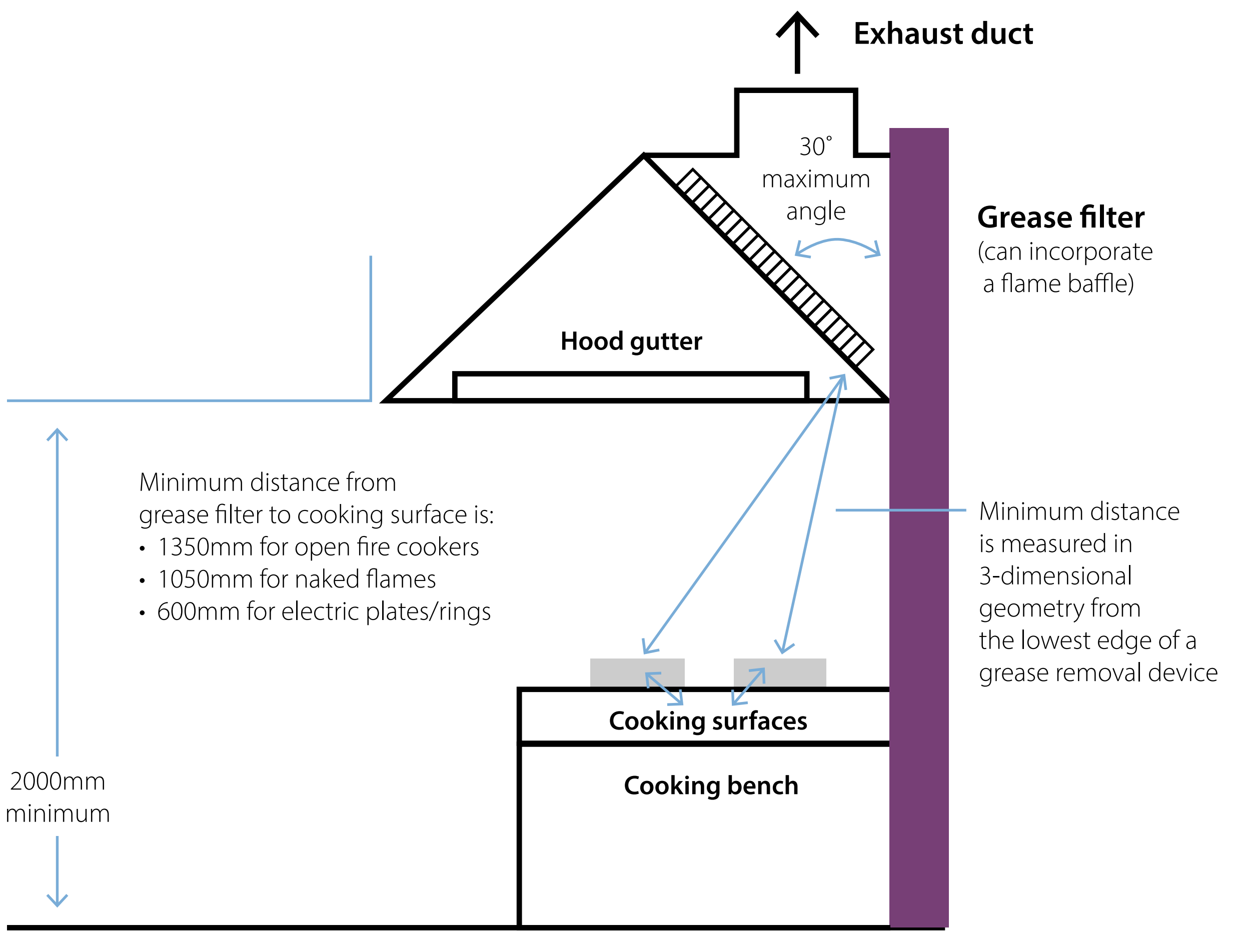

Figure 3.2 Location and separation distance for grease filters

Where the cooking process has an exposed flame that can result in ignition of the food or flare ups, Clause 6.2.9 of AS 1668.1 states that – *Where the length of an exhaust duct withing the building exceeds 10 m and where an exposed flame or embers may be present as part of the cooking process, devices that prevent the spread of flames in accordance with UL 1046 shall be incorporated into kitchen exhaust hoods (or filtration systems).*

For best practice, consideration should be given to the use of primary filters that comply with UL 1046 for either of the above situations, and not just where both are present.

Further in Clause 6.2.9 of AS 1668.1 – *Appliances (such as a wood-fired ovens and similar appliances) that can produce sparks shall additionally incorporate a spark arrestor at the connection of the appliance to the duct.*

A spark arrestor is a solid stainless steel mesh or water mist screen installed for the purpose of preventing embers passing through. No spark arrestor can guarantee that sparks will not enter the system and regular maintenance and cleaning is necessary to minimise the risk of fire within the system.

UL 1046 sets out the requirements of fire performance of grease filters used in commercial kitchen exhaust systems. They must be made of non-combustible material and act as a "flame barrier" or flame baffle as per the standardised UL performance test. Grease filters requiring UL 1046 compliance should be supplied with the relevant UL engraving or certification mark.

Loss Prevention Standard LPS 1263 picks up the requirements from UL 1046 and in addition also draws upon VDI 2052 in providing a testing methodology to determine the grease removal efficiency.

3.7 Effluent treatment equipment

Kitchen exhaust effluent treatment equipment refers to any form of treatment of the exhaust airstream that is additional to the mandatory kitchen hood grease filters.

Kitchen exhaust effluent treatment equipment is utilised to address or vary the requirements of Clause 3.10 of AS 1668.2, related to the quality of exhaust air discharges.

Since effluent treatment equipment can capture and/or breakdown grease particles, it can decrease the fire risks in kitchen exhaust systems downstream from the equipment. For this reason, designers should position effluent treatment equipment as close as possible to the start of the exhaust system, with due consideration to the performance of the entire system.

Effluent treatment equipment/systems can be located within exhaust hoods, mounted inside the exhaust ductwork, located within plant rooms, or located external to the building prior to the exhaust discharge point. At the time of preparing this guide, kitchen exhaust effluent treatment equipment currently available can include:

- Ultraviolet Light (UV) treatment (see Figure 3.3)
- Electrostatic Precipitators (ESP) (see Figure 3.3)
- Mechanical filtration systems
- Multiple-pass filtration systems
- Ozone treatments and generators
- Water-type scrubbers or mist systems
- Incinerators and catalytic converters
- Oxidizing and absorption-type media beds
- Disposable panel-type filters
- Spray odour control systems.

Particulate and grease removal equipment is often applied in series with odour control equipment.

UV systems are commonly mounted within the hood plenum or further downstream in the ductwork system as separately manufactured units. Interlock systems should be implemented to ensure the safe isolation of any UV and ozone generating systems when the exhaust system is not running and before maintenance or inspection. Exposure to unsafe elevated levels can occur if the system is not correctly isolated and purged before maintenance.

The exhaust effluent treatment equipment should be supplied with installation and operation manuals which detail the system design parameters and constraints, including the maximum capacity in terms of airflow and the appropriate cooking type as well as operational requirements related to inspection, cleaning, and ongoing maintenance.

While effluent treatment equipment within the kitchen exhaust system may reduce the accumulation of grease on ductwork and other surfaces when correctly applied and maintained, a full system inspection is still required to determine the appropriate cleaning frequency.

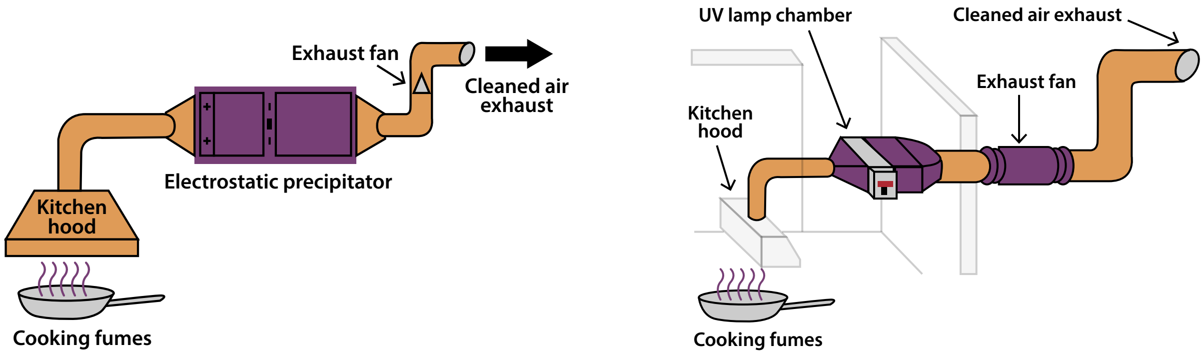

Figure 3.3 Kitchen Exhaust effluent treatment equipment

Note: Additional information on air filters, air cleaners and kitchen exhaust effluent treatment equipment is provided in AIRAH DA15.

3.8 Energy control equipment

Energy control equipment that can be incorporated into a commercial kitchen exhaust system includes equipment associated with the following:

- Demand controlled kitchen ventilation systems
- Energy reclamation systems
- Low-volume exhaust hood(s).

The equipment should be supplied with installation and operation manuals which detail the system design parameters and constraints, and the operation and maintenance protocols.

3.9 Kitchen exhaust fans

Other than the primary objective of exhausting kitchen air from the exhaust hood through to the discharge point, commercial kitchen exhaust fans also play a major role in the management of kitchen exhaust fires.

Clause 6.2.6 of AS 1668.1 details the operational requirement of these systems in fire mode. The objective is that the kitchen exhaust system be utilised wherever possible to assist in smoke removal. When kitchen exhaust fans are located within the building envelope, fan casings and cowls must be manufactured from materials that are not deemed to be combustible and that have a fusing temperature above 1000°C.

Exhaust fans require electrical components and connections. For cleaning and maintenance purposes appropriate electrical power isolation points must be installed.

Clause 6.2.7 of AS 1668.1 underlines that warning signs should be placed near the commercial kitchen ventilation power switch indicating –

Warning: this ventilation system shall not be turned off during a fire.

Over time, fans accumulate grease and electrical cables may degrade due to extreme heat, chemicals from cleaning processes, vibration caused by motor or airflow, corrosive fumes, and the accumulation of water vapour, fats, and oils. This increases the fire risk of the system, and the safety risk to maintenance technicians.

The types of fans used on kitchen exhaust systems include centrifugal up-blast, centrifugal wall-mounted, in-line, plug fan and utility set service, some of which may require variable frequency/speed control.

3.10 Fire-extinguishing systems

Types of fixed automated fire-extinguishing systems that protect commercial cooking operations include, but are not limited to, sprinkler systems and wet chemical systems (with/without water combination).

The minimum knowledge requirements for kitchen hood fire-extinguishing systems include:

- Required appliance coverage (to be reviewed when changing cooking equipment or process)
- Exhaust system areas requiring protection
- Manual release location
- Manual operating posting requirements
- Service frequency requirements
- Applicable standards, AS 2118.1, AS 2118.4, AS 3772.

3.11 Fire detection systems

Where kitchen exhaust systems form part of the required smoke control systems, the requirements of AS1670.1 Section 7 for fans operating in fire mode apply.

Types of fire detection equipment that protect commercial cooking operations include but are not limited to:

- Smoke detectors
- Heat detectors
- High-temperature heat probes
- Dual sensing detectors, and
- Smoke or heat alarms.

Shutdown and/or manual control is also a feature that is applied.

The minimum knowledge requirements for kitchen exhaust fire detection systems include:

- Fire Detection Control and Indicating Equipment (FDCIE) panel type and location
- Fire Fan Control Panel (FFCP) location and requirements
- Mechanical Services Switchboard (MSSB) location
- Fire Engineering Report (FER) requirements
- Detection type and location
- Service frequency requirements
- Supply air requirements
- Applicable standards AS 1670.1.

3.12 Access requirements

3.12.1 Why access?

Kitchen exhaust systems need to be inspected and maintained and access needs to be provided to facilitate that maintenance. The requirement for safe access is a legal requirement and the first responsibility for ensuring safe access rests with the initial designer.

It is the responsibility of the kitchen exhaust system designer to specify and communicate the access requirements of the different components of the kitchen exhaust system.

The builder or head contractor has the responsibility to ensure they and all relevant sub-contractors ensure that their works do not impede access to any of the inspection or cleaning points.

At the point of handover, full and safe access for inspection, cleaning, and maintenance must be checked to ensure it has been achieved, in line with the requirements of the relevant standards and regulations.

Final and complete as-built drawings should be produced and be available to inspection, cleaning, and maintenance contractors so that they can identify the different system components and their relevant access points.

3.12.2 Access categories

Access requirements can be separated into two main categories, access into the system and access to the system:

1. **Access into the system** – means access within commercial kitchen exhaust systems through components such as access panels and access doors. It is critical that exhaust systems are fitted with access panels in adequate numbers, quality, and sizing to facilitate unrestricted access for inspections (and cleaning). These elements are generally supplied by the manufacturer and installed by the mechanical contractor. It is recommended that warning signs be fitted to these access points indicating –
   Access to remain free for cleaning requirements
2. **Access to the system** – means access from the building to the different system components such as ceiling access panels and doors, work platforms and roof access stairways and ladders. These elements are generally installed by a trade other than the mechanical contractor and it is generally the builder's responsibility that this is done in such a way as to meet the design requirements.

System access panels and the building access arrangements must be physically aligned for them to be functional, so coordination between the trades is important.

Safe roof access, to facilitate roof-mounted duct and fan maintenance work, is essential.

3.12.3 Access into ductwork systems

Duct access panels must meet the requirements of both AS 1668.1 and AS 4254.2 for both horizontal and vertical duct systems. Access panels must be large enough to facilitate cleaning, preferably the largest size the ducting allows, see Figure 3.4.

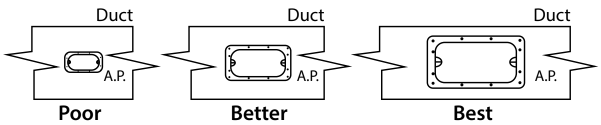

Figure 3.4 Access panel must be large enough to allow cleaning

Access is often required to both sides of duct-mounted components. Table 3.1 provides minimum access recommendations for the different components of a commercial kitchen exhaust ductwork system.

Table 3.1 – Location of access panels for cleaning and inspection purposes

EQUIPMENT	ACCESS POSITION
Volume control dampers	Both sides
Attenuators	Both sides
Changes in direction	Both sides
Filter sections	Both sides
Horizontal ducts	Maximum 3m centres
Risers	Maximum 3m centres
Exhaust fans	Both sides
Discharge grille/mesh	One side

The major issues that cause impossible or insufficient access to kitchen exhaust ductwork systems are:

1. **Horizontal ducts** are installed prior to ceilings and other services within the ceiling void. Frequently the solid fit ceilings are not fitted with access panels/doors, or these panels are not aligned to the duct access panel. Fire sprinkler pipework is commonly found installed across duct access panels preventing the panel from being removed or positioned between the ceiling access panel and the duct access panel obstructing the technician's physical access to perform cleaning or maintenance.
2. **Vertical risers** through multiple levels of buildings are installed without sufficient or any access to the duct are all too common. Installations that do have the required access panels installed every 3m are frequently encased inside wall panels or riser shafts when the final fit out is performed. It is only when the maintenance cleaning is required that the limited access is encountered, which then entails modification to enable the technicians to reach the service access panels. Where risers penetrate through occupied building levels (apartments or offices) the fit out does not provide access for the period maintenance being performed on these building levels. Additionally, the access panels in the structure need to align with the access panels in the duct.
3. **Access to the preinstalled ceiling panels** below duct access points is frequently obstructed by the shop fit out below including benchtops, refrigerated display units, and wall/servery construction. Shop layout is often not considered when designing access points nor the possible need for platforms, grab rails and harness points, etc.

Note: the *AIRAH HVAC Hygiene Best Practice Guide* provides advice when installing additional access panels onto to existing ducts.

3.12.4 Verifying safe access

Commissioning design reviews and final inspections must verify that safe access to roof-mounted equipment is present and sufficient to perform full exhaust cleanouts, as per the applicable standards. Relevant standards include:

- AS 1657 Fixed platforms, walkways, stairways, and ladders – Design, construction, and installation
- AS/NZS 1891.1 Part 1: Full body combination and lower body harnesses
- AS/NZS 1891.2 Part 2: Horizontal lifeline and rail systems
- AS/NZS 1891:3 Part 3: Fall Arrest Devices
- AS/NZS 1891.4 Part 4: Selection, use and maintenance.

System commissioning inspections should be performed post fit-out to verify:

1. That unobstructed physical access to all duct access panels have been installed as per AS 1668.1.
2. That any occupied spaces adjacent to the kitchen exhaust risers are clear of obstructions, ensuring access to the access points.
3. That no additional services or structures inhibit access to effluent treatment equipment, energy control equipment or critical grease accumulation drainage points on the system.

3.12.5 Exhaust fan access

Exhaust fans must be installed in such a way that cleaning and maintenance can be carried out safely and effectively. Compromised cleaning of the fan increases the system fire risk.

3.12.6 Effluent treatment equipment access

Effluent treatment equipment must be installed as per requirements outlined by the equipment supplier, representative or agent to ensure cleaning and maintenance can be carried out safely and effectively. Compromised cleaning of the effluent treatment equipment increases the system fire risk.

In addition to access difficulties, some equipment requires power isolation and or interlocking systems to ensure a safe working environment prior to, and during servicing. The details for any of these requirements shall be as per the code, or advice of the equipment supplier, representative or agent.

4 Inspection

4.1 Section introduction

This section outlines the inspection protocols that should be applied to a commercial kitchen exhaust system in a best-practice approach.

System inspections should be periodically undertaken to determine the levels of cleanliness, mechanical condition, structural integrity, and fire safety risk level.

It is the client's responsibility to facilitate access, including access to any third-party premises in which any part of the kitchen exhaust ductwork system may be located.

4.2 Inspection frequency

4.2.1 Minimum compliance standards

To achieve compliance with minimum standards the entire system and any related elements must be inspected for grease accumulation, at a minimum in line with the requirements of AS 1851 Tables 13.4.1.16 and 13.4.1.17, or at more frequent intervals where deemed necessary (e.g., local council or insurance requirements).

These AS 1851 compliance inspection frequencies are detailed in the DA19 Maintenance Schedule A25 for Kitchen Exhaust Systems (see Figure 4.1 on next page).

The minimum frequencies for compliance maintenance listed in the column *Maintenance Level C*. For best practice however DA19 notes that the level of grease accumulation should dictate the frequency of inspection and cleaning. This guide outlines that best practice approach, i.e., maintenance level A, based on Grease Thickness Test measurements.

4.2.2 Best-practice inspection frequency

Minimum standards provide a broad-brush minimum inspection frequency, to be applied to all systems, regardless of size or usage rates.

When considering the necessary inspection intervals for a specific or known commercial kitchen exhaust system, the frequency of inspections of the entire system can be directly related to:

1. Type of cooking operations, and
2. Usage rate of the cooking facilities which the exhaust system serves.

This helps to address the likelihood of grease accumulation over the interval period, and directly relates the inspection interval to the likely build-up of grease.

The recommended system inspection frequencies in Table 4.1 will assist as a guide to a best practice inspection approach.

Table 4.1 – Recommended inspection frequency – Grease build-up

TYPE OR VOLUME OF COOKING	INSPECTION FREQUENCY
Systems serving solid fuel cooking operations – combustion chambers	Weekly
Systems serving solid fuel cooking operations	Monthly
Systems serving high-volume cooking operations	Quarterly
Systems serving moderate-volume cooking operations	Semi-annually
Systems serving low-volume cooking operations	Annually

If other factors are known to influence the speed of grease accumulation, such as peak periods of use (e.g. seasonal trade) or where historical measurement data infers, then interim inspections should be implemented to check grease thickness or a more stringent inspection frequency applied, as appropriate.

As records of inspections and grease contamination level profiles are built up over time, inspection frequencies can again be adjusted as appropriate, to reflect the observed data (grease thickness levels).

4.2.3 Solid fuel appliances

Solid fuel combustion chambers, flues, chimneys, spark arrestors and filtration devices at the hood should be inspected weekly for deterioration, corrosion, and restrictions.

Combustion chambers should be scraped and cleaned weekly.

Action	Frequency (m) Maintenance Level			Explanation
	A	B	C	
1. Check grease level in filters.	1	1	1	AS 1851 – 13.4.1.16. Check grease-arresting filters for excessive grease accumulation.
2. Check hood and exhaust plenum.	1	1	1	AS 1851 – 13.4.1.16. Check hood and its exhaust plenum for excessive grease accumulation.
3. Check grease gutters.	1	1	1	AS 1851 – 13.4.1.16. Check grease gutters for excessive grease accumulation.
4. Check grease filters.	1	1	1	AS 1851 – 13.4.1.16. Check that grease-arresting filters are secured in the correct position and are undamaged. Any exhaust air bypassing the filter will cause grease accumulation within the exhaust duct.
5. Clean grease filters.	1*	1*	1*	AS 1851 – 13.4.1.16. Clean grease-arresting filters as required. *Frequency may be subject to inspection or regulation. Some types of filters are disposable, and manufacturers' instructions should be followed.
6. Clean hood and plenum.	12	12	12	AS 1851 – 13.4.1.16. Clean hood and its exhaust plenum of any grease accumulation or other contamination.
7. Inspect filter for damage and report.	12	12	12	AS 1851 – 13.4.1.16. Check grease-arresting filters for excessive leaks or damage and replace as necessary. Any exhaust air bypassing the filter will cause grease accumulation within the exhaust duct. **Note:** Non-metallic grease filters and other special types must be replaced at specific time intervals whether damaged or not. In these cases, follow manufacturer's instructions.
8. Inspect and clean kitchen exhaust duct.	12	12	12	AS 1851 – 13.4.1.16. Check duct for accumulated grease and clean as required. Any significant build-up of grease and dirt within the kitchen exhaust duct poses a serious fire risk and potential health hazard. **A –** Best practice is to nominate/agree and validate the level of clean (or the level of grease contamination to be allowed before and after cleaning).

Figure 4.1 Schedule A25 from DA19 – Kitchen exhaust system maintenance

4.3 Pre-inspection

Prior to conducting any inspection, the kitchen exhaust and make-up air fans should be activated to test for working condition.

After the fan test, and before the inspection of the exhaust system, electrical switches must be "locked out" to prevent accidental activation of the system during the inspection.

Where fire-extinguishing systems need to be rendered inoperable during any inspection process, only a competent person can perform this.

4.4 Inspection procedures

The entire exhaust system, components, and sub-assemblies need to be accessed and visually inspected.

Kitchen exhaust systems should be identified by the individual exhaust fan serving the system. Where multiple hoods are served by individual exhaust fans, they should be individually identified by hood location, cooking process(s) being conducted, or other means to clearly identify which exhaust hoods are served by which individual exhaust fan.

Inspection should include all accessible equipment and components located in the path of travel of the exhaust airstream, including the control assemblies where applicable, and should be conducted to determine the following:

1. Visual or audible indicators to verify that the equipment is in good working condition.
2. If accessible components have been removed from the exhaust airstream, or if the equipment or system has been otherwise rendered inoperable.
3. Any audible of visually detectable deficiencies that conflict with applicable standards.
4. Any changes made to the equipment or system.
5. An assessment of the grease accumulation levels of the system and components, using grease thickness measurements.

4.5 Grease thickness measurements

The need for cleaning can be determined by applying the Grease Thickness Test measurements during system inspections.

Grease Thickness Test measurements (see Appendix A for measurement options) should be taken at the following representative locations, where practicable, for each system:

1. Hood(s) extract plenum(s) behind grease filters/ separators
2. Duct 1m and 3m from each hood
3. Duct midway between hood(s) and fan
4. Duct upstream of fan and the fan itself
5. Discharge duct downstream of fan
6. Other location(s) noted with significant grease accumulations (e.g., at duct elbows and bends).

The results of the grease thickness testing can be compared to the grease thickness limits of Table 4.2, to determine the recommended action.

The frequency of cleaning should be sufficient to ensure that grease deposit limits of 200μm (0.2mm), as a mean across the system, are never exceeded. Ongoing cleaning frequencies should be based upon accurate historical levels of grease accumulation to maintain grease deposit levels below this level.

In certain cases, sections of the system may accumulate grease levels of 2,000μm or more. Such areas should be cleaned urgently with the caveat that the extent of fouling and the level of risk posed should be considered. For example, this level of accumulation at a spot within the hood plenum, immediately above the heat source would present a far higher risk than an accumulation at a small high point on a turning vane many meters away from the heat source. Interim cleaning of such high point areas should be introduced to the cleaning schedule where it is agreed that this is required to control the risk level of high point grease accumulation.

Grease Thickness Test results are recorded in the Inspection Report, see Appendix B.

Table 4.2 – Grease Thickness Readings

Grease Thickness Test result	Grease thickness limits	Recommended action
Mean (average) across the system	≤ 0.050mm or 50μm	Acceptable following cleaning or indicates that cleaning not yet required, but continue to monitor closely if below 50μm
Mean (average) across the system	≥ 0.200mm or 200μm	Complete system cleaning required if above 200μm
Single point of measurement	≥ 2.000mm or 2,000μm	Urgent localised cleaning required if above 2000μm
Single point of measurement	≤ 0.050mm or 50μm	For verification following cleaning, individual grease thickness tests must not exceed 50μm.

Notes to Table 4.2

1. The grease thickness limits refer to the degree of grease deposition within the system, consistent with good practice. It is important to note that other factors such as cooking methods, cuisine, potential ignition sources, and other combustible debris will also affect the risk of fire.
2. The mean measurement is calculated by dividing the total of the test results by the number of testing locations.
3. The single point category of any single measurement above 2,000μm is provided to cater for locations in the system which should be cleaned even where the whole system returns a mean result below 200μm (and does not require complete cleaning). Examples where this may occur might be immediately local to a hood or at a fan. The extent of urgent local cleaning required by the presence of grease deposits above 1000μm should be subject to reasonable appreciation of the extent of contamination and the fire risk posed.
4. The single point category of any single measurement ≤ 0.050mm or 50μm is provided to cater for verification following cleaning.
5. The mean surface grease thickness limit of ≤ 0.050mm or 50μm averaged across the system should not be confused with the level set for post-clean verification which is more stringent at ≤ 0.050mm or 50μm at any point in the system.
6. Where remote cleaning methods have been used in areas where measurements would not be possible, then visual assessment should be used, and this can be achieved by remote camera or video support.

4.6 Kitchen exhaust hood

Visual inspection of the exhaust hood should be conducted to determine the presence and working condition of the following equipment where applicable:

- Grease filters and grease removal devices
- Grease collection devices such as drip trays and receptacles
- Obvious signs of grease/water dripping back down onto the cooking surface
- Fixed automatic fire-extinguishing system(s) which, if concerns are identified, a competent person is engaged to review
- Fire-actuated dampers in the exhaust hood, exhaust air duct collar, and supply air duct collar
- Kitchen exhaust effluent treatment equipment
- Kitchen exhaust energy control equipment.

Areas on top of the hood should be visually inspected to check for:

- Leakage of grease onto the top of the hood and accessible space
- Breaches or holes in the top of the exhaust hood or plenum
- Presence of combustible materials near the hood conflicting with the clearance requirements specified by applicable standards.

4.7 Ductwork

Visual inspection of the entire exhaust duct should be conducted to determine the following:

- Duct type and routing
- Presence of enclosures
- Location of access panels
- Location of the kitchen exhaust fan
- Presence of effluent treatment equipment or energy control equipment
- Presence of any combustible materials conflicting with the clearance requirements specified by the applicable standards.

4.8 Exhaust fan

Visual inspection of the exhaust fan(s) should be conducted to determine the following:

- Compliance with access and service requirements of applicable standards
- Condition of the exhaust fan
- Presence and condition of any applied grease collection device(s)
- Maintenance safety control measures are installed i.e., an isolation switch located at the fan or a lockable power isolation mechanism, if located away from the fan.

4.9 Grease detection sensors

Visual inspection of any grease detection sensors present should be conducted to determine the following:

- Grease build-up on the sensors
- Grease build-up on the plate
- Proper alignment of sensor
- Sensors are not physically damaged.

Upon inspection, if the grease deposition monitoring system is not functioning according to manufacturer specifications, then the system should be repaired by a competent person in accordance with the manufacturer's instructions.

4.10 Effluent treatment and energy control equipment

Where applied, visual inspection should include kitchen exhaust effluent treatment equipment such as:

- Electrostatic precipitators and systems
- Ultraviolet lights and light systems
- Multiple-pass filtration systems
- Water-type scrubber or mist systems
- Incinerators and catalytic converters
- Oxidizing and absorption-type media beds
- Disposable panel-type filters
- Spray odour control systems
- Any oil accumulation drainage points caused by these systems should be checked.

Where applied, visual inspection should include kitchen exhaust energy control equipment such as:

- Demand-controlled kitchen ventilation systems
- Energy reclamation systems
- Low-exhaust volume hood(s).

If there are concerns regarding any of the above kitchen exhaust effluent treatment and energy control equipment it is recommended the relevant equipment supplier, representative or agent is contacted.

4.11 Exterior areas of enclosures

Visual inspection of the accessible exterior areas of all enclosures associated with the kitchen exhaust system should be conducted, to determine the following where applicable:

- Factory-built grease duct enclosures – for leakage, damage, or absent covers at access panels
- Field-applied enclosures – for damage to materials applied directly to the exhaust duct
- Continuous enclosures – for damage or breaches.

4.12 Inspection close-out

When inspection procedures are completed:

1. All access panel cover plates, equipment housings, and enclosure doors should be restored to their normal operating condition.

2. All electrical switches and system components affected by the inspection process should be returned to an operable state.

At the end of the inspection a report should be completed, fully documenting the condition of the system and its components, (refer Appendix B).

4.13 Inspection Report

The inspection and results need to be fully documented.

If the exhaust system inspection is completed by an external or third party, the company and the person performing the inspection should provide the owner or owner's representative with a written report that also identifies areas that are not accessible for inspection, (refer Appendix B).

Photographs and relevant diagrams (showing inaccessible areas where applicable) should form part of the report. The report should also stipulate those locations where additional access panels are recommended to render the entire system to be accessible for future inspections and to ensure cleaning of the system can be carried out in its entirety to minimise fire risk and other hazards.

As well as recording all the details of the exhaust system and the inspection observations, the reports should also include:

1. Grease Thickness Test results, by location and average

2. Recommended future cleaning frequency

3. Deficiencies or hazards identified.

Where required, inspection reports should be submitted to the relevant authorities and stakeholders, which could include state regulatory authorities, local council, insurance companies, building owners, facilities managers, and proprietors. This documentation would then form the basis for the ongoing inspection and maintenance program.

5 Cleaning

5.1 Section introduction

This section outlines the cleaning protocols that should be applied to a commercial kitchen exhaust system, in a best practice approach.

Section 13 of AS 1851 sets out the requirements for routine service of fire and smoke control features of mechanical services in buildings covered by AS 1668.1, AS 1668.2, AS 1682.1, AS 1682.2 and AS 2665.

The commercial kitchen exhaust system best practice approach outlined in this guide goes beyond the minimum inspection and routine service requirements of AS 1851 to outline a targeted evidence-based approach, as documented in overseas standards.

This risk-based approach relates the requirement or minimum frequency for inspection/cleaning to the hours and style of cooking and evidence of build-up of grease in the system.

For inspection and cleaning, it is imperative that access to the ductwork system is available in line with requirements outlined in Section 3.

5.2 Initial cleaning frequency guide

In the absence of historic data for grease deposit levels (previous Grease Thickness Test results), such as for newly installed systems, grease production load and system usage-based analysis can be used to estimate the required initial cleaning frequency. Table 5.1 and Table 5.2 provide a matrix relating (predicted) grease production and daily usage rates to minimum cleaning intervals for both non-solid fuel and solid fuel cooking applications.

Table 5.1 – Non-Solid Fuel Cooking Applications

Predicted level of grease production	Typical example	CLEANING INTERVALS (MONTHS) Where daily usage rate is:			
		≤ 6hr	>6 ≤12hr	>12 ≤16hr	> 16hr
Low	No significant production of grease laden aerosols during normal daily food production operations	12	12	6	6
Medium	Moderate production of grease laden aerosols during normal daily food production operations	12	6	4	3
High	Heavy, significant, or continual production of grease laden aerosols during normal daily food production operations	6	3	3	2

Table 5.2 – Solid Fuel Cooking Applications

Predicted level of grease production	Typical example	CLEANING INTERVALS (MONTHS) Where daily usage rate is:			
		≤ 6hr	>6 ≤12hr	>12 ≤16hr	> 16hr
Medium	Moderate production of grease laden aerosols during normal daily food production operations	6	3	3	1
High	Heavy, significant, or continual production of grease laden aerosols during normal daily food production operations	3	2	2	1

Notes to Tables 5.1 and 5.2

1. The hood and extract plenum are areas with a high risk of fire. Consideration should be given to more frequent cleaning of these areas in accordance with insurers' requirements.
2. In addition to the scheduled specialist cleaning, a daily or weekly cleaning regime should be implemented on hoods, separators and associated drains and traps in accordance with manufacturers' recommendations. Typically, these are carried out by the kitchen operator, to comply with insurers' requirements.
3. Owing to wide variations in usage, the frequency of cleaning is often best monitored by the kitchen operator.
4. The results of inspection and cleaning of the system may lead to changes to cleaning frequencies (see section 4).

5.3 Pre-cleaning requirements

5.3.1 General requirements

A competent person should perform the pre-cleaning requirements.

Prior to cleaning, the person should determine if a certificate, label, or tag has previously been posted on the exhaust hood and, if yes, then all relevant information should be recorded. If no certificate, label, or tag is posted, this should be noted in the post clean inspection report.

5.3.2 Personal Protective Equipment (PPE)

PPE must always be used during inspection, cleaning, and post-cleaning processes, in accordance with regulations. Proper inspection of all PPE must be performed prior to commencing work.

PPE required for the kitchen exhaust cleaning and inspection includes (but not be limited to) the following:

- Approved eye protection.
- Respiratory protection to prevent inhalation of harmful particulate and gases.
- Hand protection (gloves) to prevent injury from sharp objects and exposure to chemicals.
- Foot protection to prevent 'slip and fall' accidents and foot injuries.
- Lock out/tag out and ground fault interruption devices.
- Fall arresting harnesses and lanyards.
- Head protection to include bump caps and/or hard hats.

5.3.3 Ladders

Where ladders are necessary to gain access to facility rooftops or interior portions of the kitchen exhaust system, the ladder, surface, and safety requirements must comply with relevant standards and regulations and allow adequate space for safe working.

5.3.4 Chemical Handling and Use

All chemicals used in the cleaning process should be used, handled, and disposed of in accordance with manufacturer's instructions and applicable standards and the WHS regulations for chemical handling and hazard communication.

5.4 Pre-cleaning inspections

5.4.1 Basic operation test

Before cleaning it should be verified that the system is mechanically operable. If the system is powered off, system start-up should be initiated where possible, including all exhaust fans and any make-up air fans. Exhaust air flow should be verified, and the quantity should be assessed.

The owner(s) or operator(s) of the system should be interviewed, if applicable, to determine if the facility has experienced any problems with the system performance.

If system deficiencies are identified during the pre-cleaning inspection and testing operations notification should be provided as soon as practical to the owner/ operator of the system.

5.4.2 Grease removal devices

Hood grease filters or other listed grease removal devices used in exhaust hoods should be inspected to determine their condition.

5.4.3 Fan visual inspection

Where possible, the visible portion of the exhaust fan should be inspected to ensure that it is operating. Notification of recorded deficiencies should be provided as soon as practical to the owner/operator of the system.

Inspection of Belts and Drives

The fan must be locked out and tagged out and all fan motion confirmed to have ceased prior to inspection of the belts and drives of the fan. The motor compartment of the exhaust fan should be opened, and a visual inspection should be performed of the belts and drives. Deficiencies such as cracked or loose belts should be notified as soon as practical to the owner/operator of the system.

5.4.4 Effluent treatment equipment

Effluent treatment equipment and systems should be maintained in accordance with the manufacturer's instructions by persons who have received specific training to service the equipment. Where grease or oil accumulates due to these systems, this should be identified and drained or cleaned as required. Any hazards to maintenance personnel (e.g., from UV or ozone) must be identified and mitigated.

5.4.5 Other equipment and systems

Other equipment and systems should be maintained and inspected prior to cleaning by a competent person in accordance with the manufacturer's instructions. Where oil accumulates due to these systems this should be identified and drained or cleaned as required.

5.4.6 Water wash hoods

The cleaning person should surcharge the hood drain in a water wash hood system prior to the start of work to ensure that it is free-flowing and record any noted deficiencies. Specialised blowers should be maintained according to the manufacturer's instructions.

5.5 Protective covering

5.5.1 Protection of workspace areas

To avoid the possibility of contamination, all food products should be removed from the workspace area and stored in a proper place prior to the start of the cleaning process.

Where possible, all food preparation cookware and equipment should also be removed from the workspace area and stored in a proper place prior to the start of the cleaning process to avoid any possibility of contamination.

Where that is not possible, all items that remain in the workspace area should be completely covered with protective sheets, prior to the start of the cleaning process.

When all cleaning procedures have been completed, all protective sheets should be removed from food preparation equipment.

5.5.2 Wet-washing process preparation

When wet-washing kitchen exhaust systems, all equipment that may be exposed to wash water and cleaning agents should be covered with protective sheeting. Protective covering used for hood wrapping and equipment protection should be of a thickness sufficient to withstand the cleaning process. Wash water should be contained for proper disposal.

No process wastewater should be disposed through a storm-water collection system. Waste solids should be collected and disposed of in an environmentally safe and approved solid waste disposal device acceptable to the relevant authority.

5.6 Energy source protection

5.6.1 Pre-Cleaning

Prior to the start of the cleaning process, all electrical switches, open flame gas burners, and utility distribution systems serving the cooking appliances and the exhaust fans, that could be activated accidentally, must be locked out and tagged out.

Where solid fuel is present, all solid fuel must be extinguished and properly removed and disposed of, prior to the start of the cleaning process.

5.6.2 Post-Cleaning

When all cleaning procedures have been completed, all components of the system should be returned to an operable state.

5.7 Cleaning methods

This section provides specific advice on how to clean and maintain kitchen exhaust systems.

All cleaning processes must result in the removal of cooking by-product deposits, grease, and fuel from the interior surfaces of kitchen exhaust systems. The cleaning methods implemented must be capable of achieving the required standard for post-clean verification, as set out in this guide, on both the internal surfaces of the exhaust ductwork and the system components.

The guidance provided on cleaning methods is not intended to be definitive as there are many methods, both traditional and new technologies, which can be applied in tandem on a kitchen exhaust system. Table 5.3 provides examples of some typical cleaning methods.

When choosing the cleaning method, consideration should be given to operator safety. There should also be particular focus on the surrounding environment when using wet cleaning methods because grease and moisture can leak from the ductwork and components causing exterior damage.

Table 5.3 – Examples of cleaning methodology

METHOD	REMOVAL METHOD
Manual	Hand scraping and removal of deposits and/or wiping the surface of the ductwork with a cloth. Chemicals can be used to soften or dissolve heavy deposits making them easier to remove. Flammable solvents or other flammable cleaning aids must not be used.
Steam cleaning	The use of hot water vapour expelled at high pressure from a lance to dislodge/ dissolve deposits to clean the surfaces.
Rotary/ Mechanised brushing systems	Scarifying of the surfaces of the ductwork with rotating brush heads to clean the surfaces driven by a shaft.
Hot chemical foam application	Application of degreasing solution by pressurized vessels to deliver chemical laden foam to clean the surfaces.
High pressure water washing	The use of pressurised water discharged at ambient or high temperature from a lance or nozzle to dislodge deposits and clean the surfaces.

All interior surfaces of a commercial kitchen exhaust system should be accessible for inspection and cleaning purposes. Where applicable, all exhaust ducts must be provided with access openings for inspection and cleaning in accordance with AS 1668.1.

For any specialised effluent treatment equipment or energy control equipment, the relevant equipment supplier, representative or agent should provide guidance on cleaning methods and frequencies. If any cleaning process or chemical has the potential to cause disturbance to any fire safety equipment, it is recommended that a person competent in that equipment is engaged.

Wet cleaning methods using chemical foam, steam cleaning and high-pressure water washing should be carefully assessed for use in ductwork that is situated above false ceilings or in vulnerable areas. Unless the exhaust system is specifically designed and sealed for wet cleaning, these methods should be avoided, due to the risk of possible leakage of contaminants from the duct to the surrounding area and services.

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

The use of chemical cleaning agents should only be considered where a risk assessment has been carried out to assess the effects of the applied chemicals on the materials of construction, environment, and cleaning personnel.

Vertical exhaust ducts should be cleaned from top to bottom either by direct personnel entry using manual processes or remotely using any of the described cleaning processes. The exhaust fan should be positioned to allow access to the vertical duct or access should be provided to the intake side of the fan.

Horizontal exhaust ducts should be cleaned from one end of the duct to its other end either by direct personnel entry using manual processes or remotely using any of the described cleaning processes. These processes can be applied from outside or inside the exhaust ductwork.

It is not normally necessary or economically practicable to clean kitchen exhaust systems and fans to a "like new" bright metal condition. This may be impossible due to substrate staining. Refer to Table 4.2 on Grease Thickness Readings.

Excessive abrasion should be avoided, and care should be taken when cleaning to avoid damage or removal of protective coatings on fan casings, impellers, and motor housings.

5.8 Cleaning frequency

5.8.1 Minimum standard approach

AS 1851 provides guidance on minimum inspection and cleaning requirements. Specific cleaning intervals stated by property owners, facility managers, proprietors, system designers or insurers should be identified by the owner/ operator and notified to the cleaning and maintenance contractor.

5.8.2 Best practice approach

The best-practice approach is to determine cleaning frequency based on the recommended system inspection frequencies in Table 4.1 supported by Grease Thickness Test measurements (see Appendix A for measurement options) taken at representative locations (see 4.5). Following each inspection and/or clean, a decision on the frequency for future cleaning should be made so that grease levels are maintained below 0.2mm or 200µm, as a mean across the system.

Conditions and warranties within insurance policies, should stipulate minimum cleaning frequencies for kitchen exhaust systems. It should be noted that some insurance contracts may require a higher frequency of cleaning than recommended in this guide and failure to comply with such requirements may invalidate the property insurance policy.

5.9 Post-cleaning requirements

When all cleaning procedures have been completed all protective sheets should be removed and all components of the system should be returned to an operable state.

5.10 Post-cleaning verification

Pre-clean and post-clean grease measurements (Grease Thickness Test) should be taken where practicable, and these should be clearly detailed in the post clean report (see Appendix B).

For cleaned system verification, the surface should be visibly clean and capable of meeting the specified level of cleanliness.

For verification following cleaning, individual post clean grease thickness tests must not exceed 50µm.

5.11 Post clean report

A Post Clean Report, refer to Appendix B for a suggested template, should include the following:

An executive summary page that highlights the following key risks:

1. A clear statement indicating whether the system was cleaned in its entirety.
2. If the entire system was not cleaned, state precisely what element(s) was not cleaned and why it was not cleaned, together with suggested solutions and recommendations.
3. Grease Thickness Test measurements for the stipulated test locations. The mean (average) micron reading across all Grease Thickness Test measurements taken.
4. A recommendation of a new cleaning frequency based on the pre-clean Grease Thickness Test readings.

   Note: To calculate a frequency based on keeping grease levels below 200 microns as a mean across the system, the rate of build-up of grease needs to be assumed to be linear over time. This assumption can be validated by future inspections over time.
5. Any deficiencies or other hazards that have been identified.

Post clean reports should contain a description of the actual work performed, identification of systems that are cleaned, and the specific customer information, in addition to the following:

- Type of fan(s)
- Number of fan(s)
- Location of fan(s)
- Location of duct and access panels (accessible and non-accessible)
- Location and type of kitchen exhaust effluent and energy control equipment
- List of known leakage locations
- Fan switch location
- Enough photographs of the system taken before and after cleaning that are representative of the system condition
- A schematic diagram or as-installed drawing of the system layout, showing the system in its entirety including known components, changes of direction, access panels, areas that have been cleaned and any areas that could not be cleaned.

Note: If other factors are known to influence the speed of grease accumulation, such as peak periods of trade or where historical data infers, then interim inspections should be implemented/recommended to check grease thickness, and further frequency adjustments made as appropriate.

5.12 Verification Certificate

When a commercial kitchen exhaust system is inspected or cleaned, the person performing the inspection or cleaning should attach a pre-printed label or tag containing the service provider name, telephone number, and date of inspection or cleaning.

Old certificates, labels, or tags should be removed when affixing new labels, or tags.

A service verification certificate should also be provided to the client, refer to Appendix C for a suggested template.

6 Training

6.1 Section introduction

Personnel involved in the inspection and cleaning of commercial kitchen exhaust systems should be trained and competent in the operation and maintenance of all components making up the system. They should be able to identify risks and have appropriate certification to undertake maintenance of equipment. This section lists the core training and knowledge required.

6.2 Core training in risk management

All maintenance activity should be the subject of a safety risk assessment and safe work method statements.

Personnel should be trained in the appropriate risk mitigation strategies for at least the following workplace situations:

1. Safe working in a confined space in ducts and voids - AS 2865
2. Lock out and tag out procedures for electrical equipment
3. Working at heights
4. Manual handling.

All personnel should be trained in the use of any required PPE prior to use.

6.3 Core training in inspection

Personnel should be trained in the required inspection techniques including the appropriate application of the inspection procedures (refer Section 4) and the Grease Thickness Test measurement methods (refer Appendix A).

6.4 Components of kitchen exhaust systems

Personnel should be trained in the protocols relevant to the components of the kitchen exhaust system.

6.4.1 Kitchen exhaust hood

1. Hood grease filters – inspection, cleaning, and maintenance
2. Cleaning processes
3. UV lock out and tag out procedures
4. Wet scrubbers (where applicable) including isolation of plumbing systems and solenoid lock out and tag out.

6.4.2 Kitchen exhaust duct

1. Identification of access panels and locations.
2. Training on the entry into ducts and confined space training, refer section 5 cleaning.
3. Identification of fire suppression systems their condition and isolation
4. Duct cleaning methods and processes, refer section 5.

6.4.3 Kitchen exhaust effluent treatment equipment

1. Multi-staged mechanical filtration units
   A. Identification of dirty filter pressure drop for replacement or cleaning.
2. Electrostatic Precipitators – manual clean and auto wash
   A. Lock out tag out of electrical equipment and grounding of cells residual charge prior to handling
   B. Identification of dirty grease loaded cells
   C. Identification of grease or oil accumulation in sumps and drains
   D. Manual handling training
   E. Environmental management plan for cleaning of the cells.
   F. Isolation of plumbing equipment on Auto wash systems
   G. Replacement of detergent on Auto wash systems.
3. UV – lock out tag out, grease accumulation and degradation of globes and globe replacement.
4. Ozone – lock out tag out
5. Activated carbon/gas phase media
   A. PPE for handing spent media including gloves and face masks.
   B. Identification of spent media
      i. Butane activity (ASTM D5742)
      ii. Odour olfactometry.

6.4.4 Kitchen exhaust fan(s)

1. Inline fans – service and cleaning protocols
2. Plug fans – service and cleaning protocols
3. Centrifugal fans – service and cleaning protocols
4. Belts
5. Variable Speed Drives (VSD) – knowledge of isolation and handing for manual operation.
6. Flexible connections – identify worn connections and effect their replacement.
7. Nozzles
8. Grease trays.

10 Appendices

Appendix A **Grease Thickness Test measurements**

Appendix B **Post Cleaning/Inspection Report**

Appendix C **Verification Certificate**

Appendix D **Glossary**

Appendix E **References and resources**

Appendix A

Grease Thickness Test measurements

A.1 Introduction

This Appendix outlines the measurement methodologies that are applicable to the Grease Thickness Test (GTT). The GTT methodology provides an objective, repeatable and verifiable measurement of grease deposits and overcomes the subjectivity of a visual inspection alone.

The Grease Thickness Test (GTT) measurement is used to measure grease deposits on the internal surfaces of a kitchen exhaust system. These measurements are used to inform maintenance inspection and cleaning frequencies and verify post clean standards.

There are four measurement methodologies outlined, depending on the grease contamination situation.

A.2 Measurement locations

Measurements for the Grease Thickness Test should be taken at the following sites (where attainable) for each system:

- Hood(s) extract plenum(s) behind grease filters/separators
- Duct 1m and 3m from each hood
- Duct midway between hood(s) and fan
- Duct upstream of fan and the fan itself
- Discharge duct downstream of fan
- Other location(s) noted with significant grease accumulations.

A.3 Measurement methods

There are four measure methods that can be used for the Grease Thickness Test, depending on the situation. These are:

1. Visual assessment
2. Wet Film Thickness test
3. Depth probe test
4. Electro-magnetic induction gauge.

METHOD 1 - Visual assessment

The **Visual assessment** method can only be used as an assessment method where gross fouling is present with deposits more than 3,000µm (3mm) on the duct surface. These will be easily recognised as more than 15 times over the required level of 200µm (0.2mm), or where the duct is clearly free from all internal grease deposits.

A visual inspection of kitchen exhaust system components must be used to assess that the system is visibly clean or dirty. An interior surface is considered visibly clean when it is free from substances and grease and hence the base surface is clearly visible.

If a component is visibly clean, then no further GTT measurement methods are required.

METHOD 2 – Wet Film Thickness test

The **Wet Film Thickness test** method is useful on liquid or softened grease deposits. It may not achieve the required results on dried or hardened/carbonised grease deposits. Accumulated grease can be either liquid/viscous fluids or dry/hardened deposits.

A precision depth gauge comb can measure wet film thickness from 50µm to 3,000µm at suitable increments (including 50, 200 and 500µm). Toothed combs typically used to measure wet paint film thickness are suitable for this task (see Figure A1).

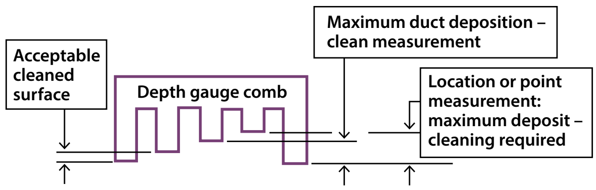

Figure A1 Depth Gauge Comb - Wet Film Thickness
(Source: ANSI/IKECA I10-2020)

The accuracy of the Wet Film Thickness depth gauge comb will be defined by a reputable manufacturer and will typically be better than ± 5µm.

It is important to ensure that the depth gauge comb is held perpendicular to the substrate, as holding the gauge at an angle greater than 90° will exaggerate the measured result.

Gauges subject to regular or hard use should be of sufficient durability to withstand wear and be regularly replaced.

Using the outer side or tooth of the comb, slide it along the surface to reveal a clean start point of clean duct.

Starting with the comb side with the highest tooth measurement (3000µm) held upright and the outer posts in contact with the revealed clean duct surface, slide it through the deposit for 100mm. For circular ductwork, similarly, slide around the circumference of the duct for 100mm.

Initially examine the grease deposits for any tracks left by the teeth that are slightly graduated in height to the outer posts. If tracks or collected grease on the comb teeth are not present, continue the process until a result is found. To verify the actual measurement, note the highest "dirty" tooth on the comb, this indicates the maximum deposit thickness of grease. The result should be given as "more than" the highest tooth measurement. The measurement should be uniform along the length of the 100mm long test area. If it is not, re-measure to establish a reliable representative result.

For very viscose grease/oil deposits, where it is not possible to clear away deposits to expose the duct surface, then the comb should be dipped into the viscose deposits, noting soiling on the highest reading tooth.

It is important to clean the depth gauge comb before carrying out any additional measurements.

METHOD 3 – Depth probe test

Before each test, the **depth probe** should be calibrated and zeroed on the supplied test surface. An area approximately 10mm wide (about the width of a slotted screwdriver blade) is cleaned for approximately 100mm. Scrape a cleaning implement through the deposited grease to expose a clean bare metal slot for a length of approximately 100mm.

Take 4 or 5 tests with the depth gauge along the length of the cleaned strip – by adding the combined depth readings and then dividing by the number of readings taken you can calculate an average reading for this test point. This reading only applies to this test point.

When taking measurements on spiral or circular ductwork, grease thickness results can be taken by holding the probe perpendicular to the curved surface that has had the cleaned 100mm slot applied to it.

METHOD 4 - Electro-magnetic induction gauge

The **electro-magnetic induction gauge** method may be used on hardened grease deposits only.

The instrument to be used is an electromagnetic induction type thickness gauge with statistics and a non-contact measuring tip. Before use, correct calibration must be undertaken as per the manufacturer's guidance using calibration foils of thicknesses 250µm, 75µm and 50µm. The accuracy of the instrument should be at least to within +/-5µm.

Place a measuring template (250 x 160mm or equivalent surface area) over the surface to be tested, marking the four corners with a marker pen. Take a minimum of 20 readings across the supplied test template within the test area, recording the highest, lowest, and mean values obtained.

Thoroughly remove the grease deposits, replace the grid into the same position as previously, lining up the pre-marked corners. Take a minimum of 20 readings across the supplied test template within the test area, recording the highest, lowest, and mean values obtained.

Calculate the measured hardened grease deposits thickness.

A.4 Results of the Grease Thickness Test

The Grease Thickness Test measurement results should be compared against the recommended levels of Table 4.1 and follow up action taken, as outlined there.

Appendix B

Post Cleaning/ Inspection Report

This Appendix outlines a basic example of a typical Post Cleaning/Inspection Report.

Post Cleaning/Inspection Report – Executive Summary
Date of report
Client name
Site name
Date of inspection/clean
Scope of work
Work conducted
Areas not able to be inspected/cleaned
Grease Thickness Test results by location and average
Recommended future cleaning frequency
Deficiencies or hazards identified
Next clean/inspection due date
Signed by

Post Cleaning/Inspection Report

Fan/s	
Location of fan/s	
Isolation switch location	
Ductwork	
Access Panels #ID number, location, and size	
Effluent Treatment Equipment Installed	
Energy Control Equipment Installed	
Leakage	
Grease Thickness Test results	
Location	
Before	After
Location	
Before	After
Location	
Before	After
Location	
Before	After
Location	
Before	After
Location	
Before	After
System diagram – noting any area not accessible or cleaned	

Appendix C Verification Certificate

This Appendix outlines a basic example of a typical service Verification Certificate.

Inspection/Clean Verification Certificate	
Service provider	
Date of certificate	
Client name	
Site name	
Date of Inspection/clean	
Work conducted	
Certificate valid until **Next inspection due date**	
Signed by	

Appendix D Glossary

D.1 Terms

Access panel. A closure device or removable cover used to cover an opening into a duct, an enclosure, equipment, or an appurtenance.

Ceiling panel. Fixed or removable elements of a ceiling installed horizontally, vertically or at any angle on a sub construction.

Competent person. A person who has acquired through training, qualification, experience, or a combination of these, that knowledge and skill enabling them to correctly perform the required task.

Damper. A device for controlling draft or flow of gases, including air.

Discharge. The final portion of a duct or pipe where the product being conveyed is emptied or released from confinement, the termination points of the pipe or duct.

Ductwork (or duct system). A continuous passageway for the transmission of air and kitchen effluent that, in addition to the containment components themselves, might include duct fittings, dampers, plenums, and/or other items or air-handling equipment.

Duct. Pipe or closed conduit (which may be round, oval, square or rectangular) and is constructed from sheet metal or other suitable material used for conveying air.

Exhaust air. Air removed from the kitchen by mechanical means and discharged to atmosphere.

Effluent treatment equipment. Any form of treatment of the Kitchen exhaust airstream that is additional to the mandatory kitchen hood grease filters.

Filter.

> **Grease filter.** A removable component of the grease removal system designed to capture grease and direct it to a safe collection point.
>
> **Mesh filter.** A grease filter construction consisting of a net made from intersecting strands with a space between each strand.
>
> **Baffle filter.** A filter that forces grease-laden air to change direction quickly and condense to the metal blades to subsequently drain away.
>
> **Cyclonic filter.** A filter with multiple cyclone chambers that centrifuge the particles from the airflow to subsequently drain away.

Grease. Rendered animal fat, vegetable shortening, and other oily matter used for the purposes of and resulting from cooking and/or preparing foods.

Grease deposition monitoring system. A system designed to electronically measure grease depositions within a commercial kitchen exhaust and provide management with potential alerts and/or notifications relating to the need to inspect or clean the exhaust.

Kitchen exhaust system. A system that is designed to collect smoke, steam, grease, cooking odours and fumes from cooking appliances into a hood, through filters, ductwork, and then discharged to atmosphere.

Grease removal devices. A system of components designed and intended to process vapours, gases, and/or air as it is drawn through such devices by collecting the airborne grease particles and concentrating them for further action at some future time, leaving the exiting air with a lower amount of combustible matter.

Hood. A capture or receiving hood canopy, three or four sided, that receives contaminated air from a process. They are located above a process and designed to provide a suitable capture velocity to ensure the safe removal of the contaminant.

Hood extract plenum. The space in the hood behind the grease filters and before entry into the ductwork system.

Make-up air. Air introduced into a space to replace air that is being extracted. Replacement of air lost due to exhaust air requirements.

Supply air. Air deliberately brought into the structure, then specifically to the vicinity of either a combustion process or a mechanically or thermally forced exhausting device, to compensate for the vapour and/or gases being consumed or expelled.

Separator. Device for the efficient separation of airborne solid or liquid particles, based on the effect of mechanical forces that deflect the particles out of the airflow.

Solid fuel. Any solid, organic, consumable fuel such as briquettes, mesquite, wood/wood chips, or charcoal or any other product that releases energy when ignited; and diminishes in mass by the process of incineration

Spark arrester. A device or method that minimises the passage of airborne sparks and embers into a plenum, duct, and flue.

Water-wash system. A system that employs a water spray to clean grease from the plenum of an exhaust hood and portions of the ductwork on an intermittent or continuous basis.

D.2 Acronyms and initialisms

The acronyms used in this application manual have the following meaning:

AHU Air handling unit

AIRAH Australian Institute of Refrigeration Air conditioning and Heating

BESA Building Engineering Services Association

FDCIE Fire Detection Control and Indicating Equipment

FER Fire Engineering Report

FRL Fire Resistance Level

FFCP Fire Fan Control Panel

GTT Grease Thickness Test

MSSB Mechanical Services Switchboard

NCC National Construction Code

IKECA International Kitchen Exhaust Cleaning Association

Appendix E References and resources

E.1 Referenced documents

Australian and international standards and codes

The following **Standards and codes** are referred to in this Application Manual:

AS 1657 Fixed platforms, walkways, stairways and ladders – Design, construction and installation

AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings – Part 1: Fire and Smoke Control in Buildings

AS 1668.2 The Use of Ventilation and Air Conditioning in Buildings – Part 2: Mechanical Ventilation in Buildings

AS 1670.1 Fire detection, warning, control and intercom systems – System design, installation and commissioning

AS 1682.1 Fire, smoke and air dampers – Part 1: Specification

AS 1682.2 Fire, smoke and air dampers – Part 2: Installation

AS 1851 Routine Service of Fire Protection Systems and Equipment

AS/NZS 1891.1 Personal equipment for work at height – Part 1: Manufacturing requirements for full body combination and lower body harnesses

AS/NZS 1891.2 Industrial fall-arrest systems and devices – Part 2: Horizontal lifeline and rail systems

AS/NZS 1891.3 Personal equipment for work at height – Part 3: Manufacturing requirements for fall arrest devices

AS/NZS 1891.4 Industrial fall-arrest systems and devices – Part 4: Selection, use and maintenance

AS 2118.1 Automatic fire sprinkler systems – Part 1: General systems

AS 2118.4 Automatic fire sprinkler systems – Part 4: Sprinkler protection for accommodation buildings not exceeding four storeys in height

AS 3772 Pre-engineered fire protection systems for cooking equipment

AS 4254.2 Ductwork for air-handling systems in buildings – Part 2: Rigid duct

AS/NZS 5601.1 Gas Installations – Part 1: General installations

ASTM D5742 Standard Test Method for Determination of Butane Activity of Activated Carbon

ANSI/UL 1046 Standard for Grease Filters for Exhaust Ducts

BECA TR19 Grease: Specification for fire risk management of grease accumulation within kitchen extraction systems

IKECA C10: Standard for the Methodology for Cleaning of Commercial Kitchen Exhaust Systems

IKECA I10: Standard for the Methodology for Inspection of Commercial Kitchen Exhaust Systems

IKECA M10: Standard for the Methodology for Maintenance of Commercial Kitchen Exhaust Systems

Loss Prevention Standard LPS 1263: Issue 1.4 Requirements for the LPCB approval and listing of the fire performance of grease filters used in commercial kitchen extract systems

NCC 2022 National Construction Code Volume One – Building Code of Australia Class 2 to 9 Buildings (NCC)

NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

VDI 2052 Air-conditioning – Kitchens – Cleaning of extract-air systems (VDI Ventilation Code of Practice)

VDI 3676 Waste gas cleaning – Inertial separators

E.2 Additional resources

The following **documents** provide additional information:

AIRAH Technical Bulletin, Fire Safety – Kitchen Hood Exhaust Systems

AIRAH DA05 Guide to fire and smoke control in buildings using AS 1668 Part 1

AIRAH DA06 Guide to fire, smoke and air dampers using AS 1682 Parts 1 and 2

AIRAH DA15 Air filters and cleaning devices

AIRAH DA19 HVAC&R Maintenance

AIRAH HVAC Hygiene Best Practice Guide

FPAA Good Practice Guide GPG03 - Adoption and Use of AS 1851-2012

AS 1841.1 Portable Fire Extinguishers – Part 1: General Requirements

AS 2444 Portable Fire Extinguishers and Fire Blankets – Selection and Location

Food Standards Australia and New Zealand – Australia New Zealand Food Standards Code

Notes:

AIRAH – National Office
JAMES HARRISON CENTRE
3/1 Elizabeth Street, Melbourne Vic 3000, Australia
Tel: +61 3 8623 3000 Fax: +61 3 9614 8249
www.airah.org.au