

11.6 APPENDIX

Kitchen Ventilation Specification



Specification for Kitchen Ventilation Systems

1.0 Objective of this document

Catering installations are required in the majority of Land Securities buildings, for use by both Landlord and Tenants. Safe and effective design of the kitchen ventilation systems serving these installations is crucial to the success of each building. The purpose of this document is to specify a kitchen ventilation system for Land Securities developments, so the Landlord and the Tenants are provided with best practice standards for the kitchen ventilation system design.

All kitchen ventilation systems in Land Securities buildings must be designed to meet the performance criteria set out in this document, to ensure Land Securities' development and insurance obligations are met.

1.1 Landlord approval

In order to ensure Land Securities obligations are met and to minimise the risk of kitchen-related fires and to comply with the requirements of Land Securities insurers, the Landlord will employ a technical team to review the Tenant's kitchen extract system proposals at three key gateways: concept design, detailed design and installation. The process for these approval stages are shown in the flow diagram below.

At concept stage, the Tenant has the opportunity to select one of two options to allow them to select appropriate 'Active Design' equipment (described later in this document), to comply with the performance criteria set out in this document and achieve concept design approval from the Landlord:

Option A - The first option is for the Tenant to undertake an odour risk assessment as the basis of their concept design, for Landlord approval. The assessment must follow the methodology set out in Annex C of the Defra document 'Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems'. Under this option, the Landlord will appoint a specialist team to review the Tenant's proposals. There is a fee associated with this work, chargeable to the Tenant, currently set at £1000.00 + VAT. See section 4.2.1 of this specification for further details.

Option B - The second option is for the Tenant to design their system in accordance with the Land Securities approved design principles, as set out in section 4.2.2 of this document.

Note that the comments provided by the Landlord at each key gateway must be addressed by the Tenant and the Tenant's design documentation resubmitted to the Landlord, until approval is achieved at each gateway.

Upon completion of the kitchen extract system installation and prior to the facility opening (regardless of whether option A or B has been followed), the Tenant will provide a certificate of conformity, as detailed below.

The certificate must include a statement from the installing contractor; that the systems have been installed in accordance with the approved design submission; that all relevant design, installation and safety standards have been adhered to; and documentation from the Tenant, to prove that the necessary ongoing maintenance procedures are in place. A set of as-installed operation and maintenance documents must accompany the certificate, clearly

identifying cleaning and maintenance requirements, including clear locations of access hatches for cleaning within the ductwork.

Upon receipt of the certificate of conformity, the Landlord will inspect the Tenants kitchen extract system. Upon successful approval by the Landlord of the installed system and the accompanying documentation, the Tenant will be allowed to put the system into use.

1.1.2 Landlord approvals – Process diagram

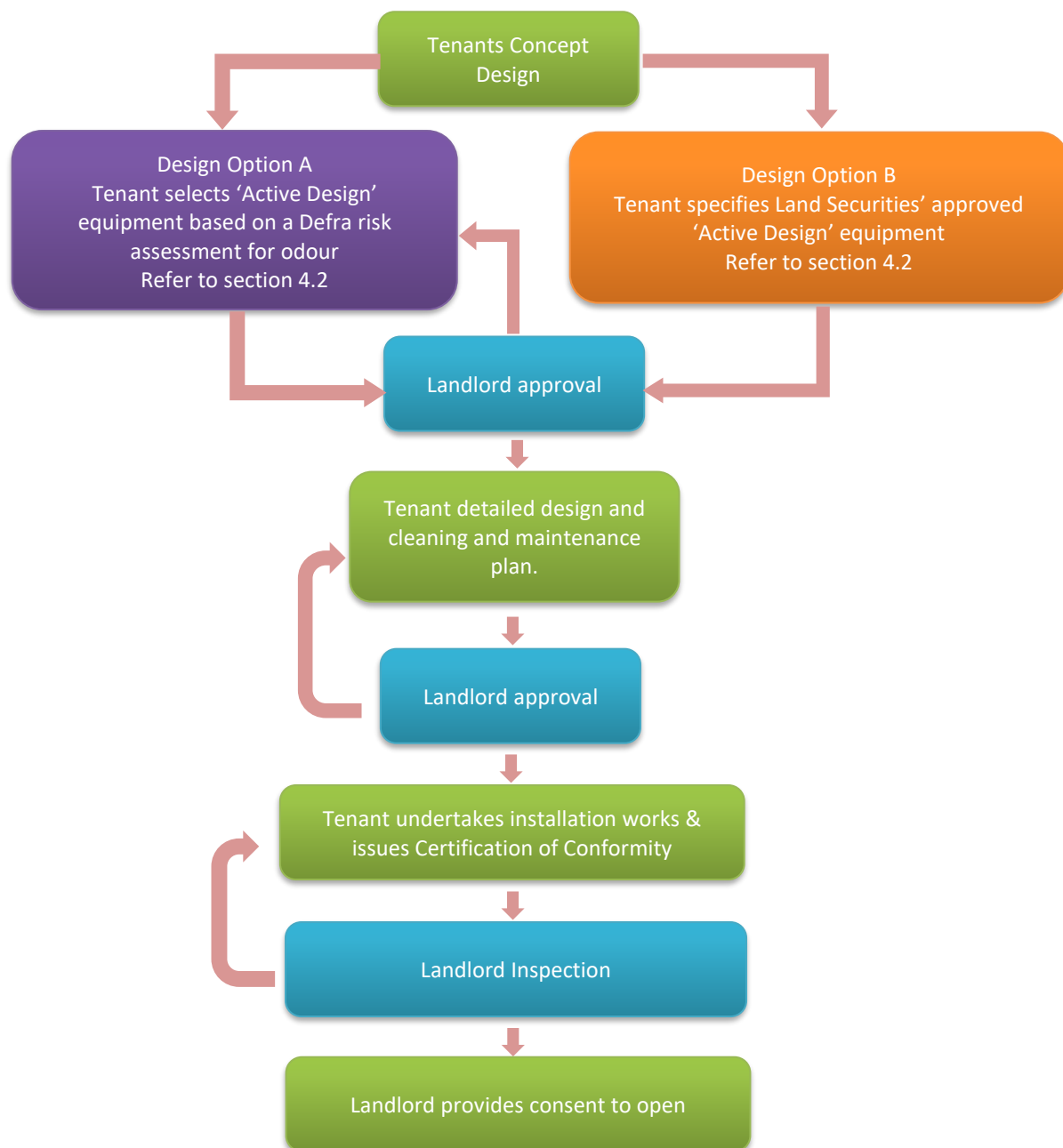


Fig 1 – Landlord approval process diagram

2.0 Performance criteria

All kitchen ventilation systems must comply with the following performance criteria:

Criteria	Performance	Performance test method
Fire	System must meet the fire safety requirements of the development Fire Strategy	Land Securities approval of design and inspection
Odour	No objectionable or offensive odours will be perceived by neighbouring receptors	Land Securities approval of design and inspection at neighbouring receptor location
Grease	Surface grease deposit limits to be in line with BESA TR/19. Maximum deposit not to exceed 200microns inside the kitchen ventilation system. No grease emission from the kitchen ventilation system.	Land Securities approval of design and inspection of internal and external system using micron measurement instrument
Smoke and particulate matter	World Health Organisation for maximum levels: PM _{2.5} - 10µg/m ³ annual mean, 25µg/m ³ 24-hour mean PM ₁₀ - 20µg/m ³ annual mean, 50µg/m ³ 24-hour mean	Land Securities approval of design and air quality inspection
Ozone	World Health Organisation for maximum levels: 100 µg/m ³ 8-hour mean	Land Securities approval of design and air quality inspection
Noise	Noise emissions limited to comply with the developments noise criteria	Land Securities approval of design and acoustic inspection

2.1 Design hierarchy

The design of the building and kitchen ventilation system will use the following design hierarchy to ensure the installations are designed to meet the performance criteria:

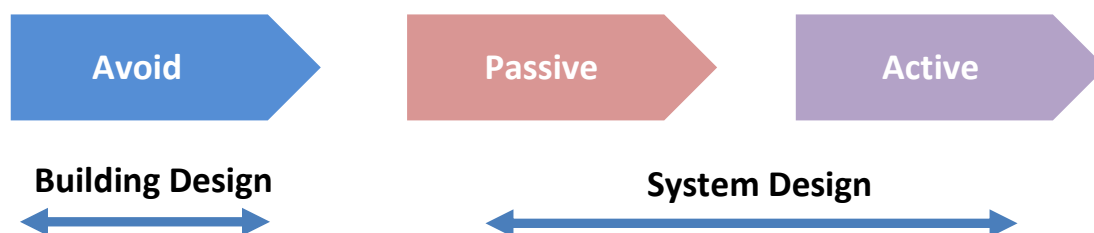


Fig 2 – Design hierarchy

3.0 Development of the building design

In most buildings, the performance criteria for the kitchen ventilation system will only be achieved when both the building and the kitchen ventilation system are designed to achieve the performance criteria. Land Securities will ensure the building is designed to accommodate kitchen ventilation systems, taking into consideration the location and configuration of systems which may be installed by the Landlord or a Tenant. Likewise, the kitchen ventilation system must be designed for the specific catering requirements and building arrangement.

3.1 Avoid

Avoid the risk of nuisance grease, smoke and odour

The location of kitchen extract discharges is an important consideration for both Landlord and Tenant, whether for new build or refurbishment. The location of the kitchen extract discharge has the greatest influence on the magnitude of nuisance grease, smoke and odour risk.

Sensitive neighbouring receptors must be identified by the designer at an early stage of the design and kitchen extract discharges must be positioned as far away from these receptors as practically possible. Common sensitive receptors include:

- Air handling units
- Windows
- Air intake vents
- Areas accessible to the public

Localised air movement, caused by wind and stack effects, will be considered, so that kitchen extract discharges are not positioned upstream of sensitive receptors. Where the form of the building is complex, and could influence the direction of air movement around the kitchen extract discharges, a specialist Computational Fluid Dynamics (CFD) dispersion model will be commissioned, to determine the likely air-flow paths from the kitchen exhausts.

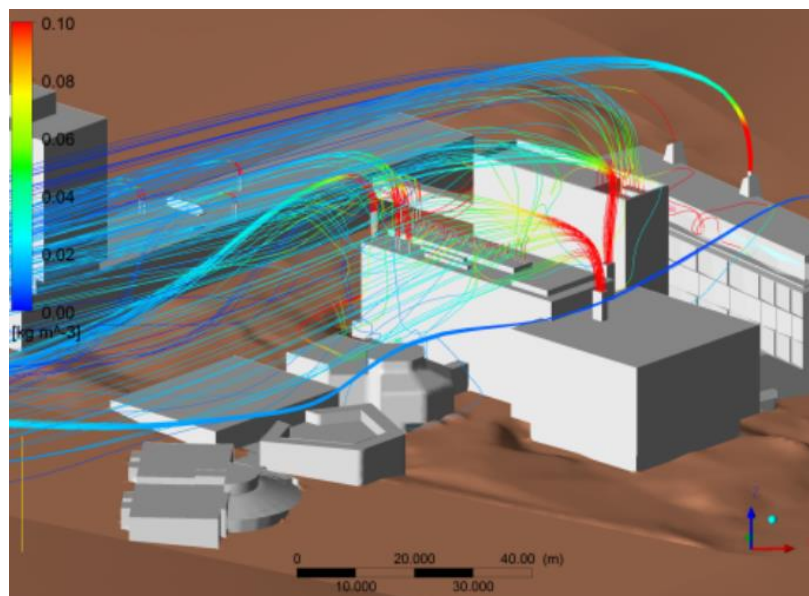


Fig 3 – Typical air movement output from a CFD dispersion model, indicating the concentration of simulated pollutants



Kitchen exhausts will be positioned to discharge at the top of the building, as high as the planning conditions allow, to ensure the best opportunity for dispersion.

Ductwork will be routed through the building, in fully accessible areas, ensuring there are no obstructions to access panels.

4.0 Tenant installation requirements

The Tenant's kitchen ventilation system will be designed to further mitigate the risk of nuisance grease, smoke and odour, by employing passive and active design measures.

4.1 Passive design

Minimise the risk of nuisance grease, smoke and odour

Before considering filtration measures, there are a number of 'best practice' design measures which must be incorporated into the kitchen extract design, to aid dispersion.

- Stack dispersion – ensure discharges are positioned vertically, as high as possible above the building
- Discharge velocity – an exit velocity of between 12 and 15m/s must be used to ensure air is dispersed effectively
- In relation to receptors and the prevailing wind direction, position discharges so receptors are not downstream of them
- Position of extract fan – the fan will be positioned at the end of the catering extract system, to ensure the internal ductwork is kept under negative pressure, to minimise leakage into the space
- Position of filtration – Filters will be installed local to the kitchen, to ensure the extract air is filtered before entering the kitchen extract ductwork
- Access for installation, maintenance and inspection of plant and ductwork will be incorporated

4.1.1 Ductwork requirements

The kitchen extract system will be compliant with BESA Specification for Kitchen Ventilation Systems DW/172. Internal surfaces of the kitchen extract systems will be rectangular and free of any irregularities which make grease accumulation more likely and cleaning more difficult.

The design will include access panels either side of every bend and at a maximum spacing of 1.5m in the horizontal ductwork, to facilitate manual cleaning. Access panels will be provided in sufficient number, quality and size, to enable unrestricted access for regular cleaning and inspection of the internal surfaces and in-line components. All access panels will be in accordance with the requirements of DW/144, DW/172 & TR/19.

The kitchen extract ductwork will be pressure tested to DW144 class C throughout. Results of the pressure tests will be submitted to the Landlord and included with the certificate of conformity. The ductwork design will allow for the high pressure drop produced by the Tenant's filtration plant and subsequent high negative pressure effects in the riser ductwork

Ensure that ductwork runs carrying humid air, such as from kitchen canopy and dishwasher extract systems, utilise 'reverse joints' and horizontal ducts fall towards the intake point and take special care in sealing all joints.



To prevent leakage, ensure extract ventilation ductwork for the removal of steam from dishwashing and pot washing machines meets the following additional requirements:

- ~ use stainless steel ductwork, with slip joints in the direction of condensation flow
- ~ install ductwork with a fall back to the appliance
- ~ apply thermal insulation to minimise condensation
- ~ locate longitudinal joints on vertical or upper surfaces (not bottom)
- ~ site weld cross joints on stainless steel ductwork
- ~ do not locate cleaning doors on the underside of ductwork

The exhaust system serving the Tenant demise will be designed and commissioned to ensure the kitchen as a whole is under a negative pressure, and allows for a make-up air rate of 85% of the exhaust quantity, to prevent migration of odours and/or heat to other premises or public areas.

The extract fan will be located at roof level, to ensure the extract system is under negative pressure. The fan unit selected will be suitable for kitchen extraction and be fully accessible for cleaning, with the motor & wiring out of the airstream, to minimise the risk of ignition.

Vertical kitchen extract ductwork will be fully accessible for manual cleaning, or made suitable for chemical cleaning.

Where the Landlord has provided kitchen extract ductwork for the Tenant to connect to, the Tenant is not permitted to alter the Landlord ductwork, unless approved by the Landlord, with the works completed by the Landlord's approved ductwork contractor.

Where ducts from more than one canopy are jointed together, fit branch connections flush, on the underside of the duct.

Do not use internal linings in ducts.

Do not use turning vanes.

Ensure all interior surfaces of the ductwork are accessible for cleaning and inspection. Provide panels that are at least the same thickness of material as the ductwork and which are grease tight, using a heat-proof gasket or sealant, without projection into the ductwork.

Locate access panels on the top or sides of horizontal ducts, at least 40 mm from the underside of the duct.

Where ductwork is concealed within ceiling voids or builder's work shafts, ensure that adequate access is provided within the builder's work fabric, to provide easy access to the ductwork cleaning panel.

Do not use flexible joint connections within a kitchen extract ventilation system.

In attenuators installed in extract ventilation systems, incorporate a protective membrane to protect the acoustic media from grease impregnation.

Design extract ventilation ductwork systems to comply with the requirements of BS 9999.

Install fire rated ductwork systems, where required, that have been tested in accordance with BS 476-24 for:

- ~ fire inside (type B) rated for stability, integrity and insulation for the same period of time as the compartment through which the duct passes

- ~ additionally, ductwork tested for fire outside (type A) and the internal surface of the ductwork within the compartment meeting the insulation criteria

Ensure the design of fixings and supports associated with fire rated ductwork are suitable for the specified duration of fire protection.

Ensure the fire rating of kitchen extract ductwork includes insulation to ensure that a fire outside the duct does not cause any grease build-up inside the duct to ignite.

Provide the insulation to ensure that the temperature on the outside of the duct does not exceed 140°C average above ambient, or 180°C maximum above ambient, at any one point.

Make provision for drainage of condensation from steam collection canopies. Where drainage facilities are provided within the hood from cooking equipment, install a condensation drain, manufactured from grade 1.4301 stainless steel tubing, to discharge over a convenient gully. Alternatively, when no drainage facility is available, provide a suitable drain tap, manufactured in grade 1.4301 stainless steel, at the lowest point of the canopy condensation gutter.

Make provision for drainage from water mist cleaning systems by installing a drain, manufactured in grade 1.4301 stainless steel tubing, to discharge over a convenient gully.

Provide plumbed drainage at the base of extract ventilation duct risers wherever condensation is considered possible. Connect the drain, manufactured in grade 1.4301 stainless steel, to a suitable foul water drain and incorporate a suitably sized trap.

4.1.2 Kitchen Supply Air

Where a kitchen supply air system is provided, it will be installed in accordance with DW172 Section 6. The supply system will be positioned as to not obstruct safe access to the kitchen extract system.

4.1.3 Filtration ductwork connections

The ductwork installed either side of the filters must be positioned centrally in relation to the filter. Ductwork plenums must be sized and designed so an equal distribution of air passes through all sections of the filter, such that all of the air is filtered equally. The diagram in section 4.1.5 illustrates a typical best practice installation.

4.1.4 Flues


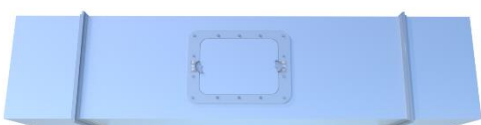

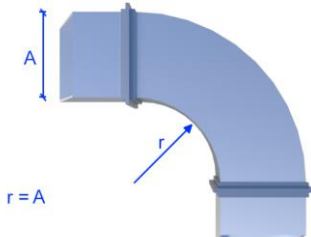
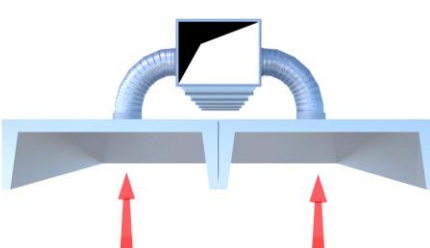
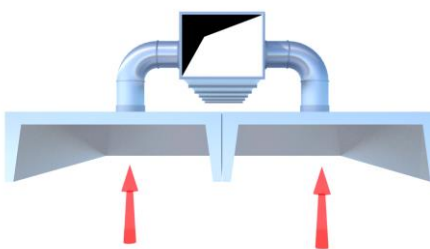
Where Tenants utilise wood-burning pizza ovens and/or wood-burning ovens/grilles/barbeques or coffee roasting equipment, a dedicated twin wall insulated flue, with bolted connections, will be used, discharging at roof level. The flue will be manufactured to BS EN 1856-1 and constructed from fully seam welded 0.71mm stainless steel for the inner liner, 0.71mm stainless steel outer casing, with an annulus of insulation, compacted with mineral wool to a density of 128Kg/m³, to a thickness suitable to achieve the maximum limiting surface temperature required. Components will be assembled by means of a fully integral flange, with spigot location and sealed V-band jointing system. This system will have a 4 hour rated certificate for fire resistance. The flue will be installed laid to fall to drain at a minimum of 1 degree. The flue will be pressure tested to 1000Pa for 1 hour.

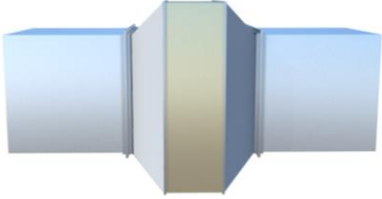
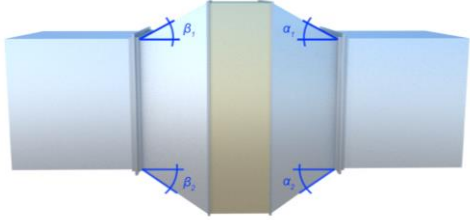
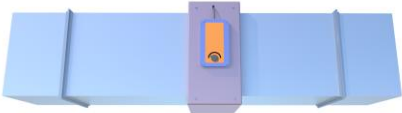
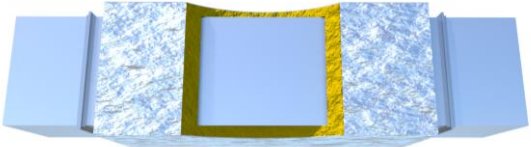
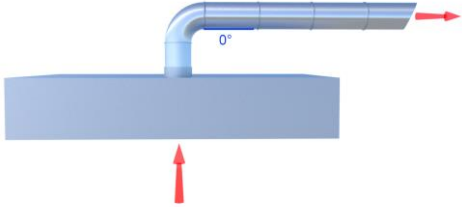
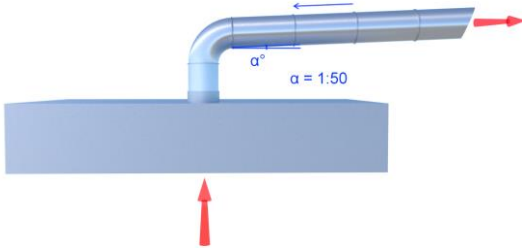
Flues from these appliances must not be combined with the kitchen extract system.

All flues must be fitted with an extract fan at the top of the flue, to ensure the appliance and flue remains under negative pressure, so no combustion products are drawn from the appliance into the neighbouring kitchen or seating areas.

4.1.5 Acceptable ductwork fabrication standards

The following diagrams indicate ductwork installations common to kitchen ventilation systems and provide examples of acceptable and unacceptable installations. Note all ductwork must meet the performance standards set out in this specification.

Unacceptable	Acceptable
<p>Access panels installed on the bottom of the ductwork will be prone to leakage and will gather grease.</p> 	<p>Access panels installed on the sides of the duct, at least 40mm above the underside of the duct, to allow suitable access for ductwork cleaning.</p> 
<p>Square bends and turning vanes accumulate grease.</p> 	<p>Swept bends with a suitable radius will be used</p> 
<p>Flexible duct connections to the kitchen canopy accumulate grease and are not possible to clean fully.</p> 	<p>Rigid duct connections to the canopy will be used.</p> 

Unacceptable	Acceptable
<p>Ductwork connections to filtration units will not have a sharp transitions, which would prevent suitable air distribution through the filter unit.</p> 	<p>Ductwork connections will have a low approach angle of 15 degrees to promote even airflow distribution through the filter unit.</p> 
<p>Fire dampers, if installed in a kitchen extract system, collect grease which prevents them operating, posing a serious fire risk.</p> 	<p>Fire rated, fire insulated ductwork will be used wherever ductwork passes through a fire compartment.</p> 
<p>Ductwork connections to water mist canopies, installed without a gradient, accumulate moisture.</p> 	<p>Ductwork connections to water mist canopies will be installed to a fall of 1:50, back to the canopy</p> 

4.2 Active design

Actively reduce the residual risk of nuisance grease, smoke and odour

To achieve the specified performance criteria, active design measure will be required, in addition to the passive measures detailed in the previous section. At concept stage, the Tenant has the opportunity to select one of two options, to select appropriate 'Active Design' equipment, to achieve the performance criteria set out in this document and achieve concept design approval from the Landlord:

4.2.1 Option A – Defra risk assessment for odour risk

The Tenant will undertake a risk assessment for odour, using the methodology set out in Annex C of the Defra document 'Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems'. The assessment will be used to establish the appropriate filtration systems for incorporation into the kitchen extract design.

Odour risk will be assessed based on the following parameters:

- Catering type:
 - Odour concentration
 - Grease content
- Dispersion risk
- Proximity of receptors
- Size of kitchen

The table below indicates typical filtration systems, which are commonly required for different types of catering. This table is provided for guidance only and each Tenant's catering operation will be assessed in isolation, in the Tenant's odour impact assessment:

Key

C – Common

U – Unusual

Catering Type	Smoke, grease and odour characteristics			Grease, Smoke & Solid Filtration			Low Intensity Odour	Odour Control	
	Smoke	Grease	Odour	Grease Filter	Cold Water Mist Hood	Electrostatic Precipitator	3 Stage Fine Filters	Ultra Violet Odour Control	Activated Carbon Filter
African	Low	Moderate	Moderate	C	U	C	U	C	U
Chinese	Low	Very high	Moderate	C	C	C	U	C	U
Char Grilling	Very high	High	High	C	C	C	U	C	C
European	Low	Low	Moderate	C	U	C	U	C	U
Fish & Chips	Low	High	Moderate	C	C	C	U	C	U
Fried Chicken	Low	High	High	C	C	C	U	C	C
Indian	Low	High	Very high	C	C	C	U	C	C
Malaysian	Low	High	High	C	C	C	U	C	C
Mexican	Low	High	High	C	C	C	U	C	C
Pizzeria	Low	Low	Low	C	U	C	U	C	U
Pub food	Moderate	Moderate	Moderate	C	U	C	U	C	U
Seafood	Low	Low	High	C	U	C	U	C	U
Turkish	High	Moderate	Moderate	C	U	C	U	C	U
Coffee Roasting	High	None	High	U	U	C	U	U	C
Warmed food	None	Low	Low	U	U	U	C	U	U

Fig 4 – Common and uncommon filtration equipment for differing catering types

4.2.2 Option B - Land Securities approved active equipment

Where the Tenant chooses to pursue this option, they must provide the equipment specified for each of the following catering types. Each item of equipment must comply with the performance requirements set out in section 4.2.3

4.2.2.1 Gas or electric fired appliances

Kitchens using gas or electric fuelled appliances will incorporate the following filtration components in airstream order:

1. Canopy grease filters in the kitchen
2. Electrostatic precipitator unit (ESP) located inside the retail unit
3. Passive filters inside the retail unit
4. UV filter inside the retail unit
5. An activated carbon filter prior to the kitchen extract fan.

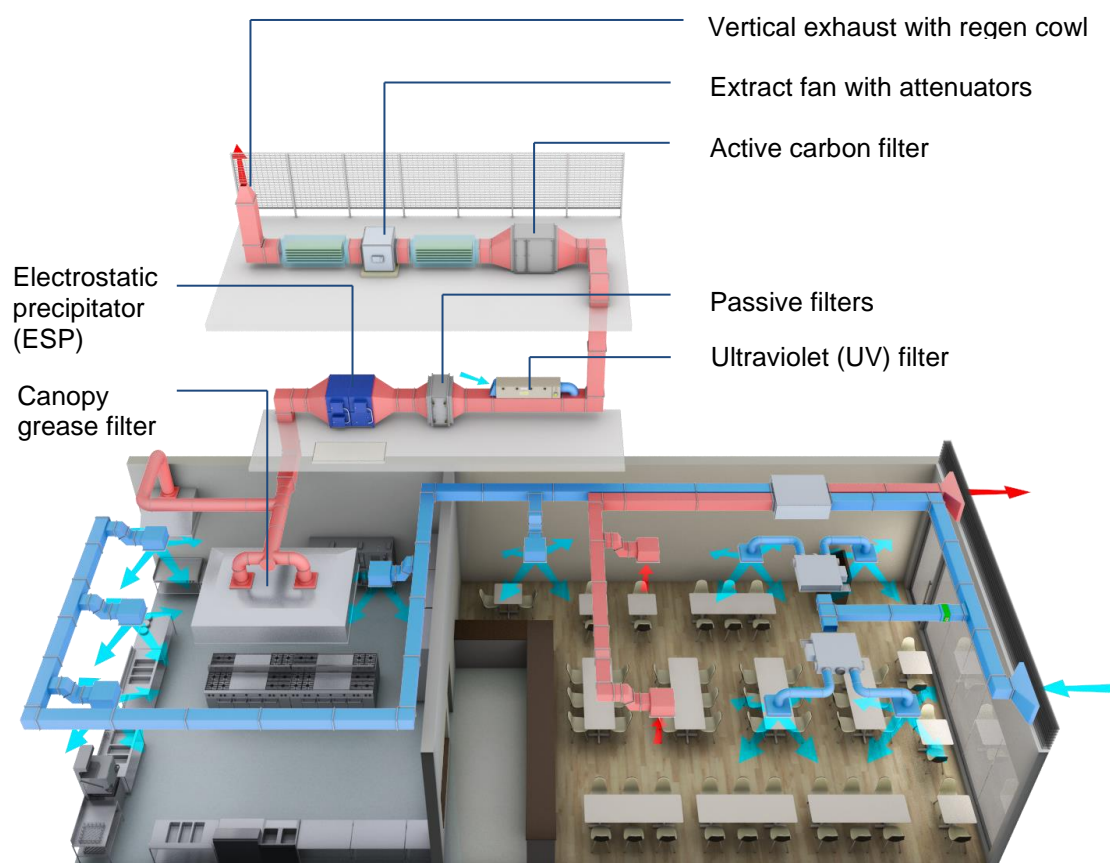


Fig 5 – Kitchen ventilation arrangement for a kitchen with gas or electric appliances

4.2.2.3 Wood or solid fuel burning appliances

In addition to the filtration requirements for a kitchen with gas or electric fuelled appliances, a kitchen with wood or solid fuel burning appliances in the kitchen area must be provided with a spark arrestor, in the form of a cold water mist canopy. Kitchens with these appliances will incorporate the following filtration components in airstream order:

1. Cold water mist canopy in the kitchen
2. Electrostatic precipitator unit (ESP) located inside the retail unit
3. Passive filters inside the retail unit
4. UV filter inside the retail unit
5. An activated carbon filter prior to the kitchen extract fan

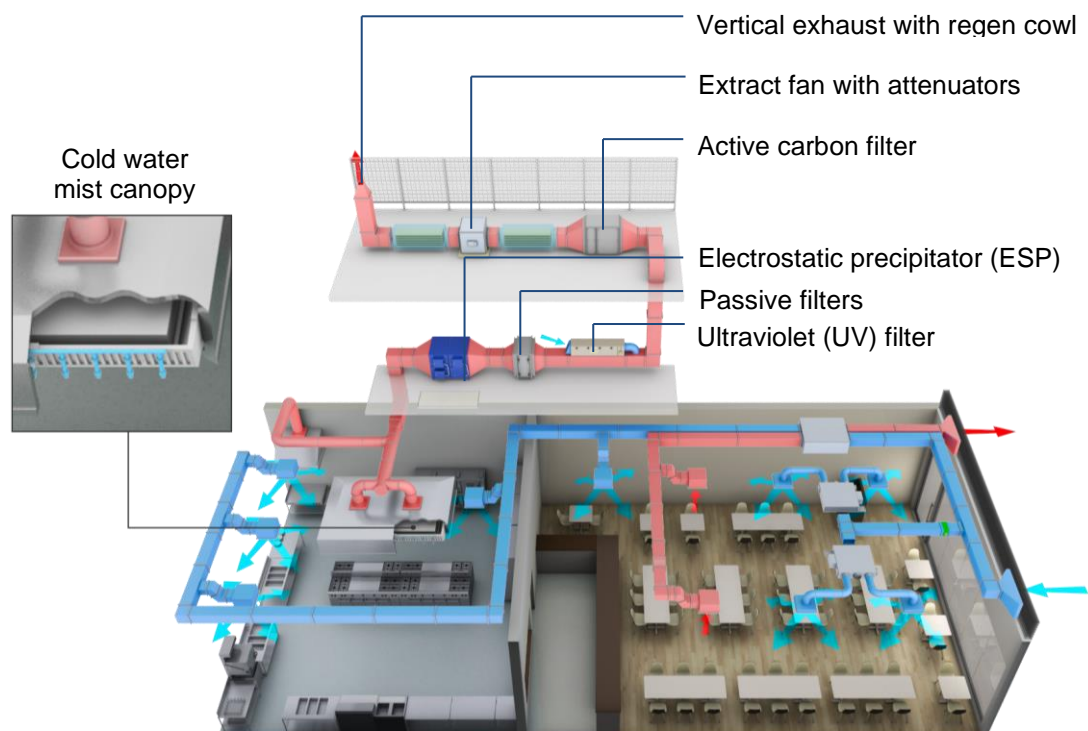


Fig 6 – Kitchen ventilation arrangement for a kitchen with wood or solid fuel appliances

4.2.2.4 Gas and Electric Pizza Ovens

All pizza ovens will be provided with a twin-wall flue as described in section 4.1.4 of this specification. A mesh filter will be installed inside the retail unit, above the pizza oven, to filter flour from the flue system. The flue will discharge at roof level and will be provided with a fan at the top of the flue system.

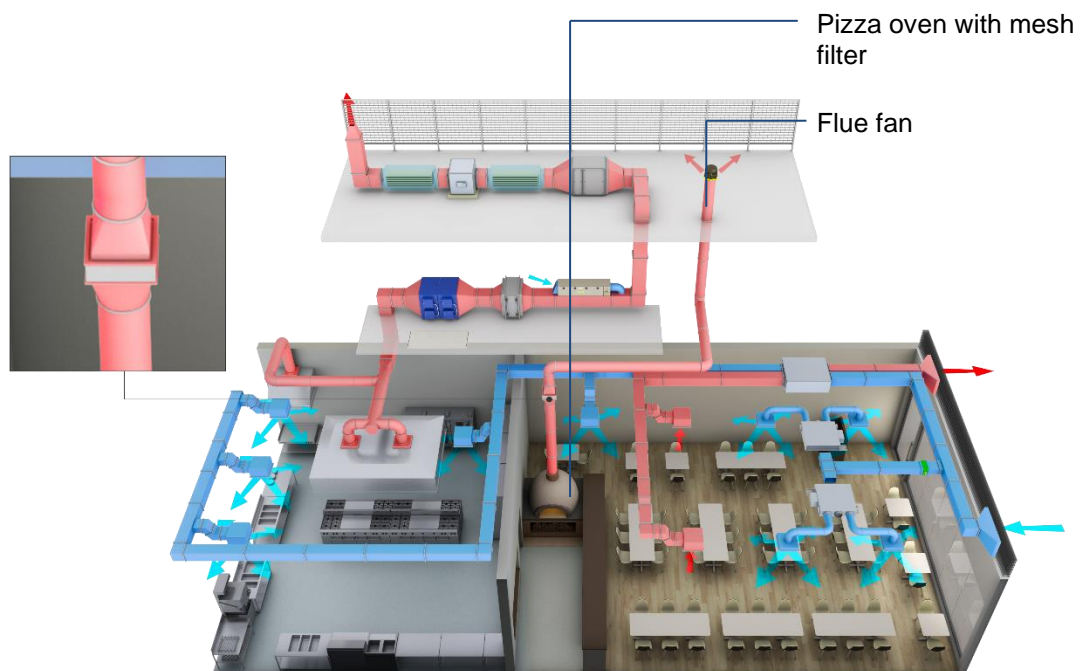


Fig 7 – Gas and electric pizza oven extract arrangement

4.2.2.5 Wood and Solid Fuel Pizza Ovens

Wood and solid fuel pizza ovens will be provided with a twin wall flue as in section 4.1.4 of this specification. A soot abatement filter will be installed inside the retail unit, to filter soot and embers from the flue system. The flue will discharge at roof level and will be provided with a fan at the top of the flue system.

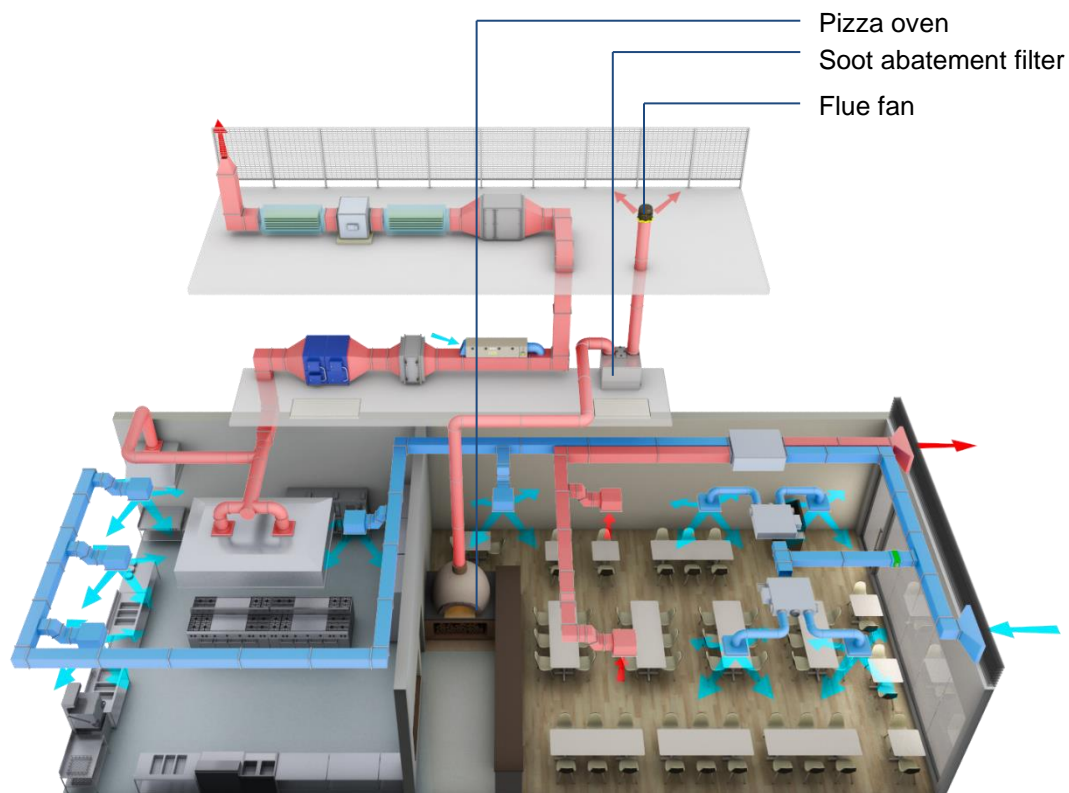


Fig 8 – Wood or solid fuel pizza oven arrangement

4.2.2.6 Coffee bean roasting

Coffee bean roasters must be provided with dedicated twin wall flues, as described in section 4.1.4 of this specification. The coffee bean roasters must be provided with a bean chaff cyclone separator prior to connection to the flue system. The following filtration components must be provided in airstream order:

1. Chaff cyclone
2. Electrostatic precipitator unit (ESP) located inside the retail unit
3. An activated carbon filter prior to the flue fan.

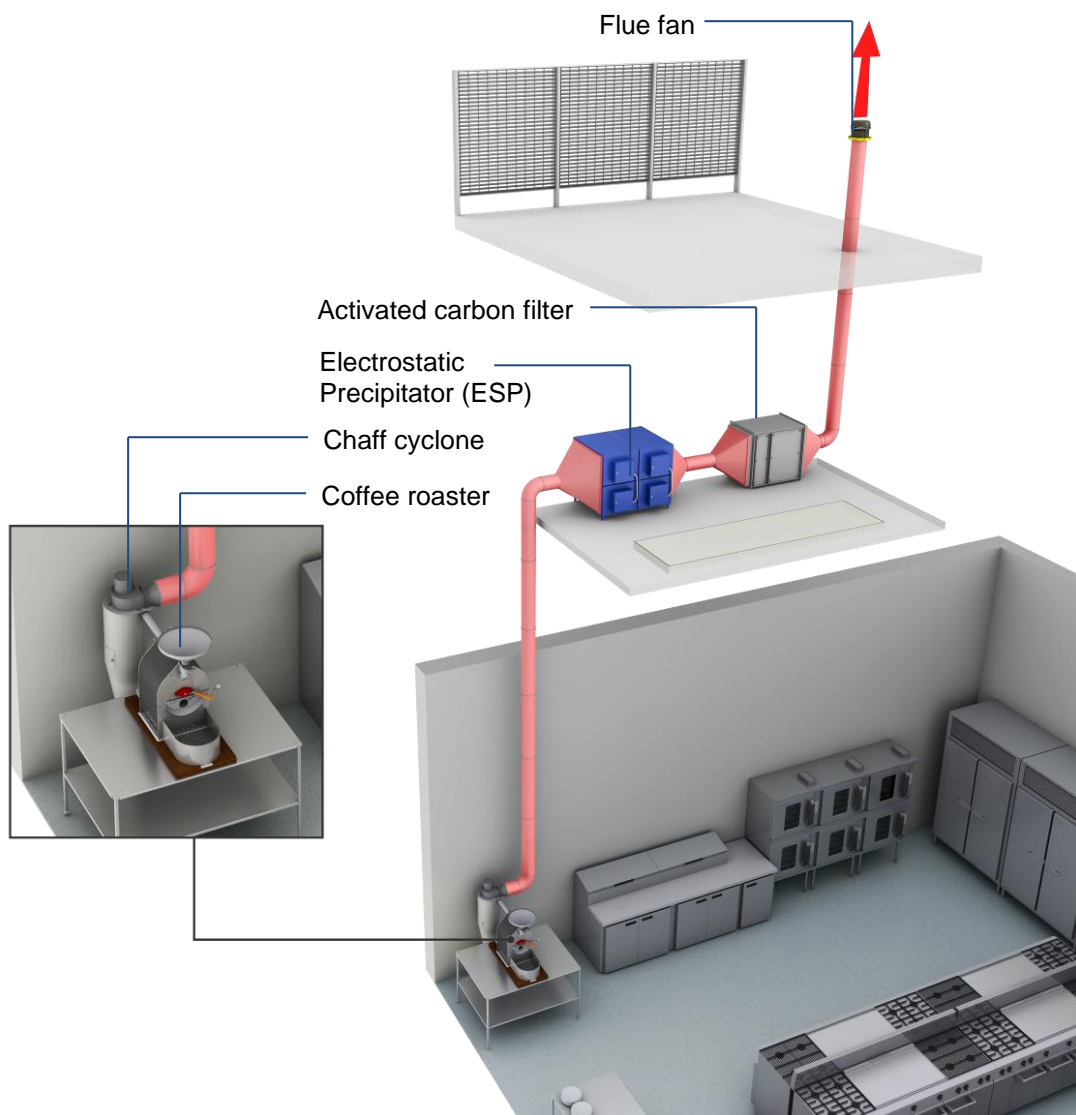


Fig 9 – Coffee roasting schematic



4.2.3 Filter Specification

4.2.3.1 Canopy Grease Filters

Canopy grease filters will comply with LPS 1263, as required within BESA Specification for Kitchen Ventilation Systems DW/172 and be of non-combustible construction.

4.2.3.2 Cold Water Mist Canopy

The kitchen exhaust canopy will be of the cold water mist on demand type, complete with automated hot water wash system. This will provide grease filtration, whilst providing protection against the risk of sparks and embers igniting grease in the extraction ductwork.

Cold water nozzles will be of stainless steel construction and situated at 200mm intervals, in such a way that creates a 'fishtail' effect of overlapping spray, to ensure maximum efficiency.

Hot water nozzles will be of brass construction and situated at 280mm intervals, positioned in such a way as to facilitate the automatic wash down of the system. These nozzles will spray the internal surfaces of the extract plenum with a hot water and detergent mix, at a temperature of 60°C-77°C, for approximately 2-3 minutes at the end of each working day, allowing the grease collected on the internal baffles to wash to drain.

The canopy will be constructed of stainless steel. All joints and seams will be welded and/or liquid tight. Hanging brackets will be supplied on each unit, suitable for ceiling or wall mount installations.

All internal water manifolds will be constructed from box-section stainless steel tubing. Spray nozzles will be constructed from machined brass, for hot water wash, and constructed from stainless steel for cold water mist.

The canopy will be provided with drains, for connection into the Tenant's drainage system.

Watertight extract ductwork will be installed, as detailed in this specification. Horizontal duct runs will be installed at a gradient of 1:50, towards the canopy.

Infra-red sensors will be incorporated within the canopy, to monitor the thermal signature of the cooking equipment and thereby control the cold mist accordingly.

4.2.3.3 Electrostatic Precipitators

Main Cabinet

- The housing will be formed from galvanised steel.
- The unit will be IP64 rated.
- The housing construction will be fully welded to prevent any collected grease leakage.
- The housing will incorporate a sump for collection of oil and grease outside the airstream – This sump will have a capacity of a minimum of 16 litres per collector cell. The sump will be angled towards the drain position to enable gravity drainage away from the cells.

Electrical Housing

- The electrical housing will be made as a complete, sealed housing, in galvanised steel, which is fixed to the door of the main housing.



- A rotary safety isolator will be provided, to prevent opening of the housing when switched on.
- The door will be lockable for safety.
- The door will be sealed to the housing using EPDM seal.

Mesh filters

- Provide a mesh pre and post filter per collector.
- The mesh filter will be made from woven aluminium.
- Provide weep holes to allow drainage of captured oil to the sump and to assist with washing.
- Provide three layers of mesh in each filter.

Serviceable Components

- Ensure collectors are fully removable.
- Ensure pre and post filters are fully removable.
- Ensure the door is hinged but can be completely removed if necessary for cleaning and maintenance.

4.2.3.4 Passive Filters

The passive filter system will consist of bag and HEPA filters and be housed within a galvanised steel casing that allows for side withdrawal of the filters.

Bag filter:

- The bag filter media will be 100% polyester synthetic
- The bag filter media will be nontoxic and non-irritant
- The bag filter will be fire rated CP413
- The filter media will be fitted into a galvanised steel header frame
- Corrosive resistant

HEPA filter:

- The High Efficiency Particulate Air (HEPA) Filter will have a minimum efficiency of 95%
- The media will be glass fibre paper mini-pleated
- The sealant will be cold moulded polyurethane
- The frame will be galvanised or stainless steel
- The gasket will be PU foam

4.2.3.5 Activated Carbon Filters

- The carbon filter panels will be bonded panels that hold the activated carbon granules in a rigid biscuit.
- The biscuit will be encapsulated in a carbon impregnated cloth, which will prevent any leakage of granules or powder.
- The grade of carbon will be AC207
- Carbon filters will be sized to have a dwell time of between 0.4s to 0.8s.

4.2.3.6 Ultraviolet Air Treatment

Inline UV

- The in-airstream UV system will only be used in a system following an Electrostatic Precipitator, otherwise lamps will become contaminated and rendered ineffective.
- Construction will be of steel
- There will be light baffles either side of the unit, to prevent direct eye contact with UV light
- Safety interlock will be standard to the door when opening
- 185 or 254nm lamps will be fitted
- Volt-free contact will be able to be made to demonstrate a fault

Side Stream UV

- UV lamps will sit outside of the extract duct to avoid contamination
- Construction will be of steel
- There will be light baffles either side of the unit to prevent direct eye contact with UV light
- Safety interlock will be standard to the door when opening
- 185 or 254nm lamps will be fitted
- Volt-free contact will be able to be made to demonstrate a fault or connection to BMS system will be possible
- Air pressure switch will be fitted to prevent the unit running without airflow
- Key lock access to main UV cabinet and electrical enclosure, safety interlocked when door opened

UV systems will be sized to an ozone dwell time of 2 seconds within the ductwork, to breakdown odour and ozone prior to discharge. UV systems must be interlocked using an airflow switch.

4.2.3.7 Soot Abatement Filters

Soot abatement filters will be used where wood or solid fuel pizza ovens are used. The abatement unit will be a 'Smoki' type unit (or equal and agreed) and will incorporate a wash cycle to reduce particulate from solid fuel pizza oven exhausts. The wash cycle of the unit will also reduce odour created by cooking and the burning of solid fuel. The unit will pass products of combustion through a fine water spray, reducing the likelihood of any sparks or embers entering the extract flue system.

4.2.4 Kitchen Interlock Controls

4.2.4.1 General

The Tenant's kitchen ventilation control system will be configured with an interlock, so that if the extract fan or any filter fails, then the gas/cooking supply will be disabled. The control system will be interfaced with the fire alarm system, to raise an alert if the extract system fails, which would pose a risk of combustion products escaping from the kitchen appliances into the kitchen and neighbouring areas.

Where gas or electric appliances are used, the kitchen extract controls system will be interlocked with the fire alarm, such that in the event of a fire alarm signal, all kitchen extract



plant shuts down. Where wood burning/solid fuel appliances are used, the extract system will continue to operate, to ensure combustion products continue to be extracted until the solid fuel has extinguished. The Landlord will be consulted, to review and approve this strategy in relation to the developments' cause and effect fire strategy.

If a filter unit or the kitchen extract system fails, an alarm will be raised on the Tenant's control system panel and also via a flashing beacon located in a readily accessible & visible position within the Landlord's corridor, adjacent to the back of house entrance to the unit. A notice will be provided adjacent to the beacon to state its purpose: "KITCHEN EXTRACT SYSTEM FAULT"

4.2.4.2 Cold water mist canopies

Cold water mist canopies will be interlocked with the kitchen extract system, to shut down the water mist system if the kitchen extract system stops or fails.

4.2.4.3 Electrostatic precipitators

The ESP unit will be interlocked with the kitchen extract system, to shut down the ESP unit if the kitchen extract system stops or fails.

A safety isolator will be provided on the access doors to the ESP unit, to prevent opening of the housing when switched on.

4.2.4.4 Passive and activated carbon filters

Differential pressure sensors will be provided across passive and active carbon filters and will be linked to the Tenant's controls system. The filters will be monitored and an alarm will be activated if either of the following conditions occur:

1. Filter pressure drop exceeds the manufacturer's recommended dirty filter pressure drop.
2. Filter pressure drop is less than the manufacturer's specified clean filter pressure drop.

The tenant will provide passive and active filter pressure drops to Land Securities for agreement:

1. Clean filter pressure drop
2. Dirty filter pressure drop (pressure drop at which the filter will be changed, as recommended by the manufacturer)
3. Proposed filter alarm pressure drop

4.2.4.5 Ultraviolet air treatment

The UV unit will be interlocked with the kitchen extract system, to shut down the UV unit if the kitchen extract system stops or fails.

A safety isolator will be provided on the access doors to the UV unit, to prevent opening of the housing when switched on.

4.2.4.6 Soot Abatement Filters



The soot abatement unit will be interlocked with the extract fan, to shut down the soot abatement unit if the extract fan stops or fails.

4.3 Maintenance Requirements

Maintenance requirements will vary, subject to the intensity of use and type of cooking. Therefore, frequency of cleaning and filter replacement will be adjusted to suit. The Tenant will ensure the following minimum levels of maintenance are adhered to.

The most advanced filtration systems and ductwork designs will quickly become completely ineffective at mitigating grease, smoke and odour, when the detailed maintenance regime is not followed

The table below provides requirements for the type and frequency of maintenance in accordance with Defra guidelines.

Kitchen extract component	Recommended maintenance intensity
Grease, smoke & solid filtration	
Grease filter - Mesh/baffle/cartridge/water wash	Daily cleaning
Canopy UV	Quarterly clean, replace lamps after 8000 hours of operation
Cold water mist hood	Daily cleaning
Electrostatic Precipitator	Clean every four weeks
Low intensity odour control	
3-stage fine filters	Replacement every two weeks or replace when filter monitoring system dictates
Odour control	
Ultra Violet odour control	Clean every four weeks, annual lamp replacement
Adsorption - Activated carbon filter	4 to 6 month filter replacement or replace when filter monitoring system dictates

Fig 10 – Maintenance frequency

The Tenant will provide the Landlord and Insurance Team with a maintenance report on a quarterly basis, detailing checks undertaken, defects noted and works carried out. The report will note the differential pressures across the filtration systems and compare against the manufacturer's recommended levels. Maintenance checks and cleaning/replacement of filters will be increased as necessary, to ensure odour control systems works effectively.

4.3.1 Cleaning

The following are the Maximum Grease Deposit Levels as set out in BESA Guide to Good Practice Internal Cleanliness of Ventilation Systems TR/19 and these apply to this specification:

<u>Wet Film Thickness Test Measurement</u>	<u>Required Action</u>
Average of 200microns across Kitchen Extract System	Complete system cleaning required
Any single measurement above 500microns i.e. 'hot spots'	Urgent Local Clean Required (i.e. specific attention to problem areas)

The below table sets out the minimum frequency with which full system cleaning of ductwork will be undertaken. Based on the findings of the Landlord's on-site inspections, the Landlord reserves the right to stipulate a minimum cleaning frequency for grease extract ductwork systems, as per the requirements of our insurers, which may be a higher frequency of cleaning than set out in the TR/19 recommendations. Failure to comply with such requirements can invalidate the building insurance policy.

Minimum frequency of ductwork cleaning (as set out in BESA Guide to Good Practice Internal Cleanliness of Ventilation Systems TR/19.):

	<u>Frying time</u>	<u>Minimum clean frequency</u>
Heavy Use	12-16 hours per day	3 Monthly
Moderate Use	6-12 hours per day	6 Monthly
Low Use	2-6 hours per day	12 Monthly

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

The Landlord requires regular evidence of system status, to ensure that maintenance requirements are being adhered to and that ductwork is being cleaned to the specified standards of frequency and quality. Cleaning operations will be done in line with the frequencies indicated above. Post-clean wet film thickness tests will be representative of the entire system and will not exceed 50 µm. Any access issues that impede cleaning must be highlighted. The Landlord will employ a specialist to assess the standards of work carried out by the Tenant's contractor.

Post-clean, the duct cleaning contractor must provide a report that includes the following elements (a copy of this report will be made available on site for inspection):

- The system(s) cleaned
- Pre-clean measurements
- Post-clean measurements
- Pre and post clean photographic records
- Additional works carried out (if any)



- COSHH data on any chemicals used
- Recommendations for future cleaning requirements
- A sketch or schematic of the system indicating access panel and testing locations and highlighting any un-cleaned/inaccessible areas, with an explanation as to why the area could not be accessed/cleaned
- A certificate summarising the cleaning works completed.

4.3.2 Wood Burning Ovens

Wood-fired oven flues generally require more regular maintenance. The canopy and canopy/extract plenum is an area of higher fire risk and consideration will be given to more frequent cleaning, in line with manufacturer's recommendations and in accordance with insurers' requirements

4.4 Mitigating Fire Risk

The exhaust hood and system will be protected by an approved automatic fire detection and fixed fire suppression system, installed in accordance with the requirements of the LPC and the Landlord's property insurers.

Where wood-fired ovens, barbecues fired with charcoal or wood, and water heaters fired with biomass are provided, as part of the kitchen fit out, a smoke, grease and soot filtering and spark arrestor system will be provided. The system will be a cold water mist canopy, installed in line with the requirements of this specification.

A carbon monoxide sensing system will be installed in the kitchen/restaurant space, local to the charcoal/wood/biomass fired equipment. This sensing system will control the ventilation system in the space, to ensure that no build-up of carbon monoxide gases occurs during unoccupied (and occupied) periods.

The Tenant will provide a plant shut-down switch within the unit and a run-on timer facility for the kitchen extract fan, variable between 0 and 30 minutes, to allow the extract fan to run-on in the event of a fire alarm activation. The kitchen extract fan will also be provided with a fireman's override switch with 'Hand, Off, Auto' settings, located adjacent to the Tenant's fire alarm panel. This will be presented to the local Building Control officer, to ensure they are satisfied with the provisions.

4.5 Mitigating Noise Impact

Tenants' plant will not exceed the specified noise and vibration limits for the site and local authority limitations.

Kitchen extract fans will be provided with suitably designed attenuators, connected with rigid connections to the fan. Flexible connections will then be provided between the attenuators and the ductwork to isolate vibration. Where the noise breakout from the casing of the fan exceeds the noise limits, an acoustic enclosure will be installed around the fan, enclosing the attenuators.

The fan and connecting ductwork and attenuators will be supported on anti-vibration mounts.

4.6 Operation & Maintenance information

4.6.1 General

Issue of Operating and Maintenance Instruction Manuals is a pre-requisite of practical completion of the Works. The Certificate will not be issued until the Landlord has been satisfied that the manuals have been produced in accordance with this specification.

Produce all manuals using a word processing package.

Provide a computer based O&M manual, written, compiled and completed in accordance with the requirements of this specification and BSRIA document BG2/2004 *Computer-based operating and maintenance manuals – Options and procurement guidance*.

Write all text in English, with all terms defined when first introduced.

Make the final electronic O&M manual clear to read, easy to navigate and easy to understand by all levels of users. Ensure that the electronic manual is capable of being printed out clearly, both in its entirety and as selected pages from it. Ensure that the manual is capable of having pictures loaded into it. Ensure that the manual is protected, to prevent overwriting of information and Record Drawings.

4.6.2 Contents

Ensure that the following are included:

- ~ A full description of each of the systems installed, written to ensure that the Landlord's and Tenant's staff fully understand the scope and facilities provided.
- ~ A description of the mode of operation of all systems including services capacity and restrictions.
- ~ Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
- ~ A set of drawings of the installation upon which is recorded all plant settings, water flow-rates, pump heads and noise level readings as adjusted and measured during the testing and commissioning period. Protection and overload relay settings will be recorded and calibration charts will be incorporated.
- ~ Legend of all colour-coded services.
- ~ Schedules (system by system) of plant, equipment, valves, etc. stating their locations, duties and performance figures. Each item must have a unique number cross-referenced to the record and diagrammatic drawings and schedules.
- ~ The name, address and telephone number of the manufacturer of every item of plant and equipment together with catalogue list numbers.
- ~ Manufacturers' technical literature for all items of plant and equipment, assembled specifically for the project, excluding irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions.
- ~ A copy of all test certificates, inspection and test records, commissioning and performance test records including, but not limited to, electrical circuit tests, corrosion tests, type tests, start and commissioning tests, for the installations and plant, equipment, valves, etc., used in the installation.

- ~ A copy of all manufacturers' guarantees or warranties, together with maintenance agreements offered by subcontractors and manufacturers.
- ~ Copies of insurance and inspecting authority certificates and reports.
- ~ Starting up, operating and shutting down instructions for all equipment and systems installed.
- ~ Control sequences for all systems installed.
- ~ Schedules of all fixed and variable equipment settings established during commissioning.
- ~ Detailed recommendations for the preventative maintenance frequency and procedures which will be adopted by the Tenant to ensure the most efficient operation of the systems.
- ~ Details of lubrication for lubricated items including schedules of lubricant type, frequency, etc.
- ~ Details of regular tests to be carried out (e.g. water analysis for pseudomonas).
- ~ Details of procedures to maintain plant in safe working conditions.
- ~ Details of the disposal requirements for all items
- ~ A list of normal consumable items.
- ~ A list of recommended spares to be kept in stock by the Tenant, being those items subject to wear or deterioration and which may involve the Tenant in extended delivery periods when replacements are required at some future date.
- ~ A list of special tools needed for maintenance cross-referenced to the particular item for which each tool is required.
- ~ Procedures for fault-finding in diagrammatic and tabular form to show the action necessary to correctly identify defective pieces of equipment and the steps to be taken to rectify faults.
- ~ Emergency procedures, including telephone numbers for emergency services.
- ~ Contractual and legal information including, but not limited to: details of local and public authority consents; details of design team, consultants, installation contractors and associated sub-contractors; start date for installation, date of practical completion and expiry date for the defects liability period; details of warranties for plant and systems including expiry dates, addresses and telephone numbers.
- ~ Health & Safety (CDM) relevant information (e.g. safety measures in maintenance, COSHH substances, disposal instructions, risk assessments, etc.), written schemes of examination for pressure systems, written schemes of examination and tests for systems at risk of causing Legionellosis.
- ~ Details of planned kitchen extract plant and ductwork cleaning methodology and frequency.