

Mechanical Engineering Specification

Ventilation & Environmental Control Equipment

KFC BIRSTALL GELDERD ROAD, BIRSTALL, BATLEY WF17 9TB



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1.01 General

This specification covers standards for the selection, supply, delivery, installation, testing and commissioning of Kitchen ventilation in accordance with HVAC Specification DW/172 for Restaurant developments. The cooking of food involves appliances releasing heat, steam, fumes and airborne grease.

The cooking process requires extract ventilation for the removal of fumes, smoke and vapours generated by the cooking activity.

1.02 Objectives

To provide an acceptable working environment for all kitchen staff by the extraction / removal of heated air, fumes, steam and cooking smells, as well as preventing condensation. The extract canopies are designed to enable ease of access for cleaning throughout the system and distribution ductwork and primary fan equipment.

1.03 Odours

All fumes and odours from the food preparation areas of the kitchens shall be mechanically extracted utilizing an extract canopy to remove all cooking odours. This will take into account the dimensions of the kitchen, the type of grease filters used in the application and the cooking equipment within the grouped cooking range.

1.04 Noise

All fan equipment, ductwork and filter housing shall be so mounted and installed so as not to give rise to a noise nuisance. Any noise generated by the extraction or supply systems as a whole shall not exceed the pre-existing hourly background noise level at nearby residential accommodation by more than 5dB(A). When measured and rated in accordance with BS 4142, entitled Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas 1997.

1.05 Location

The canopies will be sited over the grouped cooking equipment, or any heat, steam or grease producing equipment.

1.06 Size

The canopies shall overhang the grouped cooking range by not less than 250mm and will be mounted at a height no lower than 2000mm from the finished floor level to the underside of the canopy.

1.07 Fire Suppression

Where specifically required or instructed, an automatic fire suppression system will be installed to protect the cooking appliances, extract canopies and associated distribution ductwork. Fire suppression systems will be of the "Amerex" type, tested and approved to UL 300 specification with automatic and manual activation. Fire suppression systems will be designed, installed and commissioned by LPC1204 approved installers.

1.08 Canopy Construction

The extract canopies shall be constructed from 18 swg (1.22mm thick) stainless steel type 304. All visible surfaces shall be ultra-fine grain satin polished to 280 grit, and Polythene protected during installation. All constituent parts must be suitable for use in a working kitchen environment.

The canopies shall be cut, punched and folded into sub sections of up to 6000mm in length and factory assembled by means of computer-controlled seam welds, and non-visible mechanical fixings. All joints shall be formed to enable ease of cleaning with no cut edges or corners, which shall become an encumbrance to cleaning requirements. All metal edges shall be rolled smooth and shall be free from any sharp edges or projections.

The canopy lower edge at each end and the rear shall be formed into a condensation channel with inclined internal elevation to simplify cleaning requirements, the inner edges having crush folded safety finish.

When constructed, the canopies should be flush with sealing surface as should any ducting within the kitchen itself. This is to prevent the creation of a shelf which would permit the collection of dust etc. where this is not possible infill panels are to be fitted so there are no dust traps. All infill panel requirements shall be constructed from the same material as the canopy.

1.09 Splash Backs

Stainless steel sheets of the same grade and polish finish should be fitted to the rear and side walls below the canopy. This should be, as a minimum, the width of the canopy and should be flush with the base of the canopy, the wall and down to the floor. All joints between the splashback, cooking equipment and the canopy should be sealed with a silicone sealant. Silicone sealant should be applied only when absolutely necessary to joints in a neat finish not protruding the metal surface. Silicone joints will not be accepted as an alternative for a welded or poor constructed joint.

1.10 Lighting

The canopies shall be fitted with vapour proof LED lamps suitable for use in damp atmospheres. The lamps should have a diffuser, which can also withstand high temperature. Recess lighting is preferred to bulkhead fittings. Lighting within the canopies shall provide a minimum of 500 lux at the working surface.

1.11 Fan Equipment

All fans are to be adequately sized to overcome the system resistance and to provide the required extraction/supply rate specified. Multiple fans rather than single units should be used to reduce noise in instances when the system resistance is inherently high.

All fan motors are to be totally enclosed, air cooled, class F rated, with motor protection IP55. All single phased motors are to have “sealed for life” bearings. The fan motor should have an operating temperature of -40 deg. Cent. to +50 deg. Cent.

All fans will be provided with suitably rated on/off/variable speed controllers, and all fan equipment having local isolators and emergency stops fitted adjacent to the applicable equipment. Fans should be fitted with necessary resilient mounting to prevent noise and vibration transfer to the kitchen, other unit rooms and the external environment.

The Contractor will ensure that the fans are capable of producing the required air volumes as specified. All fans and motors arrangements shall be capable of running at 10% over the maximum specified duty.

The Contractor shall ensure that fan motors are suitable for the electrical supply available to the building.

Casing mounted fans shall have internal vibration isolation. Duct mounted fans shall have flexible duct connections consisting of or be externally protected by material having a fire penetration time of at least 15 minutes when tested in accordance with:

BS 476 Part 8,

& shall comply with BS 476 Part 7, Section 2, Clause 2.8 (Class 1 : surface of a very low flame spread properties).

Fans shall be selected to meet the specified noise criteria.

The construction of the fan shall be such that it is capable of withstanding the pressures and stresses experienced under continuous operation.

Fan casings shall be constructed such that access can easily be gained to motors and impellers, and that these can be removed if required for maintenance or replacement.

1.12 Distribution Ductwork

Kitchen canopy exhaust ductwork shall be constructed and installed in accordance with BESA Specification DW/172 and BESA Specification DW/144. Ductwork shall be routed to external source in the shortest possible route, without excessive use of bends and horizontal ductwork installation.

Ductwork shall be suitable for kitchen extract systems, with smooth internal surfaces that facilitate easy removal of grease deposits.

Access doors shall be provided at regular intervals along the entire length of the installed systems to allow effective maintenance, inspection and cleaning.

Any Kitchen Extract duct which passes through the boundary of a fire compartment shall be formed from fire Rated ductwork.

1.13 Grease Filters

The canopies should be fitted with internal extract plenum(s) with grease filters cells across its length. The filters should be of a sufficient size and number to ensure that the velocity through them does not lead to grease “carry over” into the ductwork and onto the extract fan.

The grease filters should have rigid frames in stainless steel baffle filters of sufficient density to capture and hold airborne grease. Filters shall fit correctly into holding frames to eliminate any extracted air passing around the filter.

The extracted fumes shall first be passed through these filters designed to remove the grease entrained in the fumes; the filters shall be removed and cleaned of their deposits at the end of each working day.

The grease filters should be easily removed and should be adequately sized to fit easily within dishwashers to facilitate easy cleaning.

The location of the filters should be such that it is not affected by the heat of wall mounted equipment, such as grills. This is particularly important with replaceable filter fittings, which carbonize at high temperature.

1.14 Kitchen Extract Cleaning

The B&ES Guidance Note TR/19 Second Edition; ‘Internal Cleanliness of Ventilation Systems’ makes specific reference in Chapter 7 to post cleaning verification of cleaning effectiveness.

It states: -

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

Verification of cleanliness should be by means of the WFTT, as detailed in System Testing (Inspection/Monitoring).

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

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

In addition, any other location(s) noted with significant grease accumulations.

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

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

- The system(s) cleaned
 - Pre and 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 clearly 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

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

The guidance within Chapter 7 states: -

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

The frequency of cleaning should be sufficiently frequent that grease deposit limits are not exceeded. In the absence of data on measured levels of cleanliness, time-and- usage-based methods are often used to estimate required cleaning frequency (see Table 11). Pre-cleaning micron readings should be taken to enable cleaning frequency to be confirmed as suitable or adjusted accordingly.

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

Table 11 below will assist in assessing the required frequency of cleaning.

Table 11 Kitchen grease extract systems

Perceived Level of Grease Production	Typical Example	Cleaning Intervals (Months) Daily Usage			
		Up to 6 Hours	6-12 Hours	12-16 Hours	16+ Hours
Low	No significant production of grease laden aerosols during normal daily food production operations	12	12	6	6
Medium	Moderate production of grease laden aerosols during normal daily food production operations	12	6	4	3
High	Heavy, significant or continual production of grease laden aerosols during normal daily food production operations	6	3*	3	2

* indicates suggested frequency of Cleaning for this site is every 3-months

1.15 Particular Main Canopy Arrangement

The kitchen area shall have a mechanical forced air system, with a side-wall mounted canopy arrangement over the main grouped cooking equipment, and supply air system fitted to the underside of the canopy for the cooking operatives' benefit. The extract system shall have an on/off speed controller sited away from the kitchen area to suit site and operatives' requirements.

The supply air shall then be discharged through ventilation grilles, with each grille having internal volume control. The supply air to the canopy shall be drawn from the high level fresh air intake via a supply fan. The supply directly to the canopy shall constitute 45% (85% room total) of the extract air volume to achieve a negative pressure within the kitchen area. The canopy shall be sited over the grouped cooking range of equipment as per tender drawings.

The canopy arrangement shall be as follows:

- a) 5530(w) x 1500(d) x 600(h) - dimensions to be checked and confirmed prior to site start
- b) Four-sided outer valance casing
- c) The canopy lower edge at each end shall be formed into a condensation channel with inclined internal elevation to simplify cleaning requirements

-
- d) Full area horizontal ceiling plate, manufactured in tray form, fixed and sealed into the outer valance casing
 - e) Full length single sided extract plenum, fixed and sealed to the canopy outer structure and complete with: -
 - Stainless steel baffle filters
 - Extract factory fitted duct connection collars
 - f) 1 No. full length insulated integral make-up air plenum to introduce make-up air into the canopy and into the kitchen area, comprising: -
 - Integrated supply air through front facing double deflection grills and down facing supply air nozzles on front face of canopy
 - g) LED recessed luminaries manufactured to IP65, steam, heat and grease proof to give an average level of illumination of 500 Lux upon the working surfaces
 - h) Grease collection trays
 - i) Full-length stainless-steel splashback

1.16 Particular Fryer Canopy Arrangement

The chip fryer station in the kitchen area shall have a mechanical extract system that shall have an on/off speed controller sited away from the kitchen area to suit site and operatives' requirements.

- a) 1400(w) x 900(d) x 500(h) - dimensions to be checked and confirmed prior to site start
- b) Four-sided outer valance casing
- c) The canopy lower edge at each end shall be formed into a condensation channel with inclined internal elevation to simplify cleaning requirements
- d) Full area horizontal ceiling plate, manufactured in tray form, fixed and sealed into the outer valance casing
- e) Full length single sided extract plenum, fixed and sealed to the canopy outer structure and complete with: -
 - Stainless steel baffle filters
 - Extract factory fitted duct connection collar(s)
- f) Grease collection trays

1.17 Supporting Documentation

TYPICAL CANOPY DESIGN



PERFORMANCE DESIGN DATA

MAIN COOKLINE CANOPY

Extract volume 2.1 m³/s at a constant pressure drop of 120 pascals

Supply volume 1.8 m³/s at a constant pressure drop of 100 pascals

CHIP FRYER CANOPY

Extract volume 0.75 m³/s at a constant pressure drop of 85 pascals

N.B. 80% of the air extracted from the kitchen shall be supplemented by supply air
All duties to be checked against the manufacturers filter performance data

SECTION 2.0 : ODOUR ABATEMENT SYSTEM

General

- 2.01 Odour Equipment Particulars
- 2.02 System Description
- 2.03 Particular Preventative
- 2.04 Supporting Documentation

2.01 General

As part of the KFC commitment to the brand, an odour control system will be installed to serve the kitchen extract system on the project.

– See Separate odour risk assessment document submitted with this Specification justifying the particular equipment proposed to mitigate any nuisance odour risks.

2.02 Odour Equipment Particulars

1 No. UV-O 500 ozone injection system and 1 No. UV-O 1000 ozone injection system as supplied and commissioned by Purified Air Limited **or equal and approved alternate.**

2.03 System Description

The first stage of the odour control system would be the grease baffle filters actually located within the extraction hood, which remove the large particles of grease and water vapour.

The second stage of control should be the Electrostatic Precipitator: 2 No. ESP 4500 units.

The ESP unit has been specifically designed for kitchen extract and not modified from industrial use, they have integral sumps to collect the oil, grease and smoke particles filtered out of the exhaust; this not only simplifies servicing but eradicates potentially dangerous spillage from the bottom of the units and greatly cuts down on flammable build-ups within the duct run.

The ionisation voltage has been designed to run at a negative potential which enhances the ionisation of particles and also produces more Ozone which is helpful in reducing odours in kitchen applications.

The ESP units fit in-line with the kitchen ducting and can be configured modularly to cope with all extract volume requirements

The Electrostatic Precipitator is a very efficient means for separating the particulate phase; operating efficiency when clean can be as high as 98% at particle sizes down to 0.01 micron.

The Electrostatic Precipitator does not present a high-pressure loss (190Pa approx. dependent on-airflow).

This gives a specific advantage in that most standard Kitchen extractor fans will have the capability of overcoming this small differential.

This is particularly advantageous when it is considered that if the pressure loss were high larger noisier fans would probably be necessary resulting in potential noise pollution.

The final stage of the odour control system would be the UV-O ozone injection system which is mounted on or adjacent to the extract ductwork. The system is interlocked with the extract fan power supply so that it can only operate whilst the extract fan is running.

Under its own control, the UV-O system draws in fresh air from the immediate area, this passes through the unit and across the UV-C lamps, and injects ozone directly into the negative side of the extract fan ductwork. The ozone then breaks down any odour particles prior to discharge through the final duct outlet.

How the UV-O 1000 works.

The Purified Air UV-O 1000 unit uses UV-C technology to produce ozone and hydroxyl free radicals to oxidize odours through a process of Ozonolysis. Unlike other UV-C systems, the UV-O 1000 is located outside the kitchen extract duct and connects via spigots and small diameter ducting. It is widely accepted that the best way to apply UV-C is in the airstream itself. However, the lamps quickly become dirty and the effectiveness is greatly reduced. By applying the lamps outside of the airstream, we are able to fully control the condition of the lamps, which provides for a uniform output, the air entering the UV-O 1000 does not come via the extract and is filtered on entry, the system allows a uniform delivery of clean treated air to enter the extract system. A further advantage is that the pressure loss exhibited when the unit is installed is low and uniform.

Installation

Simple to install, with low maintenance and running costs, the system is designed to be located on a wall in the kitchen or plant room or can be fitted to the ducting itself. The fact that it is located external to the ducting makes the unit ideal for retrospective installations.

Technical & Safety Considerations

The unit must always be installed on the negative side of the fan and the system should be switched via an interlock both connected to the fan and an airflow switch connected to the unit itself which will ensure that in the event the unit is disconnected from the duct or if the extract system is switched off the system will be isolated. The unit can only discharge into duct which is going to atmosphere the unit must not discharge into an enclosed space.

The unit comes as standard with six lamps but a further rack can be added to make a total of twelve lamps. Dependant on the type of cooking the maximum each set of six lamps will be capable of handling 0.5 m³/sec. UV-C technology cannot remove smoke or other particulate, for instance where there is a lot of smoke produced due to the cooking style, for example char-grilling.

Further information about odour, smoke and grease control technology can be found at

<http://www.odourcontrol.com>.

2.04 Preventative Maintenance

A maintenance contract will be taken out directly between the Occupier and their preferred maintenance provider.

Work to be carried out is:

UV-O System

1. Clean lamps and check operation
2. Replace Filter
3. Check operation and air flow filter switch

Frequency

- | | |
|-----------------------|-----------|
| 1. Clean UV-O lamps | 4 weekly |
| 2. Change UV-O Filter | Quarterly |
| 3. Change UV-O lamps | Annually |

2.05 Supporting Documentation

See Site specific Odour risk assessment document

UV-O Range

Unlike other UV-C systems, our UV-O units are located outside of the kitchen extract duct and are connected via a spigot and spiral ducting.



KEY FEATURES

- Easy to install
- Can be retro-fitted into existing duct
- Virtually no pressure loss
- No monthly maintenance needed

Our UV-O range includes:-

- UV-O 500 which handles up to 1 m³/sec of air flow
- UV-O 1000 which handles up to 2 m³/sec of air flow

The UV-O 500 has been designed for smaller capacity commercial kitchens.

The UV-O range uses UV-C technology to produce ozone and hydroxyl free radicals to oxidise cooking odours through a process of ozonolysis.

Unlike other UV-C systems, our UV-O units are located outside of the kitchen extract duct and are connected via a spigot and small diameter ducting.

Although it is widely accepted that the best way to apply UV-C light is directly in-line with the air stream itself, performance will be impacted as the lamps get dirty.

With our UV-O units the air flow does not come from the exhaust duct but from the ambient air around the unit, which is filtered on entry. This means that it is able to provide a uniform supply of ozone and hydroxyl free radicals into the extract system with an extremely low pressure loss.

For optimum performance we would recommend between 2 & 6 seconds of dwell time to allow the ozone to work effectively upon the malodorous gases within the duct.




UV-O 500 Unit UV-O 1000 Unit



- Cooking particulates and odours
- Canopy Grease Filter
- ESP - Particulate Control Unit
- UV-O 500 (above)
UV-O 1000 (below)
Odour Control Units
- Ozone joins airflow

Technical Specification

	UV-O 500	UV-O 1000
Electrical Supply	220/240V 50Hz	220/240V 50Hz
Power Consumption	140 Watts	700 Watts
Max Air Volume	up to 1m ³ /sec	up to 2m ³ /sec
Dimensions	W 605mm H 300mm D 200mm	W 1568mm H 350mm D 363mm
Weight	10.5Kg	50Kg

This unit's tried and tested UV-C technology allows for the siting of commercial kitchens in locations such as residential areas and shopping centres, where previously planning permission may not have been granted. After extensive research and development Purified Air are able to devise the best combination of lamps to provide the most effective odour control.

Safety

Ultra-Violet band C light is the most powerful of the three bands. It is a very strong oxidant and as such exposure to UV-C light is dangerous. To ensure safety the UV-C lamps are secured behind locked panels and the system has been engineered to shut down automatically when these panels are unlocked. However, since the lamps typically have a minimum life of twelve months and with the system able to operate at optimum efficiency even if one lamp fails it is unlikely that, apart from routine servicing by experienced engineers, that the system will ever need to be opened.

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Our ESP Range

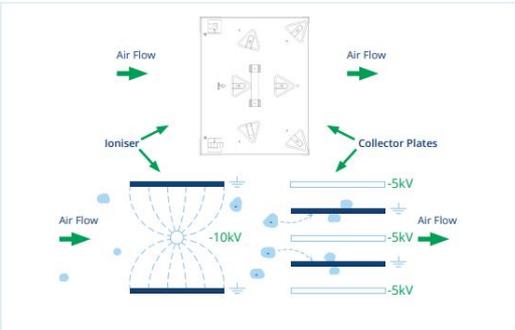


ESP 4500

- ESP 1500E which can handle up to 0.7m³/sec of air flow
- ESP 3000E which can handle up to 1.4m³/sec of air flow
- ESP 4500E which can handle up to 2.1m³/sec of air flow
- ESP 6000E which can handle up to 2.8m³/sec of air flow

Our ESP's have been specifically designed for kitchen extract systems; they have integral sumps to collect the oil, grease and smoke particles filtered out of the exhaust. This not only simplifies servicing but eradicates potentially dangerous spillage from the bottom of the units and greatly cuts down on build-ups of grease within the ducting.

The ionisation voltage has been designed to run at a negative potential which enhances the ionisation of particles and also produces more ozone which is helpful in reducing cooking odours.



The above diagram shows, in a basic visual, how an electrostatic precipitator works. As air passes into the combined ioniser / collector cell, the particulates in the air stream are polarised to a negative potential. As they continue through the ioniser and between the collector cell plates, the polarised particulates are repelled away from the negatively charged plates and attracted to the earthed plates where they stick and so are filtered out of the air flow.

Our ESP units fit in-line with the kitchen ducting and can be configured modularly to cope with all extract volume requirements.



- Cooking particulates and odours
- Canopy Grease Filter
- ESP - Particulate Control Unit
- Airflow

KEY FEATURES

- Eliminates up to 98% of oil, grease and smoke particles
- Filters particles down to sub-micron levels
- Produces Ozone to help reduce malodours
- Designed with an integral sump
- Modular in design
- Specifically designed for commercial kitchen application
- Energy efficient - uses no more than 50W
- Greatly reduces grease build-up within the duct run




Technical Specification

	ESP 1500E	ESP 3000E	ESP 4500E	ESP 6000E
Electrical Supply	220/240V 50Hz	220/240V 50Hz	220/240V 50Hz	220/240V 50Hz
Power Consumption	20 Watts	30 Watts	40 Watts	50 Watts
Max Air Volume	up to 0.7m ³ /sec	up to 1.4m ³ /sec	up to 2.1m ³ /sec	up to 2.8m ³ /sec
Dimensions W/H/D	450mm/630mm/ 640mm	900mm/630mm/ 640mm	1350mm/630mm/ 640mm	1800mm/630mm/ 640mm
Weight	55Kg	85Kg	118Kg	153Kg

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SECTION 3.0 : PLANT DETAILS

- 3.01 General
- 3.02 Restaurant Environmental Control System Description
- 3.03 Kitchen & Staff Area Environmental Control System Description
- 3.04 Kitchen & Staff Area Environmental Control System Particulars
- 3.05 Kitchen Extract Fan Equipment Particulars
- 3.06 Kitchen Supply Fan Equipment Particulars
- 3.07 General Extract Fan Equipment Particulars
- 3.08 Coldroom Plant Particulars
- 3.09 Consideration of generated Noise, potential sensitive receptors and Noise mitigation strategies

3.01 General

KFC have a common philosophy to provide a comfortable environment within restaurants for customers, with all areas having thermostatic control and adequate ventilation, which is further extended to their staff.

This section covers the technical information with respect to the external mechanical plant.

3.02 Restaurant Environmental Control System Description

The Restaurant area shall be provided with its cooling, heating and ventilation requirements via a mechanically forced air movement system, in conjunction with DX air conditioning system(s). The indoor units mated to these systems will be:

- 2 No high level four way blow ceiling cassette units to the front of house operating on a vapour compression cycle, utilising refrigerant R410A.
- 1 No Hi Wall A/C unit within the manager's office operating on a vapour compression cycle, utilising refrigerant R410A or R32.
- 1 No. Compact Cassette A.C Unit in the Staff Room.
- 1 No. Ducted Ceiling void unit serving the kitchen area

The AC systems shall operate on a re-circulation basis, with the minimum fresh air requirement in conjunction with the specified occupancy level in accordance with Document F1 of Building Regulations, provided by the dedicated fresh air ventilation system. The specific fresh air requirement shall be in accordance with Building Regulations and CIBSE Guide relating to minimum fresh air requirements per individual occupant.

Supply and return air distribution shall be through fabricated galvanised steel ductwork, routed generally as per the mechanical drawings, with air terminal devices situated within the open ceiling structure, dissipating air in the specified patterns.

Temperature control of the area shall be sensed with a return air temperature sensor, and the DX heating and cooling plant controlled accordingly.

The external heat rejection condenser shall be located in the external plant area and shall be fully weatherproofed and situated on anti-vibration mountings and secured in position.

The contractor shall be responsible for ensuring that the indoor and outdoor primary plant has the specified access space for maintenance and service around the packaged unit(s) in accordance with the manufacturer's recommendations.

3.03 Kitchen & Staff Area Environmental Control System Description

The Kitchen and staff area shall be provided with its cooling, heating and ventilation requirements via a mechanically forced air movement system, in conjunction with DX air conditioning system(s). The indoor units mated to these systems will be:

An above ceiling ducted unit operating on a vapour compression cycle, utilising refrigerant R410A or R32.

1 No four way blow ceiling cassette unit within the Staff room operating on a vapour compression cycle, utilising refrigerant R410A.

1 No Hi Wall AC unit within the manager's office operating on a vapour compression cycle, utilising refrigerant R410A.

The AC systems shall operate on a re-circulation basis, with the minimum fresh air requirement in conjunction with the specified occupancy level in accordance with Document F1 of Building Regulations, provided by the dedicated fresh air ventilation system. The specific fresh air requirement shall be in accordance with Building Regulations and CIBSE Guide relating to minimum fresh air requirements per individual occupant.

Supply and return air distribution shall be through fabricated galvanised steel ductwork, routed generally as per the mechanical drawings, with air terminal devices situated within the open ceiling structure, dissipating air in the specified patterns.

Temperature control of the area shall be sensed at room conditions with a high-level room mounted zone temperature sensor, and the and the DX heating and cooling plant controlled accordingly.

The external heat rejection condenser shall be located in the external plant area and shall be fully weatherproofed and situated on anti-vibration mountings and secured in position.

The contractor shall be responsible for ensuring that the indoor and outdoor primary plant has the specified access space for maintenance and service around the packaged unit in accordance with the manufacturer's recommendations.

3.04 Kitchen & Staff Area Environmental Control System Particulars

The unit serving the Kitchen and Staff area shall be as follows **or equal and approved**: -

AC/1 – Outdoor Unit	
Mitsubishi FDC 450 KXZRE2	
1350 x 720 x 2052	
372 kg	
62/61 dB(A)	

AC 1A Kitchen AC/Htg Void unit	
Mitsubishi FDU 224 KXZRE1 ducted internal Void Unit	
1600x883x379	
89 kg	
50 / 47 / 45 dB(A)	

AC 1B – Managers Office A/C Unit	
Mitsubishi FDK22KXZE1	
870x230x290	
11kg	
36 / 32 / 28 dB(A)	

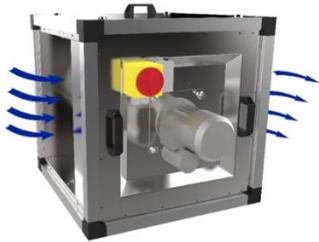
AC 1C – Staff Room A/C unit	
Mitsubishi FDTC 22 KXZE1	
570x570x248	
13 kg	
38/36/31 dB(A)	

AC 1 D/E F.O.H Cassette Units	
Mitsubishi FDT 90 KXZE1	
840x840x298	
25kg	
38/36/31 dB(A)	

3.05 Kitchen Extract Fan Equipment Particulars

The main extract system within the kitchen shall serve the single wall mounted canopy arrangements as described in earlier sections of this document. The main extract fan shall also serve both the Main Canopy and Chip Fryer Canopy. The fan is mounted in the external plant area.

The extract fan equipment shall be as follows: -

EF-01	
Systemair MUB/T-S 062 630EC centrifugal acoustic box fan	
3.1kW	
3ph	
820(h) x 820(w) x 820(d)	
81.5kg	
Sound Pressure [Sabine 20m ²]	50dB(A) @ 3M
Sound Pressure [Free Field]	36dB(A) @ 3m

Mid-frequency band, Hz (Sound power level)										
630EC	Hz	Tot	63	125	250	500	1k	2k	4k	8k
LwA Inlet	dB(A)	83	53	71	72	76	78	76	73	70
LwA Outlet	dB(A)	85	54	73	74	78	80	77	74	72
LwA Surrounding	dB(A)	57	32	55	45	44	48	47	40	35
Measuring point: qv = 2.7 m ³ /s, Ps = 653 Pa										

The filtered and treated air discharge from the fan is routed to high level through an attenuator before discharging vertically at atmosphere

Attenuator Insertion Loss Performance

CP03-CA-0560-2D	63	125	250	500	1k	2k	4k	8k
LwA Outlet	3	6	10	19	20	14	12	10

Attenuator characteristic performance:

3.06 Kitchen Supply Fan Equipment Particulars

The main supply air system within the kitchen serves the single wall mounted canopy arrangements as described in earlier sections of this document. The supply fan shall also serve both the Main Canopy and general areas via ceiling mounted diffusers. The fan is mounted internally in the ceiling void.

The supply fan equipment shall be as follows **or equal and approved** :-

SF-01	
Systemair MUB/T-S 062 560EC centrifugal acoustic box fan	
1.8W	
3ph	
820(h) x 820(w) x 820(d)	
83kg	
53dB(A) @ 3M	

Mid-frequency band, Hz (Sound power level)										
630EC	Hz	Tot	63	125	250	500	1k	2k	4k	8k
LwA Inlet	dB(A)	83	53	71	72	76	78	76	73	70
LwA Outlet	dB(A)	85	54	73	74	78	80	77	74	72
LwA Surrounding	dB(A)	57	32	55	45	44	48	47	40	35

Measuring point: $q_v = 2.7 \text{ m}^3/\text{s}$, $P_s = 653 \text{ Pa}$

The supply Fan shall be fitted with 2D Attenuators on both intake and delivery sections

Dynamic insertion loss @ Octave Band Hz										
560 2D ENP	Hz		63	125	250	500	1k	2k	4k	8k
dBW	dB(A)		-4	-8	-12	-17	-23	-17	-12	-10

3.07 General Extract Fan Equipment Particulars

The general extract fan serves the customer toilet and staff toilets areas. The fan is mounted internally within the ceiling void. Details are included in this document for reference even though the equipment is not located externally.

The extract fan equipment shall be as follows: -

EF-02	
Vent Axia ACM 200	
0.04kW	
1ph	
29dB(A)	

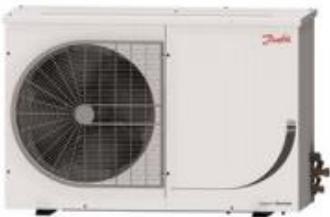
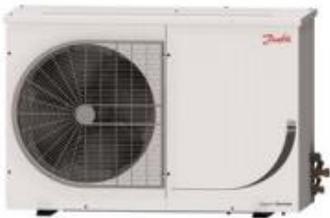
Sound Power Level dBW @ Octave Band Hz										
VA ACM 150 (@ Low)	Hz	Tot	63	125	250	500	1k	2k	4k	8k
dBW Inlet	dB(A)	38	38	46	52	57	52	54	46	37
dBW Outlet	dB(A)	37	33	45	49	54	54	52	45	36

3.08 Coldroom Plant Particulars

There are three coldrooms serving the KFC unit. The heat rejection condensers serving the coldrooms are mounted externally in the external plant area, and one separate condenser serves each coldroom unit.

The coldroom condensing units shall be located in the external plant area and shall be fully weatherproofed and situated on anti-vibration mountings and secured in position.

The refrigeration equipment selected shall be as follows **or equal and approved**: -

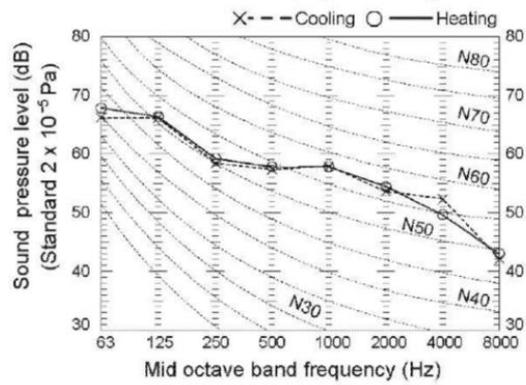
<table border="1"> <tr><td>FR/01</td></tr> <tr><td>Veg Chiller Coldroom</td></tr> <tr><td>Danfoss MSYM0144MPW05G</td></tr> <tr><td>1ph</td></tr> <tr><td>910x364x530</td></tr> <tr><td>52kg</td></tr> <tr><td>33dB(A) @ 10M</td></tr> </table>	FR/01	Veg Chiller Coldroom	Danfoss MSYM0144MPW05G	1ph	910x364x530	52kg	33dB(A) @ 10M	
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<table border="1"> <tr><td>CU-02</td></tr> <tr><td>Chicken Chiller Coldroom</td></tr> <tr><td>Danfoss Optyma Slim MSYM014MPW05G</td></tr> <tr><td>1ph</td></tr> <tr><td>695(h) x 910(w) x 364 (d)</td></tr> <tr><td>52KG</td></tr> <tr><td>33dB(A) @ 10M</td></tr> </table>	CU-02	Chicken Chiller Coldroom	Danfoss Optyma Slim MSYM014MPW05G	1ph	695(h) x 910(w) x 364 (d)	52KG	33dB(A) @ 10M	
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<table border="1"> <tr><td>CU-03</td></tr> <tr><td>Freezer Coldroom</td></tr> <tr><td>Danfoss Optyma Slim LSQM048NTW05G</td></tr> <tr><td>1ph</td></tr> <tr><td>695(h) x 1106(w) x 464 (d)</td></tr> <tr><td>62kg</td></tr> <tr><td>40dB(A) @ 10 M</td></tr> </table>	CU-03	Freezer Coldroom	Danfoss Optyma Slim LSQM048NTW05G	1ph	695(h) x 1106(w) x 464 (d)	62kg	40dB(A) @ 10 M	
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Supplemental information:

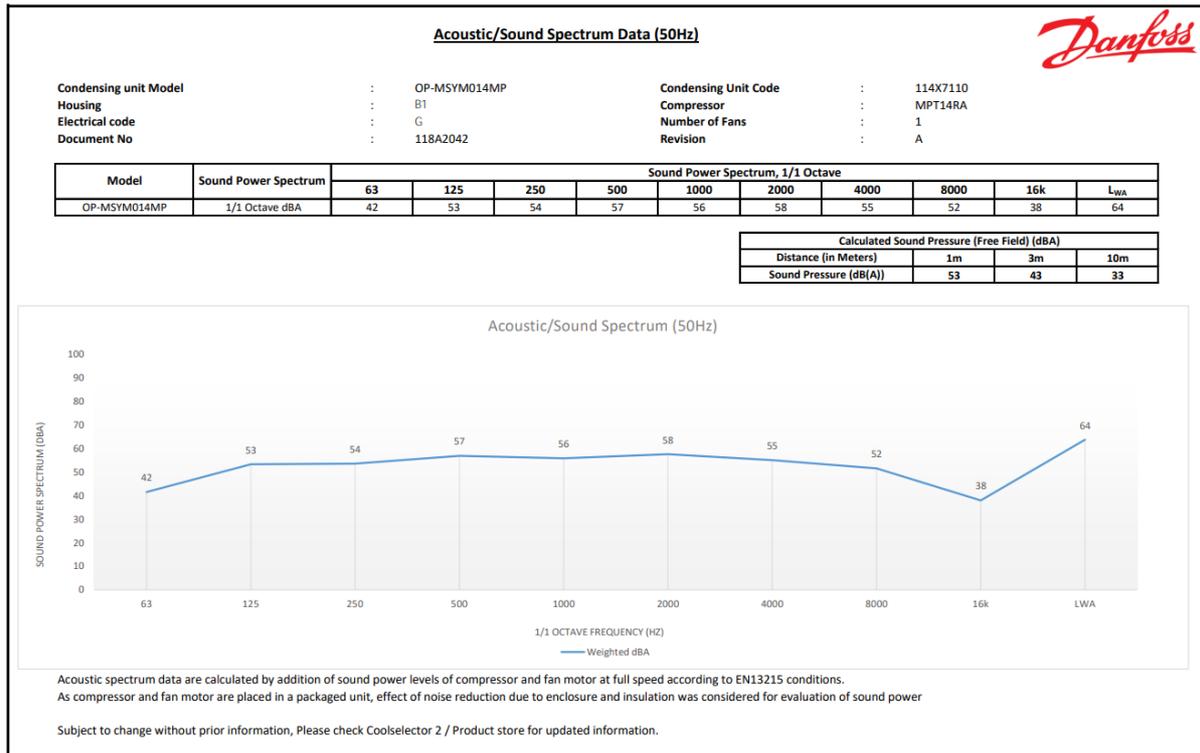
AC01 outdoor unit operational Acoustic Spectra:
Sound Pressure

FDC450KXZRE2

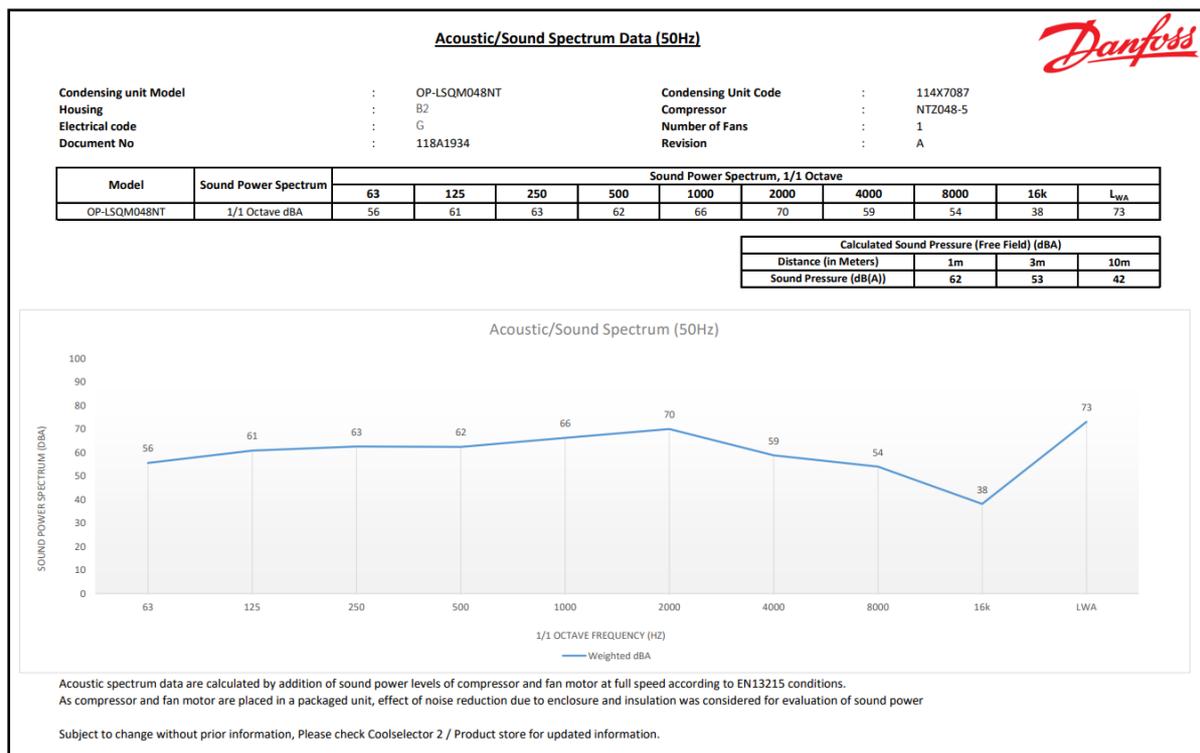
Noise level 61 dB (A) at cooling
62 dB (A) at heating



CU01&CU02 Coldroom Condenser unit Acoustic Spectra:



CU03 Coldroom Condenser unit Acoustic Spectra:



3.09 Consideration of generated Noise and potential sensitive receptors

The Proposed location of the new restaurant will be in excess of 400m from the nearest residential property and is also a similar distance from the main carriageway of the M62.

The proposed new restaurant will be surrounded by similar existing restaurants operating similar equipment and is intended to replace an existing KFC restaurant less than 100m distant from the proposed new location.

Given the above characteristics of this particular installation it is not deemed necessary to conduct a noise survey for this location.

However, based upon the proposed equipment noise characteristics identified above, and the distance to the closest receptor, - a general calculation of the likely noise level from the KFC, if measured at the closest sensitive receptor would be less than 35 dB(A) which given the location and other noise local emissions likely in this vicinity will not be perceptible above the general background noise [L_{A90}].



Odour Control Assessment
For
KFC Restaurant
Gildered Road, Batley,
Birstall, WF17 9TB

Rev A

Client:
KFC

Prepared By:

Denmech LTD
Clippers House,
Clippers Quay,
Salford M50 3XP

Table of Contents

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7.0	Guide Odour Abatement Measures.....	7
8.0	Proposed Odour and Grease Abatement Measures	8
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APPENDICES

Appendix 1	PURIFIED AIR ESP DATA SHEETS
Appendix 2	PURIFIED AIR UV-O DATA SHEETS

Revisions

Reference	Revision	Date
A	Original Issue	23-Jan-25

1 Introduction

This report provides an odour risk assessment for the new proposed KFC restaurant located on Gildered Road, Birstall, Batley, WF17 9TB. The assessment follows the approach described in the EMAQ+, Ricardo-AEA Technology/NETCEN Guidance on the 'Control of Odour and Noise from Commercial Exhaust Systems' (2018) to identify the recommended equipment and techniques to minimise the impact of restaurant kitchen extract system.

The EMAQ+ Guide was published in 2018 to supersede the original DEFRA (2005) document which was officially withdrawn in September 2017.

References in this report to 'The Guides' can be taken as referring to either or both guide documents.

2 Policy Context

The Department for Environment, Food and Rural Affairs (DEFRA) is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the UK and Northern Ireland. It provides air quality standards and objectives to reduce concentrations of key pollutants, which are designed to protect health, economic and environmental impacts. Local authorities have a legal responsibility to review and assess the odour and noise control aspects of the planning application. The DEFRA (2005) Guidance on the 'Control of Odour and Noise from Commercial Exhaust System' provided a framework to carry out an odour control risk assessment with the level of information required to support Planning Applications.

An updated report by Ricardo-AEA Technology/NETCEN (EMAQ+) has been published to supersede the original DEFRA (2005) document which was officially withdrawn in September 2017.

The formal status of the new Ricardo-AEA EMAQ+ report is currently ambiguous, as it does not carry the DEFRA accreditation, however it is widely regarded by Planning Authorities as an acceptable updated alternative to the original withdrawn document.

3 Regulation Governing Design and Performance of Ventilation Systems

There is no legislation directly governing the design and performance of commercial kitchen ventilation systems. However other regulations do exist protecting the health and safety of the employees, food safety, and local amenity. There are numerous sources of guidance and industry standards available relating to design and performance of ventilation systems.

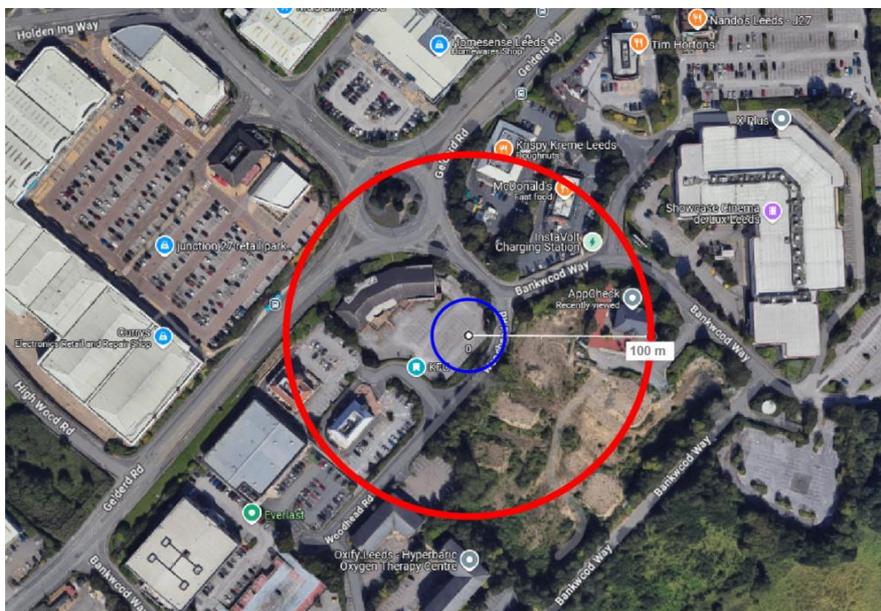
Building Regulation Part F provides the requirements for ventilation systems. For commercial kitchens, Part F refers to CIBSE Guide B section 3.6 which sets out the requirements for ventilation system in commercial kitchens.

4 Site Location

The proposed development is a new Restaurant to be constructed, located on an existing retail and business park. The closest sensitive receptors are commercial properties located to the East of the extract discharge point at approximately 70m.

The closest residential properties are located approximately 580m South of the extract discharge point.

The proximity of nearest sensitive receptors forms the basis of odour nuisance risk assessment which informs on the recommendations relating to odour control provision.



5 Assessment Criteria

The following score methodology derived from defined standardised risk levels is suggested in the original DEFRA report and is unchanged in the new EMAQ+ version as a means of determining odour control requirements using a simple risk assessment approach.

The total 'significance score' is used to determine the recommended odour control measures and techniques to be applied according to the severity of risk.

The risk schedule carries the following sub-note:

'Note 1: A Planner may take a pragmatic view when assessing whether certain low risk kitchens require any odour abatement to be fitted. In reaching this decision the Planner may consider the nature of the food being cooked and/or the size of kitchen and/or its location.'

Table 1: Odour Risk Severity Assessment

Impact Risk	Odour Control Requirement	Significance Score*
Low to Medium	Low level odour control	Less than 20
High	High level odour control	20 to 35
Very High	Very high level odour control	More than 35

* based on the sum of contributions from dispersion, proximity of receptors, size of kitchen and cooking type.

The Defra and EMAQ+ Guides on the 'Control of Odour and Noise from Commercial Kitchen Exhaust Systems' contain an assessment procedure for identifying the potential risk of odour impacts from commercial kitchen operations. The results of this risk assessment can be used to determine a suitable level of odour abatement to be installed into a commercial kitchen.

The risk assessment for odours is split into the following four parts:

- Dispersion.
- Proximity to receptors.
- Size of kitchen.
- Cooking type and grease loading.

Each part is given a risk rating score and the total risk rating denotes the level of odour abatement which is likely to be required to prevent the kitchen from causing odour impacts. The following sections of this report outline each part of the risk assessment in relation to the proposed KFC Restaurant.

6 Odour Control Assessment

6.1 Dispersion

The risk rating for dispersion relates to the conditions under which kitchen extraction emissions are discharged. The relevant risk ratings described in the guidance are shown below. The risk score is shown in parentheses.

- VERY POOR (20) – Low level discharge, discharge into courtyard, or restriction on stack.
- POOR (15) – Discharge not low level, but below eaves, or discharge rate below 10m/s.
- MODERATE (10) – Discharging 1m above eaves at a rate of 10-15m/s.
- GOOD (5) – Discharging 1m above ridge at a rate of 15m/s or more.

These guidance classifications relate to a typical High Street situation with a pitched roof building and the relationship of the point of discharge to the eaves and ridge of the pitched roof. The drivers for these scores are the relationship of the point of discharge to a physical obstruction and the effects on wind generated air movement around the building. A separation of at least 1m from the nearest roof surface is considered sufficient isolation from the wind generated high velocity surface boundary layer. A discharge at least 1m above the ridge is considered also to provide isolation from any negative effects of wind turbulence caused by the obstruction.

Air extracted from the kitchen at this restaurant will be discharged vertically via a single high velocity terminal located in the back of house service yard. This will be at an approximate height of 3.5 meters, and approximately equivalent to the level of the Eaves (Roof).

6.1 Proximity to Receptors

The risk rating for proximity to receptors relates to the distance between the point of discharge of kitchen emissions and the nearest sensitive receptor locations. Sensitive receptor locations may be residential properties, commercial premises or frequently used public open spaces. The relevant risk ratings described in the guidance are shown below. The risk score is shown in parentheses.

- CLOSE (10) – Closest sensitive receptor is less than 20m from kitchen discharge.
- MEDIUM (5) – Closest sensitive receptor is between 20 and 100m from kitchen discharge.
- FAR (1) – Closest sensitive receptor is more than 100m from kitchen discharge.

The risk rating for this restaurant for the proximity to sensitive receptors is judged to be 'medium' as existing commercial properties are located at a distance of between 20m and 100m from the exhaust point.

6.3 Size of Kitchen

The risk rating for size of kitchen relates to the volume of food prepared by the kitchen and is described in terms of the capacity of the restaurant or take-away. The relevant risk ratings described in the guidance are shown below. The risk score is shown in parentheses.

- LARGE (5) – More than 100 covers or a large-sized take-away.
- MEDIUM (3) – Between 30 and 100 covers or a medium-sized take-away.
- SMALL (1) – Less than 30 covers or a small take-away.

The number of meals served at this restaurant classifies it as a 'large' sized kitchen.

6.4 Cooking Type and Grease Loading

The risk rating for cooking type and grease loading relates to the type of cooking methods employed in the kitchen and the type of food prepared. The relevant risk ratings described in the guidance are shown below. The risk score is shown in parentheses.

- VERY HIGH (10) – Pubs (those serving a high level of fried food), fried chicken, burgers or fish and chips.
- HIGH (7) – Kebab, Vietnamese, Thai or Indian.
- MEDIUM (4) – Cantonese, Japanese or Chinese.
- LOW (1) – Most pubs, Italian, French, Pizza or Steakhouse.

Under the current guidance the KFC Restaurant would be classified with a score of 10.

The Defra/EMAQ+ Guides state:

'Odour control must be designed to prevent odour nuisance in a given situation. The following score methodology is suggested as a means of determining odour control requirements using a simple risk assessment approach. The odour control requirements considered here are consistent with the performance requirements listed in this report.'

Table 2: KFC Restaurant Kitchen Odour Risk Assessment Summary

Criteria	Score	Score	Details
Dispersion	Very poor	20	Low level discharge, discharge into courtyard or restriction on stack.
	Poor	15	Not low level but below eaves, or discharge at below 10m/s.
	Moderate	10	Discharging 1m above eaves at 10-15m/s.
	Good	5	Discharging 1m above ridge at 15m/s.
Proximity of receptors	Close	10	Closest sensitive receptor less than 20m from kitchen discharge.
	Medium	5	Closest sensitive receptor between 20 and 100m from kitchen discharge.
	Far	1	Closest sensitive receptor more than 100m from kitchen discharge.
Size of kitchen	Large	5	More than 100 covers or large sized take away.
	Medium	3	Between 30 and 100 covers or medium size take away
	Small	1	Less than 30 covers or small take away.
Cooking type (odour and grease loading)	Very high	10	Pub (high level of fried food), fried chicken, burgers or fish and chips.
	High	7	Kebab, Vietnamese, Thai or Indian.
	Medium	4	Cantonese, Japanese or Chinese.
	Low	1	Most pubs, Italian, French, Pizza or steakhouse.
TOTAL		35	

The scoring system results in an overall odour risk rating of ‘high’, with a recommended high level of odour control as defined by The Guides to minimise the risk of odour impacts.

7.0 Guide Odour Abatement Measures

The Guides define a number of recognised odour abatement measures, to be used individually or in combinations to achieve levels of abatement rated 'None', 'High' or 'Very High', depending on configuration and on sizing and selection.

Table 3: EMAQ+ Guide Abatement Classifications

Abatement Type	Level of Odour Abatement
Panel and Bag	None
Panel, Bag and HEPA	None
Pre, Fine and Carbon Filter	High
Panel, Bag, HEPA and Carbon Filter.	High - 0.1 to 0.2 Seconds dwell Very High - 0.2 to 0.4 Seconds dwell Extreme - 0.3 to 0.8 Seconds dwell
Panel, Bag, HEPA and Carbon Filter (As above)	High to Very High (As above)
ESP and Carbon Filter (As above)	High to Very High (As above)
ESP and Counteractant	Medium to High
ESP and UV/Ozone	High

In addition to the above, whilst the exhaust location is factored into the point scoring assessment method, the guidance additionally states that the discharge should:

1. Discharge the extracted air not less than 1m above the roof ridge of any building within 20m of the building housing the commercial kitchen.
2. If 1 cannot be complied with for planning reasons, then the extracted air shall be discharged not less than 1m above the roof eaves or dormer window of the building housing the commercial kitchen. Additional odour control measures may be required.
3. If 1 or 2 cannot be complied with for planning reasons, then an exceptionally high level of odour control will be required.

Thus, if the flue cannot be extended to a height of 1m above the tallest building within 20m, then additional odour abatement may be required.

8.0 Proposed Odour & Grease Abatement Measures

8.1 Context

This section of the report describes the proposed odour control measures for this restaurant with the particular site specific odour risk factors, using the assessment and control techniques from the Guides, to minimise the risk of odour impacts giving cause for complaint at surrounding properties.

Based on the recommendations and approaches identified in section 6 and following discussions with KFC and Soul Foods Group LTD and their construction development team, the following combination of odour abatement measures have been selected as the most appropriate solution for this situation.

The kitchen extract schematic shows the arrangement of proposed grease and odour control system.

8.2 General

'High Level' classification grease control and odour abatement will be provided with the use of Nationwide Canopy grease baffle filters, electrostatic precipitation (ESP) filters followed by ozone injection.

8.3 System Description

Canopy Filtration

Each item of cooking equipment (friers and ovens) has local fume extraction by means of a low level extract canopy containing stainless steel, removable and cleanable grease filters, which remove 98% of airborne grease at source.

Extract air volumes are controlled to within the effective grease removal range of the filters.

Ductwork Cleaning

Kitchen extract ductwork access doors are provided at sufficient frequency to access all internal duct surfaces for audit and cleaning purposes and not less than 2.0m intervals.

Internal ductwork cleanliness is maintained to KFC standardised cleaning standards, based on BESA (Building Engineering Services Association) Specification: Fire Risk Management of Grease accumulation in Kitchen Extraction Systems - TR19 – Grease 2019.

Frequency of duct cleans or audits is based on a scale related to restaurant production levels designed to meet TR19 requirements for internal duct cleanliness with a minimum of 2 cleans or audits per year.

Ventilation Rates

Kitchen ventilation rates are typically in excess of 30 air changes per hour, with full fresh air make-up.

The system is designed and automatically controlled to maximise ambient fresh air free cooling and minimise supply air heating and cooling energy use.

Electrostatic Precipitator

Electrostatic filtration serves as 'fine filtration' for further removal of airborne grease particles which further reduces grease contamination, with only yet smaller grease particles passing through and these very much reduced particles are more effectively oxidised by the subsequent ozone treatment stage than would otherwise be the case.

Ozone Injection

Ozone injection will be provided with ozone laden air discharged into the exhaust ductwork immediately after the electrostatic precipitator and before the kitchen extract fan. The ductwork will be configured to ensure a minimum 2 second ozone contact period before discharge to atmosphere.

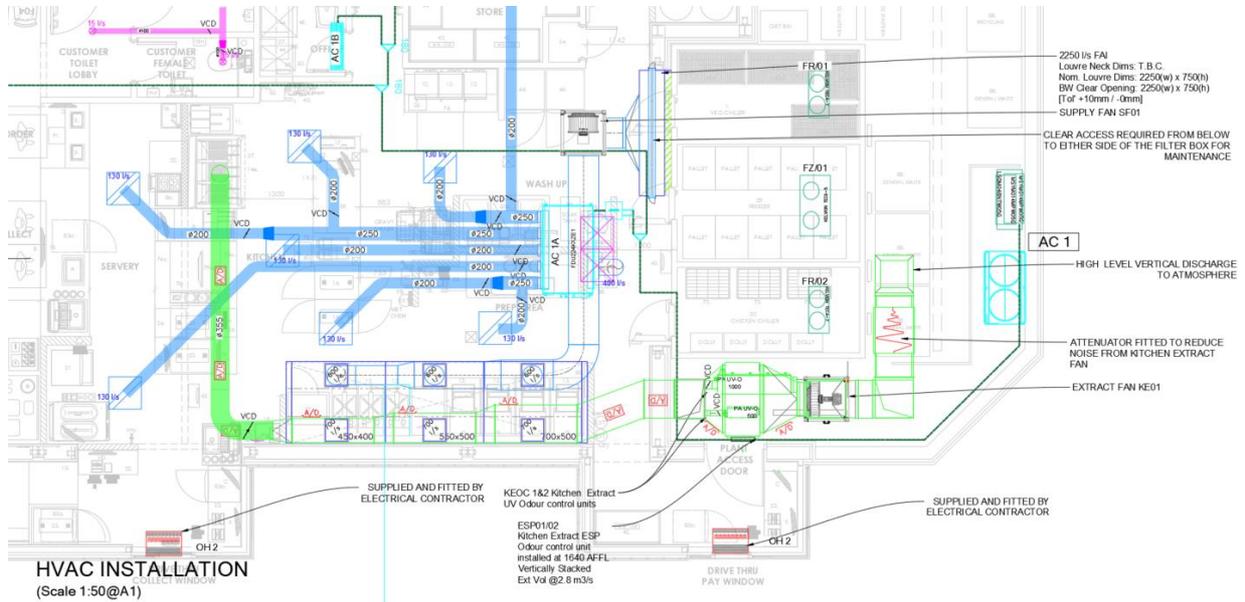
Monitoring & Alarm

The ESP and UVO units will include the manufacturer's remote status indication reporting to the building management system in order to alert the store operator by automatic email in the event of failure of operation.

Discharge Arrangement

A common ducted extraction system is connected to a centrifugal extract fan which discharges to atmosphere via an un-restricted vertical high velocity discharge at 15 m/s at nominal design air volume flowrate, to provide effective dispersal of the exhaust air. The discharge point at this restaurant is equivalent to the highest point of the building to provide the best possible conditions to achieve the most effective dispersion to atmosphere.

8.4 Kitchen Extract Schematic



9.0 Maintenance

The Standard arrangement for maintenance is for quarterly changing of supply air system filters and six-monthly servicing.

Kitchen extract duct cleaning is carried out in accordance with Building & Engineering Services Association Guide To Good Practice – Internal Cleanliness of Ventilation Systems TR19.

Access doors are provided in the extract ductwork at minimum 2000mm intervals for cleaning purposes.

Ozone generators are serviced annually,

Electrostatic precipitator filters are serviced every two to three months.

Intervals for filter changing and duct cleaning may be increased or decreased depending on the particular store characteristics when they are apparent.

10.0 Conclusion

An assessment has been carried out using the EMAQ+ (Formerly DEFRA) style Odour Risk Assessment method and concluded that in this situation a 'High' level of odour control is recommended as defined by the EMAQ+ Guide.

Appropriate odour mitigation can be achieved to protect the amenity of nearby receptors

The proposed grease and odour control measures meet the requirements of the 'High' classification control band.

This report should be read in conjunction with drawing reference: DML-XX-GF-DR-M-5701

Our ESP Range

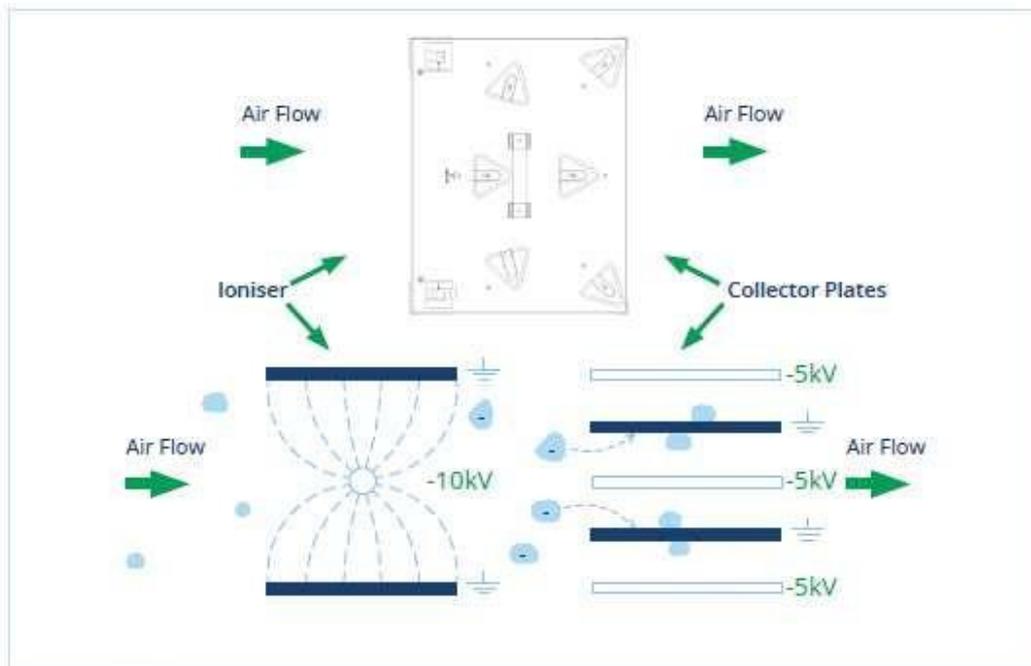


ESP 4500

- ESP 1500E which can handle up to 0.7m³/sec of air flow
- ESP 3000E which can handle up to 1.4m³/sec of air flow
- ESP 4500E which can handle up to 2.1m³/sec of air flow
- ESP 6000E which can handle up to 2.8m³/sec of air flow

Our ESP's have been specifically designed for kitchen extract systems; they have integral sumps to collect the oil, grease and smoke particles filtered out of the exhaust. This not only simplifies servicing but eradicates potentially dangerous spillage from the bottom of the units and greatly cuts down on build-ups of grease within the ducting.

The ionisation voltage has been designed to run at a negative potential which enhances the ionisation of particles and also produces more ozone which is helpful in reducing cooking odours.



The above diagram shows, in a basic visual, how an electrostatic precipitator works. As air passes into the combined ioniser / collector cell, the particulates in the air stream are polarised to a negative potential. As they continue through the ioniser and between the collector cell plates, the polarised particulates are repelled away from the negatively charged plates and attracted to the earthed plates where they stick and so are filtered out of the air flow.

APPENDIX 1 – PURIFIED AIR ESP DATA SHEETS

Our ESP units fit in-line with the kitchen ducting and can be configured modularly to cope with all extract volume requirements.



KEY FEATURES

- Eliminates up to 98% of oil, grease and smoke particles
- Filters particles down to sub-micron levels
- Produces Ozone to help reduce malodours
- Designed with an integral sump
- Modular in design
- Specifically designed for commercial kitchen application
- Energy efficient: - uses no more than 50W
- Greatly reduces grease build-up within the duct run



3 ESP Units Stacked in modular formation



4 ESP Units Stacked in modular formation with a double pass

Technical Specification

	ESP 1500E	ESP 3000E	ESP 4500E	ESP 6000E
Electrical Supply	220/240V 50Hz	220/240V 50Hz	220/240V 50Hz	220/240V 50Hz
Power Consumption	20 Watts	30 Watts	40 Watts	50 Watts
Max Air Volume	up to 0.7m ³ /sec	up to 1.4m ³ /sec	up to 2.1m ³ /sec	up to 2.8m ³ /sec
Dimensions W/H/D	450mm/630mm/ 640mm	900mm/630mm/ 640mm	1350mm/630mm/ 640mm	1800mm/630mm/ 640mm
Weight	55Kg	85Kg	118Kg	153Kg



Purified Air Limited, Lyon House, Lyon Rd, Romford, Essex RM1 2BG England
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 enq@purifiedair.com | www.purifiedair.com

UV-O Range

Unlike other UV-C systems, our UV-O units are located outside of the kitchen extract duct and are connected via a spigot and spiral ducting.



Our UV-O range includes:-

- UV-O 500 which handles up to 1 m³/sec of air flow
- UV-C 1000 which handles up to 2 m³/sec of air flow

The UV-O 500 has been designed for smaller capacity commercial kitchens.

The UV-O range uses UV-C technology to produce ozone and hydroxyl free radicals to oxidise cooking odours through a process of ozonolysis.

Unlike other UV-C systems, our UV-O units are located outside of the kitchen extract duct and are connected via a spigot and small diameter ducting.

Although it is widely accepted that the best way to apply UV-C light is directly in-line with the air stream itself, performance will be impacted as the lamps get dirty.

With our UV-O units the air flow does not come from the exhaust duct but from the ambient air around the unit, which is filtered on entry. This means that it is able to provide a uniform supply of ozone and hydroxyl free radicals into the extract system with an extremely low pressure loss.

For optimum performance we would recommend between 2 & 6 seconds of dwell time to allow the ozone to work effectively upon the malodorous gasses within the duct.

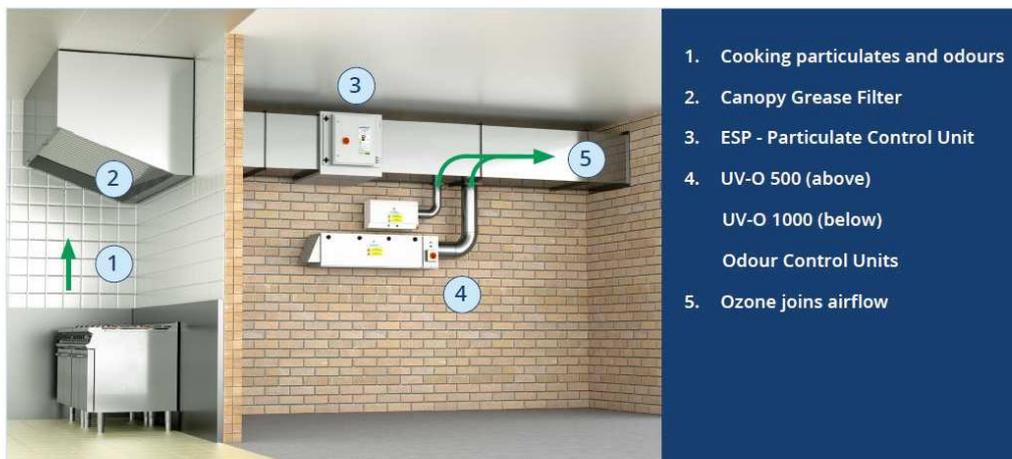


UV-O 500 Unit



UV-O 1000 Unit

APPENDIX 2 – PURIFIED AIR UV-O DATA SHEETS



1. Cooking particulates and odours
2. Canopy Grease Filter
3. ESP - Particulate Control Unit
4. UV-O 500 (above)
UV-O 1000 (below)
Odour Control Units
5. Ozone joins airflow

Technical Specification

	UV-O 500	UV-O 1000
Electrical Supply	220/240V 50Hz	220/240V 50Hz
Power Consumption	120 Watts	700 Watts
Max Air Volume	up to 1m ³ /sec	up to 2m ³ /sec
Dimensions	W 605mm H 300mm D 200mm	W 1568mm H 350mm D 363mm
Weight	10.5Kg	50Kg

This unit's tried and tested UV-C technology allows for the siting of commercial kitchens in locations such as residential areas and shopping centres, where previously planning permission may not have been granted. After extensive research and development Purified Air are able to devise the best combination of lamps to provide the most effective odour control.

Safety

Ultra-Violet band C light is the most powerful of the three bands, it is a very strong oxidant and as such exposure to UV-C light is dangerous. To ensure safety the UV-C lamps are secured behind locked panels and the system has been engineered to shut down automatically when these panels are unlocked. However, since the lamps typically have a minimum life of twelve months and with the system able to operate at optimum efficiency even if one lamp fails it is unlikely that, apart from routine servicing by experienced engineers, that the system will ever need to be opened.



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