Overview

CCE (Commercial Catering Engineers Ltd). Is pleased to submit the design and specification for the proposed commercial kitchen ventilation system at 70 Poyser Street Wrexham. The property is located within a residential area with takeaways and corner shop within close proximity. The ventilation system has been designed to provide effective extraction, minimise odour and noise emissions, and reduce the risk of nuisance to nearby receptors.

- System Specification
- Design
- Noise and Odour Control Measures
- Drawing CCE-JBS1303
- Cleaning and Maintenance Requirements
- Appendices

Appendix A Extract Fan

Appendix B Supply Fan

Appendix C Baffle Filters

Appendix D Silencers

Appendix E Activated Carbon

Appendix F Fine Filtration

System Specification

To design and install a commercial kitchen ventilation system that:

- Provides adequate extract and supply air
- Controls heat, grease, odour and airborne contaminants
- Minimises noise emissions
- Prevents nuisance to neighbouring residential properties
- Complies with EMAQ+ guidance, DW/172 and TR/19 Grease

Whilst no system is 100% effective, a properly designed and installed ventilation system can drastically reduce the level of pollution (Odour, noise).

System Design

Wall dual air (extract and supply) two canopies to create a corner canopy with rectangular ductwork above, central spigot top of each canopy manufactured from stainless steel and including front facing grilles, fire rated LED spotlights, and baffle type grease filters.

Extract Flow Rate Calculation

Extract flow rate calculated using the 'Thermal Convection Method' for the cooking equipment listed during our site visit.

Item	Area m2	Coefficient	Flow Rate m^3s^{-1}
Oven	0.675	0.51	0.34425
Free standing single fryer	0.292	0.45	0.1314
Free Standing twin basket fryer	0.487	0.45	0.21915
Griddle	0.6	0.40	0.24
Theoretical extract flow rate required			0.9348
Canopy Factor - overhead wall open one end			1.20
Specific extract flow rate required			1.12176
All electric catering equipment			

Supply Air Calculation

Supply (make-up) air shall be introduced through the front grilles of the canopy. The airflow rate shall be adjustable via a variable-speed controller, allowing the fan speed to be increased or reduced to suit kitchen conditions. The system shall operate between 75% and 95% of the total extract duty, maintaining the kitchen under slight negative pressure. With an extract rate of 1.12176 m^3/s, the corresponding supply air range shall be 0.84–1.07 m^3/s.

System Arrangement

- Rear extract / front supply top of canopy
- Extract and supply air duct through building to flat roof
- Extract ductwork only – any compartment breach to be installed using method 2 or 3 of BS 9999 depending on approval by appropriate person.
- Extract Horizontal- filter housing → silencer → acoustic box fan → vertical silencer → riser
- Discharge via high-velocity jet cowl, 1 metre above eaves
- Flexible connections either side of the fan
- System mounted on U-channel and strut framework
- TR/19 Grease-compliant access doors provided throughout
- Supply air, fire damper if fire compartment breached.

High-Level Discharge (Jet Cowl)

A high-velocity jet cowl is selected to achieve 10–15 m/s discharge velocity. This promotes rapid vertical plume rise and effective dispersion of odours and moisture above roof level, reducing ground-level impacts.

Installation to ridge height is not feasible due to:

- Structural constraints
- Wind loading
- Safety considerations

The jet cowl therefore provides the most suitable and safe high-level discharge solution.

External Extract Arrangement Detail

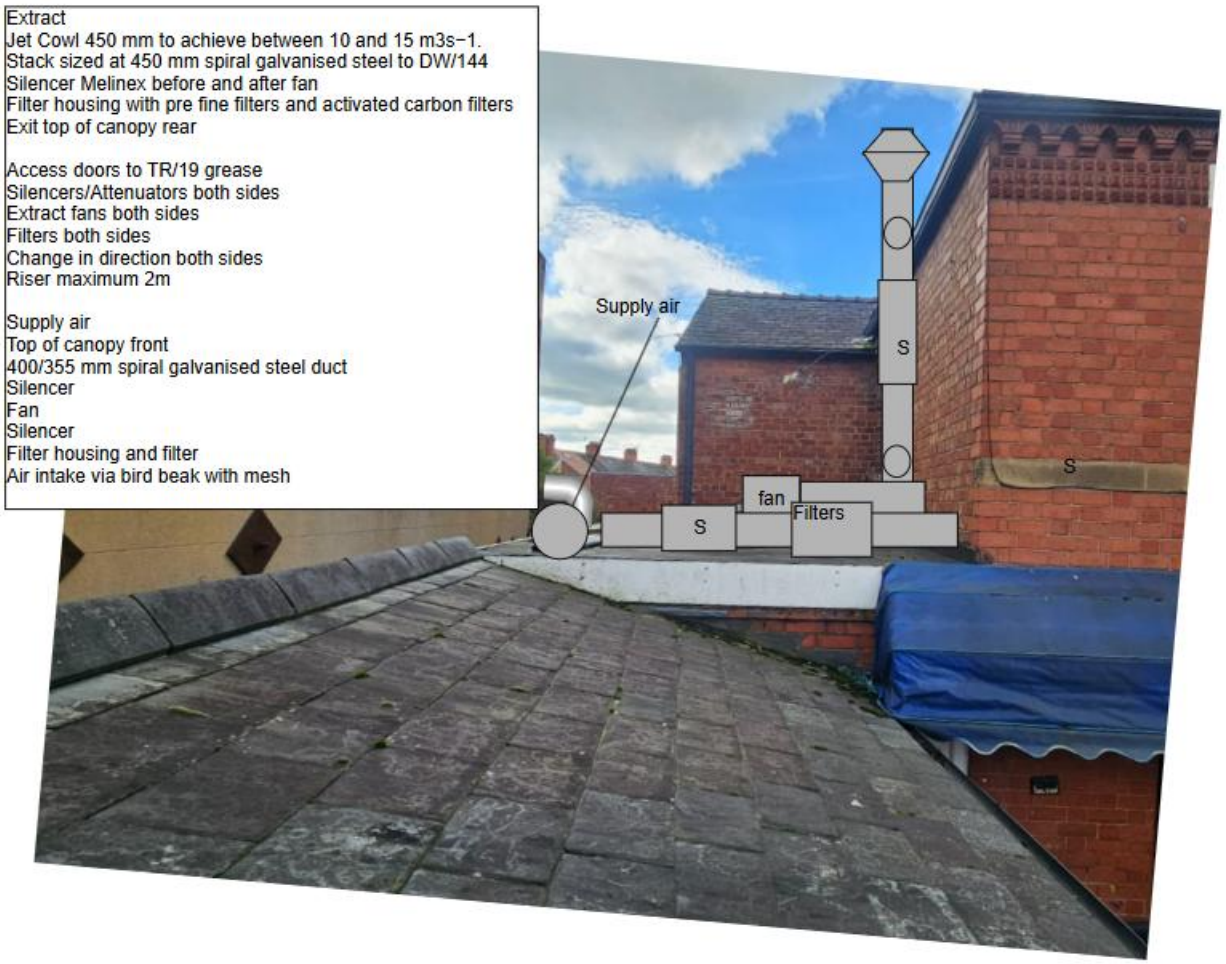
Upon exiting the roof, the system incorporates:

- Galvanised steel ductwork to DW/144
- Fine filtration followed by activated carbon filtration within the same housing
- Melinex-lined silencers before and after the extract fan
- Acoustic box fan extract
- supply
- Jet cowl with weather protection and drainage

External Supply Arrangement Detail

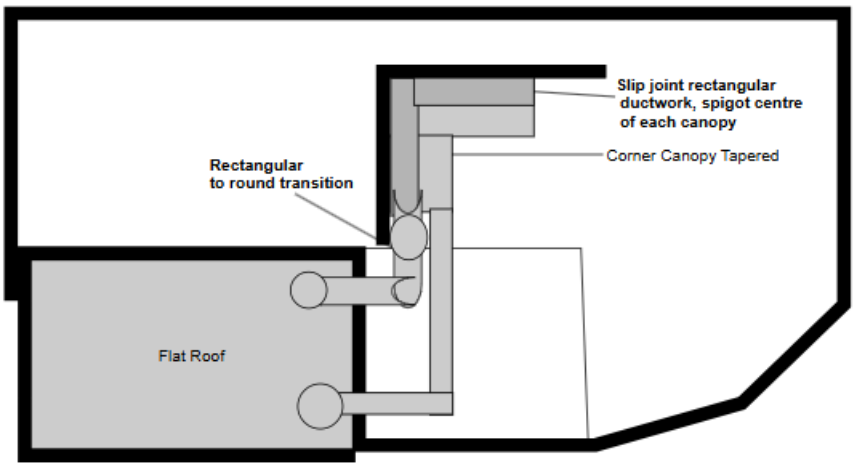
- Galvanised steel ductwork to DW/144
- Silencer before and after supply fan
- Filter housing and food grade filter G4 Coarse Filter 70% or equivalent
- Bird beak with mesh

Refer to drawing CCE-JBS1304 for general layout not to scale.



CCE-JBS1304

Internal general layout not to scale



If the duct breaches a fire compartment, advice should be sought from Building Control or a qualified fire engineer.

Only two methods are suitable for commercial kitchen extraction, according to BS 9999:

Method 2: The duct runs inside a fire-resistant service duct (protected shaft) to the outside. The shaft must not contain any other services or fire dampers.
Method 3: The duct itself is fire-resistant.

For projects of this size, Method 2 is typically used due to the prohibitive cost of Method 3. Method 2 is also easier for clients to maintain or modify in the future.

CCE-JBS1004

Odour and Noise Control

Risk Assessment for Odour

	Descriptor	Score	Impact Risk	Odour Control Required
Dispersion	Moderate Discharging 1m above eaves at 10-15m/s	10	High	High level of odour control
Proximity of receptors	Close Closest sensitive receptor less than 20m from kitchen discharge	10		
Size of kitchen/food cooking area	Medium Between 30 and 100 covers or medium sized takeaway	3		
Cooking type and odour grease loading	Very High	10		
Total		33		

The EMAQ+ risk assessment places the development in the **High Odour Control** category.

The extract airflow rate is **1.12 m^3/s**, exhausted via a 450 mm duct with silencers and a high-efficiency jet cowl.

Odour Abatement Measures

1. High-Efficiency Baffle Filters (Primary Grease Removal)

High-efficiency flame-baffle filters fitted within the canopy provide enhanced grease and aerosol capture. This reduces particulate loading on the downstream filtration stages, in accordance with EMAQ+ requirements for pre-conditioning.

2. Fine Filtration (Secondary Grease/Aerosol Control)

Fine filtration is installed within the external filter housing prior to the carbon stage:

F5 Bag Filter (EN779) – Product code 1410624

This protects the carbon and ensures effective odour treatment.

3. Activated Carbon Filtration (Gas-Phase Odour Removal)

Carbon type: Discarb Cells – Grade 50 Extra Duty (GR50, 1620606)

Designed for a 0.2-second residence time duty

Manufacturer duty capacity at 0.80 m^3/s

System flow: 1.12 m^3/s with air distribution reducing internal face velocity

Achieves 0.20 seconds residence time, meeting EMAQ+ requirements for High-risk sites (0.2–0.4s)

This ensures effective removal of vapour-phase odorous compounds and supports compliance with planning requirements.

Noise Abatement Measures

Fan Noise Levels (Manufacturer Data)

Extract Fan selected

KABT/4-6000/450 1.1KW 3PH 230/400V 50HZ ACOUSTIC BOX FAN

Motor out of the air steam, acoustic box with 25 mm thickness of fireproof insulation.

The extract fan has been assessed using the manufacturer-supplied octave-band sound power and sound pressure data. The following table summarises the key levels relevant to environmental noise assessment:

Sound Performance

	63	125	250	500	1k	2k	4k	8k	Overall
Inlet (LwA)	54	73	74	76	75	76	72	66	82
Inlet LpA @ 3m	43	61	63	64	63	64	61	55	71
Outlet (LwA)	54	80	77	81	80	76	71	65	86
Outlet LpA @ 3m	42	68	65	69	68	64	59	53	75
Surrounding (LwA)	48	59	62	66	63	58	53	47	70
Surrounding LpA @ 3m	36	47	51	54	52	47	42	36	58

Silencer Data (F-Series Manufacturer Table)

Two F-Series cylindrical silencers are included:

Two upstream (horizontal) silencer

One downstream (vertical) silencer
Silencer attenuation is taken directly from the manufacturer's table (F-Series Data Sheet)

Silencer Attenuation Data - Silencers: Two × F0450-2 straight-through units

	63	125	250	500	1k	2k	4k	8k	Overall
Outlet LpA@3m	42	68	65	69	68	64	59	53	75
Combined attenuation(2	7	9	16	26	27	23	18	15	

silencers after fan)									
Corrected LpA @ 3 m	35	59	49	43	41	41	41	38	43-44dB(A)

The kitchen extract system shall incorporate two F0450-2 straight-through silencers installed in series on the discharge ductwork. Single unit attenuation data is taken from the manufacturer's F-Series performance table (F0450-2).When combined, the silencers provide a total reduction sufficient to achieve a predicted external noise level of 43–44 dB(A) at the nearest residential façade (estimated at 3m from the jet cowl termination point). The extract system will operate only between 13:00 and 22:20, ensuring compliance with typical evening-period plant noise limits of ≤ 45 dB(A) at noise-sensitive premises.

To prevent structure-borne noise, the extract fan will be installed using flexible anti-vibration connectors on both the inlet and discharge spigots. These connectors isolate the fan from the ductwork and prevent transmission of vibration into the building fabric. The fan assembly will be mounted on a Unistrut framework with proprietary anti-vibration feet, ensuring that all mechanical vibration is damped at source and not transferred into the supporting structure. These measures are included to comply with recognised best practice for minimising structure-borne noise from mechanical plant and to prevent any perceptible vibration or hum at neighbouring properties.

Supply Fan Selected

5740124200 - TCBB/4-400/H 1PH 230V 50Hz CASED AXIAL

With REB 3 electronic speed controller

Sound Performance

Hz	63	125	250	500	1k	2k	4k	8k	Overall dB(A) / dB
Inlet (LwA)	47	59	66	72	73	72	67	59	78 dB(A)
Inlet LpA @ 3m	29	41	48	54	55	54	49	41	60 dB(A)

Sound Distance 3 Apply

Sound Directivity



Podded F Series after the fan

Hz	63	125	250	500	1k	2k	4k	8k	Overall
Outlet LpA@3m	29	41	48	54	55	54	49	41	60dB(A)
Podded atten	3	7	12	22	29	29	25	20	
Corrected LpA @ 3 m	26	34	36	32	26	25	24	21	34dB(A)

Combine Supply and Extract

Hz	63	125	250	500	1k	2k	4k	8k
Extract after silencers	35	59	49	43	41	41	41	38
Supply after podded	26	34	36	32	26	25	24	21
Combined	35	59	49.5	43.2	41.1	41.1	41.1	38.0

The supply and extract systems have been acoustically treated to ensure compliance with the required external noise limit of ≤ 45 dB(A) at the nearest noise-sensitive façade. The supply fan uses the manufacturer's stated LpA @ 3 m values together with a single F-Series F0450-2P podded silencer, providing octave-band attenuation of 3, 7, 12, 22, 29, 29, 25 and 20 dB respectively, bringing the supply fan output down to approximately 34 dB(A) at 3 m. The extract fan, treated with two F0450-2 straight-through silencers, achieves a final level of approximately 43–44 dB(A) at 3 m. When combined, the total predicted external noise level from both supply and extract systems is approximately 45 dB(A), satisfying typical planning and Environmental Health requirements for plant operating before 22:00.

The ventilation system has been acoustically designed using the manufacturer's octave-band sound data and certified silencer attenuation values, allowing an accurate prediction of external noise levels without requiring a separate third-party noise report. The combined supply and extract noise level at 3 m has been demonstrated to meet the Local Authority's criterion of 45 dB(A) at the nearest residential façade. Should any unexpected noise issues arise following installation, further reasonable mitigation such as additional acoustic treatment or housing around the plant will be implemented to ensure ongoing compliance

Cleaning and Maintenance

To comply with TR/19 Grease and maintain performance:

Daily / Routine

- Grease baffle filters cleaned daily
- Grease channels cleaned after every service
- Collection drawers emptied and cleaned daily (if fitted)

Planned Maintenance

- System cleaned professionally to TR/19 Grease
- Contractor to advise frequency following initial clean
- Fine filters inspected weekly and replaced as required
- Carbon filters checked monthly and replaced every 4–6 months or if breakthrough occurs

Grease Accumulation Guidance (TR/19)

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

References

- EMAQ+ Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018 Update)
- DW/172 (2nd Edition, 2018)
- BS EN 16282 (Equipment for commercial kitchens – Ventilation components)
- HSE Ventilation of Kitchens in Catering Establishments – Catering Sheet No. 10