



Frough Limited

233 HIGH STREET, UXBRIDGE

Odour Assessment

Revision A

233 HIGH STREET, UXBRIDGE

Odour Assessment

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1.0 INTRODUCTION

- 1.1 Create Consulting Engineers Limited (CCE) have been appointed by Frough Limited to undertake an Odour Assessment (OA) in support of the commercial redevelopment of 233 High Street, Uxbridge.
- 1.2 The Proposed Development lies within the jurisdiction of the London Borough of Hillingdon (LBH). The site is bounded by High Street to the south, a service road to the west, and Cumberland Way to the north. The red line boundary is shown in Figure 1.1.
- 1.3 The Site currently comprises two linked buildings, including the former Regal Cinema entrance on High Street. The cinema is situated behind a row of terraced buildings and to the south of Cumberland Way. The proposals involve the conversion of the former cinema nightclub into a banqueting hall with associated kitchen facilities, alongside the construction of a new four-storey hotel comprising 31 bedrooms to the west of the existing structure. The Proposed Development is anticipated to be completed by 2028.
- 1.4 The Proposed Development is located to the rear of the mixed-use frontage along Uxbridge High Street, within an area characterised by ground floor retail and commercial units with residential flats above. While the site is set back from the primary High Street frontage, it remains within a dense urban block. To the west lies the main shopping centre and Uxbridge Underground Station, whilst the surrounding areas to the north and east are predominantly residential in character.
- 1.5 Figure 1.2 shows the location of the proposed kitchen relative to the nearby residential units.
- 1.6 As part of the proposals, the ground floor of the former cinema and nightclub will be converted into a banqueting hall and commercial kitchen, located directly beneath residential accommodation.
- 1.7 The proposed banqueting hall will operate seven days a week, serving food for organised events. The menu will include a range of hot and cold food options. Cooking equipment will comprise electric hobs, commercial ovens, and deep fat fryers.
- 1.8 Figure 1.3 presents the proposed ground floor layout of the premises.

Assessment Scope

- 1.9 The proposed development includes a commercial kitchen serving both the banqueting hall and the proposed hotel. As odour emissions from cooking activities have the potential to affect nearby sensitive receptors, an OA has been undertaken to evaluate potential impacts in the vicinity of the site.
- 1.10 This assessment has been specifically prepared following a recent refusal of planning permission by the Local Planning Authority (Ref: 3638/APP/2025/2108). The reason for refusal stated that:

"Insufficient detail has been provided to demonstrate that the required mitigation measures to protect neighbouring amenity in terms of odour pollution would not have a detrimental impact on the Grade II Listed Building, or to determine that they do not require separate Listed Building Consent. As such, the required conditions to protect amenity cannot be attached to a grant of planning consent and the development is contrary to Policy S11 of the London Plan (2021), Policy DMTC 4 of the Hillingdon Local Plan: Part Two – Development Management Policies (2020), Policies BE1 and EM8 of

the Hillingdon Local Plan: Part 1 – Strategic Policies (2012) and paragraphs 187(e) and 198 of the National Planning Policy Framework (2024)."

- 1.11 In response to the reason for refusal, this OA assesses the effectiveness of the proposed odour mitigation measures and their integration within the development, including potential implications for the Grade II* Listed Building. The assessment has been informed by the *Kitchen Ventilation Performance Specification – Odour Mitigation* report prepared by CCE (Ref: BO/VL/P25-3550/05). For any overlapping matters regarding Listed Building Consent or impacts on the Grade II* structure, reference should be made to the standalone Heritage Statement previously submitted in 2025 (Ref: H00347).

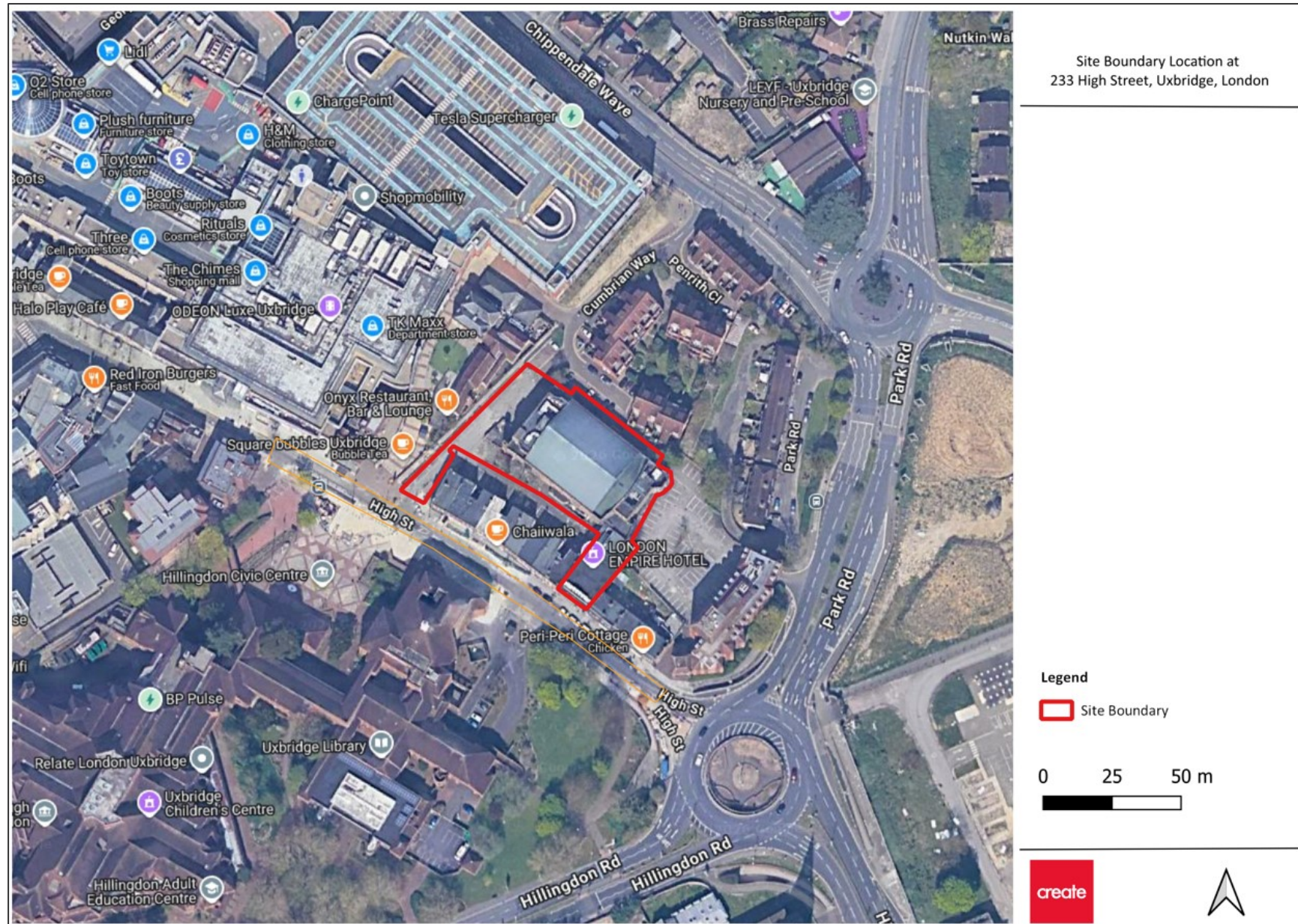


Figure 1.1: Location of the development site

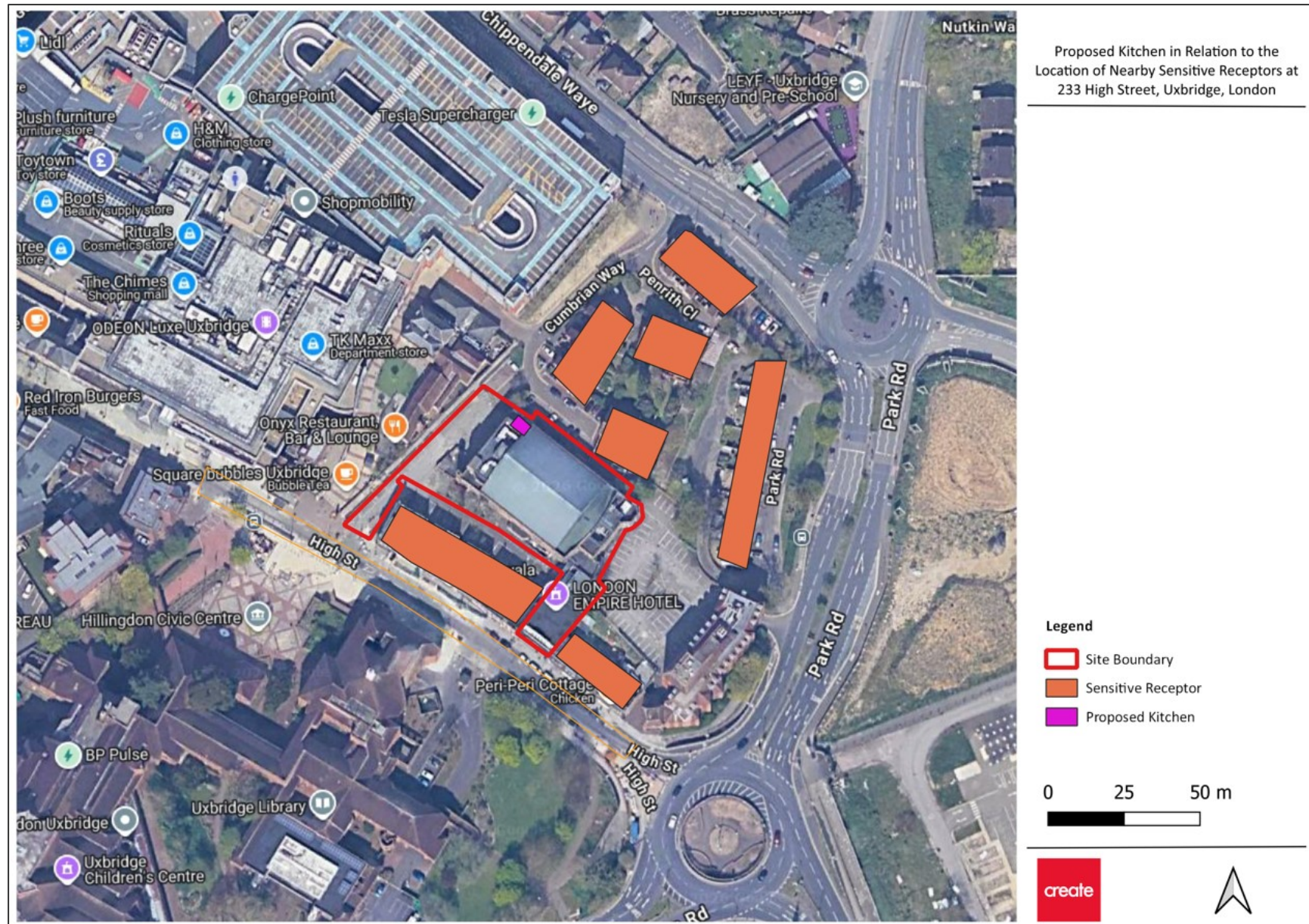


Figure 1.2: Location of the proposed kitchen relative to nearby residential units

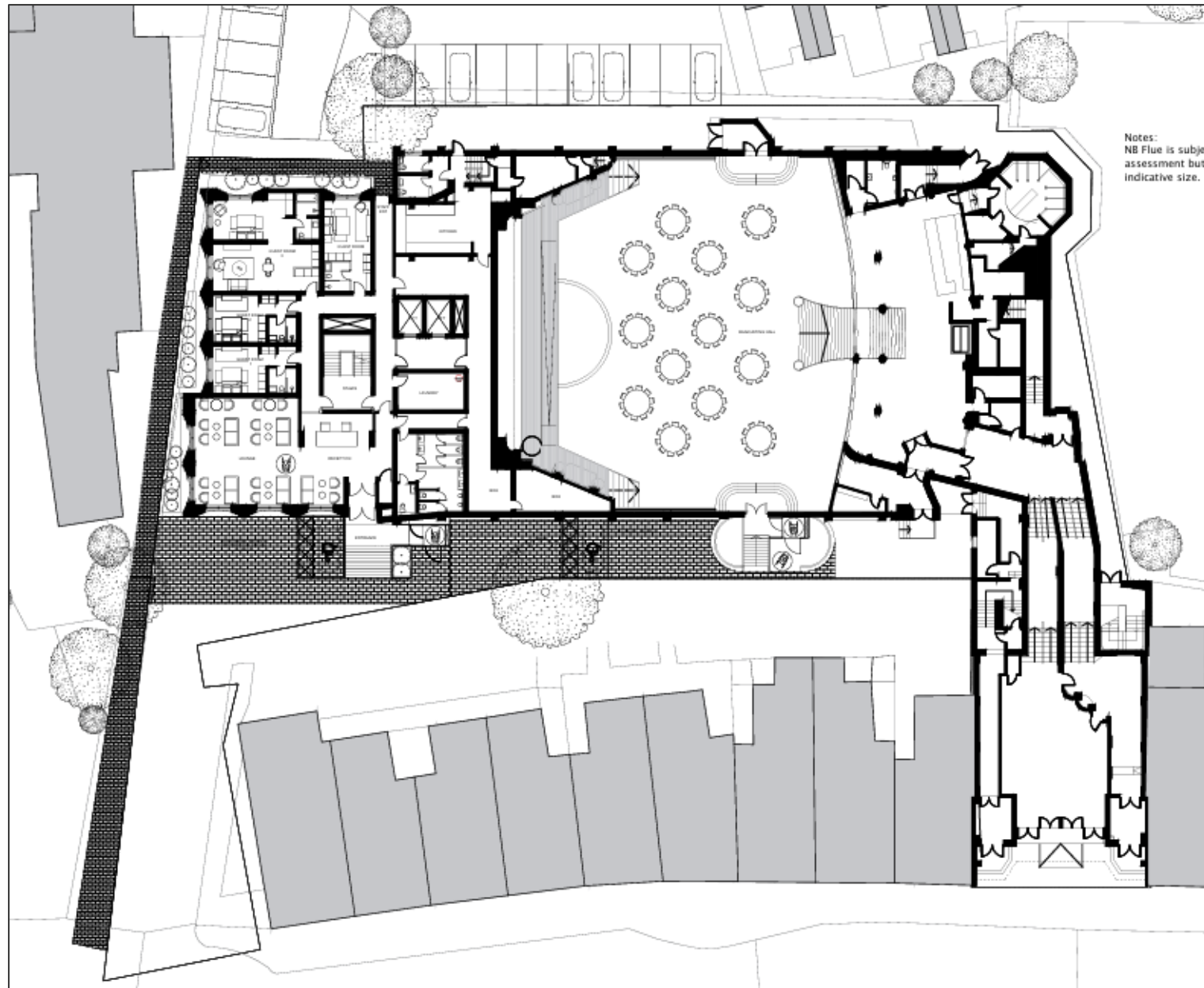


Figure 1.3: Proposed Ground Floor Layout

2.0 LEGISLATION AND POLICY CONTEXT

Environmental Protection Act 1990 (Part III – Statutory Nuisance)

- 2.1 The primary domestic legislation governing ambient odour and emissions from commercial premises is Part III of the Environmental Protection Act (EPA) 1990. Under Section 79(1)(d) of the Act, *"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance"* can be designated as a Statutory Nuisance.
- 2.2 Local Authorities hold a statutory duty under Section 80 of the EPA 1990 to serve an Abatement Notice if they are satisfied that a statutory nuisance exists or is likely to occur or recur. For commercial kitchens, the standard defence against an Abatement Notice is demonstrating the use of Best Practicable Means (BPM) to prevent or counteract the effects of the effluvia. This assessment identifies the mitigation measures required to demonstrate the use of Best Practicable Means.

BESA DW/172 – Specification for Kitchen Ventilation Systems

- 2.3 The Building Engineering Services Association (BESA) publication DW/172 is the recognized industry standard for the design, installation, and sizing of commercial kitchen ventilation systems in the United Kingdom. It provides strict guidelines on canopy dimensions, internal face velocities, grease filtration efficiencies, and minimum global capture velocities. All extraction hood configurations, primary baffle filters, and internal duct networks for this development have been designed to maintain strict compliance with DW/172 parameters to ensure effective capture of cooking plumes at the source.

BESA TR19® Grease – Cleanliness of Kitchen Extract Systems

- 2.4 The internal surfaces of kitchen extract systems become heavily fouled with grease and cooking oil aerosols over time, presenting a severe fire risk and reducing mechanical efficiency. BESA TR19® Grease provides the definitive specification for the testing, cleaning, and verification of commercial kitchen extraction ductwork. Compliance with TR19® standards dictates mandatory mechanical cleaning intervals and regular Micron Deposit Gauge (MDG) testing based on cooking hours and grease loading. Adherence to this standard is required to maintain the fire-safety integrity of the system and prevent downstream odour bypass caused by structural grease saturation.

National Planning Policy Framework 2024

- 2.5 The National Planning Policy Framework (NPPF), paragraph 97, states that:

"Local planning authorities should refuse applications for hot food takeaways and fast food outlets: a) within walking distance of schools and other places where children and young people congregate, unless the location is within a designated town centre; or b) in locations where there is evidence that a concentration of such uses is having an adverse impact on local health, pollution or anti-social-behaviour".

2.6 NPPF, paragraph 198, states that:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.”

Local Planning Policy

London Borough of Hillingdon Local Plan

2.7 The London Borough of Hillingdon Local Plan sets out the borough’s planning strategy up to 2026, guiding development, housing, and infrastructure. It consists of two parts: strategic policies (Part 1, adopted in 2012) and detailed development management policies and site allocations (Part 2, adopted in 2020). A review is underway to align with national planning reforms, with a new plan expected by December 2026.

London Borough of Hillingdon Local Plan Part 2: Development Management Policies (Adopted 2020)

2.8 This Development Management Policies document forms part of Hillingdon’s Local Plan Part 2 and sets out detailed policies to guide the Council’s decisions on individual planning applications.

“Policy DMTC 4: Amenity and Town Centre Uses

Proposals for restaurants and hot food takeaways, drinking establishments, betting shops, night clubs, casinos, amusement centres, minicab offices and other similar uses will only be supported provided that they:

- i) would not result in adverse cumulative impacts due to an unacceptable concentration of such uses in one area;*
- ii) would not cause unacceptable disturbance or loss of amenity to nearby properties by reason of noise, odour, emissions, safety and security, refuse, parking or traffic congestion; and*
- iii) would not detrimentally affect the character or function of an area by virtue of the proposed use or visual impact;”*

Key Guidance Documents

Control of Odour and Noise from Commercial Kitchen Exhaust Systems (EMAO+2018)

2.9 This guidance provides practical advice for assessing and mitigating the environmental impacts of commercial kitchen operations, particularly in relation to odour and noise emissions. Aimed at developers, planners, and environmental health officers, the document outlines a risk-based approach to odour assessment, considering factors such as cooking type, frequency, proximity to sensitive receptors, and ventilation design. The assessment methodology outlined in the guidance has been utilised throughout this report where relevant. The methodology is replicated in Appendix A of this report.

Guidance on the Assessment of Odour for Planning (IAQM, 2018)

- 2.10 This guidance sets out a risk-based approach for assessing odour impacts from new developments, considering emission characteristics, local sensitivity, and mitigation. It supports planning decisions and is the current industry standard widely recognised by UK planning authorities.

H4 Odour Management: How to comply with your environmental permit (2011)

- 2.11 The Environment Agency's H4 Odour Management Guidance (2011) outlines the expectation that operators must take all reasonable and appropriate measures to prevent odour pollution from occurring beyond the site boundary. Where complete prevention is not practicable, operators are required to minimise odour emissions using suitable control techniques. The guidance emphasises that the level of control should be proportionate to the risk of odour impact and tailored to the nature of the activities undertaken, the sensitivity of the surrounding area, and site-specific conditions. Measures should also take into account the balance between the effectiveness of control and the associated costs, ensuring a practical and justified approach to odour management.

3.0 ODOUR ASSESSMENT

Odour Risk

- 3.1 The odour risk associated with the kitchen extraction system has been assessed in accordance with the EMAQ+ and DEFRA methodology.

Dispersion

- 3.2 To protect the architectural integrity of the Grade II* Listed Cinema building, no external ductwork or penetrations will be made to its fabric. Instead, the kitchen extraction system will route internally through a dedicated, fire-rated shaft into the new four-storey hotel extension. The system will terminate vertically as a dedicated flue exiting approximately 1.0m above roof level of the new hotel extension, away from the historical façade.
- 3.3 In accordance with BESA DW/172, internal duct velocities of approximately 8 m/s are assumed for the grease extract ductwork, and a terminal discharge velocity of approximately 12 m/s is assumed at the flue exit to promote atmospheric dispersion and minimise local downwash and re-entrainment. The flue exit layout is illustrated in Figure 3.1, which visually confirms that the flue is located entirely on the new hotel extension and will not be visible on the historical façade of the Grade II* Listed structure.
- 3.4 Based on the EMAQ+/DEFRA guidance, the proposed flue arrangement is classified as providing moderate.

Proximity of receptors

- 3.5 The Proposed Development is located within a highly constrained and sensitive urban environment, directly beneath residential flats. The nearest sensitive receptors are located to the north and east, at distances of less than 20 m from the proposed high-level discharge point. As such, the receptor proximity is classified as Close.

Size of kitchen

- 3.6 The kitchen facility will serve a dual purpose: providing catering for the 31-bedroom hotel (approx. 40 covers) and full catering operations for the main banqueting hall floor, which accommodates up to 150+ guests. Based on the EMAQ+/DEFRA guidance, kitchens serving more than 100 covers are classified as large; accordingly, the proposed kitchen has been classified as a large commercial kitchen.

Cooking type

- 3.7 The proposed menu will include a range of hot and fast-food options, involving cooking processes such as deep fat frying, grilling, baking, and boiling. The use of deep fat fryers and similar equipment is associated with elevated grease and odour emissions. Based on the EMAQ+/DEFRA guidance, the proposed cooking activities are classified as very high-risk.
- 3.8 Table 3.1 presents the assessed odour risk.

Criteria	Score	Score
Dispersion	Moderate	10
Proximity of Receptors	Close	10
Size of kitchen	Large	5
Cooking type	Very High	10
Total Score		35

Table 3.1: Odour Risk Assessment Criteria and Scores

- 3.9 As shown in Table 3.1, the overall odour risk score from the proposed premises is scored at 35. In strict accordance with the EMAQ+ and DEFRA framework, a significance score 35 mandates a High-Level Odour Control Requirement to successfully mitigate risk and entirely protect local residential amenity. Consequently, the engineering mitigation string detailed below has been upgraded beyond standard commercial specifications to deliver the advanced particulate and gas-phase abatement required for this threshold

Odour Abatement System

- 3.10 Based on the results of the odour risk assessment, it is considered that the Proposed Development would require mitigation suitable for a high level of odour risk. To protect the architectural integrity of the Grade II* Listed Cinema building, no external ductwork or penetrations will be made to its fabric. Instead, the kitchen extraction system will route internally through a dedicated, fire-rated shaft into the new four-storey hotel extension. The system will terminate vertically as a dedicated flue exiting 1.0m above roof level of the new hotel extension, away from the historical façade.
- 3.11 To meet the 'High' risk threshold, a multi-stage abatement string will be seamlessly integrated internally within the plant area of the new hotel extension to avoid heritage impacts:
- Primary Mitigation: Commercial-grade stainless-steel canopies fitted with high-efficiency primary grease baffle filters compliant with BESA DW/172 standards.
 - Secondary Particulate Control: Dual-stage Electrostatic Precipitators (ESPs) units designed specifically for kitchen extraction, achieving a particulate/smoke removal efficiency in excess of 90–95% to substantially reduce smoke and grease aerosols before they reach the carbon bed.
 - Gas/Odour Mitigation: A deep-bed Activated Carbon Filtration system located downstream of the ESP, sized specifically to provide sufficient dwell time and surface area to adsorb residual volatile organic compounds (VOCs) and odorous gases. A supplementary UV/ozone treatment stage may be incorporated at the detailed design stage if provided for within the final specification.
- 3.12 To promote maximum atmospheric dispersion and clear the surrounding building wake, the assessment assumes a flue diameter of approximately 500 mm and a terminal discharge velocity of approximately 12 m/s to achieve an effective high-velocity vertical discharge. The system will utilise a dedicated final vertical termination to preserve momentum, maximise atmospheric dispersion, and minimise the potential for local downwash and re-entrainment. The precise final flue dimensions, fan pressure drops, discharge velocities, and cowl detailing will be confirmed by the appointed contractor during the detailed design stage.

- 3.13 It is recommended that carbon filters are replaced regularly, and that the extraction system is properly maintained and cleaned in accordance with the updated maintenance schedule to minimize the potential for odour-related complaints.
- 3.14 The identified control measures are considered appropriate given the assumed nature of the development and are consistent with the abatement measures outlined in EMAQ+ and DEFRA guidance for high-risk cooking activities. In addition, the inclusion of fine filtration is recommended to assist in particulate removal.
- 3.15 Subject to the implementation of the proposed and recommended mitigation measures, it is considered that the potential for odour impacts at nearby sensitive receptors would be reduced to an acceptable level.



Figure 3.1: Proposed Southern Elevation Showing the Extract Ductwork Flue Exit

4.0 ODOUR ABATEMENT SYSTEM MAINTENANCE AND MANAGEMENT

- 4.1 To ensure the continued effectiveness of the odour abatement system and to minimise the risk of odour nuisance, it is recommended that a robust maintenance and servicing regime is implemented.
- 4.2 The recommended maintenance schedule for the kitchen odour abatement system is based on manufacturer recommendations, BESA TR19 guidance, IAQM technical advice, and industry best practice, as well as the manufacturer's maintenance manuals, to ensure the system operates efficiently and effectively.
- 4.3 A summary of the recommended maintenance procedures is presented in Table 4.1

System Component	Maintenance Task	Frequency
Kitchen Canopy	Inspect and clean external stainless-steel surfaces	Daily
	Thorough cleaning of internal and external surfaces	Daily (Cleaned by kitchen staff at close of play)
Grease Filters	Inspect and replace as necessary (or per manufacturer recommendations)	Daily to Weekly (Deep clean/Dishwasher cycle)
	Inspect ioniser wires and collector plates for grease bridging.	
ESP	Remove, wash, and completely clean internal electronic cells using a specialist detergent or steam wash.	Every 1 to 2 months (Steam clean/wash cells to maintain charge)
	Inspect and clean electrical contact pins and safety interlocks.	
Carbon Filters	Test carbon media to assess saturation and replace as indicated	Every 4 to 6 months (Complete media replacement based on pressure drop indicators)
	Inspect external casing and seals	Every 3 months
Extract Ductwork	Clean using mechanical brushing and vacuum system	Every 3 months (Quarterly) (Mandatory for high-grease/heavy usage outputs)
	Scrape first few metres above canopy to remove grease	Every 3 months (Quarterly) (Mandatory for high-grease/heavy usage outputs)
Extract Fans	Inspect and clean to remove grease build-up	Every 3 months

Table 4.1: Recommended Maintenance Schedule for Kitchen Odour Abatement System

- 4.4 Because the system relies on high-efficiency ESPs to eliminate smoke and fine grease aerosols before they reach the carbon beds, strict adherence to the 1-to-2-month electronic cell cleaning cycle is required. Heavy cooking oils and fast-food grease loading will cause cell saturation, leading to electrical arcing, reduced efficiency, and premature blinding of the downstream carbon filters. Cleaned collector plates must be allowed to dry completely before re-insertion to prevent damage to the power packs.
- 4.5 All inspection, filter replacement, and maintenance activities must be fully documented in a dedicated maintenance logbook. The frequency of cleaning may need to be increased depending on the intensity of use once the kitchen is operational. It is recommended that the maintenance schedule be reviewed periodically and adjusted in line with manufacturer recommendations and operational demands.
- 4.6 These procedures will support the effective functioning of the odour abatement system and are essential to maintaining compliance with the mitigation strategy outlined in this assessment.

5.0 CONCLUSIONS

- 5.1 Create Consulting Engineers Limited have been appointed by Frough Limited to undertake an Odour Assessment in support of the redevelopment of 233 High Street, Uxbridge.
- 5.2 The Proposed Development has the potential to result in odour impacts associated with cooking activities within the proposed kitchen. As such, an Odour Assessment was undertaken to consider potential effects and to identify appropriate odour control measures.
- 5.3 The assessment has been specifically prepared to address a recent planning refusal by the Local Planning Authority (Ref: 3638/APP/2025/2108) regarding an insufficiency of technical detail for the proposed odour mitigation system. The primary focus of this report is to define the exact engineered specifications, extraction routing, and abatement efficiencies required to protect neighbouring amenity from odour pollution. The assessment therefore demonstrates how the odour control measures can be successfully integrated internally without causing a physical or visual impact on the Grade II* Listed Cinema building.
- 5.4 Based on the assessed parameters, a high level of odour control is required to prevent potential nuisance. While this does not necessarily indicate that the development will result in significant odour impacts or harm to local amenity, it does highlight the need for appropriate mitigation to minimise potential effects.
- 5.5 The specified and recommended odour abatement strategy is considered appropriate given the proposed system design. The measures align with EMAQ+ and DEFRA guidance for high-risk kitchen operations and, if implemented as described, are expected to reduce potential odour impacts at nearby sensitive receptors to an acceptable level.
- 5.6 Subject to the contract installation, commissioning verification, and adherence to the maintenance schedules detailed herein, the development will not generate any significant or offensive odour from being detectable at or beyond the site boundary. Consequently, odour emissions do not represent a constraint to the granting of planning consent for this development.
- 5.7 It is recommended that the assumptions used in this assessment are reviewed and, if necessary, revised should more detailed design information become available at a later stage.

6.0 DISCLAIMER

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- 6.3 Create Consulting Engineers Limited accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

7.0 REFERENCES

- 7.1 *Environmental Permitting (England and Wales) Regulations 2016*. Environment Agency (2016)
- 7.2 *H4 Odour Management: How to comply with your environmental permit*. Environment Agency (2011)
- 7.3 *Guidance on the Assessment of Odour for Planning*. Institute of Air Quality Management (IAQM) (2018)
- 7.4 *Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems*. Department for Environment, Food and Rural Affairs (2005)
- 7.5 *Local Plan*. London Borough of Hillingdon (2020)
- 7.6 *National Planning Policy Framework*. Ministry of Housing, Communities and Local Government (2024)
- 7.7 *The London Plan. Mayor of London*, Greater London Authority (2021)

APPENDIX A

Odour Assessment Methodology

The Proposed Development has the potential to cause odour impacts due to emissions from cooking processes. Accordingly, an odour assessment has been undertaken following the methodology set out in the guidance document *Control of Odour and Noise from Commercial Kitchen Exhaust Systems* prepared by EMAQ+ for the Department for Environment, Food and Rural Affairs (DEFRA, 2018). This document updates the previous DEFRA guidance published in 2005.

Assessment Methodology

The EMAQ+ and DEFRA methodology provides a systematic approach for identifying the risk of odour impacts associated with food preparation premises and determining an appropriate level of odour mitigation to reduce potential effects to acceptable levels.

The assessment process begins by scoring the proposed premises against specific criteria, as set out in Table 1 below. These criteria include dispersion characteristics, proximity of sensitive receptors, size of the kitchen, and cooking type, each assigned a score based on their relative influence on odour risk.

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 takeaway
	Medium	3	Between 30 and 100 covers or medium sized takeaway
	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 & chips, Turkish, Middle Eastern or any premises cooking with solid fuel
	High	7	Vietnamese, Thai, Indian, Japanese, Chinese or steakhouse
	Medium	4	Cantonese, Italian, French, Pizza (gas fired)
	Low	1	Most pubs (no fried food, mainly reheating and sandwiches etc) or Tea rooms

Table A1: Risk Scoring Criteria

The combined score from the criteria in Table 1 is then used to determine the overall risk level and the required odour control measures, as shown in Table 2.

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

Table A2: Odour Control Requirement

Based on the risk score and impact level, appropriate odour control systems are identified from the options summarised in the EMAQ+ and DEFRA guidance, ensuring mitigation measures effectively reduce potential odour impacts from the kitchen exhaust emissions.

APPENDIX B

Kitchen Ventilation Performance Specification – Odour Mitigation



Frough Limited

233 HIGH STREET, UXBRIDGE

Kitchen Ventilation Performance Specification –
Odour Mitigation

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Kitchen Ventilation Performance Specification – Odour Mitigation

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1.0 INTRODUCTION

- 1.1 This document sets out the performance requirements for the kitchen extract ventilation and odour control systems serving the proposed banqueting hall and commercial kitchen at 233 High Street, Uxbridge.
- 1.2 The development comprises the conversion of former cinema and nightclub areas into a new food-led operation located beneath residential accommodation within a constrained and sensitive urban environment. The system design must therefore ensure robust control of grease, smoke and odour emissions to protect building occupants, neighbouring receptors and satisfy Local Authority Environmental Health requirements.
- 1.3 The site and existing building are prominently located along Uxbridge High Street, with the L-shaped structure forming part of a frontage comprising retail units at ground floor level and residential flats above.
- 1.4 To the west lies the main shopping centre and Uxbridge Tube Station complex. South of the site are a large office building and the Uxbridge Council offices. The northern and eastern boundaries are predominantly residential. The proposed hotel site, outlined in red, is currently used as a car park for the adjacent gym.
- 1.5 It is proposed to convert the former cinema and nightclub areas on the ground floor into a new banqueting hall and kitchen.
- 1.6 The proposed banqueting hall will be open 7 days a week and will serve breakfast, lunches and dinners. The menu for the premises has not yet been finalised, but it is understood that it will be serving cold and hot food including fast food. It is anticipated that cooking methods are likely to involve the use of electric hobs, ovens and a small number of deep fat fryers.
- 1.7 Emissions will be extracted from the kitchen via a stainless-steel canopy fitted with grease baffle filters. At the time of writing this report the type of canopy is not decided, and it is unknown whether emissions will be discharged to the atmosphere horizontally or vertically, and the location of dedicated louvre. For the assessment assumptions were made.
- 1.8 It is proposed that the discharge duct will be installed to the roof of the building to terminate approximately 1m min of roof level. Fresh air intake will need to be reviewed for a suitable position away from any intake of air contaminants.
- 1.9 The discharge arrangement shall:
 - Promote effective dispersion of treated air
 - Minimise risk of re-ingestion into the building or adjacent properties
 - Be coordinated with architectural and planning constraints
 - Where high-level discharge is not achievable, enhanced odour control shall be provided to maintain acceptable environmental performance.
- 1.10 The Contractor shall allow for all costs associated with the complete design, coordination, installation, commissioning and demonstration of the kitchen extract and odour control system as described within this specification.

- 1.11 The pricing shall be deemed to include all labour, materials, plant, equipment, temporary works and specialist subcontractors necessary to deliver a fully compliant and operational system.
- 1.12 The Contractor shall include for full design responsibility, including the preparation of detailed calculations, coordination drawings, specialist supplier input, and all technical submissions required to demonstrate compliance with the specified performance, odour control and planning requirements. This shall include the development of an odour control strategy aligned with DEFRA guidance and suitable for approval by the Local Authority Environmental Health Officer.
- 1.13 Allowances shall be included for all specialist odour mitigation equipment, including but not limited to electrostatic precipitators, carbon filtration systems, ultraviolet or hybrid treatment systems, and associated housings, supports and access provisions. The Contractor shall include for all necessary pre-filters, secondary filtration stages, replacement media, and commissioning consumables.
- 1.14 The Contractor shall include for all ductwork systems associated with grease extract, including fully welded or liquid-tight construction to DW/172, access panels for cleaning, drainage provisions, fire-rated solutions at compartment interfaces, and any additional measures required to suit constrained routing within the existing building.
- 1.15 Full allowance shall be made for working within a refurbishment building project, including restricted access, limited working space, protection of existing fabric, and compliance with conservation requirements. The Contractor shall include for additional labour, sequencing, temporary works and careful installation methods necessary to accommodate these constraints, including any requirements for out-of-hours working or phased installation.
- 1.16 The Contractor shall include for all builder's work in connection with the installation, including formation of penetrations, structural supports, brackets, builder's work openings, making good, fire stopping, and weatherproofing. Where structural alterations or specialist supports are required, these shall be coordinated with the Structural Engineer.
- 1.17 Allowances shall be made for all access provisions required for safe operation and maintenance, including access panels, lifting provisions, safe working platforms where required, and maintenance clearances around all plant and equipment. The Contractor shall ensure that all maintenance activities can be undertaken safely in accordance with CDM requirements.
- 1.18 The Contractor shall include for all acoustic treatment required to ensure compliance with project noise limits, including attenuators, acoustic lining, anti-vibration mounts and isolation measures. The system shall be designed and installed such that noise breakout does not impact hotel accommodation or neighbouring properties.
- 1.19 All electrical and controls interfaces associated with the kitchen extract system shall be included, including local isolators, controls integration, interlocks with kitchen equipment where required, and coordination with the Building Management System. The Contractor shall include for all power requirements, containment and final connections unless explicitly noted otherwise.
- 1.20 Full allowance shall be made for commissioning, testing and demonstration of the complete system, including air balancing, verification of airflow rates, operation of odour control equipment and provision of all commissioning records and certification. The Contractor shall also include for demonstration to the Contract Administrator and, where required, to the Local Authority or Environmental Health Officer.

- 1.21 The Contractor shall include for the preparation and provision of full operation and maintenance documentation, including system descriptions, maintenance schedules, cleaning requirements in accordance with TR19, and detailed guidance on replacement intervals for filters and odour control components.
- 1.22 The contractor shall include for all risks associated with routing of ductwork within the existing building, including extended duct runs, multiple offsets, coordination with existing structure and services, and any necessary redesign required to accommodate site conditions.
- 1.23 No additional claims shall be accepted for reasonably foreseeable constraints associated with refurbishment and integration within the existing building.
- 1.24 All materials shall be new, unless otherwise specified and of a type and rating matched to the duty for which they are intended. Samples of proposed fittings, materials and workmanship, where required by the Contract Administrator, shall be submitted without delay and in good time to suit the project programme.
- 1.25 All systems shall be complete and operational unless otherwise specified and the designed installation shall be 'fit-for-purpose' in all respects. All test requirements at manufacturer's works, as listed in relevant British Standards or elsewhere in this specification, shall be met prior to dispatch of equipment.
- 1.26 All items of plant and equipment shall arrive on Site in good condition and be suitably protected from all hazards once there and all prime movers etc. shall be in working order. If items of plant are found not to function correctly after installation and this causes a delay to the Contract, the Contractor shall be charged for any costs incurred.
- 1.27 Contractor is responsible for:
- full system design
 - odour modelling/justification
 - performance compliance
 - coordination including listed constraints

2.0 KITCHEN EXTRACT VENTILATION SYSTEM

- 2.1 The Contractor shall design, supply, install, test and commission a complete kitchen extract ventilation system serving the commercial kitchen areas within the building. The system shall include all ductwork, plant, fans, attenuation, odour control equipment and associated controls necessary to provide a fully functional installation. The design shall be suitable for integration within a listed building and shall be fully coordinated with the architectural, structural and conservation requirements of the project. The Contractor shall allow for a kitchen ventilation system comprising extraction canopy and ductwork discharge to outside, a cookline extract canopy, in-line bifurcated extract fan, supply air unit for make-up air with induction and room side diffusion. CIBSE guide B stipulates a minimum air change rate of 30 air changes per hour up to 40 air changes per hour. This equates to an air volume of circa 1.0 m³/sec for the kitchen area (33 sqm). This requirement is delivered by the extract canopy with ventilation rate that exceeds the minimum CIBSE guideline.
- 2.2 The system shall be designed to safely remove heat, grease-laden air, smoke, and odours, generated by the kitchen processes, ensuring that no nuisance is caused to nearby occupants, adjoining spaces or neighbouring properties. The installation shall comply with the requirements of BESA DW/172 for kitchen ventilation systems, relevant Building Regulations and any specific requirements of the Local Authority Environmental Health Officer.
- 2.3 The kitchen extract ductwork shall be designed and installed in accordance with DW/172 and DW/144 as applicable. Ductwork shall be constructed to be liquid-tight and suitable for conveying grease-laden air. Internal velocities shall be selected to ensure transport of grease without deposition and to minimise fire risk.
- 2.4 Access doors shall be provided at regular intervals and at all changes in direction and plant connections to facilitate inspection and cleaning in accordance with TR19. Drain points shall be incorporated at low points within the system.
- 2.5 Fire dampers shall not be installed within grease extract ductwork, and where ductwork passes through fire compartments, fire-resisting ductwork or alternative approved methods shall be adopted.
- 2.6 The Contractor shall provide a complete odour control solution suitable for the proposed kitchen operation and building constraints. The system shall be designed to achieve a level of odour control such that no significant or offensive odour is detectable at or beyond the site boundary under normal operating conditions.
- 2.7 The Contractor shall select the most appropriate form of treatment, which may include multi-stage filtration, electrostatic precipitation, activated carbon filtration, ultraviolet/ozone treatment or a combination thereof. The selected system shall be capable of achieving a high level of odour reduction commensurate with best practice and shall be demonstrably suitable for grease-laden extract air.
- 2.8 The Contractor shall employ a kitchen canopy specialist designer and installer to provide the cookline extraction hood within the kitchen in accordance with the requirements of DW172. The canopy shall be sized based on the cooking type appliances underneath and calculate the volume of extraction required to ensure full capture of grease laden air, heat and smoke.

- 2.9 Discharge of extracted air shall be arranged to maximise dispersion and minimise the risk of re-ingestion into the building or adjacent properties. Discharge points shall be located at high level wherever practicable and shall be designed to achieve appropriate discharge velocities to aid dispersion.
- 2.10 At proposed roof level, all discharge arrangements shall be coordinated with the Architect and shall be acceptable in terms of planning and listed building consent.
- 2.11 Given the listed status of the building, all aspects of the installation shall be carefully coordinated to minimise visual and physical impact on the existing fabric. The Contractor shall allow for restricted service routes, limited penetrations and constrained installation conditions.
- 2.12 All plant, ductwork and external terminals shall be located and detailed to minimise visibility and preserve the character of the building. Any proposed penetrations or external installations shall be subject to approval by the design team and relevant statutory authorities.
- 2.13 The Contractor shall assume full design responsibility for the kitchen extract and odour control system. This shall include preparation of detailed calculations, equipment selection, coordination drawings, builders' work requirements and installation details. The Contractor shall demonstrate that the proposed system meets the required performance criteria, including airflow rates, odour control effectiveness, acoustic performance and maintainability. Evidence of similar installations may be requested as part of the technical submission.
- 2.14 The Contractor shall coordinate all builders' work requirements associated with the installation, including penetrations, supports, access provisions and weatherproofing. All structural fixings shall be designed in accordance with the project requirements and approved by the Structural Engineer where necessary.
- 2.15 Fire compartmentation shall be maintained at all penetrations, and all external works shall be detailed to ensure a watertight and durable installation.
- 2.16 The system shall be fully commissioned upon completion. Commissioning shall include verification of airflow rates, system balancing and operational checks of all plant and odour control equipment. The Contractor shall demonstrate that the system performs in accordance with the specified requirements and shall provide full commissioning documentation, including test results and certification.
- 2.17 The design shall ensure that all elements of the system are readily accessible for inspection, cleaning and maintenance. Adequate access shall be provided to ductwork, odour control equipment, fans and filters without the need for dismantling permanent building elements. Maintenance activities shall be capable of being undertaken safely and with minimal disruption to hotel operations. The Contractor shall provide operation and maintenance manuals, including details of cleaning regimes, filter replacement intervals and servicing requirements.
- 2.18 This shall include allowances for specialist equipment, coordination within constrained and listed building conditions, access provisions, structural supports, acoustic treatment, electrical works, commissioning and any statutory approvals required.
- 2.19 The Contractor shall be deemed to have allowed for all constraints associated with the refurbishment nature of the project, including restricted access, limited working space and potential phasing requirements.

- 2.20 The Contractor shall develop the odour control strategy using a risk-based approach in accordance with recognised guidance, including DEFRA “Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018)”. The level of odour mitigation provided shall be appropriate to the assessed risk, taking into account the type of cooking, scale of operation, proximity and sensitivity of receptors, and discharge characteristics.
- 2.21 The proposed system shall be selected to achieve an odour abatement performance consistent with the risk category identified using the following matrix:

Cooking Type / Activity	Low Sensitivity Receptors	Medium Sensitivity Receptors	High Sensitivity Receptors
Light (e.g. reheating)	Low Risk	Low–Medium Risk	Medium Risk
Moderate (e.g. standard hotel kitchen)	Low–Medium Risk	Medium Risk	High Risk
Heavy (e.g. frying, chargrill, Asian cooking)	Medium Risk	High Risk	Very High Risk

Table 2.1: Risk category matrix

- 2.22 For this development, the Contractor shall assume a minimum receptor sensitivity consistent with hotel and private residential accommodation and surrounding urban receptors unless demonstrated otherwise. The system design shall be based on a conservative assessment of risk and shall demonstrate that the selected odour mitigation measures are appropriate to the identified risk category.
- 2.23 Where discharge is constrained by the building form or located at low level, the Contractor shall adopt odour control measures consistent with a higher risk classification to ensure that the overall impact remains acceptable.
- 2.24 The Contractor shall provide justification of the selected approach as part of the technical submission, including reference to the above matrix and supporting performance data.

3.0 KITCHEN SUPPLY VENTILATION SYSTEM

- 3.1 The Contractor shall provide a Kitchen Air Handling Unit, which shall operate at 85% of the extraction rate calculated for the canopy extract system. 10% of the supply air serving the kitchen shall be induced into the extraction canopy so operating as an induction unit, having full width supply meshed grille to the kitchen, with downflow nozzles provided along the front edge of the canopy for end user comfort.
- 3.2 The Air Handling Unit is specified as Swegon Gold SD SA – 014 and having a maximum Specific Fan Power of 0.64kW/m³/s), and manufactured with frameless double skin, with Class T2 thermal insulated panels. The casing thermal leakage class shall be L1(M) / L2(R) according to EN 1886:2007 at -400Pa and +700Pa. The Contractor shall liaise with the specialist canopy designer to agree the extraction and supply air make-up flowrates.
- 3.3 The unit shall comprise:
- Inlet motorised damper with spring return
 - Inlet Silencer
 - Pre-heating coil, dx/electric, in casing unit
 - Filter
 - Fan Section
 - Re-Heating Coil, tbc
 - Supply Silencer
- 3.4 Air Handling Plant can be delivered in sections and craned into position for assembly on site or delivered as one complete unit and craned into position. The units shall be mounted on a purpose built 150mm, high concrete plinth which shall be 150mm greater on all sides in plan dimension.
- 3.5 The external installation shall include proprietary roof independent of the main side panels shall be provided. The roof shall be of the pitched type complete with overhang and gutter. Gutter to have a 100mm drain point for drainage to the roof and away from the unit support systems.
- 3.6 The unit shall be complete with an adequate support channel 100mm minimum running its entire length on all sides. Structural cross members shall support all major components.
- 3.7 A corrosion resistant finish shall be applied after manufacture, and all external units to have galvanised support channel.
- 3.8 The air handling fan unit shall be linked to the BMS controls which shall provide enable signals and fault monitoring. The fan on-off and speed control shall be provided within the kitchen for the end user to operate as required offering a 3-stage speed control, low, medium, and high operating the extract fan. Speed selection settings shall link both supply and extract fan speeds to ensure 85% supply volume is maintained at the three extract fan speed settings.
- 3.9 Ductwork externally does not require fire rating and shall be insulated with foil faced mineral fibre or phenolic foam pre-formed sections complete with self-adhesive foil taped joints and weather-proofed using Venture Clad or similar insulation covering. Ensure all duct mounted equipment mounted externally, e.g., test points, access panels, VCDs, temperature sensors, etc., are insulated and protected from the weather. All controls, valve actuators, sensor connection etc., are IP65 rated.

- 3.10 Extra care shall be taken with the fabrication of unlined ductwork to ensure that edges of sheets do not protrude into the airways, and that all spigots are well matched, so that a smooth airflow is obtained throughout the length of the duct.
- 3.11 All ductwork including dampers, etc., shall be free from vibration. Ductwork shall be stiffened and braced to prevent vibration and drumming.
- 3.12 An adequate number of quick-release hinged or chain linked to the ductwork, clean-out doors shall be provided in each range of ducting. These shall be spaced at no more than 6 metres centres in supply ductwork in accordance with HVCA TR/17.
They shall be approved heavy construction, closing on felt or rubber seal/fire retardant seals, with multiple clamps, and shall have retaining chain and bolted to ductwork.

4.0 FILTRATION REQUIREMENTS

- 4.1 The kitchen extract system shall incorporate a multi-stage air treatment arrangement specifically designed to remove grease aerosols, smoke particulate and odorous compounds generated by commercial cooking processes. The system shall include electrostatic filtration and activated carbon filtration as a minimum for medium to high-risk installations, particularly where discharge is constrained or located in proximity to sensitive receptors.
- 4.2 Electrostatic filtration (ESP) units shall be provided to remove fine grease particles, smoke and aerosol contaminants from the extract airstream. The ESP system shall be capable of achieving a high level of particulate removal efficiency, typically in excess of 90–95% for fine particulate matter and shall be suitable for continuous operation within a grease-laden kitchen extract environment. The system shall be designed to significantly reduce visible smoke discharge and prevent grease deposition within downstream ductwork and discharge systems.
- 4.3 The electrostatic filtration system shall be of a commercial grade, specifically designed for kitchen extract applications, and shall include prefabricated housings, high-voltage ionisation and collection cells, integral access panels and safe isolation provisions for maintenance. The Contractor shall ensure that the system incorporates appropriate pre-filtration to remove larger grease particles prior to entering the ESP unit, thereby protecting the equipment and ensuring efficient operation.
- 4.4 Activated carbon filtration shall be provided downstream of the electrostatic filtration stage to remove residual odorous compounds from the airstream. The carbon filtration system shall be designed to adsorb volatile organic compounds (VOCs) and odorous gases associated with cooking processes. The system shall comprise deep-bed carbon filters or proprietary housings sized to provide sufficient dwell time and contact area to achieve effective odour removal.
- 4.5 The combined ESP and carbon filtration system shall be designed to achieve a high level of overall air cleaning performance, including:
- Removal of grease and smoke particulates to eliminate visible emissions at the discharge point;
 - Reduction of odorous compounds to a level that prevents nuisance at nearby receptors;
 - Protection of downstream ductwork and fans from grease accumulation.
- 4.6 Where required to meet performance objectives, the Contractor shall supplement the system with additional treatment stages such as ultraviolet (UV) ozone systems to further break down grease and odorous compounds. The selection of such systems shall be justified based on the cooking process, discharge constraints and identified odour risk level.
- 4.7 The Contractor shall provide full technical details of the proposed filtration systems, including performance data, pressure losses, maintenance requirements and anticipated replacement intervals. The design shall take account of pressure drop across all filtration stages and ensure adequate fan selection and system balancing.
- 4.8 Maintenance access shall be provided to all filtration equipment to allow safe removal, cleaning and replacement of components. The Contractor shall ensure that maintenance operations can be undertaken safely and at appropriate intervals to maintain system performance. Indicative maintenance regimes, including cleaning of ESP cells and replacement of carbon media, shall be included within the operation and maintenance documentation.

- 4.9 The Contractor shall allow for all electrical requirements associated with ESP systems, including power supplies, control panels, interlocks and safety systems. The system shall be arranged such that failure or shutdown of the filtration plant results in appropriate alarms and does not allow untreated air to discharge without warning.
- 4.10 The Contractor shall include for a minimum two-stage odour control system comprising electrostatic filtration followed by activated carbon filtration, sized to suit a high-risk odour classification.
- 4.11 The kitchen extract and odour control system described within this specification is a performance-critical system required to ensure compliance with planning conditions, Environmental Health requirements and statutory nuisance legislation. The system, including all odour and grease mitigation measures, shall be considered an integral part of the building services installation and shall not be reduced, substituted or altered without formal approval.
- 4.12 The Contractor shall base the design on a minimum "High Risk" odour classification, including a multi-stage treatment system comprising electrostatic precipitation followed by activated carbon filtration, sized to suit the full anticipated kitchen duty. The Contractor shall include all associated plant, controls, access provisions and installation requirements within the contract fee.

5.0 ODOUR AND AIR TREATMENT

- 5.1 The kitchen extract system shall incorporate a multi-stage air treatment arrangement designed to remove grease aerosols, smoke particulates and odorous compounds generated by cooking processes. The system shall be selected to achieve a high level of odour control consistent with a minimum "High Risk" classification in accordance with DEFRA guidance, particularly in view of the proximity of sensitive receptors and constraints on discharge location.
- 5.2 The primary stage of treatment shall comprise electrostatic precipitation (ESP) units designed to remove fine grease particles, smoke and aerosol contaminants from the extract air stream. The ESP system shall achieve a high efficiency of particulate removal and shall significantly reduce visible emissions at the discharge point.
- 5.3 The equipment shall be specifically designed for commercial kitchen applications, incorporating high-voltage ionisation and collection cells, integral access for maintenance, and safe isolation provisions.
- 5.4 Downstream of the ESP, the system shall include activated carbon filtration for removal of residual odorous compounds. The carbon filters shall be of sufficient depth and surface area to provide adequate dwell time and effective adsorption of volatile organic compounds associated with cooking processes.
- 5.5 The Contractor shall ensure that the carbon system is correctly sized for airflow rate and contaminant load, and shall include for appropriate filter housing, access arrangements and replacement provisions.
- 5.6 Where required to meet performance objectives, additional treatment stages such as ultraviolet (UV) or ozone systems may be incorporated to further break down grease and odorous compounds. The complete system shall be designed to ensure that the discharged air is visually clean and free from smoke, grease plume and objectionable odours under normal operating conditions.

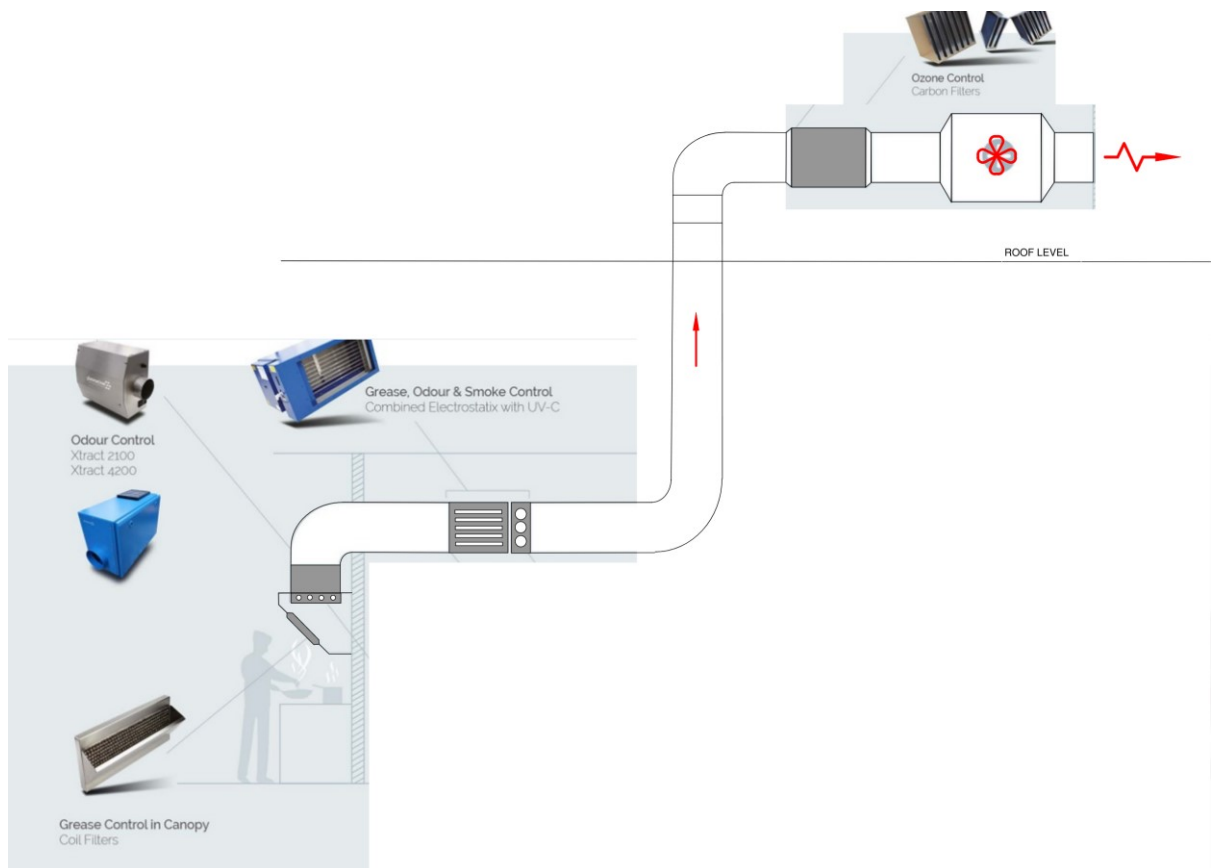


Figure 5.1: Kitchen extract system

6.0 EXTRACT DUCTWORK

- 6.1 The kitchen extract ductwork shall be designed, fabricated and installed in accordance with BESA DW/172 and DW/144 as applicable for grease-laden air systems and shall be fire rated to 2 hours.
- 6.2 The ductwork shall be of welded or liquid-tight construction, manufactured from galvanised or stainless steel as appropriate, and shall be capable of withstanding the operational conditions associated with commercial cooking, including elevated temperatures, grease loading and potential fire exposure. All joints shall be grease-tight and constructed to prevent leakage or accumulation of contaminants.
- 6.3 Where kitchen extract ductwork serving grease-laden air systems passes through fire-rated compartments or adjacent to fire-resisting construction, the ductwork shall be provided as a fire-resisting system designed to maintain the required fire separation of the building. In such cases, fire dampers shall not be used, and the integrity of the compartmentation shall be maintained by the ductwork construction itself.
- 6.4 Fire-resisting ductwork shall be tested and classified in accordance with relevant British and European Standards, including BS EN 1366 (all applicable parts), and shall achieve a fire resistance rating equivalent to that of the element through which it passes. The system shall provide both fire integrity and insulation performance as required by the building fire strategy and approved by the design team.
- 6.5 The fire-rated duct system shall be of a proprietary, fully tested construction, installed strictly in accordance with the manufacturer's certified details. The Contractor shall select a system suitable for kitchen extract applications, capable of withstanding grease-laden airstream conditions and elevated temperatures associated with cooking processes. The selected system shall include all ancillary components required to maintain performance, including fire-rated supports, fixings, seals, collars and penetration details.
- 6.6 All joints, access panels and connections within fire-resisting ductwork shall be constructed to maintain the fire rating of the system. Access panels shall be fire-rated and provided in locations consistent with cleaning and maintenance requirements in accordance with DW/172 and TR19.
- 6.7 The Contractor shall ensure that maintenance access does not compromise the fire integrity of the system.
- 6.8 Supports and fixings for fire-rated ductwork shall be designed to ensure that the duct remains in place for the duration of the required fire resistance period. All supports shall be independent of the building elements where required and shall be capable of withstanding the effects of fire exposure without failure. The Contractor shall ensure that the support strategy is in accordance with the duct manufacturer's requirements and relevant guidance.
- 6.9 The routing of fire-rated ductwork shall be minimised where possible to reduce cost and complexity; however, where required due to building constraints, including those associated with the listed structure, the Contractor shall allow for all additional costs associated with fire-rated construction, including materials, installation, supports and coordination.
- 6.10 Penetrations through fire-rated walls, floors or ceilings shall be carried out using tested and certified arrangements specific to the selected fire-rated duct system. The Contractor shall ensure that the

interface between the ductwork and the building structure maintains the required fire performance, including allowance for thermal movement and expansion during a fire.

- 6.11 The Contractor shall provide full technical submission for the proposed fire-rated ductwork system, including test certification, installation details, and confirmation of compliance with the project fire strategy. No works shall proceed until the proposed system has been reviewed and accepted by the design team.
- 6.12 Internal duct velocities shall be selected to ensure effective conveyance of grease particles without deposition, in accordance with DW/172 recommendations. The system shall be designed to minimise horizontal runs and incorporate adequate fall towards designated drainage points where required. Drain points shall be provided at all low points within the duct system to enable removal of accumulated grease and condensate.
- 6.13 Access doors shall be provided at every 1.5m on a linear run and at every change of direction, including vertical risers, and connections to plant, to facilitate inspection and cleaning in accordance with TR19.
- 6.14 Access doors shall be grease-tight and constructed to maintain the integrity of the duct system. The layout of the ductwork shall ensure that all internal surfaces are accessible for cleaning.

7.0 FANS AND DISCHARGE SYSTEMS

- 7.1 Extract fans shall be selected to provide the required airflow rates and overcome total system resistance, including pressure drops associated with ductwork, filters, odour control equipment and discharge arrangements. Fans shall be suitable for operation with grease-laden air and shall be constructed accordingly, with appropriate access for cleaning and maintenance. The fan systems shall be designed to operate reliably under continuous kitchen duty and shall include anti-vibration mounts and flexible connections to minimise transmission of vibration.
- 7.2 Acoustic attenuation shall be provided as necessary to ensure that the operation of the system complies with project noise criteria and does not cause disturbance to hotel occupants or neighbouring properties.
- 7.3 Attenuators shall be designed to suit the grease extract system, with materials suitable for the airstream conditions and access provided for inspection and cleaning where required.
- 7.4 Discharge systems shall be designed to safely and effectively expel treated air to atmosphere, promoting dispersion and preventing re-ingestion into the building or adjacent properties. Discharge points shall be located at high level wherever practicable and shall achieve adequate discharge velocity to assist dispersion.
- 7.5 All external discharge grilles or terminations shall be designed to minimise visual impact on the building façade and shall be coordinated with the Architect and conservation requirements. The Contractor shall ensure that all external elements are weatherproof, corrosion-resistant and appropriately detailed.

8.0 INTERFACE SYSTEMS

- 8.1 The Contractor shall provide all controls necessary for the safe and effective operation of the kitchen extract and odour control system. The controls shall include local control panels, isolators, interlocks with kitchen equipment where required, and integration with the Building Management System where applicable. The system shall be arranged such that the extract ventilation operates in conjunction with cooking equipment and that appropriate alarms are generated in the event of system failure.
- 8.2 Electrical supplies to all plant, including extract fans, electrostatic filtration units and odour control systems, shall be fully coordinated and included within the scope of works unless noted otherwise.
- 8.3 The Contractor shall provide all associated cabling, containment, control wiring and final connections, and shall ensure that all equipment is properly earthed and protected in accordance with relevant standards. ESP systems shall include dedicated power supplies, control panels and safety interlocks to ensure safe operation and maintenance.
- 8.4 The Contractor shall coordinate all builder's work requirements associated with the installation, including formation of penetrations through walls and floors, provision of builders' work openings, structural supports, brackets and frames for plant and ductwork, and making good of all disturbed finishes.
- 8.5 All penetrations through fire-rated elements shall be appropriately fire-stopped to maintain compartmentation, and all external penetrations shall be sealed and weatherproofed to prevent ingress of water.
- 8.6 The Contractor shall also include for all access provisions required for operation and maintenance, including access panels, safe working clearances and lifting arrangements for plant and filters. All works shall be fully coordinated with the architectural and structural design, particularly in respect of the constraints associated with the listed building and shall allow for installation in restricted spaces and difficult routing conditions.

9.0 ELECTRICAL INSTALLATIONS

Scope of Works:

- 9.1 The Electrical Contractor shall design (where specified), supply, install, test and commission all electrical installations associated with the kitchen ventilation, extract systems, and odour control plant, including electrostatic filtration systems, carbon filtration units and associated mechanical plant. The works shall include all power supplies, control wiring, containment systems, isolators, interlocks and connections necessary to provide a complete and fully operational installation. The Contractor shall ensure full coordination with the Mechanical Contractor and all specialist suppliers to deliver an integrated system.
- 9.2 Power Supplies and Distribution: The Contractor shall provide all power supplies to kitchen extract plant and associated odour control equipment, including but not limited to:
- Extract and supply fans
 - Electrostatic filtration (ESP) units
 - Carbon filtration systems (if active systems require power)
 - UV or ozone odour treatment systems (where provided)
 - Control panels and ancillary equipment
- 9.3 All supplies shall be taken from the appropriate distribution boards and shall include all cabling, containment, protection devices and final connections. Cable sizing shall be based on actual installed loads, voltage drop limitations and installation conditions.
- 9.4 The Contractor shall coordinate with equipment suppliers to confirm all electrical requirements prior to procurement and shall ensure compatibility of voltage, phase and control arrangements.
- 9.5 Local Isolation and Safety: All items of mechanical plant and odour control equipment shall be provided with local means of isolation in accordance with BS 7671 and relevant regulations.
- 9.6 Isolators shall:
- Be located adjacent to the associated equipment
 - Be of appropriate IP rating for the environment
 - Be clearly labelled to indicate the equipment served
 - Allow safe maintenance and lock-off procedures
- 9.7 Special consideration shall be given to ESP systems, which shall include appropriate electrical safety interlocks, discharge systems and isolation arrangements to ensure safe access for maintenance.
- 9.8 Control Systems and Interlocks: The Electrical Contractor shall provide all wiring and interfaces required to achieve the specified control strategy for the kitchen extract and odour control systems.
- 9.9 The system shall include, as a minimum:
- Interlock between kitchen extract systems and cooking equipment
 - Interlock to ensure odour control systems (ESP, carbon, UV etc.) operate whenever extract fans are running
 - Fault indication and alarm signals in the event of equipment failure

- Integration with the Building Management System where specified
- 9.10 The Contractor shall coordinate with the Mechanical Contractor and controls specialist to ensure that all control interfaces, signal requirements and sequencing are fully understood and implemented.
- 9.11 Where ESP or specialist odour control systems include proprietary control panels, the Electrical Contractor shall allow for all interconnections, power supplies and integration with the wider system.
- 9.12 Containment Systems: The Contractor shall provide all containment required for power and control cabling associated with the kitchen extract and odour control systems.
- 9.13 Containment shall:
- Be suitable for the environment, including grease-laden or high-temperature areas
 - Be routed to avoid conflict with ductwork and other services
 - Allow safe access for installation and maintenance
 - Include capacity for future expansion where appropriate
- 9.14 Routing shall be fully coordinated with all services and building constraints.
- 9.15 The Electrical Contractor shall design, supply, install and coordinate all cable containment systems required for the complete installation of power, control and communication wiring associated with the kitchen extract and odour control systems. The containment systems shall form a fully integrated installation suitable for the environmental conditions, spatial constraints and operational requirements of the project.
- 9.16 All containment systems shall be selected to suit the installation environment, taking into account factors such as temperature, presence of grease-laden air, cleaning regimes, humidity and potential mechanical damage. Containment installed within kitchen areas or extract zones shall be suitable for use in such environments and shall be resistant to corrosion, contamination and degradation. Where required, containment shall be manufactured from galvanised steel, stainless steel or other approved materials appropriate to the environment.
- 9.17 Containment shall be routed in a coordinated manner alongside ductwork, pipework and other building services, taking full account of access requirements, structural constraints and maintenance needs. The Contractor shall ensure that containment routes are fully coordinated with all other services and building elements, avoiding clashes and ensuring clear access to duct access panels, fire dampers, plant and maintenance zones.
- 9.18 Particular care shall be taken in areas of high service density to ensure that installations remain accessible and maintainable.
- 9.19 The Contractor shall provide containment systems sized to accommodate all installed cables with an allowance for future expansion. As a minimum, primary containment routes shall include a spare capacity of not less than 25%, unless otherwise specified. Containment shall be arranged to facilitate safe cable installation, removal and replacement without disruption to adjacent systems.
- 9.20 All containment shall be properly supported using suitable brackets, fixings and support systems designed to carry the imposed loads. Supports shall be spaced in accordance with relevant standards and manufacturers' recommendations and shall be coordinated with the building structure. Fixings into the building fabric shall be appropriate for the substrate and loading conditions,

and shall be installed in accordance with manufacturer's requirements. Where required, independent support systems shall be provided to avoid overloading existing structures or services.

- 9.21 Containment systems shall include all necessary fittings, including bends, tees, risers, reducers and expansion joints, to ensure a continuous and mechanically sound installation. All sharp edges shall be removed, and all terminations shall be fitted with suitable protective edging to prevent damage to cables during installation and operation.
- 9.22 In areas where containment passes through walls, floors or ceilings, appropriate sleeves and fire stopping systems shall be provided to maintain the fire integrity of the building. All penetrations shall be sealed in accordance with approved fire stopping details and relevant standards. External containment shall be suitably weatherproofed and protected against environmental exposure.
- 9.23 Where containment is installed within ceiling voids or service risers, the Contractor shall ensure that sufficient access is maintained for installation, inspection and maintenance. Containment shall not obstruct access to other services or equipment, including ductwork access panels, valves and plant maintenance zones.
- 9.24 The Contractor shall ensure that segregation is maintained between different services within containment systems, including separation of power, control and data cabling, in accordance with relevant standards and best practice. Crossings of services shall be minimised and arranged in a controlled manner to avoid interference or damage.
- 9.25 The installation shall be carried out in a neat and workmanlike manner, with all containment systems level, aligned and securely fixed. The Contractor shall ensure that all systems are robust, durable and suitable for the operational life of the installation.
- 9.26 All containment systems shall be included within the Contract Sum, including all materials, supports, fittings, coordination, installation and associated works. No additional allowance shall be made for complexity of routing, environmental conditions or coordination constraints associated with the kitchen and odour control systems.
- 9.27 Containment installed in kitchen extract zones or in proximity to grease-laden ductwork shall be positioned to minimise contamination and shall be arranged to permit cleaning and maintenance without removal of services.

Equipment Connections and Coordination:

- 9.28 The Contractor shall provide all final electrical connections to mechanical plant and odour control equipment, including termination within plant control panels where required.
- 9.29 The Contractor shall coordinate closely with all equipment suppliers, including ESP and odour control specialists, to ensure that:
 - All requirements for power, control and communication are identified
 - Correct connection arrangements are provided
 - Equipment warranties are maintained
- 9.30 No equipment shall be energised until it has been fully checked and commissioned in accordance with manufacturer's instructions.

Testing and Commissioning:

- 9.31 The Contractor shall be responsible for the complete testing, commissioning and setting to work of all electrical installations associated with the project, including those serving kitchen extract systems and odour control equipment. All testing and commissioning activities shall be undertaken in accordance with BS 7671 (IET Wiring Regulations), relevant British and European Standards, and current industry best practice.
- 9.32 The Contractor shall develop and submit a detailed testing and commissioning programme for approval, coordinated with the overall construction programme and mechanical commissioning activities. The programme shall clearly identify the sequence of commissioning activities, interfaces with other trades, and any dependencies associated with energisation, plant operation and access requirements. Adequate time shall be allowed within the programme for inspection, witnessing and verification by the Contract Administrator and design team.
- 9.33 All electrical installations shall be fully tested prior to energisation, including inspection, continuity testing, insulation resistance testing, polarity checks, earth fault loop impedance testing, and verification of protective devices. All testing shall be recorded and documented in accordance with BS 7671 requirements, and certificates shall be issued for all completed installations.
- 9.34 The Contractor shall ensure that all power supplies to kitchen extract systems, electrostatic filtration units, odour control systems and associated plant are correctly installed, tested and functional. This shall include verification of voltage, phase rotation, earthing arrangements and protection coordination to ensure safe and reliable operation of all equipment.
- 9.35 Commissioning shall include full functional testing of all control systems, interlocks and safety devices associated with the kitchen extract and odour control systems. The Contractor shall verify that:
- Extract fans, odour control systems (ESP, carbon, UV etc.) and associated plant operate in the correct sequence;
 - All safety interlocks function correctly, including interlocks between cooking equipment and extract systems where applicable;
 - Odour control equipment cannot operate independently of the extract system unless specifically designed to do so;
 - Fault conditions are correctly identified and appropriate alarms or shutdown signals are generated;
 - Local isolators and emergency stop arrangements function correctly and safely.
- 9.36 The Contractor shall coordinate with the Mechanical Contractor and specialist suppliers of odour control equipment to ensure that all systems are commissioned as a complete integrated installation. This shall include joint commissioning activities to verify that electrical and mechanical systems operate together to achieve the specified performance requirements.
- 9.37 Where electrostatic filtration systems are provided, the Contractor shall ensure that all electrical safety features are fully commissioned and operational. This shall include correct operation of high-voltage power supplies, safety interlocks, discharge systems and access door interlocks to ensure that the equipment is safe for operation and maintenance. The Contractor shall verify that the system cannot be accessed in an unsafe condition and that all isolation and discharge arrangements operate correctly.

- 9.38 The Contractor shall participate in integrated system testing to demonstrate that the kitchen extract and odour control systems perform as intended under operational conditions. This shall include verification that all electrical systems support the mechanical performance requirements, including continuous operation of odour control systems during kitchen operation and correct response to system faults or shutdown conditions.
- 9.39 All testing and commissioning results shall be recorded and submitted as part of the project documentation. The Contractor shall provide full test certificates, commissioning records and system settings, clearly referenced and cross-linked to the installed plant and equipment. Documentation shall be sufficiently detailed to allow verification and future maintenance of the systems.
- 9.40 The Contractor shall allow for attendance during witnessing of commissioning by the Contract Administrator, Engineer and other stakeholders, including demonstration of system operation and response to fault conditions. Any defects or non-compliances identified during testing and commissioning shall be rectified without delay and at no additional cost.
- 9.41 The Contractor shall ensure that all systems are fully commissioned, tested and operating in accordance with the specification prior to handover. Practical Completion shall not be achieved until all testing and commissioning activities have been satisfactorily completed, all documentation has been submitted, and the systems have been demonstrated to operate correctly.
- 9.42 All costs associated with testing, commissioning, coordination, specialist attendance, re-testing and demonstration shall be deemed to be included within the Contract Sum. No additional allowance shall be made for completion of these activities.

Allowances for Specialist Equipment:

- 9.43 The Contractor shall include within the Contract Sum for all electrical works associated with specialist equipment forming part of the kitchen extract and odour control systems, whether such equipment is supplied by the Contractor, Mechanical Contractor, or by others. The scope shall include all power supplies, control wiring, interconnections, containment systems, isolators, protection devices and integration necessary to provide a complete and fully operational installation.
- 9.44 The Contractor shall not assume that specialist equipment is self-contained or requires only a basic electrical connection.
- 9.45 Full allowance shall be made for all electrical requirements associated with such systems, including electrostatic filtration (ESP) units, carbon filtration systems (where electrically assisted), ultraviolet or ozone treatment systems, control panels, monitoring devices and any associated ancillary equipment. This shall include confirmation of electrical loads, starting currents, control voltages, protection requirements and environmental constraints prior to installation.
- 9.46 Where specialist equipment is provided by others, the Contractor shall be responsible for obtaining all necessary technical information from the supplier, including electrical loadings, wiring diagrams, control interfaces, safety requirements and commissioning procedures. The Contractor shall ensure that all electrical systems are designed and installed to suit the specific requirements of the supplied equipment and shall fully coordinate installation details prior to procurement and installation.
- 9.47 The Contractor shall allow for the provision and installation of all necessary control and interconnection cabling between specialist equipment and associated plant. This shall include wiring between kitchen extract fans, odour control units, control panels and any Building Management

System interfaces, ensuring that all systems operate as an integrated installation in accordance with the specified control strategy. Particular attention shall be given to ensuring that odour control equipment is fully interlocked with the extract system to prevent operation under unsafe or ineffective conditions.

- 9.48 The Contractor shall include for all electrical safety systems associated with specialist equipment, particularly electrostatic filtration units, which may incorporate high-voltage components. This shall include provision of suitable isolators, safety interlocks, discharge systems, access door interlocks, fault indication and alarm systems. The Contractor shall ensure that all safety features are fully operational and compliant with relevant standards, and that safe access for maintenance is achieved.
- 9.49 The Contractor shall also allow for the provision of all containment systems associated with specialist equipment, including routing to and from plant locations, coordination with other services, and installation within restricted or congested areas. The Contractor shall ensure that containment systems are suitable for the environment, including areas subject to grease, moisture or elevated temperatures, and that sufficient capacity is provided to accommodate all associated cabling.
- 9.50 Installation of specialist equipment shall be fully coordinated with the Mechanical Contractor and any specialist suppliers. The Contractor shall allow for attendance during equipment installation, provision of temporary wiring or connections as required, and final connection and termination of all electrical services. The Contractor shall also allow for liaison and coordination during commissioning to ensure that all systems operate correctly and in accordance with the design intent.
- 9.51 All costs associated with specialist equipment integration, including design coordination, additional cabling, containment complexity, electrical protection, safety systems, and commissioning support, shall be deemed to be included within the Contract Sum. No additional allowance shall be made for incomplete or assumed scope relating to specialist systems.
- 9.52 The Contractor shall ensure that all electrical requirements associated with specialist equipment are fully included within the tender, regardless of whether such requirements are explicitly detailed within the Contract Documents.

Installation Constraints

- 9.53 The Contractor shall allow for all constraints associated with:
- Installation within an existing or listed building
 - Restricted access routes and working space
 - Coordination with large ductwork systems
 - Installation in ceiling voids and service risers
- 9.54 All additional labour, containment routing complexity and installation sequencing shall be included within the tender.
- 9.55 The Contractor shall be deemed to have fully satisfied themselves as to all installation constraints affecting the services works and shall allow for all such constraints within the Contract Sum. This shall include, but not be limited to, the physical, logistical and operational constraints associated with working within an existing and potentially listed building, as well as the coordination of services within restricted ceiling voids, risers and plant areas.

- 9.56 The Contractor shall allow for installation within confined and congested spaces, including limited ceiling void depths, narrow risers, restricted service zones and areas with high service density. All services, containment systems and equipment shall be carefully routed and arranged to fit within the available space, while maintaining required clearances for access, maintenance and safe operation. The Contractor shall allow for additional labour, detailed setting out and complex sequencing necessary to achieve installation within these constraints.
- 9.57 Where installation routes are restricted, the Contractor shall allow for sectional installation of plant and services, including the breaking down of equipment into smaller components for transport and reassembly in situ. This shall include any additional labour, temporary works, lifting arrangements and specialist assembly procedures required to complete the installation. The Contractor shall verify all access routes in advance and ensure that all equipment can be delivered and installed without damage to the building or the equipment.
- 9.58 Particular account shall be taken of the constraints associated with working within or adjacent to existing and heritage building fabric.
- 9.59 The Contractor shall allow for restricted fixing methods, limitations on penetrations and the need to avoid damage to existing finishes and structural elements. All installation methods shall be appropriate to the condition and sensitivity of the existing structure and shall be coordinated with the design team and any conservation requirements.
- 9.60 The Contractor shall allow for coordination with other trades to ensure that installation activities can be carried out safely and efficiently within shared working areas. This shall include sequencing of works to avoid clashes, congestion and damage to completed installations. The Contractor shall not rely on unrestricted access to working areas and shall include for interruption, reworking and phased installation where required.
- 9.61 Installation works shall be planned and executed to maintain safe working conditions at all times. The Contractor shall allow for installation at height, working within confined spaces, and access to difficult locations, including the provision of suitable access equipment, temporary working platforms and safe systems of work. Additional allowances shall be made where works are required outside normal working hours or in restricted time windows.
- 9.62 The Contractor shall ensure that all installations are coordinated with the requirements for future access, inspection and maintenance. No installation shall obstruct access to plant, equipment, dampers, valves or other serviceable components. Where space is limited, the Contractor shall adjust routes and installation methods to maintain adequate access and shall not rely on removal of permanent building elements to achieve maintenance access.
- 9.63 All costs associated with installation constraints, including restricted working conditions, complex routing, phased installation, confined spaces, coordination with other trades and protection of existing building fabric, shall be deemed to be included within the Contract Sum. No additional claims shall be accepted where such constraints could reasonably have been identified from the tender documentation, site inspection and coordination requirements of the project.
- 9.64 The Contractor shall allow for installation of all services and plant within restricted access conditions typical of refurbishment works and shall not assume that large items of plant can be installed without sectionalisation or special handling.

- 9.65 The Contractor shall ensure that all plant, equipment, ductwork, containment and associated services installations are designed, coordinated and installed to allow safe and adequate access for inspection, maintenance, cleaning, testing and replacement of components throughout the life of the installation. Access provisions shall be integral to the design and installation and shall not rely on the removal of permanent building elements or other services.
- 9.66 The Contractor shall allow for sufficient clearances around all items of plant and equipment, including kitchen extract systems, electrostatic filtration units, carbon filters, fans, control panels and associated components, to permit safe operation and maintenance. Minimum access zones shall be in accordance with manufacturer's recommendations and good engineering practice and shall be maintained free from obstruction by other services or building elements.
- 9.67 Access to services installed within ceiling voids, risers and service zones shall be carefully coordinated. The Contractor shall ensure that suitable access panels, hatches or removable ceiling sections are provided and aligned with maintainable components. Access shall be of sufficient size to allow safe entry, inspection and maintenance activities and shall comply with relevant health and safety requirements for confined spaces where applicable.
- 9.68 The Contractor shall ensure that all access provisions comply with CDM Regulations and good practice for safe maintenance. No maintenance activity shall require unsafe working practices, including overreaching, working from unsuitable positions, or excessive manual handling. Where necessary, the Contractor shall allow for the provision of safe access equipment, lifting provisions or specialist access solutions to facilitate maintenance activities.
- 9.69 The Contractor shall demonstrate, as part of the design and coordination process, that all installations can be safely maintained. This may include provision of access studies, coordination drawings or maintenance clearance diagrams where requested by the Contract Administrator.
- 9.70 All costs associated with the provision of access for maintenance, including additional space allowances, access panels, structural modifications, coordination, and specialist solutions, shall be deemed to be included within the Contract Sum. No additional claims shall be accepted for lack of access or difficulties associated with maintenance activities where such requirements could reasonably have been identified during design and coordination.

Testing, Certification and Handover:

- 9.71 The Contractor shall include for:
- Full electrical testing and certification
 - Integration testing with mechanical systems
 - Demonstration of system operation
 - Provision of as-installed drawings and documentation
- 9.72 No additional allowance shall be made for completion of these requirements.
- 9.73 The Contractor shall be responsible for the complete testing, inspection, certification and handover of all electrical installations associated with the Works. This shall include all systems serving the kitchen extract, ventilation and odour control installations, ensuring that all elements are safe, fully operational and compliant with the Contract Documents and relevant statutory requirements prior to handover.

- 9.74 All electrical installations shall be inspected and tested in accordance with the requirements of BS 7671 (IET Wiring Regulations) and any other applicable standards. Testing shall include, but not be limited to, verification of circuit continuity, insulation resistance, polarity, earth fault loop impedance, protective device operation and functional performance of all installed systems. Testing shall be carried out by competent personnel using calibrated equipment and in accordance with recognised procedures.
- 9.75 Upon completion of testing, the Contractor shall provide full certifications for all electrical installations. This shall include Electrical Installation Certificates, Minor Works Certificates (where applicable), and any specialist certification required for specific systems. All certificates shall be complete, signed and clearly referenced to the installed systems and drawings. Copies shall be submitted to the Contract Administrator for review and inclusion within the project documentation.
- 9.76 The Contractor shall ensure that all control systems, interlocks and safety systems are fully tested and verified as part of the commissioning process. This shall include demonstrating correct operation of all kitchen extract interlocks, odour control system operation (including ESP, carbon and any UV systems), fault alarms, emergency stop functions and system shutdown sequences.
- 9.77 All systems shall be shown to operate in a safe and coordinated manner under both normal and fault conditions.
- 9.78 Integrated system testing shall be carried out in conjunction with the Mechanical Contractor and specialist suppliers to demonstrate that all mechanical and electrical systems function together as a complete installation. The Contractor shall ensure that all electrical systems correctly support the operation of mechanical plant, including continuous operation of odour control equipment during kitchen use and correct response to system faults. Any deficiencies identified during integrated testing shall be rectified prior to handover.
- 9.79 The Contractor shall allow for witnessing of testing and commissioning by the Contract Administrator, Engineer and other relevant stakeholders. This shall include demonstration of system operation, verification of test results and confirmation that all installations meet the specified performance requirements. Adequate notice shall be given for all witnessing activities, and the Contractor shall allow sufficient time within the programme to accommodate review and re-testing where required.
- 9.80 Full documentation shall be provided at handover to demonstrate compliance with all testing and certification requirements. This shall include all test certificates, commissioning records, system settings, schedules and verification reports, clearly organised and cross-referenced to the installed equipment and systems. Documentation shall form part of the Operation and Maintenance manuals and shall be sufficiently detailed to enable future inspection, maintenance and fault finding.
- 9.81 Prior to Practical Completion, the Contractor shall confirm that all systems have been fully tested, commissioned and certified, and are operating in accordance with the specification. Practical Completion shall not be deemed to have been achieved until all required testing, certification and documentation have been completed, submitted and accepted by the Contract Administrator.
- 9.82 The Contractor shall allow within the Contract Sum for all testing, certification, coordination, specialist attendance, witnessing, re-testing and final system demonstration required to achieve handover. No additional allowance shall be made for completion of these activities, including any remedial works required to achieve compliance. Any systems found not to comply with the specified performance, safety or operational requirements at the time of testing or handover shall be modified, re-tested and re-submitted by the Contractor at no additional cost.

Post Completion Testing.

- 9.83 Following Practical Completion and during the Defects Liability Period, the Contractor shall remain responsible for the performance and continued operation of all electrical installations associated with the Works. The Contractor shall allow for post-completion testing, inspection and verification of systems to confirm that the installation continues to operate safely and in accordance with the specified performance requirements.
- 9.84 The Contractor shall carry out a structured programme of post-completion inspections and performance checks at agreed intervals, including but not limited to the expiry of initial operation (typically 3 months) and prior to the end of the Defects Liability Period. These checks shall include verification of electrical safety, inspection of connections and terminations, confirmation of protective device operation, and review of system performance under normal operating conditions.
- 9.85 Particular attention shall be given to systems associated with kitchen extract and odour control installations. The Contractor shall verify that all electrical supplies, control systems and interlocks associated with extract fans, electrostatic filtration units, carbon filtration systems and any additional odour treatment equipment remain fully operational and correctly coordinated. The Contractor shall confirm that all interlocks, safety systems and alarms continue to function correctly and that no degradation in system performance has occurred.
- 9.86 The Contractor shall liaise with the Employer and Facilities Management team to review system operation in use, including any issues encountered during normal operation. Where faults, deficiencies or performance issues are identified, the Contractor shall investigate and rectify such issues without delay and at no additional cost, ensuring that systems are restored to full compliance with the specification.
- 9.87 Where required, the Contractor shall undertake re-testing of electrical installations and re-verification of control systems, including functional testing of interlocks and fault conditions. Any adjustments required to system settings, control strategies or coordination between systems shall be implemented as necessary to maintain performance.
- 9.88 The Contractor shall provide records of all post-completion inspections, testing and corrective actions undertaken. These records shall be submitted to the Contract Administrator and included within the project documentation. Updated information shall also be incorporated into the Operation and Maintenance manuals where applicable.
- 9.89 Prior to expiry of the Defects Liability Period, the Contractor shall carry out a final inspection and verification of the installation to confirm that all systems remain safe, fully operational and compliant with the Contract requirements. Any defects or outstanding issues shall be rectified prior to final acceptance of the Works.
- 9.90 All costs associated with post-completion inspections, testing, re-testing, adjustments and rectification works shall be deemed to be included within the Contract Sum. No additional allowance shall be made for ensuring continued compliance of the systems during the Defects Liability Period. Any deterioration in performance of systems, including odour control or safety operation, identified during the Defects Liability Period shall be treated as a defect and rectified by the Contractor at no additional cost.

10.0 PERFORMANCE VERIFICATION

- 10.1 The Contractor shall carry out performance verification of all electrical and mechanical systems upon completion of testing and commissioning activities to demonstrate that the installations achieve the specified design intent and operate as an integrated system under normal operating conditions.
- 10.2 Performance verification shall include confirmation that all systems, including kitchen extract ventilation, electrostatic filtration units, odour control equipment and associated controls, operate in accordance with the required sequence of operation. The Contractor shall verify that all plant operates in the correct order, that interlocks between systems function correctly, and that all components work together as a complete and coordinated installation. The Contractor shall demonstrate that the electrical systems fully support the operational requirements of the mechanical plant, including continuous operation of odour control systems during kitchen use, correct response to system start-up and shutdown, and appropriate operation under fault conditions. This shall include testing of all control logic, sequencing and alarm conditions to confirm that the system behaves as intended.
- 10.3 Performance verification shall be carried out under realistic or simulated operating conditions where practicable, to demonstrate that the system performs as required during normal use. This shall include verification of system response to operational demand, fault conditions and emergency shutdown procedures.
- 10.4 The Contractor shall provide records of all performance verification activities, including test procedures, results and any adjustments made to achieve compliance. Where systems do not meet the specified performance requirements, the Contractor shall carry out all necessary modifications, adjustments or re-testing to achieve compliance at no additional cost.
- 10.5 Final acceptance of the systems shall be subject to satisfactory completion of performance verification and demonstration to the Contract Administrator that the installation meets the specified functional and operational requirements.

11.0 EQUIPMENT

Kitchen Extract and Ventilation Systems

- 11.1 General Description: The building shall include a commercial kitchen facility. The Contractor shall design, supply, install, test and commission a complete kitchen ventilation system, including extract canopy, grease extract ductwork, extract fans, make-up air systems and discharge arrangements to atmosphere.
- 11.2 The system shall be designed to safely remove heat, grease-laden air, smoke and odours generated by commercial catering processes and shall comply with the requirements of BESA DW/172, DW/144 and all relevant regulations.
- 11.3 The Contractor shall engage a specialist kitchen ventilation designer/installer to undertake the detailed design, manufacture and installation of the complete canopy and extract system.

Kitchen Extract Canopy

- 11.4 The kitchen extract canopy shall be designed in accordance with DW/172 and sized specifically to suit the type and arrangement of catering equipment beneath.
- 11.5 The canopy plan dimensions shall extend a minimum of 250mm beyond the edges of the cooking equipment on all open sides, with larger overhangs provided where required.
- 11.6 Combination ovens and similar appliances shall be provided with a front overhang not less than 600mm to accommodate steam and plume capture.
- 11.7 The canopy shall incorporate:
- High-efficiency baffle grease filters
 - Integral LED lighting
 - Induction plenum arrangement
 - Full-width front supply discharge grille
 - Extract spigots
 - Grease collection drip tray and drainage channel
- 11.8 The canopy shall be designed using the Thermal Convection Method in accordance with DW/172. The use of simplified sizing methods such as face velocity or air change rates shall not be permitted. Appliance duty factors and canopy coefficients shall be applied to calculate the required extract airflow. The kitchen extract canopy shall be purpose designed for the specific cooking process and appliance layout and shall be constructed as a continuous, rigid and hygienic stainless-steel assembly suitable for commercial catering environments. The canopy shall be fabricated from a minimum of 430 or 304 grade stainless steel with all seams continuously welded, ground smooth and polished to a uniform brush finish to create a non-porous, cleanable surface.
- 11.9 The canopy construction shall be of a double-skin or reinforced single-skin design as required to ensure adequate structural rigidity and resistance to deformation under operational conditions.

- 11.10 All exposed surfaces shall be smooth and free from crevices, sharp edges or projections which could trap grease or impede cleaning. Internal surfaces shall be designed to promote smooth airflow and minimise turbulence, ensuring efficient capture and transport of grease-laden air.
- 11.11 The canopy shall be provided complete with an integrated grease collection system comprising a continuous perimeter drip channel and accessible drainage point to facilitate removal of collected grease and condensate. The entire canopy assembly shall be designed to withstand the thermal and mechanical stresses associated with intensive cooking operations while maintaining long-term durability and hygiene.
- 11.12 The extract canopy shall incorporate high-efficiency stainless steel baffle grease filters, designed to remove grease droplets and particulate from the extract air stream prior to entry into the ductwork system.
- 11.13 The filters shall be of a multi-pass labyrinth baffle design, typically minimum 650mm in height, arranged to create directional changes in airflow that promote inertial separation of grease particles. As air passes through the filter, grease droplets shall impact the baffle surfaces and be separated from the airflow, draining downward into the integrated drip tray system.
- 11.14 The filter assembly shall be designed to achieve effective grease removal while maintaining a consistent pressure drop, typically in the region of 90 Pa at design airflow conditions. Filters shall be easily removable without the use of tools, enabling routine cleaning and maintenance in accordance with TR19 and DW/172 requirements.
- 11.15 The filter housing shall be fully integrated within the canopy and shall:
- Provide an airtight seal around each filter element
 - Prevent bypass of unfiltered air
 - Be constructed to allow safe removal, inspection and reinstallation of filters
- 11.16 The Contractor shall ensure that the filter arrangement provides uniform airflow distribution across the canopy face, avoiding areas of high velocity or dead zones that may compromise grease separation efficiency.

Induction Plenum and Air Distribution

- 11.17 The canopy shall incorporate an integral induction plenum designed to introduce a controlled proportion of supply air directly into the canopy face to assist in the capture and containment of the cooking plume.
- 11.18 The induction system shall deliver approximately 10–15% of the total supply air volume into the canopy through a full-width discharge grille located along the front face of the canopy. This air shall be introduced at low velocity via a series of evenly distributed slots or nozzles, directed downward and inward toward the cooking appliances. The purpose of the induction plenum shall be to:
- Enhance capture efficiency by containing and directing the thermal plume
 - Reduce spillage of smoke and vapours into the kitchen space
 - Improve operator comfort by providing a tempered air curtain
 - Reduce overall extract airflow requirements compared to non-induction systems

- 11.19 The plenum shall be designed to ensure even distribution of supply air along the full length of the canopy, avoiding localised high velocities which could disrupt plume capture. The discharge velocity and angle shall be carefully selected to support, rather than oppose, the natural convective plume from the cooking equipment.
- 11.20 The induction plenum construction shall be fully integrated within the canopy structure and shall be accessible for inspection and cleaning where required. The plenum shall be designed to prevent grease ingress into the supply air system and shall include appropriate separation between supply and extract air paths.
- 11.21 Integrated Lighting – The canopy shall be fitted with recessed, sealed and grease-resistant LED lighting fixtures, designed specifically for kitchen applications. Lighting shall provide adequate illumination of the cooking surfaces while being protected from grease contamination and thermal exposure. All lighting units shall:
- Be IP-rated for kitchen environments
 - Be easily removable for maintenance
 - Be flush mounted to prevent grease accumulation
- 11.22 The canopy and induction plenum system shall be designed to achieve complete and stable capture of the thermal plume generated by the cooking appliances under all normal operating conditions. The canopy shall:
- Contain and direct the full grease-laden plume into the extract system
 - Prevent spillage of smoke, vapours or grease into the kitchen environment
 - Deliver a uniform and stable airflow into the extract duct system
- 11.23 Failure to achieve effective capture at canopy level shall be considered a failure of system performance, regardless of downstream filtration capability.
- 11.24 Grease Load Control into ESP – The Contractor shall ensure that the canopy and baffle filter arrangement provides effective primary grease separation prior to entry into the ductwork and ESP system.
- 11.25 The canopy filtration system shall:
- Remove the majority of large grease droplets
 - Deliver a consistent, conditioned airstream to the ESP unit
 - Prevent excessive grease loading of the ESP
- 11.26 The Contractor shall demonstrate that:
- The grease loading entering the ESP is within the operational limits of the selected system
 - The upstream filtration is sufficient to prevent premature fouling or reduced efficiency of the ESP
- 11.27 Airflow Stability and Distribution – The extract system, including canopy spigots and ductwork, shall be designed to provide stable and uniform airflow to the ESP unit. The Contractor shall ensure that:
- Airflow entering the ESP is evenly distributed across the unit face
 - There are no significant turbulence, velocity imbalances or localised high-speed zones

- System layout (including bends, transitions and offsets) does not adversely affect ESP performance
- 11.28 Poor airflow distribution that reduces ESP efficiency shall not be accepted.
- 11.29 ESP Performance Dependency – The Contractor shall recognise that the effectiveness of the ESP system is critically dependent on upstream conditions created by the canopy and ductwork installation. The system shall therefore be designed such that:
- The ESP operates within its designed airflow and grease loading range
 - The canopy and ductwork do not introduce contaminants or flow conditions that reduce ESP performance
 - The combined system achieves effective removal of grease, smoke and particulate matter
- 11.30 The integrated canopy, ductwork and ESP system shall be capable of achieving:
- Effective capture and containment of cooking emissions at source
 - High-efficiency removal of grease particulates prior to discharge
 - Elimination of visible smoke emissions at discharge under normal operation
 - Stable performance across all operating conditions
- 11.31 The system shall be considered non-compliant if:
- Smoke or grease escapes the canopy
 - Excessive grease enters the ductwork or ESP
 - ESP performance is degraded due to upstream system design
- 11.32 The Contractor shall be responsible for the performance of the complete kitchen extract and grease removal system as a single integrated installation, and no claim shall be accepted on the basis that individual components comply in isolation.

Extract Ductwork

- 11.33 Grease extract ductwork shall be designed and installed in accordance with DW/172 and DW/144 and shall be constructed to a liquid-tight standard suitable for grease-laden air.
- 11.34 Internal duct velocities shall be based on approximately 8 m/s to ensure effective transport of grease without deposition.
- 11.35 The ductwork shall:
- Be routed to discharge to atmosphere at high level, minimum 1m above roof level
 - Incorporate access doors at maximum 1500mm centres
 - Include drainage provisions at low points
 - Be constructed with welded seams
- 11.36 All ductwork from canopy to discharge point shall be provided as a 2-hour fire-rated ductwork system, maintaining fire compartmentation without the use of fire dampers. Access doors within fire-rated sections shall be fire-rated accordingly.

- 11.37 External ductwork shall be insulated using foil-faced mineral fibre or phenolic insulation and weatherproofed with a suitable external cladding system (e.g. Venture Clad).

Kitchen Extract Fan

- 11.38 The extract system shall be served by an in-line bifurcated extract fan, selected to provide the required duty with a minimum 15% duty margin.
- 11.39 The fan shall:
- Be a high-temperature rated bifurcated design
 - Be suitable for grease-laden air applications
 - Be certified in accordance with EN 12101-3
 - Operate continuously at 90°C and withstand 400°C for 2 hours
- 11.40 The fan impeller shall be backward-curved centrifugal type constructed from galvanised steel. The motor shall be direct-drive, high efficiency (minimum IE2) and located outside the air stream.
- 11.41 The fan shall be controlled via an inverter drive and shall provide multi-speed operation (minimum three-stage: low, medium, high) via a local user controller within the kitchen.
- 11.42 All transitions, connections and duct interfaces shall be provided in accordance with manufacturer's guidance and DW/144.

Kitchen Supply Air System

- 11.43 Make-up air shall be provided via a dedicated kitchen air handling unit sized to approximately 85% of the extract airflow rate.
- 11.44 Approximately 10–15% of supply air shall be delivered via the canopy induction plenum, with the remaining supply air distributed within the kitchen via suitable diffusers to ensure occupant comfort and maintain correct airflow balance.
- 11.45 The supply air handling unit shall:
- Be of high-efficiency double-skin construction (minimum Class T2)
 - Include filters, heating coils and silencers
 - Be selected to achieve low specific fan power (target $\leq 0.64 \text{ kW/m}^3/\text{s}$)
 - Be suitable for external installation
- 11.46 The unit shall be installed on a concrete plinth and provided with weather protection, including a pitched roof, drainage provisions and corrosion-resistant construction.
- 11.47 The supply air system shall be interlocked with the extract system such that proportional airflow is maintained at all operating speeds.
- 11.48 The kitchen extract canopy, ductwork system and downstream grease and odour control equipment, including electrostatic filtration (ESP), shall be designed and installed as a fully integrated system to ensure the effective capture, transport, separation and treatment of grease-laden air from source to discharge.

- 11.49 The Contractor shall ensure that the performance of the canopy system directly supports and enhances the operation of the ESP and downstream odour control systems, and that no element of the system compromises the overall efficiency of grease and smoke removal.

Acoustic Performance

- 11.50 The Contractor shall assess and control noise emissions from kitchen extract plant, particularly where located externally.
- 11.51 Acoustic treatment, including screening and attenuation, shall be provided to ensure that noise levels do not exceed 45 dBA at 10 metres from the plant location.

Fire Suppression System

- 11.52 The Contractor shall provide a complete automatic fire suppression system to the kitchen canopy, associated extract ductwork and catering equipment. The system shall be a proprietary wet chemical fire suppression system specifically designed for commercial kitchen applications and shall be installed, tested and commissioned by a specialist contractor approved by the system manufacturer.
- 11.53 The system shall be designed to automatically detect and suppress fires associated with cooking equipment, grease-laden vapours and extract systems, and shall comply with all relevant standards, including LPC rules, insurer requirements and applicable Building Regulations.
- 11.54 The system shall be an approved proprietary system (e.g. ANSUL R-102 or equivalent) designed to protect:
- Cooking appliances
 - Canopy and plenum
 - Extract ductwork
 - Associated grease extraction systems
 - Provide rapid flame knockdown and securement using a wet chemical extinguishing agent
 - Prevent re-ignition of oil and grease fires
 - Be suitable for protection of canopy, plenum, ductwork and cooking appliances
 - Be listed and approved for use in commercial kitchen environments
- 11.55 The extinguishing agent shall be a formulated aqueous solution suitable for grease fire suppression and compliant with manufacturer and certification body requirements.
- 11.56 The system shall:
- Operate automatically via fusible links
 - Include manual pull stations
 - Integrate with gas shut-off and electrical interlock systems
 - Interface with the building fire alarm system
- 11.57 Agent Storage and Discharge Arrangement - The fire suppression system shall incorporate a wet chemical agent storage tank (or tanks) complete with regulated release mechanism.
- 11.58 Storage Arrangement Requirements: The Contractor shall allow for one of the following configurations, as appropriate to the system design:

- Local Tank Arrangement (Typical Requirement)
 - Agent storage tank(s) mounted locally within or adjacent to the kitchen canopy, or within a nearby wall-mounted enclosure
 - Stainless steel enclosure or bracket-mounted system
 - Direct connection to discharge pipework and nozzle system
 - Easily accessible for inspection, maintenance and recharge
- Be stainless steel construction
- Be rated for appropriate working and test pressures
- Be located in an accessible, protected position
- Be installed in accordance with manufacturer's requirements

11.59 The Contractor shall ensure that:

- Tank location does not obstruct maintenance access
- Adequate space is provided for servicing and replacement
- Tanks are protected from damage and environmental exposure

11.60 System Integration - The fire suppression system shall be fully integrated with building services and shall, upon activation:

- Automatically shut down all cooking equipment (gas and/or electric)
- Shut off fuel supplies via mechanical or electrical gas valves
- Switch off electrical supplies to protected appliances where required
- Interface with the building fire alarm system
- Provide alarm signal to BMS (where installed)

11.61 The kitchen extract system shall:

- Either continue operation or shut down in a controlled manner depending on fire strategy
- Be interlocked with the fire suppression system as required

11.62 Discharge System and Pipework - The discharge pipework system shall:

- Be constructed from approved materials (e.g. stainless steel or Schedule 40 black iron)
- Be sized and installed in accordance with manufacturer's design
- Be fully coordinated with canopy and ductwork layout
- Include directional discharge nozzles specific to each protected hazard

11.63 All nozzles shall:

- Be correctly positioned and oriented
- Be provided with protective caps to prevent grease ingress
- Be suitable for the application (appliance, duct, plenum etc.)

11.64 Control and Release Mechanism. The system shall incorporate a regulated release mechanism providing controlled discharge of extinguishing agent.

11.65 The release unit shall:

- Be housed within a secure enclosure
- Include pressure regulation and relief features
- Be capable of automatic and manual actuation

- Be connected to detection system and manual pull stations

11.66 The system shall include:

- Gas cartridges (CO₂ or nitrogen) for discharge actuation
- Mechanical or electrical interfaces to service shutdown systems

11.67 Installation, Testing and Certification. The system shall be:

- Designed by the manufacturer or authorised specialist
- Installed by certified personnel
- Tested and commissioned in accordance with manufacturer requirements

11.68 The Contractor shall provide:

- Full commissioning certification
- Installation drawings and nozzle layout
- Maintenance instructions
- Evidence of compliance with insurer and authority requirements

11.69 Maintenance and Access

11.70 The system shall be installed to allow safe and easy access for:

- Inspection and testing
- Replacement of fusible links
- Recharge of agent tanks
- Maintenance of pipework and nozzles

11.71 The Contractor shall ensure:

- No obstruction to system components
- All elements are accessible without removal of permanent building elements

11.72 The system shall be installed, tested and commissioned in accordance with manufacturer's requirements and relevant standards and shall be maintained in accordance with approved procedures.

Electrical and Controls Integration

11.73 All kitchen ventilation systems shall be fully integrated with electrical controls and shall operate in accordance with the defined Sequence of Operation.

11.74 The system shall include:

- Interlocked operation of extract fans, supply air and odour control systems
- Local speed control within the kitchen
- BMS monitoring of system status and alarms
- Fault indication and safe shutdown functionality

11.75 Odour control systems (ESP, carbon, UV) shall not operate independently of the extract system and shall be energised only when airflow is proven.

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Kitchen Ventilation Performance Specification – Odour Mitigation

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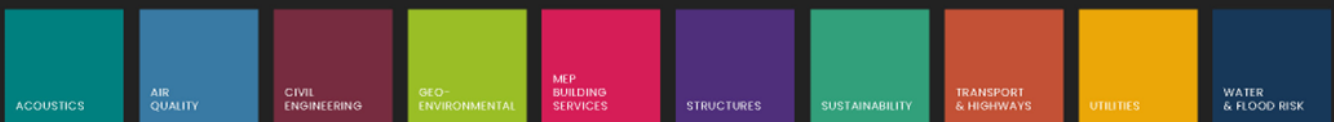
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Odour Assessment

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