

KNIGHT FRANK - 2C ENGLAND'S LANE, BELSIZE PARK, NW3 4TG

**ENVIRONMENTAL NOISE ASSESSMENT OF PROPOSED
CONDENSER UNIT AND VENTILATION UNIT**

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1 INTRODUCTION

The commercial property at No. 2C England's Lane is to be refurbished at lower ground and ground floor levels and occupied by Knight Frank LLP as an estate agency. The surrounding area is a mix of retail, commercial and residential properties, with a number of cafeteria restaurants in the vicinity, and residential dwellings directly above the subject premises.

In connection with the Knight Frank refurbishment, it is proposed to install 1 no. condenser unit externally outside the lower ground floor level kitchen area in an access yard at the rear of the subject premises, and to install 1 no. small ceiling void mounted heat reclaim ventilation unit within the ground floor of the subject premises.

The EQUUS Partnership has been commissioned to assess the likely environmental noise impact of the proposed condenser unit and ventilation unit on nearby noise-sensitive properties. This report presents the results of an environmental noise survey undertaken to establish the ambient / background noise conditions prevailing at the site, discusses London Borough of Camden's noise control policy, and assesses noise emissions from the proposed plant.

2 SUBJECT PREMISES AND SURROUNDING ENVIRONMENT

The subject property is located on England's Lane near to the junction with Antrim Road and is within a terrace of commercial properties which also contains a number of café restaurants. There is a residential block directly above the subject premises known as 'Priory Mansions' (the entrance for which is located adjacent to the shopfront of the subject premises). The property was until recently used as another estate agency office.

There is a communal access yard at the rear of the subject premises within which there are 2 no. existing kitchen/restaurant extract fans serving the nearby café restaurants, and around the corner at the end of a narrow walkway, there is a wall mounted condenser unit.

The proposed location of the new condenser unit is at low level on the external wall of the subject premises in the rear access yard (adjacent to the window of the proposed Knight Frank kitchen area at lower ground floor level) as shown on ICFM Ltd. drawing no. KF001009-M-01 (Rev. T1). The proposed location of the new heat reclaim ventilation unit is within the ceiling void of the proposed ground floor level office as shown on the same drawing.

The closest noise-sensitive properties to the proposed condenser unit and heat reclaim ventilation unit are as described below:

- (i) *Rear elevation of 'Priory Mansions' apartments* - the closest dwelling window to the proposed condenser unit is approx. 5m above the unit at first floor level overlooking the rear access yard. The closest dwelling window to the proposed heat reclaim ventilation unit is approx. 2m above the intake/discharge louvre at first floor level overlooking the side access walkway.
- (ii) *Side and rear elevations of 'Elizabeth Mansions' apartments* - the closest dwelling windows to the proposed condenser unit are approx. 9m to 10m away at second floor level overlooking the rear access yard. These windows will be far less affected by the proposed heat reclaim ventilation unit by virtue of the increased distance.

3 PLANT NOISE DATA

3.1 Proposed Condenser Unit

It is proposed that 1 no. condenser unit (Daikin type RXYSQ6P8V1) will be installed to provide the necessary cooling of the Knight Frank office space. The following manufacturer's 'free-field' sound pressure levels have been obtained for this unit (standard operating mode). The data relate to the measured noise level at 1m from the side of the unit:

Condenser Unit Noise Levels: Octave Band Sound Pressure Levels (dB re: 2x10 ⁻⁵ Pa)									
Operating Mode (Cooling)	63	125	250	500	1k	2k	4k	8k	(A)
RXYSQ6P8V1	62	55	54	52	48	42	35	28	(53)

3.2 Proposed Heat Reclaim Ventilation Unit

The following manufacturer's sound power levels have been confirmed for the proposed Daikin VAM 1000 FB heat reclaim ventilation unit. The sound power levels have been derived from readings taken within an anechoic chamber and based on the assumption that the measuring point is directly below the source of operating sound. (The Contractor shall seek further information from the manufacturer, as required, during the detailed design stage.)

Daikin VAM 1000 FB Units: Octave Band Sound Power Levels (dB re: 10 ⁻¹² W)								
Unit Speed	63	125	250	500	1k	2k	4k	8k
U-H Speed	62	59	54	51	49	42	37	28
H Speed	61	57	52	50	48	39	31	26
L Speed	58	55	49	46	44	37	28	24

N.B. It is understood that the unit has been selected to operate nominally at L speed

4 ENVIRONMENTAL NOISE SURVEY

It is understood the proposed condenser unit and ventilation unit will only need to operate when the Knight Frank office is occupied to provide the required comfort cooling (i.e. between 09.00 and 18.00 hours). In order to establish typical prevailing daytime ambient/background noise levels a fully manned 'critical period' environmental noise survey was undertaken during the afternoon of Tuesday 10th February 2015.

The weather conditions during the noise survey were dry, overcast and cold, mainly calm with a very light breeze and no precipitation at any time. These weather conditions were considered fully acceptable for the purposes of this environmental noise assessment.

4.1 Noise Measurement Locations

An initial inspection of the site environs indicated the most suitable noise measurement locations to be as follows:

Position A: Side access walkway at yard level at rear of subject premises

Position B: Access yard level close to main elevation at rear of subject premises

These measurement positions were judged to be reasonably indicative of the ambient noise climate that would be prevailing outside the nearest noise-sensitive properties.

4.2 Noise Survey Procedure

Sample measurements of the L_{A90} , L_{Aeq} and L_{Amax} sound levels were made periodically between 15.30 and 18.00 hours. The noise levels obtained during these measurement samples are taken to be representative of the typical noise climate in that period. The noise measuring instrumentation was fully manned such that any noise sources that could have been construed as unrepresentative were excluded from the measurement samples. As such, the 'back erase' facility of the real time analyser was employed to eliminate short term extraneous noise 'events' from the results, such as car horns on nearby roads, occasionally loud service noises from the nearby café restaurants, and extraneous drilling noises from neighbouring properties, etc.

Please refer to **Appendix A** for an explanation of the acoustic terminology used in this Report.

4.3 Instrumentation

The following instrumentation was used for the environmental noise survey:

Brüel and Kjær Precision Real Time Analyser	Type 2260B
Brüel and Kjær ½" Condenser Microphone	Type 4189
Brüel and Kjær Sound Level Calibrator	Type 4230
Brüel and Kjær ½" Windshield	Type UA 0237

The real time analyser was calibrated prior to the survey and the calibration was checked again upon completion. No drift was found to have occurred.

4.4 Ambient Noise Climate

The ambient noise climate outside the rear of the subject premises was principally controlled by existing plant noise emissions, noises generated by traffic movements along England's Lane and Antrim Road, and occasional noises generated by service staff outside the rear of the nearby café restaurants.

4.5 Noise Survey Results

The following environmental noise levels were measured at each of the selected noise monitoring locations:

Position A (Rear of Subject Premises - Side Access Walkway):

Measurement Period	Measured Sound Pressure Level, dB re 20µPa		
	L _{A90}	L _{Aeq}	L _{Amax}
15.30 – 16.00 hours	42	44	56
16.00 – 16.30 hours	42	44	55
16.30 – 17.00 hours	43	45	55
17.00 – 17.30 hours	44	46	58
17.30 – 18.00 hours	45	46	59

Position B (Rear of Subject Premises - Rear Access Yard):

Measurement Period	Measured Sound Pressure Level, dB re 20µPa		
	L _{A90}	L _{Aeq}	L _{Amax}
15.30 – 16.00 hours	48	49	58
16.00 – 16.30 hours	48	49	57
16.30 – 17.00 hours	48	49	59
17.00 – 17.30 hours	48	49	60
17.30 – 18.00 hours	48	50	61

5 PLANT NOISE EMISSION CRITERIA

Reference has been made to the London Borough of Camden Local Development Framework 'Camden Development Policies 2010-2025' to determine the Council's current policies relating to environmental noise. Table E of Development Policy DP28 (Noise and Vibration) prescribes the following environmental noise emission limits from plant and machinery:

Table E of Development Policy DP28: Noise Levels from Plant and Machinery at which Planning Permission will not be Granted

Noise Description and Location of Measurement	Period	Time	Noise Level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5 dB(A)<L _{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10 dB(A)<L _{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10 dB(A)<L _{A90}
Noise at 1 metre external to sensitive façade where L _{A90} >60 dB	Day, evening and night	0000-2400	55 dB L _{Aeq}

In view of the Council's requirement stated above, we would suggest the following '*Cumulative Mechanical Plant Noise Emission Limits*' are adopted in this instance. It should be noted this would be considered 'safe' in Planning terms, however, as the noise is unlikely to exhibit a 'distinguishable discrete continuous note etc.' in the presence of the prevailing ambient noise. These noise limits are applicable to the proposed condenser unit and ventilation unit running together at their proposed operating duties during the specified daytime period:

Receiver Location (Outside Façade)	Cumulative Mechanical Plant Noise Emission Limits (dB re 2 x 10 ⁻⁵ Pa.)
	Daytime - Office Hours (09.00 - 18.00 hours)
Rear Elevation of 'Priory Mansions' (Overlooking Side Access Walkway)	32 dB L _{Aeq}
Rear Elevation of 'Priory Mansions' (Overlooking Rear Access Yard)	38 dB L _{Aeq}
Rear Elevation of 'Elizabeth Mansions' (Overlooking Rear Access Yard)	38 dB L _{Aeq}

6 PLANT NOISE ASSESSMENTS

6.1 Assumptions and Required Noise Mitigation Measures

Calculations have been undertaken to assess the cumulative environmental noise emissions due to operation of the proposed condenser unit and ventilation unit based on the manufacturer's noise data as confirmed in Section 3.0 above.

Due allowance has been made for the proposed condenser unit and ventilation unit locations, the distances between the proposed plant and neighbouring windows, typical directivity characteristics, geometrical spreading, and acoustic screening / reflection effects due to the building features etc.

Initial calculations revealed that the proposed condenser unit and ventilation unit will require some atmospheric noise mitigation as described below and as shown on ICFM Ltd. drawing no. KF001009-M-01 (Rev. T1):

Condenser Unit Acoustic Canopy

An acoustic canopy shall be fitted directly over the wall mounted condenser unit. This shall be relatively close fitting over the unit and extend to at least 300mm in front of the unit (i.e. 300mm further away from the wall than the face of the condenser unit). The underside of the canopy shall be packed with mineral wool insulation of 100mm thickness (45 kg/m³ density). The mineral wool insulation shall be faced directly with 23% free area perforated steel sheet fixed onto a suitable timber or steel framework and the whole shall achieve the following sound absorption performance:

Minimum Sound Absorption of Condenser Unit Acoustic Canopy									
Required Site Installed Acoustic Performance	63	125	250	500	1k	2k	4k	8k	(Hz)
Minimum Sound Absorption Coefficients	0.15	0.35	0.75	0.90	1.00	1.00	0.95	0.90	(α)

The upper surface of the canopy shall be finished in accordance with the design aesthetic requirements of Artillery Architecture & Interior Design and/or London Borough of Camden Planning Department, as appropriate.

Ventilation Unit Atmospheric Attenuation

Calculations have shown that efficient duct attenuators will be required to control atmospheric noise emissions from the intake and exhaust louvres of the proposed ground floor heat reclaim ventilation unit, and also that the intake and discharge air plena (i.e. behind the weather louvres) will require 25mm thick suitable acoustic foam lining to all internal surfaces. The attenuators shall not be less than 1500mm long and shall have at least the minimum acoustic performance specified in the table below:

Minimum Insertion Losses of 1500mm Nominal Length Atmospheric Attenuators for Ground Floor VAM1000FB Heat Reclaim Ventilation Unit									
Location	Max Pa.	63	125	250	500	1k	2k	4k	8k
Intake Attenuator (Fresh Air)	5 Pa.	4	11	21	35	37	27	15	12
Discharge Attenuator (Exhaust Air)	5 Pa.	4	11	21	35	37	27	15	12

The atmospheric attenuators shall be of the circular 'podless' type and have a nominal internal diameter of approximately 250mm - i.e. to suit the proposed ductwork - and shall incorporate 100mm external acoustic insulation such that the outside diameter is not less than 450mm, and shall be of minimum length 1500mm (but as required to achieve at least the minimum insertion losses specified above). The attenuators shall also be designed and installed to prevent excessive aerodynamic resistance / regenerated noise.

Transformation sections of suitable length shall be installed between the atmospheric attenuators and the acoustically lined plena of the proposed intake/discharge weather louvres in order to reduce airflow velocities onto the plenum boxes, and these shall be designed to ensure the maximum airflow velocity in the ducts is less than 2.0 m/s. The ductwork shall be connected

onto the ventilation unit via suitable flexible connections. Suitable attenuation measures shall also be selected by the M&E Contractor for the roomside supply and extract ductwork, and any measures necessary to control noise breakout from the ceiling, although these are beyond the scope of this environmental noise assessment report.

The M&E Contractor shall also ensure that the proposed WC extract fan is fitted with an atmospheric duct attenuator, as required, to control environmental noise emissions to a level not exceeding 30 dB L_{Aeq} at 1m externally from the terminal air brick louvre (at 0° on site).

As a further Planning safeguard, to minimise any risk of noise disturbance to neighbouring dwellings it is recommended that the proposed plant be time-switch controlled to prevent operation outside the period 09.00 to 18.00 hours.

6.2 'Priory Mansions' (Overlooking Side Access Walkway)

Calculations indicate the following 'worst case' cumulative plant noise level outside the closest windows in the rear/side elevation of 'Priory Mansions' (i.e. with the condenser unit and ventilation unit operating together) allowing for the noise mitigation measures specified above:

'Worst case' plant noise level outside dwelling windows - 32 dB L_{Aeq} .

It may be seen that the calculated cumulative plant noise emission level accords with the '*Cumulative Mechanical Plant Noise Emission Limit*' of 32 dB L_{Aeq} referred to in Section 5 of this report, provided all the specified noise mitigation measures are installed.

6.3 'Priory Mansions' (Overlooking Rear Access Yard)

Calculations indicate the following 'worst case' cumulative plant noise level outside the closest windows in the rear elevation of 'Priory Mansions' (i.e. with the condenser unit and ventilation unit operating together) allowing for the noise mitigation measures specified above:

'Worst case' plant noise level outside dwelling windows - 37 dB L_{Aeq} .

It may be seen that the calculated cumulative plant noise emission level accords with the 'Cumulative Mechanical Plant Noise Emission Limit' of 38 dB L_{Aeq} referred to in Section 5 of this report, provided all the specified noise mitigation measures are installed.

6.4 'Elizabeth Mansions' (Overlooking Rear Access Yard)

Calculations indicate the following 'worst case' cumulative plant noise level outside the closest windows in the rear elevation of 'Elizabeth Mansions' (i.e. with the condenser unit and ventilation unit operating together) allowing for the noise mitigation measures specified above:

'Worst case' plant noise level outside dwelling windows - 38 dB L_{Aeq} .

It may be seen that the calculated cumulative plant noise emission level accords with the 'Cumulative Mechanical Plant Noise Emission Limit' of 38 dB L_{Aeq} referred to in Section 5 of this report, provided all the specified noise mitigation measures are installed.

7 CONCLUSIONS

An environmental noise survey has been undertaken to establish the prevailing daytime ambient and background noise levels at the rear of No. 2C England's Lane, Belsize Park, NW3 4TG.

Based on analyses of the noise survey results, suitable plant noise emission limits have been determined in order to comply with the standard acoustic design criteria given within London Borough of Camden's Local Development Framework.

Based on manufacturer's noise data for the proposed condenser unit and ventilation unit, and considering the measured background noise levels, cumulative environmental noise emissions to the closest noise-sensitive properties have been assessed.

The initial calculations indicated that the proposed condenser unit will require an acoustic canopy to be fitted, and the heat reclaim ventilation unit will require atmospheric attenuators to be fitted, in order to acoustically protect the closest windows of nearby dwellings. In addition, the WC toilet extract fan will need to be fitted with an atmospheric duct attenuator, as required, to control environmental noise emissions to a level not exceeding 30 dB L_{Aeq} at 1m externally

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from the terminal air brick louvre (at 0° on site). Suitable specifications for these noise mitigation measures are contained in Section 6.1 of this report.

Further calculations demonstrate that cumulative daytime environmental noise emissions from the proposed condenser unit and ventilation unit to neighbouring dwellings would be expected to comply with the acoustic design criteria stated within London Borough of Camden's Local Development Framework, subject to the installation of all the noise mitigation measures specified herein.

As a further Planning safeguard, and to minimise the risk of noise disturbance to neighbouring dwellings, it is recommended that the proposed mechanical plant be time-switch controlled to prevent operation outside the period 09.00 to 18.00 hours.

Any changes to the proposed plant selections, operating conditions and/or unit positions should be referred back to The EQUUS Partnership for further advice.

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APPENDIX A

Glossary of Acoustic Terminology

Decibel (dB)

The Decibel is a logarithmic unit used to express ratios of quantities such as sound pressure or sound power. The logarithmic nature of the unit means that decibel values cannot be added or subtracted in the usual way. An auditory sensation of halving or doubling of loudness equates to a decrease or increase of around 10 dB.

dB(A) or LA

"A" weighted sound pressure level (sound level) measurements correspond roughly to the subjective impression of loudness of the average listener.

L₉₀

The L₉₀ is the sound level that is exceeded for 90% of the measurement period, and is generally considered to describe the background noise, since it inherently excludes the sounds of transient events.

L_{eq}

The L_{eq} index is used as a method of averaging temporally or spatially varying sound levels. At a given position, it may be defined as the notional sound level which contains the same amount of acoustical energy as the actual (time varying) sound level over the same measurement period.

L_{max}

The L_{max} is the maximum sound level recorded during the measurement period.