

Acoustic Assessment of Proposed Mechanical Equipment at 170A-171 Drury Lane, London

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B: Updated to reflect London Borough of Camden Council's acoustic criteria

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0. SUMMARY

- ACA Acoustics Limited have been commissioned to assess sound levels from a proposed flue dilution fan at 170A-171 Drury Lane, London.
- The assessment is required in order to provide evidence that noise emissions from the fan complies with London Borough of Camden Council's acoustic requirements. London Borough of Camden Council's requirement, applicable at this site, is that noise from the new equipment shall be designed to 10dBA below the prevailing background level at 1m outside windows of the nearest affected noise-sensitive property.
- A sound level survey has been carried out in the vicinity to establish existing background sound levels. Whilst on site the author identified the closest residential properties to the equipment as first floor apartments above The Sun Public House, opposite 170A-171 Drury Lane; the nearest window is approximately 15m from the external louvre.
- Lowest background sound levels during the survey were measured at LAF90 53dB. Background sound levels fluctuate and comprise primarily of traffic and pedestrian activity on Drury Lane. Noise from existing mechanical services equipment serving other non-associated properties along Drury lane was also audible during lulls in other activity. Based on results of the sound level survey and London Borough of Camden Council's requirement, the overall sound level limit for the equipment to outside nearest residential noise-sensitive windows is set at $\leq 43\text{dBA}$.
- Based on calculations using manufacturer's noise data, and with benefit of acoustic treatment recommended within this report, the overall sound level for the equipment is 38dBA outside the nearest residential noise-sensitive windows, ensuring compliance with London Borough of Camden Council's requirements. Noise from the equipment should not be detrimental to the amenity of any residential occupiers in the vicinity.
- The proposed equipment is indirectly structurally linked to adjoining commercial premises and therefore it is recommended that the fan is installed on vibration isolators; specification for suitable isolators is included in this report.

1. INTRODUCTION

A new flue dilution fan is proposed to 170A-171 Drury Lane, London to serve a pizza restaurant.

The Planning Department of London Borough of Camden Council requires information in the form of an acoustic report regarding noise from the condenser. The report is required to demonstrate that the fan complies with London Borough of Camden Council's acoustic requirements applicable for mechanical services equipment affecting nearby noise-sensitive properties.

ACA Acoustics Limited has been commissioned by the client to carry out an assessment of noise and vibration from the new equipment and, where necessary, make recommendation to reduce noise and vibration levels from the equipment to comply with London Borough of Camden Council's planning requirements.

This report presents results of the noise survey and assessment and includes:

- Review of London Borough of Camden Council's noise-related planning requirements;
- Measurement of existing background sound levels;
- Calculation of equipment sound levels;
- Consideration of vibration from the proposed new equipment;
- Review of any noise/vibration control treatments necessary to the equipment to ensure compliance with the requirements of London Borough of Camden Council.

2. LONDON BOROUGH OF CAMDEN COUNCIL PLANNING CONSENT ACOUSTIC REQUIREMENTS

London Borough of Camden Council's policies relating to noise from new mechanical services equipment are contained within the Council's Local Development Framework; Policy DP28.

In Summary, London Borough of Camden's noise-related conditions are:

Noise level from plant and machinery at which planning permission will not be granted:	
Noise at 1m external to a sensitive façade;	5dBA < LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1m external to a sensitive façade;	10dBA < LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1m external to a sensitive façade;	10dBA < LA90
Noise at 1m external to sensitive façade where LA90 > 60dB	55dB LAeq

Table 1: London Borough of Camden Council noise-related planning conditions

Each of the above is applicable over a period of 60 minutes and measured at 1m external to noise-sensitive facades.

The characteristic of noise from the flue dilution fan would typically be described as having a distinguishable discrete continuous note. Therefore to ensure that the assessment is robust and that the amenity of nearby occupiers is not detrimentally affected, the more onerous noise condition of 10dBA below the existing background noise is used for the assessment in this report.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The development site is at 170A – 171 Drury Lane, London WC2B 5PD. 170A-171 Drury Lane is a ground floor restaurant with offices above.

A flue dilution fan is proposed to be installed internally and ducted externally to two louvres on the western façade of the premises at ground floor level.

During the author's visits to site closest noise-sensitive properties to the proposed equipment appear to be first floor windows of residential apartments above The Sun Public House at 21 Drury Lane. These closest windows are around 15-17m from the proposed location of the fresh air supply and exhaust louvres respectively. Partial screening is provided to the fresh air inlet louvre by the wall surrounding the stairwell to the underground comedy club at 170 Drury Lane.

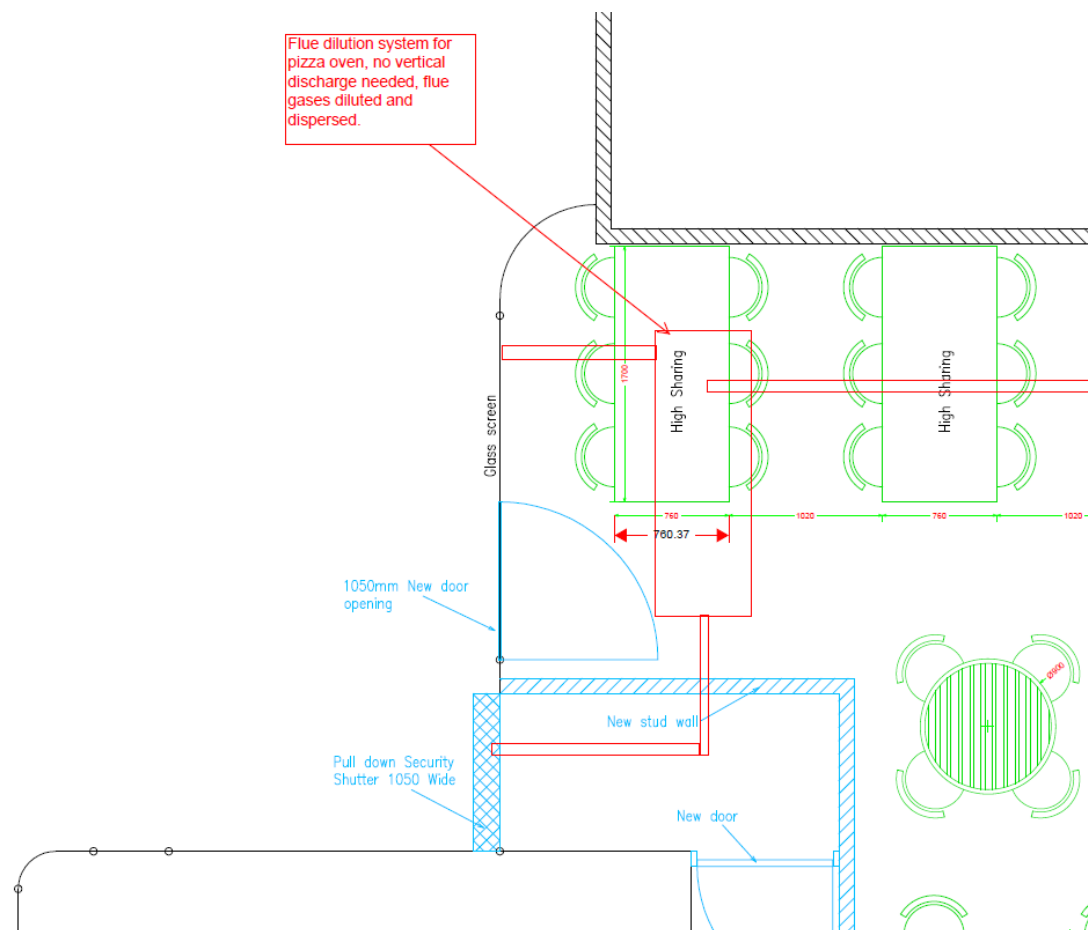


Figure 1 - Drawing of proposed fan and ducting to louvres

Drury Lane is a busy street, with a large theatre and a number of restaurants. This contributes a large volume of traffic and pedestrians, resulting in a raised ambient sound level.

4. SOUND LEVEL SURVEY

In order to assess noise from the mechanical services equipment in accordance with London Borough of Camden Council's requirements it is necessary to establish representative background sound levels at the nearest noise-sensitive properties. Details of the background sound level survey carried out by ACA Acoustics Limited are provided in Sections 4.1 to 4.3 below.

4.1 Sound Level Survey Measurement and Assessment Procedure

The proposed fan will operate between 11:30 – 23:00 daily.

The background sound level survey measurement position was selected to the front of The Sun Public House at 21 Drury Lane. The chosen site was not considered secure and therefore a manned survey was carried out on 20th January 2016 between approximately 20:00 and 22:30, chosen to be representative of the likely quietest periods of equipment operation.

4.2 Instrumentation

The following equipment was used during the noise survey; the sound level meter was calibrated before and after the survey measurements with no change noted:

Equipment	Serial Number
NTi Audio sound level meter type XL2 Class 1	A2A-06294-E0
NTi Audio calibrator type CAL200 94/114dB. Compliant to IEC 60942-1:2003 (Calibrated to a reference traceable to NIST)	11441

Table 2: Equipment used

4.3 Sound Level Survey Measurement Results

The lowest measured background sound level during the operating times of the new equipment was LA90 53dB; background levels fluctuate due to pedestrian activity and traffic noise on Drury Lane.

In accordance with London Borough of Camden Council's criteria, the values recorded by ACA Acoustics Limited are used as basis for acoustic design such that noise from the proposed flue dilution fan is ≤ 43 dBA outside nearest residential windows (≥ 10 dBA below the lowest recorded values). Summary of measured noise levels are provided in Table 3 on the following page.

Period	Lowest Measured LA90	Camden Noise Limit
20 th January 2016	53dB	≤ 43dBA

Table 3: Summary sound level survey results and London Borough of Camden Council noise limit

The limit to achieve London Borough of Camden Council's requirement outside residential windows is 43dBA; this is 10dBA below the lowest measured background sound level. At this level the equipment noise will not increase the prevailing background sound level.

5. SOUND LEVELS FROM NEW MECHANICAL SERVICES EQUIPMENT

The planning application includes installation of a new flue dilution fan along with associated pipework.

Noise levels from the proposed equipment can be determined from manufacturer's noise data. Manufacturer's data in terms of octave band sound power level spectra has been used in the calculations.

A computer noise model has been used to calculate the noise contribution from the equipment to outside nearest noise-sensitive windows. The model takes account of losses within the ductwork system in accordance with CIBSE Guide B5 and environmental corrections of ISO 9613-2:1996.

The calculated sound level from the proposed fan, with benefit of acoustic treatment as detailed in Section 7 of this report, to outside the nearest noise-sensitive windows compared with the planning requirement is shown in Table 4. Summary print-out from the calculation model is included in Appendix A.

Description	Calculated Equipment Sound Levels	Noise Limit
1m from closest residential noise-sensitive windows	38dBA	(Camden Council) $\leq 43\text{dBA}$

Table 3: Calculated equipment sound levels at 1m outside noise-sensitive windows

Table 4 shows that with benefit of acoustic treatments as described in section 7, the overall sound level from the equipment is at least 10dBA below the lowest measured background noise and achieves London Borough of Camden Council's planning consent requirements.

6. VIBRATION FROM MECHANICAL EQUIPMENT

The proposed fan is indirectly structurally connected to non-associated residential properties.

For the new fan system it is recommended that the flue dilution fan is installed on steel spring type isolators providing minimum 35mm deflection at the working load. The isolators shall incorporate rubber or neoprene high-frequency isolation pads. The fan should be installed with flexible connections to adjacent ductwork; flexible connections should be loose and not compressed under operation.

The steel spring type vibration isolators proposed are readily available from most acoustic hardware suppliers, including Allaway Acoustics Limited (Contact Chris Williams – Tel: 01992 550825).

7. RECOMMENDATIONS FOR NOISE CONTROL TREATMENTS

Note that consideration of non-acoustic aspects such as structural, visual, airflow and construction material are outside the scope of ACA Acoustics Limited and should be considered by others accordingly.

Alternative methods of attenuation to those detailed below may be acceptable, for example relocation of noisy equipment to other, less sensitive, areas of the development. Full details of any alternative scheme, including working drawings and expected attenuation should be submitted and approved prior to manufacture.

7.1 Duct Mounted Attenuators

It is recommended that duct-mounted attenuators are installed to the atmospheric inlet and outlet sides of the fan. Schedule of minimum dynamic insertion loss performance for the attenuator along with description of typical silencer to comply with the specified performance is provided in Appendix B. Note that the dimensions and free-area shown are nominal and the successful supplier should confirm their own selections to meet the minimum specified insertion loss performance.

The duct-mounted attenuators proposed are readily available from most acoustic hardware suppliers, including Allaway Acoustics Limited (Contact Chris Williams – Tel: 01992 550825).

APPENDIX A

Acoustic Calculations

Calculation Sheet

GBDF2- Inlet to Closest residential reciever

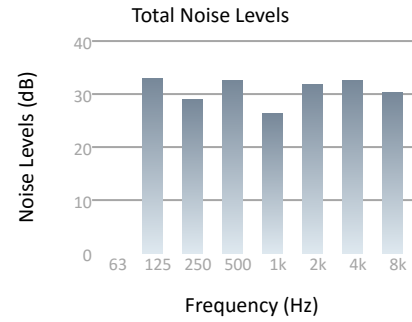
		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - GBDF2- Inlet									
Sound Power Levels		-	71.0	68.0	75.0	72.0	72.0	71.0	65.0
Silencer									
Silencer - AT1									
Width (m)	0.4								
Height (m)	0.2								
% Free Area (%)	45.0								
Face Velocity (m/s)	5.9								
		-	-7.0	-11.0	-15.0	-19.0	-14.0	-12.0	-7.0
Bend Loss									
Levels after bend		-	64.0	56.0	56.0	47.1	54.0	55.0	54.0
Rect Unlined Duct Losses									
Levels after duct		-	63.3	55.3	55.3	46.4	53.3	54.3	53.3
End Reflection - Rect Flush									
		-	-4.8	-1.6	-0.3	1.3	0.1	0.0	0.0
External Grille Directivity									
Radiating Lw		-	59.9	55.5	57.2	50.5	56.8	58.0	57.0
ISO 9613 Calculation - Reflections									
Reflected Lp		0.0	0.0	0.7	2.4	-4.4	1.8	2.4	-0.8
ISO 9613 Calculation									
Direct Lp		-	29.5	25.1	26.8	20.0	26.2	27.1	24.7
Cumulative Lp at Receiver									
External Receiver									
External Receiver - Closest residential reciever									
Sound Pressure, Lp:		-	29.5	25.1	26.8	20.0	26.2	27.1	24.7

Calculation Sheet

GBDF2- Discharge to Closest residential receiver

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - GBDF2- Discharge									
Sound Power Levels		-	71.0	68.0	75.0	72.0	72.0	71.0	65.0
Silencer									
Silencer - AT1									
Width (m)	0.4								
Height (m)	0.3								
% Free Area (%)	45.0								
Face Velocity (m/s)	5.2								
		-	-7.0	-11.0	-15.0	-19.0	-14.0	-12.0	-7.0
Rect Unlined Duct Losses									
Levels after duct		-	63.7	56.7	59.7	52.7	57.7	58.7	57.7
		-	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
End Reflection - Rect Flush									
		-	-4.8	-1.7	-0.5	0.2	0.0	0.0	0.0
External Grille Directivity									
Radiating Lw		-	60.0	56.4	60.8	55.0	60.2	61.4	60.4
ISO 9613 Calculation									
Direct Lp		-	30.4	26.7	31.1	25.3	30.4	31.2	28.7
ISO 9613 Calculation - Reflections									
Reflected Lp		0.0	0.0	1.6	6.1	0.1	5.2	5.8	2.6
Cumulative Lp at Receiver									
External Receiver									
External Receiver - Closest residential receiver									
Sound Pressure, Lp:		-	30.4	26.7	31.2	25.3	30.4	31.2	28.8

Project Name	170a-171 Drury Lane
Project Reference	151212
Reference	Closest residential reciever
Description	Flats above The Sun Pub
Noise Limit	43
dBA	38.2



Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
GBDF2- Discharge	1	-	30.4	26.7	31.2	25.3	30.4	31.2	28.8
GBDF2- Inlet	1	-	29.5	25.1	26.8	20	26.2	27.1	24.7

151212-ER-1A

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APPENDIX B

Typical Noise Control Treatments



170a-171 Drury Lane

Schedule of Noise Control Treatments

Reference	Description	Location	Pressure Drop (Pa)	Insertion Losses (dB)							
				63	125	250	500	1k	2k	4k	8k
AT1	600L 45% Free Area			4	7	11	15	19	14	12	7