

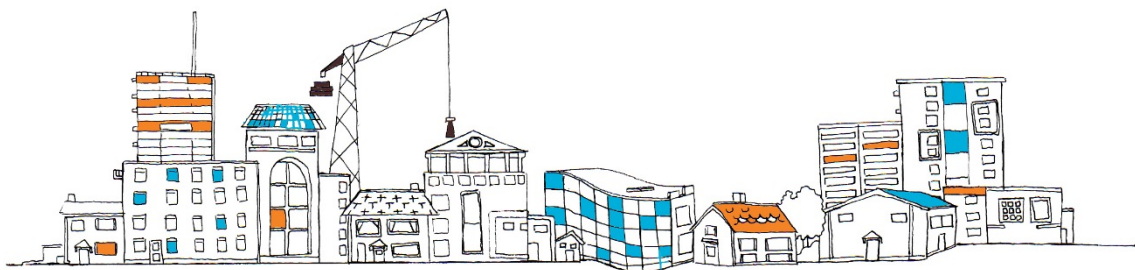
COMMISSIONING TEST REPORT

Middlesex Street Car Park, London

On behalf of Neilcott

Date: 06/07/2020

Energist UK



REVISION HISTORY

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1. INTRODUCTION

New smoke extract fans have recently been installed at an underground car park at Middlesex Street, London. Noise emissions from the new extract fans are subject to the City of London plant noise emission criteria.

The following report presents the methodology and results of acoustic commissioning testing carried out to determine noise levels from the newly installed plant at the nearest noise sensitive properties in comparison to the required noise limits.

Appendix 1 presents an explanation of the acoustic terminology used in this report.

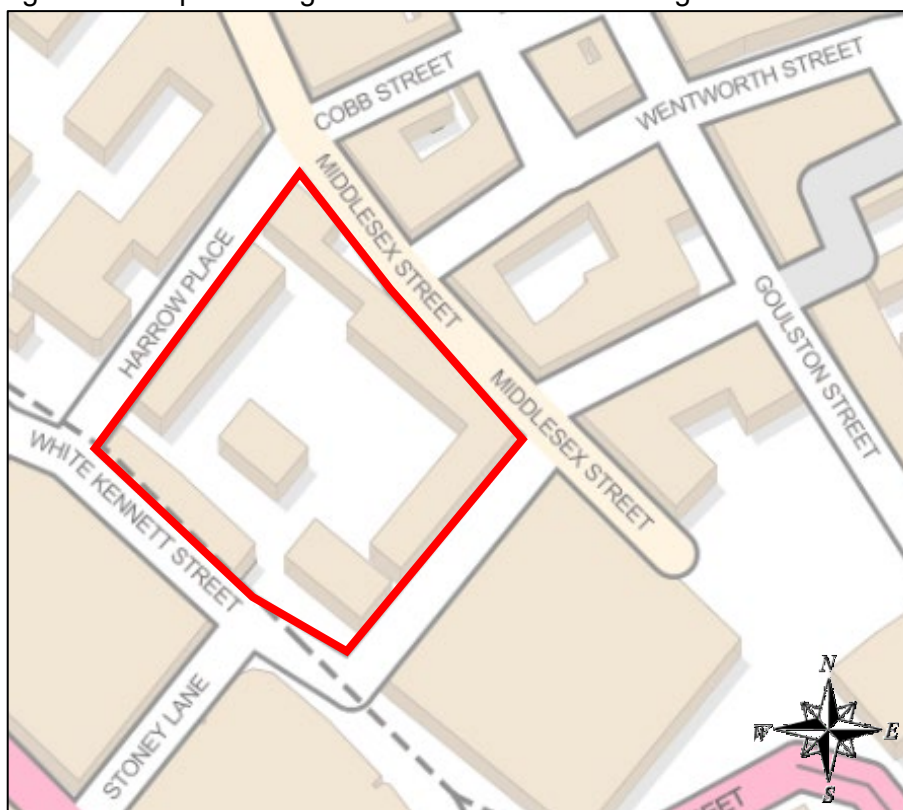
2. DESCRIPTION OF SITE

The Middlesex Street Car park is an underground car park located below the Middlesex Estate in the City of London district.

New smoke extract fans have recently been installed in two locations within the underground car park with the associated exhaust grilles facing out to the atmosphere.

Figure 2.1 shows the approximate site extent in **red** in relation to the surrounding area.

Figure 2.1 Map Showing Site Extent and Surroundings



3. COMMISSIONING TESTING

3.1 Installed Plant

The smoke extract fans serving the car park are installed in two plant areas within the car park. The two plant areas and are as follows:

- Zone A - 2 No. Smoke extract fans (SEF 01 & 02) located in a lightwell area in the underground car park which faces upward towards the central courtyard of the Middlesex Estate
- Zone B - 2 No. Smoke extract fans (SEF 03 & 04) with associated exhaust grilles facing out to Artizan Street

3.2 Nearest Noise Sensitive Properties

The nearest noise sensitive properties to the two plant areas are as follows:

- Zone A - Nearest windows of residential properties within the Middlesex Estate overlooking the central courtyard approximately 8m from the lightwell opening
- Zone B – Nearest windows of residential properties located approximately 3m directly above the centre of the exhaust grilles facing out on to Artizan Street

3.3 Plant Noise Limits

A background noise survey was carried out at the site in September 2019 in a measurement position representative of the nearest noise sensitive properties. The methodology and results of the noise survey are presented the Plant Noise Assessment Report dated 28/01/2020.

The report set noise limits for the plant based the noise survey results and the City of London's standard external plant noise emission requirements.

The extract fans will operate continuously during day and night-time periods, a noise limit based on background noise levels captured during the night-time period was therefore used to provide a worst case.

A plant noise limit of 29dB $L_{Aeq,T}$ was set to be achieved 1m outside the window of the nearest noise sensitive properties, including any additional character corrections in accordance with BS 4124:2014 methodology.

3.4 Commissioning Testing

Commission testing of the newly installed extract fans was carried out on Thursday 18 June 2020.

The measurements were undertaken by Acoustic Consultant Sam Martin BA(Hons) PGDip MIOA.

The equipment used for the measurements is summarised in Table 3.1.

Table 3.1. Description of Equipment used for Noise Survey

Item	Make & Model	Serial Number
Type 1 automated logging sound level meter	01dB DUO	11388
Type 1 ½" external microphone	GRAS 40CD	259634
Calibrator	01dB CAL 21	34375252

The noise monitoring equipment was calibrated before and after the measurements. No significant change was found. Laboratory equipment calibration certificates can be provided upon request.

Due to the presence of extraneous noise sources during the measurements (e.g. other surrounding plant noise sources, distant construction and road traffic noise etc) it was not possible to determine if the plant noise limit of 29dB $L_{Aeq,T}$ had been achieved via measurements at the location of nearest noise sensitive properties alone.

Noise levels from the plant at the nearest noise sensitive properties has therefore been determined via a combination of measurements taken at source and prediction using standard acoustic formulae.

Our method for determining the plant noise levels from both plant Zone A and Zone B are presented below.

Zone A

Source measurements were taken 1m directly above the opening of the lightwell which opens to the courtyard area.

Measurements were taken with the extract fans operating at typical capacity (fans operating at 3 air changes per hour). Noise from the plant was continuous (i.e. not intermittent or impulsive) with no obvious tonal elements, therefore no character corrections have been applied in the calculations.

A sound pressure level of 60dB L_{Aeq} was measured which has been corrected to a sound power level of 62dB based on the dimensions of the lightwell opening (approximately 2.5m x 2.5m), this is the source noise level used in our calculations.

Calculations of the plant noise level to the nearest noise sensitive property are presented in Table 3.2 below.

Table 3.2. Plant Noise Calculation – Plant Zone A

Element	Noise Level (dB)
Derived Sound Power Level L_w from Sound Pressure Level L_p at 1m	62
Angle of view (90 degrees)	-7

Element	Noise Level (dB)
Screening Attenuation (0.8m high wall around perimeter of lightwell opening)	-11
Distance Attenuation (Rathe distance loss – 7m to 1m outside nearest window)	-19
Calculated Noise Level 1m Outside Nearest Window	25
Noise Limit	29
Difference	-4

The results show that predicted plant noise emissions from the extract fans located in plant Zone A are below the required noise limit at the nearest noise sensitive properties.

Note: It is understood that the fans have the capability to operate at an increased capacity of 6 air changes per hour when there is a need to quickly extract excess fumes from the car park. This operation is understood to be rare and occurring only for brief periods. A sound power level of 78dB L_w was measured at source with the fans operating at 6 air changes per hour. Our assessment is based on the fans operating at 3 air changes per hour as this is understood to be representative of the typical operation.

Zone B

Source measurements were taken 1m from the centre of each extract grille.

Measurements were taken with the extract fans operating at typical capacity. Noise from the plant was continuous (i.e. not intermittent or impulsive) with no obvious tonal elements, therefore no character corrections have been applied in the calculations.

Noise from the new extract fans was only just audible in comparison to noise from other existing nearby building services plant.

Measured noise levels with the extract fans switched on and switched off are presented in Table 3.3.

Table 3.3 Measured Noise Levels – Plant Zone B

Measured Noise Level (dB) Extract Fans ON		Measured Noise Level (dB) Extract Fans OFF	
$L_{Aeq,T}$	$L_{A90,T}$	$L_{Aeq,T}$	$L_{A90,T}$
51	49	51	49

The results show that there was no difference between the measured L_{Aeq} or L_{A90} noise level when the new extract fans were switched on or switched off.

Given that there was no increase to the lower L_{A90} background noise level when the fans were switched on, it can be assumed that noise from the fans is at least 10dB below the measured background noise level of 49dB.

A worst-case sound pressure level of 39dB has therefore been assumed at 1m from each grille. This has been corrected to a sound power level of 44dB based on the dimensions of each grille (approximately 1m x 3m), which is the source noise level used in our calculations.

Calculations of the plant noise level to the nearest noise sensitive property are presented in Table 3.4 below.

Table 3.4. Plant Noise Calculation – Plant Zone B

Element	Noise Level (dB)
Derived Sound Power Level L_w from Sound Pressure Level L_p at 1m	44
Angle of view (90 degrees)	-6
Distance Attenuation (Rathe distance loss – 3m to 1m outside nearest window)	-15
Correction 2No. Grilles	+3
Calculated Noise Level 1m Outside Nearest Window	26
Noise Limit	29
Difference	-3

The results show that predicted plant noise emissions from the extract fans located in plant Zone B are below the required noise limit at the nearest noise sensitive properties.

4. CONCLUSION

Commissioning testing has been carried out on the new extract fans installed in the underground carpark at Middlesex Street in London.

Noise limits for the plant were set based on the results of a background noise survey carried out in September 2019 and the City of London’s standard external plant noise emission requirements.

Plant noise emissions to the nearest noise sensitive properties have been predicted based on measurements of the new extract fans operating at source and calculation using standard acoustic formulae.

Results of the assessment showed that predicted noise emissions from the new extract fans were below the required noise limits at the nearest noise sensitive properties.

Noise emissions from the new extract fans are therefore considered to have achieved the City of London’s external plant noise emission requirements.

APPENDIX 1: ACOUSTIC TERMINOLOGY

Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing (20×10^{-6} Pascals).
Sound Pressure Level (L_p)	The sound pressure level is the sound pressure fluctuation caused by vibrating objects relative to the threshold of hearing.
A-weighting (L_A or dBA)	The sound level in dB with a filter applied to increase certain frequencies and decrease others to correspond with the average human response to sound.
L_{Amax}	The A-weighted maximum noise level measured during the measurement period.
$L_{Aeq,T}$	<p>The A-weighted equivalent continuous noise level over the time period T (typically T = 16 hours for daytime periods, T = 8 hours for night-time periods).</p> <p>This is the sound level that is equivalent to the average energy of noise recorded over a given period.</p>