



24 Bell Street
Romsey
SO51 8GW

T: 01794 515999
F: 01794 515100

**PROPOSED RESIDENTIAL DEVELOPMENT
61 LINCOLN'S INN FIELDS
42 KINGSWAY, LONDON
ASSESSMENT OF POTENTIAL NOISE IMPACT**

Technical Report: R3037-2 Rev 2

Date: 17th June 2010

For: Masterworks Corporation
c/o Robert Hutson Architects
94 Leonard Street
London
EC2A 4RH

24 Acoustics Document Control Sheet

Project Title: Proposed Residential Development, 61 Lincoln's Inn Fields / 42 Kingsway, London: Assessment of Potential Noise Impact

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	Name	Position	Signature	Date
Prepared by	Stephen Gosling BEng MIOA	Principal Consultant		
Approved by	Reuben Peckham MPhil CEng BEng MIOA	Principal Consultant		
For and on behalf of 24 Acoustics Ltd				

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1.0 INTRODUCTION

1.1 The Masterworks Corporation plans to redevelop 61 Lincoln's Inn Fields / 42 Kingsway, London for both residential accommodation. The proposed development overlooks Kingsway which is a busy road and carries a high level of traffic during the daytime and night-time. On this basis, the Local Planning Authority, Camden Council, has advised that a noise assessment is required.

1.2 Accordingly, Robert Hutson Architects, on behalf of the Masterworks Corporation, has commissioned 24 Acoustics Ltd to carry out an environmental noise assessment at the proposed site. The noise impact assessment has included:

- Ambient noise monitoring at the proposed development site;
- Assessment of the noise arising from traffic using Kingsway in accordance with national standards and guidance.

1.3 An explanation of acoustical terms used in this report is provided in Appendix A. All sound pressure levels in this report are given in dB re: 20 μ Pa.

2.0 SITE DESCRIPTION

2.1 Kingsway is an important thoroughfare that runs between Holborn Underground Station and Aldwych to the south. It is proposed that five new apartments located on the first to fifth floor overlooking Kingsway.

2.2 Lincoln's Inn Fields, which by contrast is a quiet thoroughfare, is located at the rear of the site.

2.3 An overview of the site layout is shown in Figure 1.

3.0 CRITERIA

- 3.1 When assessing the merits of developments which have issues relating to noise, Local Authorities are guided by Planning Policy Guidance (PPG) 24 [Reference 1], published by the former the Department of the Environment. The aim of this guidance is to provide advice on how the planning system may be used to minimise the adverse impact of noise without placing unreasonable restrictions on developments or any future residential amenity.
- 3.2 The document introduces the concept of Noise Exposure Categories (NECs); these provide a useful framework for classifying the level of noise that a proposed residential site will be exposed to. The advice is given with respect to the development of new residential properties in the vicinity of different transportation systems and of mixed noise sources.
- 3.3 An explanation of the NEC groups is given in Table 1 below.

NEC	Description
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to secure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

Table 1: NEC Definitions

- 3.4 PPG 24 indicates that as noise levels vary throughout a 24 hour period, it is usually necessary to assess the acceptability of noise levels for separate periods of the day. The day is divided into two periods; 07:00-23:00 hours (daytime) and 23:00-07:00 hours (night-time). The noise levels associated with each of the noise exposure categories for road traffic (re: PPG 24) are given in Table 2.

Time Period	Noise Exposure Category, dB $L_{Aeq,T}$			
	A	B	C	D
07:00 to 23:00	< 55	55 - 63	63 - 72	> 72
23:00 to 07:00	< 45	45 - 57	57 - 66	> 66

Table 2: NEC Criteria – Road Traffic

- 3.5 The noise levels within each NEC apply to the noise levels on the undeveloped site at the position of the proposed dwellings, at a height of between 1.2 and 1.5 m above ground level. A further stipulation of PPG 24 is if noise levels at night regularly exceed 82 dB L_{Amax} (slow time weighting) several times in any hour, the site should be categorised as being in NEC C, regardless of the $L_{Aeq, 8h}$ (except where the night-time value puts the site in NEC D). PPG 24 relates to the assessment of external free field noise levels.
- 3.6 PPG 24 recognises the importance of good sound insulation and refers the reader to BS 8233: 1987 for guidance on suitable internal levels (superseded by BS 8233: 1999 'Sound insulation and noise reduction for buildings' [Reference 2]). It is generally taken that the difference in noise level from a road, between outside and inside, is approximately 30-35 dBA for a standard residential construction with windows closed.
- 3.7 BS 8233 provides internal design sound levels for 'good' and 'reasonable' conditions. The figures shown in Table 3, together with a night-time maximum value of 45 dB $L_{Amax,fr}$ are design recommendations from BS 8233: 1999 for a reasonable internal noise level.

Criterion	Typical Situation	Design Noise Levels (dB $L_{Aeq, \tau}$)	
		Good	Reasonable
Resting/ sleeping conditions	Living rooms	30	40
	Bedrooms	30	35

Table 3: Indoor Ambient Noise Levels ref: BS 8233

Summary

- 3.8 Noise at the development site has been assessed using BS 8233 for the assessment of internal noise levels (arising from road traffic). It is considered that a daytime level of 35 dB L_{Aeq} and a night-time level of 30 dB L_{Aeq} (with a night-time maximum value of 45 dB $L_{Amax,f}$) are appropriate.

4.0 ENVIRONMENTAL NOISE MEASUREMENTS

Measurement Instrumentation and Procedure

- 4.1 A precision integrating sound level meter was used to assess the prevailing noise climate on the third floor overlooking Kingsway. Ambient environmental noise levels were measured using the following equipment:

Rion Type 1 precision sound level meter	Type NL32;
Bruel and Kjaer acoustic calibrator	Type 4231.

- 4.2 The instrument was equipped with an environmental microphone, powered by external batteries and stored in a weatherproof case. The calibration of the instrumentation was checked before and after the tests and no signal variation occurred. Calibration of 24 Acoustics' equipment is traceable to National Standards.
- 4.3 Noise measurements were taken over the period of the 9th to 11th September 2009. The noise monitor was configured to continuously measure and store overall A-weighted statistical parameters such as L_{Aeq} , L_{Amax} and L_{A90} (all measured on fast response) in 5 minute intervals. Measurements were made in accordance with BS 7445: 1991 "Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use [Reference 4].
- 4.4 The principal noise source during the survey was road traffic using Kingsway. The weather was dry throughout the survey and the windspeed was considered to be less than 5 m/s.

5.0 RESULTS, ASSESSMENT AND RECOMMENDATIONS

Results

- 5.1 The results of the long-term background noise survey are shown in Appendix B in Figure B1. Measured noise levels at the rear of the site during the daytime were in the order of 50 dB to 55 dB L_{Aeq} and are therefore considered acceptable.
- 5.2 The measured average (L_{eq}) values from the Kingsway façade have been averaged to generate the overall 16 hour daytime and 8 hour night-time free field levels. The highest maximum night-time levels were in the order of 85 to 95 dB $L_{Amax, f}$. The overall average (L_{eq}) levels are shown in Table 4 below.

Date	Night-time Level (23:00 – 07:00) dB $L_{Aeq, 8\text{ hour}}$	Daytime Level (07:00 – 23:00) dB $L_{Aeq, 16\text{ hour}}$
9th September	-	69 *
10th September	65	69
11th September	65	70 *

Table 4: Overall Noise Levels

* Incomplete sample period

Assessment

- 5.3 Accordingly, based on the averaged measured noise levels of 70 dB $L_{Aeq, 16\text{ hours}}$ (daytime) and 65 dB $L_{Aeq, 8\text{ hours}}$ (night-time), a classification of Noise Exposure Category C is made for this development.

Night-time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Comment
NEC C	NEC C	Road traffic

Table 5: PPG 24 Assessment Categories

- 5.4 Most local authorities, including Camden Council, normally accept developments in Noise Exposure Category C on the basis that the site was previously used for residential purposes and that daytime and night-time internal noise levels are controlled to meet the requirements given in BS 8233: 1999 (ie, those identified above).

Recommendations

- 5.5 The analysis given below is based on 24 Acoustics' current understanding of the envelope construction proposed for the building and on all relevant architectural drawings available at the time of writing.
- 5.6 The acoustic requirements for the glazing (Type A applies to bedrooms overlooking Kingsway, Type B applies to all other habitable rooms) are given in Table 6.

Description	SRI (dB) per Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Type A	25	30	35	46	46	46	55	55
Type B	20	24	20	25	35	38	35	35

Table 6: Required Glazing Performance

- 5.7 In making a comparison with the values in Table 6, it is important that the glazing figures used are the result of tests in accordance with ISO 140, Part 3: 1998 and that the quoted minimum sound reduction specifications are met by the window as a whole, including frames, seals, etc. and not just the glass.
- 5.8 In order to assist with the selection process the following specifications are capable of achieving the required sound reduction performance, if installed correctly:
- Type A: Upgraded existing glazing to double glazed unit and inclusion of 8.8mm laminated secondary glazing on 150mm airspace from main glazing, including absorptive reveals);
- Type B: 4mm glass: 16mm (min) cavity: 4mm glass.
- 5.9 The apartments are to be ventilated using "whole house" mechanical ventilation which will be designed to achieve a trickle rating of NR 25 in habitable spaces.

6.0 CONCLUSIONS

- 6.1 The Masterworks Corporation has commissioned 24 Acoustics Ltd to undertake a noise impact assessment for proposed residential dwellings at 61 Lincoln's Inn Fields / 42 Kingsway, London.

- 6.2 An ambient noise survey has been carried out at the site to determine existing noise levels during daytime and night-time periods. The site has been classified as Noise Exposure Category C which means that steps must be taken in the design to ensure that internal noise levels are controlled to within acceptable values.

- 6.3 On the basis of the measured data, noise control measures have been given to protect residents from noise arising from Kingsway, in accordance with the local authority's requirements.



**Noise
Measurement
Location**

Project: 42 Kingsway, London		Title: Location Plan and Measurement Location		
DWG No: Figure 1	Scale: N.T.S.	Rev: A		
Date: 16-11-09	Drawn By: SG	Job No: 3037-2		

REFERENCES

1. Planning Policy Guidance 24, Planning and Noise (1994)
2. British Standards Institution. British Standard 8233: Sound Insulation and Noise Reduction for Buildings, 1999.
3. World Health Organisation, Guidelines for Community Noise (1999)
4. British Standards Institution. British Standard 7445: 1991 Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use.

APPENDIX A: ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dB(A) weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dB(A) corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

- i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

- ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 [1] as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T , has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B: RESULTS OF AMBIENT NOISE SURVEY

Figure B1: Measured Environmental Noise Levels
42 Kingsway 9th - 11th September 2009

