39-45 Gray's Inn Road
London

EXTERNAL BUILDING FABRIC
REPORT 20447/EBF1 Revision A

For:

The Lincolns Management Limited
Care of; Opai Developments Ltd
3rd Floor
33 Lowndes Street
London
SW1X 94X

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HANN TUCKER ASSOCIATES
Consultants in Acoustics
Noise and Vibration

Head Office
Duke House
1-2 Duke Street
WOKING
Surrey GU21 5BA

Tel : 01483 770595
Fax : 01483 729565

Northern Office
First Floor
346 Deansgate
MANCHESTER
M3 4LY

Tel : 0161 832 7041
Fax : 0161 832 8075

E-mail : enquiries@hanntucker.co.uk
www.hanntucker.co.uk

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Revision No.	Date	Description
A	08/10/2014	Minor Alterations to Section 6.0

1.0 INTRODUCTION

It is proposed to change the use of 39-45 Gray's Inn, London from a disused office building (formerly B1 use) to 9No. residential units with commercial use at Ground Floor level.

An environmental noise survey has recently been undertaken by ourselves, to establish the existing airborne noise levels due to road traffic and other environmental sources of airborne noise around the proposed development.

The data obtained has subsequently been used to undertake a detailed acoustic analysis to determine the sound insulation requirements of the external building fabric elements in order to control the aforementioned environmental airborne noise levels in line with required internal acoustic design criteria. Our findings and recommendations are presented herein.

2.0 OBJECTIVES

Based upon the environmental noise survey data and the agreed internal noise criteria, sound reduction performance specifications will be produced for the critical external building fabric elements, particularly the glazed areas. Advice will be given, where appropriate, on the likely ability of the proposed scheme to achieve the required performance specifications, with alternative forms of construction recommended where necessary. However, it will be the responsibility of the successful tenderer or the nominated supplier to comply with the specification.

3.0 EXTERNAL NOISE LEVELS

Hann Tucker Associates have been provided with a noise survey report by Hawkins Environmental dated 29 May 2013.

The results presented therein, with suitable corrections applied form the source noise data upon which our analysis and recommendations are based.

The following table presents the typical worst case incident traffic noise levels for each position. This data has been extrapolated from the data contained in Tables 5.1 and 5.2 of the Hawkins Environmental Report. We have applied a typical traffic noise spectrum to the single figures in the report provided. The traffic noise spectrum correction is from BS 8233: 1999 (derived from BS EN 1793-3: 1998). The data may be used in subsequent analysis to establish sound performance specifications for each of the external building fabric elements.

Facade	Period / Unit	Incident Sound Pressure Levels dB at Octave Band Centre Frequencies						dBA
		125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	
Front	Daytime $L_{eq,T}$	75	71	69	69	67	60	74
	Night-time $L_{eq,T}$	70	66	64	64	62	55	69
Rear	Daytime $L_{eq,T}$	54	50	48	48	46	39	53
	Night-time $L_{eq,T}$	45	41	39	39	37	30	44

4.0 ARCHITECTURAL ASSUMPTIONS

4.1 Room Finishes

In our calculations we have assumed bedrooms and living areas will have typical furnishings including beds, sofas, chairs etc.

4.2 Drawings

Our calculations have been based on the following drawings by RPP Architects.

East Elevation: A_10_300 Revision C03
West Elevation: A_10_301 Revision C03
Section East to West: A_10_211 Revision C03
Plan: Level 01: A_21_101 Revision R03
Plan: Level 04: A_21_104 Revision R03

4.3 Non-Glazed Façade Elements

In our calculations we have assumed that the non-glazed façade elements provide at least the following octave band sound reduction indices.

Façade Element	Sound Reduction Index (dB) at Octave Band Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Walls to all areas	34	41	44	48	55	55	55	55

5.0 ACOUSTIC DESIGN CRITERIA

There are no criteria in current Building Regulations concerning external noise intrusion. We also understand the Planning Authority have not imposed any noise criteria for external noise intrusion. Therefore, there are no statutory requirements for controlling external noise intrusion on this project.

Various reference documents including BS 8233: 2014 edition and WHO Community Noise Guidelines present acoustic criteria for residential premises, as outlined below.

BS 8233: 2014 "Guidance on sound insulation and noise reduction for buildings"

British Standard 8233: 2014 "Guidance on sound insulation and noise reduction for buildings" states that it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

World Health Organisation (WHO)

The World Health Organisation document on "Guidelines for Community Noise" states the following guideline values for community noise in specific environments.

Specific Environment	Critical Health Effect(s)	L_{Aeq}	$L_{Amax,fast}$
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35dB	-
Inside Bedrooms	Sleep disturbance, night-time	30dB	45dB

The document also states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dBA L_{Amax} more than 10-15 times per night, (Vallet & Varnet 1991)."*

The above levels are however the subject of much controversy, as indicated by one of the feature articles in the January/February 2003 edition of the Institute of Acoustics' publication.

In our opinion the above criteria for bedrooms should thus be regarded as preferred, rather than mandatory maxima to be achieved in all cases.

Summary

On the basis of the above we propose the following internal acoustic design criteria which the levels of road traffic/train/aircraft/other noise intrusion should not exceed:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

The above levels correspond to the guidance contained within BS 8233: 2014.

6.0 SPECIFICATION FOR GLAZING

The composite acoustic performance required of any portion of the building envelope will depend on its location relative to the principal noise sources around the site and the nature of the spaces behind it (noise criteria, size, room finishes etc).

The levels of noise incident upon each façade of the building are different. Consequently, each façade therefore has its own unique sound insulation requirement. In our experience, however, it is not appropriate to prepare numerous performance specifications. In this instance, for the sake of simplicity, we have prepared a specification with two different performance levels in order to comply with the guidelines contained within BS 8233: 2014, each of which corresponds to appropriate notional glazing configurations.

The enclosed Acoustic Specification for Glazing to Residential Facades details our recommended minimum octave band sound reduction indices. In all cases, it is essential that the system is tested in accordance with BS EN ISO 10140-2:2010 and that the quoted minimum sound reduction specifications are met by the system as a whole, including frames, trickle ventilators etc as appropriate - not just the glass.

Where structural glass or non-vision spandrel panels are proposed, they should provide sound reduction performance at least equal to that required of the cladding in order to maintain the acoustic integrity of the building envelope.

In order to comply with Building Regulations (Part F), it is necessary to provide background trickle ventilation to habitable rooms (living rooms and bedrooms). Where trickle ventilators do not form an integral part of the cladding they should comply with the Acoustic Specification for Trickle Ventilators which details the recommended minimum octave band element normalised level differences. In all cases, it is essential that ventilators are tested in accordance with BS EN ISO 10140-2:2010. Where ventilators form an integral part of the cladding system the ventilators shall be tested in conjunction with the cladding system.

7.0 CONSTRUCTION GUIDANCE FOR GLAZING AND VENTILATORS

It is essential that prospective cladding system suppliers can demonstrate compliance with the acoustic performance detailed in our specification rather than simply offering a generic glazing configuration. However, we would suggest that the following configurations could typically be expected to provide the required levels of noise insulation.

Type	Façade/Zone	Example Glazing Configuration	Type of Trickle Vent
A	East: Gray's Inn Road	10.8/20/8.8mm	Greenwood Airvac Wall Vent MA3051
B	West: Kings mews	4/16/4	Hit-and-miss Trickle Vent

In order to avoid weakness at junctions between cladding and party walls/floors we recommend;

a) All party walls abut 2No. separate mullions
All party floors abut 2No. separate transoms

b) The cladding shall incorporate suitable elements on partitioning lines against which partitions can be sealed. The complete system shall be tested for flanking transmission at a junction with party walls (between adjoining rooms at the same floor abutting cladding) and with floor slabs (between adjoining floors abutting cladding). The system shall provide a weighted normalised flanking level difference of at least 50 $D_{nf,w}$ +Ctr dB when tested in a laboratory in general accordance with BS BS EN ISO 10848-2:2006 and rated in accordance with BS EN ISO 717-1:2013. Junctions with floor slabs shall be tested in the absence of raised floors and suspended ceilings.

N.B. To adequately control flanking transmission it is recommended that all party walls should be sealed to 2No. separate mullions and all party floors should be sealed to 2No. separate transoms.

8.0 CONCLUSION

The existing environmental noise levels due to traffic and other environmental sources have been extracted from Hawkins Environmental's noise survey report.

Suitable environmental noise intrusion criteria have been proposed on the basis of BS 8233: 2014.

Detailed acoustic analysis has been undertaken to assess the sound insulation requirements of the external cladding and ventilators.

This has enabled a sound reduction performance specification for the cladding and ventilators to be prepared, along with advice to be given on types of constructions we would typically expect to provide the required acoustic performance.

We would stress however, that the proposed cladding and ventilator systems (including frames) must comply with the relevant enclosed performance specifications.

Prepared by
Paul Hill
Senior Consultant
HANN TUCKER ASSOCIATES

Checked by
John Ridpath
Director
HANN TUCKER ASSOCIATES

HT : 20447 **03/10/2014**

39-45 GRAY'S INN ROAD, LONDON

ACOUSTIC SPECIFICATION FOR CLADDING TO RESIDENTIAL FACADES

SOUND REDUCTION PERFORMANCE

In order to comply with the guidance contained within BS 8233: 2014, the complete cladding system shall achieve the following minimum sound reduction indices when tested in accordance with BS EN ISO 10140-2:2010.

Type	Façade/Zone	Minimum Sound Reduction Index (dB) @ Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
A	Gray's Inn Road	25	33	41	50	53	57
B	Kings Mews	24	20	25	34	37	40

FLANKING PERFORMANCE

Where party walls/floors abut the cladding it shall incorporate suitable elements on partitioning lines against which walls/floors can be sealed to control flanking. The complete system shall be tested for flanking transmission at a junction with party walls (between adjoining rooms at the same floor abutting cladding) and with floor slabs (between adjoining floors abutting cladding). The system shall provide a weighted normalised flanking level difference of at least 50 $D_{nf,w}$ +Ctr dB when tested in a laboratory in general accordance with BS EN ISO 10848-2:2006 and rated in accordance with BS EN ISO 717-1:2013. Junctions with floor slabs shall be tested in the absence of raised floors and suspended ceilings. N.B. To adequately control flanking transmission it is recommended that all party walls should be sealed to 2No. separate mullions and all party floors should be sealed to 2No. separate transoms.

TEST DATA

Fully detailed test reports from independent acoustic test authorities shall be supplied. All test reports shall be in English or, a full English translation.

Test data should include the $^1/_3$ octave band results from 100Hz to 3150Hz inclusive, together with the corresponding octave band results from 125Hz to 4000Hz inclusive.

The test report shall be provided for test samples which are representation of the complete system for the relevant facades - including frames, joints, seals, spandrel panels and opening lights and trickle vents (as appropriate). The samples proposed should be approved by Hann Tucker Associates.

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39-45 GRAY'S INN ROAD, LONDON

ACOUSTIC SPECIFICATION FOR TRICKLE VENTILATORS

SOUND INSULATION: Ventilators shall be tested in accordance with BS EN 15010140-2:2010. This will involve testing in 1/3 octaves from at least 100Hz to 2500Hz inclusive. These results, together with suitably converted octave band results from 125Hz to 2000Hz shall be provided for a ventilator unit which is representative of the proposed ventilator for the relevant façade. The samples proposed should be approved by Hann Tucker Associates.

The following element normalised level differences shall be achieved:

		$D_{n,e}$ Values (dB) Open Areas Corrected to 8000mm^2 at Octave Band Centre Frequency (Hz)				
Type	**Façade/Zone**	**125**	**250**	**500**	**1k**	**2k**
A	Gray's Inn Road	43	43	47	52	62
B	Kings Mews	31	36	31	38	28