PLANNING
ACKD
PLIED
ECD - 4 MAR 2008
INIT | DATE
RECD

**Penthouse,
Commercial
Street,
Manchester**

**ACOUSTIC
SPECIFICATION
REPORT**

HOARE LEA
Acoustics

Royal Exchange
Cross Street
Manchester
M2 7FL

Tel: 0161 834 4754
Fax: 0161 834 475

AUDIT SHEET

REVISION	DESCRIPTION	DATE	ISSUED BY	REVIEWED BY
	Acoustic specification	26/02/08	SM	JCE

This report is provided for the stated purposes and for the sole use of the named Client. It will be confidential to the Client and the client's professional advisers. Hoare Lea accepts responsibility to the Client alone that the report has been prepared with the skill, care and diligence of a competent engineer, but accepts no responsibility whatsoever to any parties other than the Client. Any such parties rely upon the report at their own risk. Neither the whole nor any part of the report nor reference to it may be included in any published document, circular or statement nor published in any way without Hoare Lea's written approval of the form and content in which it may appear.

CONTENTS

1.0 INTRODUCTION

2.0 CRITERIA
- 2.1 Building Regulations 2000
- 2.2 Summary Performance Requirements
- 2.2.1 Party Walls & Floors – ADE 2003 E1 & HL recommendations
- 2.2.2 Internal Walls & Floors – ADE 2003 E2
- 2.2.3 Apartment Entrance Doors – ADE 2003
- 2.2.4 Common Area Absorption – ADE 2003 E3
- 2.2.5 Façade

3.0 DESIGN SOLUTIONS
- 3.1 Floor
- 3.1.1 Airborne sound insulation
- 3.1.2 Impact sound insulation
- 3.1.3 Flanking transmission
- 3.2 Terrace
- 3.3 Internal walls
- 3.4 Apartment Entrance Doors
- 3.5 Common circulation areas
- 3.6 Lift Cores
- 3.7 Façade
- 3.8 Roof

4.0 CONCLUSION

5.0 REFERENCES

APPENDIX 1; DESCRIPTION OF SOUND INSULATION ACOUSTIC PARAMETERS

1.0 INTRODUCTION

It is proposed to build a penthouse on the roof of the existing residential building, Block A of the Commercial Street development, Manchester. Block A was recently been tested with regard to Building Regulations Part E requirements and successfully passed the pre-completion tests.

The penthouse is going to be built on the top of the existing 225mm concrete slab and use the same wall construction as Block A for the internal walls. The penthouse should be built in accordance with the Approved Document E 2003 criteria.

This document is a review of the proposed construction of the penthouse in order to comply with Approved Document E 2003.

Items addressed in this report include:

- Party wall and floors
- Internal walls
- Surface finishes in common circulation areas
- Door constructions
- Lift core constructions
- Façade
- Roof

In addition to this, nominal constructions are provided where needed, for each element such that the performance criteria can be achieved.

2.0 CRITERIA

2.1 Building Regulations 2000[1]

Part E of schedule 1 to the Building Regulations 2000 (as amended by SI 2002/2871) establishes mandatory requirements for the provision of adequate sound insulation within residential buildings. Clauses E1, E2, and E3 of the regulations set out the following requirements:

E1. Protection against sound from other parts of the same building and adjoining buildings

Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings.

E2. Protection against sound within a dwelling house et.

Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that –

a) internal walls between a bedroom or a room containing a water close, and other rooms;

and

b) internal floors

provide reasonable resistance to sound.

E2 does not apply to –

a) an internal wall which contains a door;

b) an internal wall which separates an en suite toilet from the associated bedroom;

c) existing walls and floors in a building which is subject to a material change of use.

E3. Reverberation in common internal parts of buildings containing flats or rooms for residential purposes

The common internal parts of buildings which contain flats or rooms for residential purposes shall be designed and constructed in such a way as to prevent more reverberation around common parts than is reasonable.

Requirement E3 only applies to corridors, stairwells, hallways and entrance halls which give access to the flat or room for residential purpose.

In the Secretary of States view, the normal route of compliance with the above noted requirements is to design and construct the scheme to achieve the performance benchmarks set out in Approved Document E (ADE), July 2003.

2.2 Summary Performance Requirements

The following are the minimum performance criteria requirements such that the above requirements can be achieved.

2.2.6 Facade

Manchester City Council has requested that a noise intrusion level of 40dB L_{Aeq} in living rooms and 30dB L_{Aeq} in bedrooms is achieved as per our acoustic report ref. "REP-10-01572-SM-090505-1-rev1"

3.0 DESIGN SOLUTIONS

It is proposed to build one penthouse on the roof of Block A of Commercial Street. The existing roof is now the demising structure separating the Block A from the penthouse and would have to comply with the Approved Document E 20003 criteria. The building envelope and the internal wall construction of the penthouse would also have to comply with the Approved Document E 2003 and Manchester City Council criteria.

The following sections are a review of the proposed construction for the penthouse and our recommendations, plus some important detailing elements to meet the specified criteria.

3.1 Floor

3.1.1 Airborne sound insulation

Drawing "as(05)02" dated July 07 is a section of the floor construction separating the penthouse from the apartments and corridors located in Block A.

This indicates the following construction starting from the apartment to the penthouse is proposed:

- 12.5mm plasterboard ceiling with 100mm void.
- 225mm thick concrete slab of 2000kg/m^3 min. density
- A floor supported on 'I' beam.
- The overall thickness of the floor (slab-void-floating floor) is 462mm.

It is the same construction between the corridor and the penthouse but there is no plasterboard ceiling in the corridor.

The airborne sound insulation performance criterion will be achieved by the proposed floor construction.

3.1.2 Impact sound insulation

To meet the impact sound insulation criterion, the floating floor should include a resilient layer achieving a minimum ΔL_w (impact insulation improvement) of 17 dB. This resilient layer should be placed on the top of the proposed 18mm chipboard. Alternatively a resilient overlay platform floor system of ΔL_w = 17dB should be placed on the top of the chipboard floor.

3.1.3 Flanking transmission

Careful consideration must be given to the edge detail of the floating floor to reduce any risk of flanking transmission as it would reduce the sound insulation performance of the floor.

The floor therefore should be isolated by placing resilient strips of ΔL_w = 17dB between the floor and the wall perimeters.

3.2 Terrace

It is proposed to provide large terraces for the penthouse. Drawing "as(05)02" dated July 07 proposes using a single ply membrane over tapered insulation. As the terraces are located on the top of the existing apartments and the properties of the proposed tapered insulation is at present unknown, it is therefore recommended placing a resilient layer of minimum ΔL_w of 17 dB within the floor build up to reduce any risks of noise complaints caused by impact noise e.g. footfall noise.

That can be met using a material such as Regupol E48 which is water resistant and tiles can be laid directly on its surface.

3.3 Internal Walls

Following discussions with Stephenson Bell, it was understood that the internal wall construction will be 2 layers of 12.5mm wallboard on each side of 48 mm Gypframe 'C' stud, with no cavity insulation. The sound insulation performance of this wall construction is 42dB Rw and therefore complies with the Approved Document E 2003 criterion.

3.4 Apartment Entrance Doors

The entrance door to the penthouse should be a solid core construction (minimum surface density 25 kg/m^2) with proprietary acoustic perimeter seals (top, sides and threshold) rated to R_w 29 dB.

3.5 Common Circulation Areas

The penthouse is accessible by extending the original stair cases to the penthouse. The following acoustic treatment for common circulation area in Block A was originally proposed:

Area	*Compliance Route Option*	
	Method A	*Method B*
Corridors	Cover an area equal to or greater than the floor areas with a Class C absorber	Provide 0.25m^2 of total absorption per cubic metre of volume

It is therefore recommended that the same acoustic treatment used for the staircases of Block A is installed in the staircase accessing the penthouse.

3.6 Lift Cores

It is proposed to extend the existing lift of Block A to the penthouse for access.

The proposed lift is located in the hallway of the penthouse. It opens directly in the hallway opposite to the master bedroom. Only one wall of the lift shaft is common to the hallway while the cloakroom, bathroom and the walk in wardrobe abut the lift shaft. The proposed lift shaft is 200mm concrete thick.

Approved Document E 2003 does not provide any guidelines for noise generated by the lift (noise generated by the people using the lift, the noise signal, lift motor...) apart from stating that it must provide party wall compliance. However, as the lift is used by the occupants of the apartments of Block A, we would strongly recommend lobbying the lift entrance to reduce the risk of noise break in into the hallway and to the master bedroom. Although the guide rails are likely isolated from the structure as recommended in the original report, the engine is located on the lift car. Consequently, we would still recommend lining the lift shaft walls located in the hallway and in the cloakroom and bathrooms with a dot and dab dry line system to reduce the risk of noise breaking out from the lift shaft when in use.

3.7 Facade

The facades of the penthouse comprise mainly glazing.

MCC internal noise levels criteria will be met by a 33dB R_w window as defined in the acoustic report ref. "REP-10-01572-SM-090505-1-rev1". That is generally achieved by a 6/12/6 or 6/16/6 double glazed window, but manufacturer's data should be reviewed to be sure of compliance.

The vents should be of the same specifications as defined in the acoustic report ref. ""REP-10-01572-SM-090505-1-rev1".

3.8 Roof

The roof should achieve a minimum sound insulation performance of 33dB R_w as per our report ref. "REP-10-01572-SM-090505-1-rev1".

Drawing "as(05)03" dated 07/07 indicates that the roof is a sandwich construction which includes prodema laminate cladding on the top of an insulation layer, a sheathing board, insulation within a 200mm cavity minimum and a plasterboard ceiling.

The properties of the prodema laminate cladding are unknown at present. Consequently, for assessment purposed, it is assumed that the roof comprises 10mm sheathing board of 892kg/m^3 density minimum and a 12.5mm layer of plasterboard with mineral fibre insulation within a minimum 200mm cavity. It is predicted that the minimum sound insulation of 33dB R_w will be achieved by the proposed system.

Note that the junctions details of the roof with the facade should be carefully reviewed to reduce the risk of decreasing the sound insulation performance of the roof.

4.0 CONCLUSION

The acoustic performance criteria have been established for the various internal separating elements of the Penthouse, Commercial Street scheme. The acoustic performances of the different proposed constructions have been reviewed against the acoustic criteria and suggestions were made where needed to reduce the risk of decreasing the acoustic performance of the separating elements.

Below is the summary of the proposed construction and our recommendations for compliance with Approved Document **E** 2003 and MCC criteria.

Element	**Proposed Construction**	**Compliance**		**Proposed construction to comply with criteria**
		ADE 2003	MCC	
Party walls	N/A	N/A		N/A
Party Floor	An acoustic floating floor raised floor supported on 'I' beam on the top of 225mm thick concrete slab of 2000kg/m^3 min. density. The overall thickness of the raised floor is 462mm.			- 18mm chipboard on the top of the I'' beam. - A resilient layer of ΔL_w =17dB to comply with impact noise criterion
Internal wall	2 layers of 12.5mm wallboard on each side of 48 mm Gypframe 'C' stud, with no cavity insulation.	Yes		
Doors	A 29dB R_w door	Yes		
Roof	A prodema laminate cladding on the top of an insulation layer on the top of a sheathing board, insulation within a 200mm cavity minimum and a plasterboard ceiling.		Yes	
Façade	6/12/6 or 6/16/6 double glazed system. A minimum sound insulation performance of 33dB R_w		Yes	-

Further recommendations were made for the terrace of the penthouse and for the lift to reduce the risk of noise complaints

Element	**Risk**	**Proposed solution**
Terrace	Impact noise breaking into the apartments located underneath the terrace	Introduce a resilient layer of ΔL_w =17dB.
Lift	Noise breaking into the walkway and in the master bedroom when the lift is used by the occupants of Block A.	- Lobby the lift to reduce the noise breaking in the walkway and in the master bedroom with doors opened. - Line the lift shaft walls with plasterboard on dabs in the hallway and in the bathroom and the cloakroom.

5.0 REFERENCES

[1] Building Regulations 2000 , Approved Document E, 2003 Edition
[2] BS 8233: 1999 Sound insulation and noise reduction for buildings – code of practice

APPENDIX 1

DESCRIPTION OF SOUND INSULATION ACOUSTIC PARAMETERS

R_w

The Weighted Sound Reduction Index (R_w) is a laboratory measurement of a partitions performance. Where requirements are given as R_w values laboratory test certificates are required to show compliance.

$D_{nT,w}$

The Weighted Standardised Level Difference ($D_{nT,w}$) is a field measurement of the sound level difference between rooms and includes the acoustic contribution of all noise paths between the two rooms. Where requirements are given as $D_{nT,w}$ values sound insulation tests are required to show compliance.

C_{tr}

This is a spectrum adaptation factor calculated from the measured R_w, R'_w, $D_{nT,w}$ and the corresponding third octave band R, R' and D_{nT} values. It uses a set of weighting levels in third octave bands derived from a road traffic noise spectrum. It is applied to airborne test results and is measured in dB.

$L'_{nT,w}$

A single-number quantity used to characterize the impact sound insulation of floors. Lower numeric values imply higher impact sound insulation.

$L_{A10,\ 5min}$

The level exceeded for 10% of the time during a 5 minute measurement period, measured in A-weighted decibels.