Mary Newman Building
St James Square
Plymouth University

MACH ACOUSTICS

Preliminary Design Review

February 2006

Contents

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1	Preliminary Design Review	Ze Nunes	10/02/06

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1.0 Introduction

The focus of this report relates to the acoustic requirements/design concept of the Mary Newman Building, St James Development, Plymouth University. This building is currently used as offices and educational rooms by the University. It is now proposed to convert this building to residential student accommodation. MACH Acoustics has therefore provided this preliminary report for the purpose of costing and developing the scheme.

The information contained within this report is therefore aimed at providing the design team with sufficient information to develop and cost this scheme, whilst achieving compliance with Building Regulations Approved Document E.

Part E requires that three areas of acoustics be complied with when refurbishing or developing a new building. These regulations are listed below:

- Regulation E1 – Protection against sound from other parts of the building and adjoining buildings.
- Regulation E2 – Protection against sound within a dwelling house.
- Regulation E3 – Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes

Under the Regulation E1, this development is seen to consist of 'rooms for residential purposes'.

1.1 Report Format

For the purposes of simplicity, this report addresses Approved Document E's (ADE) three requirements separately. Requirements E2 and E3 are addressed first since their application to this building is relatively simple.

In addition, this report is spilt into to key sections and an introductory section addressing key issues in some detail and a referenced application section addressing implications of Part E on this development.

1.2 Value Engineering

As with any building, there is always potential for cost savings and value engineering. This report, therefore addresses ADE requirements to their exact specification. In MACH Acoustics experience, it is often possible to add a degree of flexibility to these requirements and save potential costs. Since the exact performance requirements are outside of our control, MACH Acoustics intends to work closely with Building Control such to achieve the maximum level of benefit to this project.

In addition, we are proposing to demonstrate design by means of testing. This means lean design can be proposed and proved to work at an early stage. This method therefore has the potential to reduce risk and maximise costs effectively.

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2.0 Regulation E2 – Protection against sound within a dwelling-house etc.

The regulation (E2) states:

> *"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 closet, and other rooms;*
> *and*
> *(b) Internal floors provide reasonable resistance to sound."*

Section 0, clause 0.9 of ADE 2003, states that the normal way of satisfying the regulation is to provide internal walls and floors with a laboratory performance of 40 dB R_W. However, it is stated in the requirements statement in ADE 2003 that the Requirement 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."

2.1 Implication of Regulation E2

The regulation above is not seen to apply to this building since there appears to be no internal walls or floors within this development. As such, no action is needed to comply with this requirement. Note that this statement needs to be approved by Building Control.

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3.0 Regulation E3 – Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes

The regulation (E3) states:

> *"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 the common parts than is reasonable."*

Section 0, clause 0.11 of ADE 2003 states that the normal way of satisfying the regulation is to comply with the requirements set out in Section 7 of ADE 2003. Section 7 provides two design approaches, which are as follows:

Method A

Corridors and hallways should be provided with acoustically absorptive ceiling tiles to ISO 11654 Class C or better, to an area equal to the floor area. In practice, most typical ceiling tiles on a nominal 100mm suspension system meet this.

For stairwells, an area of Class C tiles equal to 50% of the area of the following should be provided:

- stair treads
- upper surface of the intermediate landings
- upper surface of the landings
- ceiling area

It is also permissible to install an area of Class D tiles equal to 100% of the above area. These would generally have a much smaller void space.

Method B

This comprises the calculation of total acoustic absorption within the common spaces, which allows for the acoustic absorption from carpeted floors and other similar, acoustically absorptive surfaces.

3.1 Implication of Regulation E3

At this stage, it is recommended that a cost allowance be made for perforated plasterboard or acoustic ceiling tiles. The areas required to be treated are the ceilings within corridors, landings and stairs. Please see the summary sheet at the back of this report for further details.

3.2 Value engineering

MACH Acoustics has in the past, approached this issue by using the design parameters given within with Building Bulletin 93 'Acoustic Design for Schools' (BB93) as opposed to the calculation method provided within Part E. BB93 forms part of Approved Document E and provides more relaxed performance requirements than those given within Part E. By using these requirements, it is hoped that the Building Control Officer will discharge Regulation E3, providing carpet is used throughout this development.

4.0 Regulation E1 – Protection against sound from other parts of the building and adjoining buildings.

Regulation (E1) states:

> *"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."*

Section 0, clause 0.1 of ADE states that the normal way of satisfying the regulation, is to provide separating floors and walls which comply with the performance standards set out in Table 1a and Table 1b of Approved Document E (ADE) 2003. Table 1b is given below and provides the regulatory sound insulation requirements for 'rooms for residential purposes'.

Table 1b: Rooms for residential purposes – performance standards separating walls, separating floors, and stairs that have a separating function.		
	Airborne sound insulation $D_{nT,w}+C_{tr}$ dB (Minimum Values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum Values)
Purpose built rooms for residential purposes Walls Floors and Stairs	 43 45	 - 62

Table 1. ADE performance requirements

Approved Document E's interpretation of a room for residential purposes is given below:

> *'Interpretation (Regulation 2) "room for residential purposes" means a room, or suite of rooms, which is not a dwelling-house or flat and which is used by one or more persons to live and sleep in, including rooms in hotels, hostels, boarding houses, halls of residence and residential homes but not including rooms in hospitals, or other similar establishments, used for patient accommodation.*

To demonstrate compliance with respect to this regulation, it is proposed that pre-completion testing will be undertaken.

4.1 Implication of Regulation E3

At this stage, a detailed analysis of the building has not been undertaken. The information below is based upon three sound insulation tests undertaken on the 6th of February 06. Due to time and other constraints, these tests did not follow the exact method provided by BS140. As such, the results of these tests should be considered indicative. In addition, the structure of the building is as yet unknown to MACH Acoustics. As such, detailed flanking calculations have not been undertaken.

The above limitation means that the information given within this section should be considered indicative and for guidance only, at this stage.

4.2 Party Walls

It is our understanding that walls within this development are intended to be upgraded to comply with ADE requirements. In addition, due to changes made to this building over time, walls have been removed and moved across various locations and floors within this development. As such, new walls will be required at some locations.

This section therefore provides suitable forms of construction for new walls, and provides indicative construction which could be used to upgrade the performance of existing walls such to meet ADE requirements.

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4.2.1 New Walls

The table below provides three wall constructions which are understood to meet ADE sound insulation requirements between student rooms. Note that flanking around these walls has not been assessed. Once these calculations and assessments have been undertaken, it may be found that an upgrade is required to the proposed constructions below.

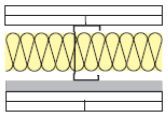
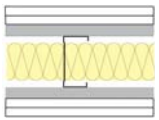
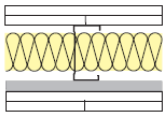
Wall Type	R_W Rating R_W+C_{tr}	Illustration	Discription
1	53 dB		Two layers of 12.5mm SoundBloc each side of a 70mm Gypframe 'C' Studs at 600mm centres with Gypframe RB1 Resilient Bar to one side. 50mm Isowool Acoustic Partition Roll (1200) in the cavity. Lined each side with 2*12.5mm Soundbloc
2	55 dB		Two layers of 12.5mm SoundBloc each side of a 70mm Gypframe 'C' Studs at 600mm centres with Gypframe RB1 Resilient Bar to both side. 50mm Isowool Acoustic Partition Roll (1200) in the cavity. Lined each side with 2*12.5mm Soundbloc
3	56 dB		Two layers of 12.5mm SoundBloc each side of a 146mm Gypframe 'C' Studs at 600mm centres with Gypframe RB1 Resilient Bar to one side. 50mm Isowool Acoustic Partition Roll (1200) in the cavity. Lined each side with 2*12.5mm Soundbloc

Table 2. Proposed constructions for new walls within the Mary Newman Building

MACH Acoustics advises that construction Type 3 be used on the grounds of cost and performance.

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4.2.2 Upgrading walls

To determine the upgrade requirements of walls, indicative sound insulation tests where undertaken on the 6th of February 06. Note that a full acoustic survey is to be undertaken on the 11th of February 06. The results of these tests are summarised within the table below.

No	Test (airborne/ Impact)	Source Room	Receiver Room	Separating Element (floor/wall)	Required Sound Insulation	Measured Sound Insulation	Pass / Fail	Short-fall
1	Airborne	Room 1006	Room 1005	Wall	43 dB Minimum level	33dB	Fail	-10 dB
2	Airborne	Room 1006	Room 1007	Wall	43 dB Minimum level	34dB	Fail	-9 dB
3	Airborne	Room 1006	Room 906	Floor	45dB Minimum level	45dB	Pass	0 dB

Table 3. Results of preliminary sound testing

The table above shows that the existing floors just meet ADE requirements. On the other hand, the performance of walls fails to meet ADE requirements by some 10 dB, meaning that to meet ADE requirements, at least 10 dB of additional sound resistance is required to be added to the performance of walls within this development.

To determine the upgrade requirements of walls, the results of sound testing were combined with the calculation method provided by Sharp B. H. (1973), as given with Engineering Noise Control. This calculation method is seen to provide an accurate form of prediction but due to the importance of this issue, it is recommended that the final proposed upgrade method be tested on site and at an exceptionally early stage. This will ensure that the proposed build method complies with ADE. This test set up is also intended to be assessed from the point of view of over design and value engineering.

Table 4 provides the results of the above assessment for a range of constructions. The assessed constructions are listed below.

a) Wooden battens attached to one side of the block wall
b) Wooden battens attached to one side of the block wall + a resilient bar
c) An independent steel stud wall
d) Wooden battens attached to both sides of the block wall

Each of these forms of construction has been assessed for a range of air gaps, where the air gap is defined as the space between the block wall and inner face of the plasterboard skin. Light weight mineral wool (30kg/m^2) is assumed to fill this gap. In addition, sound insulation levels have been determined for 1 and 2 layers of plasterboard.

Table 3 provides the increased results of preliminary site testing. Based upon the results given within this table, it can be seen that at least 10 dB of additional sound insulation is required to be added to existing walls such to comply with ADE. Note that the addition of 10 dB does not allow for construction tolerances. As such, Table 4 has been highlighted with red, yellow and green, where red indicates an unacceptable form of construction, yellow indicates suitable forms of construction but with minimal levels of construction tolerances and green indicates and appropriate form of construction. It is hoped that this table will provide the design team with a range of possible design solution to meet ADE requirements.

Note the gaps in Table 4 are seen to be un-buildable solutions. The increased levels of sound insulation are based upon the results of the sound tests and are therefore non transferable to other parts of this project.

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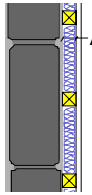
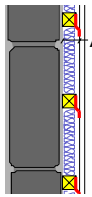
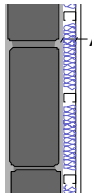
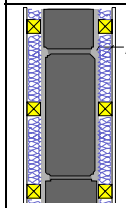
Illustration	Description	Air gap - See Drawing				
		Plasterboard	**25mm**	**50mm**	**100mm**	**150mm**
	Plasterboard on one side of block wall, wooden battens directly fixed to wall at 600mm centres, air void filled with mineral wool	1 layer of 12.5mm plasterboard	7 dB	8 dB	10 dB	-
		2 layers of 12.5mm plasterboard	8 dB	10 dB	11 dB	-
	Plasterboard on one side of block wall, wooden battens directly fixed to wall at 600mm centres, including a resilient bar, air void filled with mineral wool	1 layer of 12.5mm plasterboard	9 dB	10 dB	15 dB	-
		2 layers of 12.5mm plasterboard	11 dB	17 dB	18 dB	-
	Plasterboard on one side of block wall, steel stud independent from block wall at 600mm centres, air void filled with mineral wool	1 layer of 12.5mm plasterboard	-	13 dB	19 dB	22 dB
		2 layers of 12.5mm plasterboard	-	19 dB	24 dB	27 dB
	Plasterboard on both side of block wall, wooden battens directly fixed to wall at 600mm centres, air void filled with mineral wool	1 layer of 12.5mm plasterboard	14 dB	16 dB	20 dB	-
		2 layers of 12.5mm plasterboard	16 dB	20 dB	22 dB	-

Table 4. Possible upgrade solutions to existing walls

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4.2.3 Walls to circulation spaces

ADE requires that walls to circulation spaces meet the same performance as separating walls between rooms. This means that the same degree of wall lining as per Table 4 is required to be added to these walls.

On the otherhand, ADE and BB93 acknowledge that the same levels of sound insulation as that of a party wall, cannot be achieved by a partition containing a door. It is therefore MACH Acoustics intention to liaise with the Building Control Office and dispensate this requirement, meaning that no wall lining will be required. Note, this needs to be approved by the Building Control Officer.

4.2.4 Doors

To maintain a reasonable level of sound insulation between living spaces and circulation spaces, ADE advises that the sound insulation of the door achieves 29 dB R_w (measured according to BS EN ISO 140-3:1995 and rated according to BS EN ISO 717-1:1997). To achieve this level of sound insulation, these doors should have a good perimeter sealing and a mass greater than 25 kg/m^2. Note that this advice only applies between living spaces.

On similar developments, MACH Acoustics has argued that 28dB R_w doors are sufficient. This argument is based on acoustic ceiling tiles being used within circulation spaces and other reasons. It is MACH Acoustics understanding that a 28dB R_w door can provide significant cost savings over a 29dB R_w door. It is therefore our intention to place the same argument to the Building Control Officer on this project.

4.3.1 Floors – Airborne sound insulation

At this stage, it is understood that no additional ceiling treatments are proposed within this development. Table 2 indicates that the existing floors meet ADE requirements. On the other hand, the single test shows that there is no margin for error or variance in the floor.

Such to gauge the levels of risk to this project, further tests are needed.

4.3.2 Floors – Impact sound insulation

ADE performance requirements with respect to impact isolation between rooms, is 62 dB $L'_{nT,w}$ or less. To achieve this level of isolation, a degree of resilience is required within the floor make up. This is typically provided within the floor make up by means of a 6mm resilient layer placed under a screed. An alternative form of construction is to use a 6mm resilient layer on a 19mm plank, under T&G floor boards. See Figure 1 for an indicative detail.

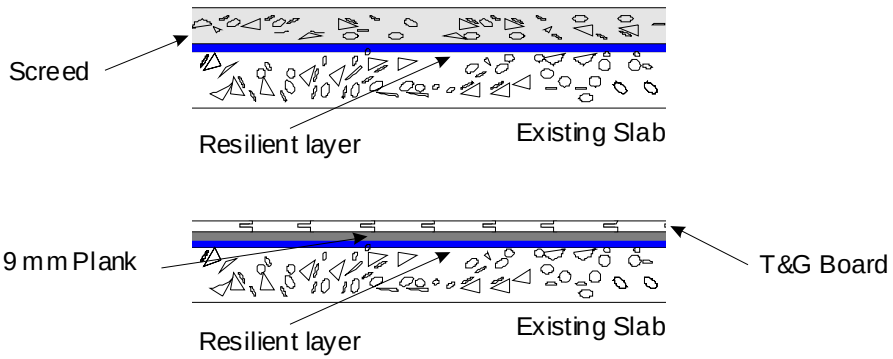

Figure 1. Indicative impact isolation details

ADE typically does not allow for the impact isolation to form part of the floor covering since floor coverings can be removed by end users. On the other hand, this building will be under the control of a strict management process. As such, it may therefore be possible to get the Building Control Officer to allow for soft floor coverings to be used during pre-completion testing.

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5.0 Flanking – Construction elements

From a site inspection, it appears that the following areas require to be addressed:

5.1 Flanking at party walls and the façade

Currently, there is a boxed out section under the window area within this development. If the cover to this box is removed, it is apparent that the separating block walls do not adjoin the façade. As such, there is potential for flanking at this point. See Figures 2 and 3.

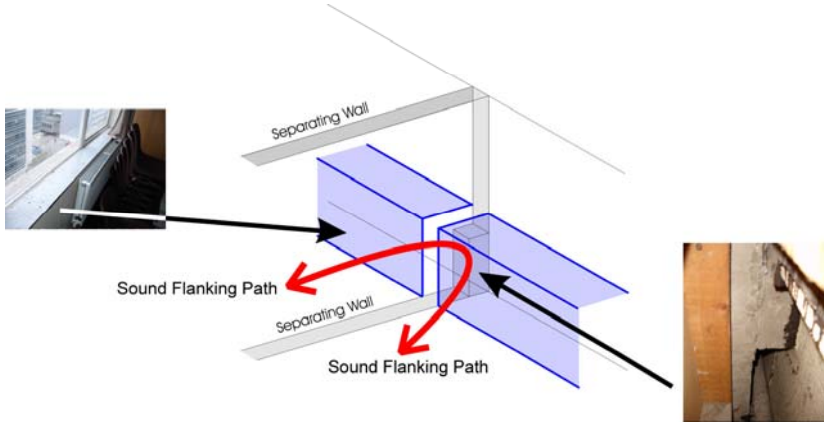

Figure 2. Flanking detail at facade

It is advised that a sound insulating fire barrier be used or that both sides of the hole be lined with two layers of plasterboard.

5.2 Wall linings and the façade

The illustration below shows the junction between the buildings perimeter columns and separating walls (Figure 3a). The illustration also shows two wall lining types, Figures 3b and 3c.

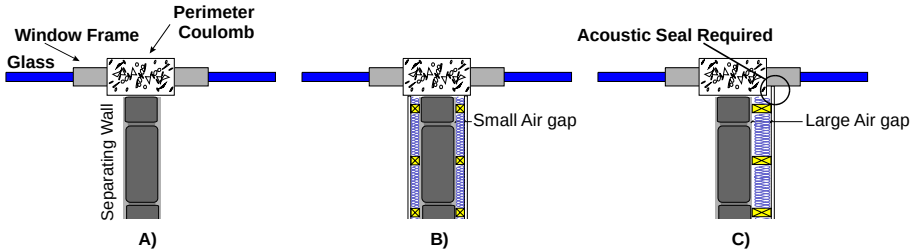

Figure 3. Detail between separation wall lining and window frames

A) As built
B) With slim wall lining on both sides of the wall
C) With large wall lining on side of wall only.

As can be seen from Figure 3 C, if a large air gap is used, care will be required to ensure the seal between the wall lining and the frame of the glazing.

Slim wall linings are therefore advised to avoid this detail Note, it may be appropriate to use a wall lining on both sides of the block wall as shown in Figure 3 b as opposed to a wide lining as shown in Figure 3c..

5.3 Service penetration

From the illustration below, it can be seen that cables and in some cases pipe work, pass through party walls. These are required to be made good by means of filling in all holes greater than 5-10 m^2, with a product containing an equal mass to that where the hole is contained. For holes smaller than 5-10 m^2, non hardening mastic should be used. Figure 4 provides typical service penetrations.

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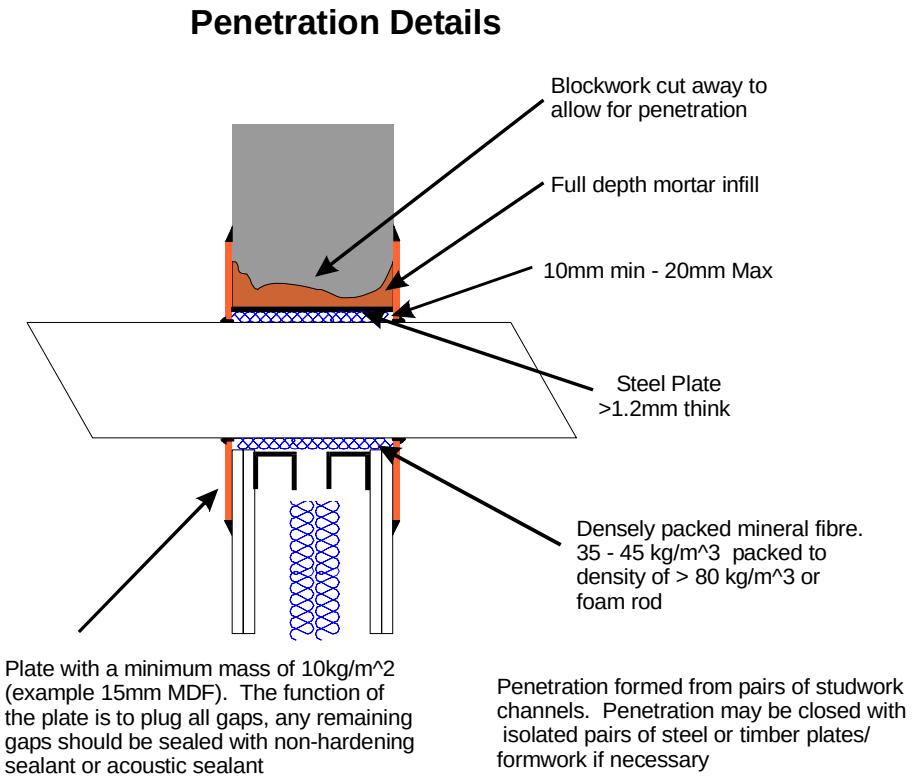

Figure 4. Penetration detail for services

5.4 Boxing out of services

The text below is taken from Part E and relates to the acoustic performance of services.

Junctions with floor penetrations (excluding gas pipes)

3.41 Pipes and ducts that penetrate a floor separating habitable rooms in different flats should be enclosed for their full height in each flat. See Diagram 3-6.

4.45 Piped services (excluding gas pipes) and ducts which pass through separating floors in conversions should be surrounded with sound absorbent material for their full height and enclosed in a duct above and below the floor.

3.42 The enclosure should be constructed of material having a mass per unit area of at least 15 kg/m^2. Either line the enclosure, or wrap the duct or pipe within the enclosure, with 25 mm unfaced mineral fibre.

4.46 Pipes and ducts that penetrate a floor separating habitable rooms in different flats should be enclosed for their full height in each flat.

4.49 The enclosure may go down to the floor base if floor treatment 2 is used but ensure isolation from the floating layer. *(note floor treatment 2 is similar to the proposed construction for this development)*

3.43 Penetrations through a separating floor by ducts and pipes should have fire protection to satisfy Building Regulation Part B - Fire safety. Fire stopping should be flexible and prevent rigid contact between the pipe and floor.

Do

a. Do seal the joint between casings and ceiling with tape or sealant.
b. Do leave a nominal gap (approx. 5 mm) between the casing and any floating layer and fill with sealant.

The illustration below is taken from Part E and RSD. This detail provides a typical penetration for services.

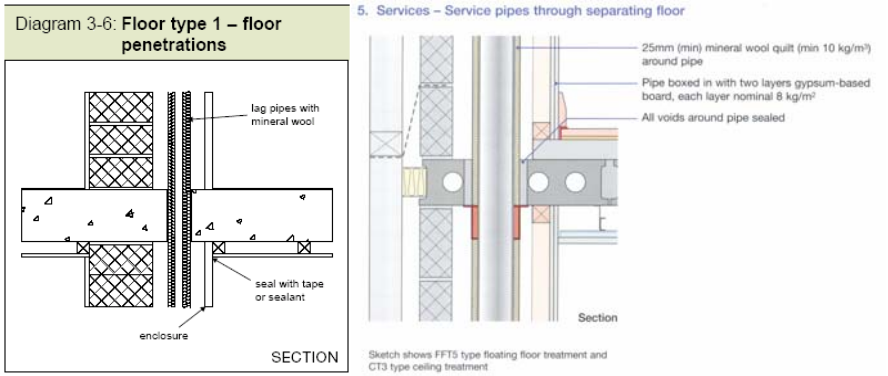

Figure 5. Penetration detail

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Regulation E1 - Party Walls - New walls

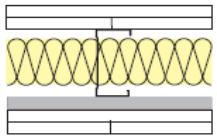
Affected area

Comments

Where new walls are required between student rooms, MACH Acoustics reccommeds the construction shown below be used.

Note that this wall type may require to be upgarded post a full flanking assessment of the building

Illustrations



Two layers of 12.5mm SoundBloc each side of a 146mm Gypframe ‘C’ Studs at 600mm centres with Gypframe RB1 Resilient Bar to one side. 50mm Isowool Acoustic Partition Roll (1200) in the cavity. Lined each side with 2*12.5mm Soundbloc

Regulation E1 - Party Walls - New walls

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Regulation E1 - Party Walls - To Corridors

Affected area

Comments

In accordance with ADE requirements, walls to circulation spaces are required to achieve the same levels of sound insulation as party walls. To achieve this, the following wall lines illustated below are proposed.

Due to the limited performance of doors, MACH Acoustics intends to negotiate out this requirement with the Building Control Officer.

Illustrations

Type	Increase sound insulation	Construction
1	+ 15 dB	100mm airgap - Wooden Battens + Res Bar - 1 layer of 12.5mm Plasterboard - on one side only
2	+ 17 dB	50mm airgap - Wooden Battens - 2 layers of 12.5mm Plasterboard - on one side only
3	+ 13 dB	50mm airgap - Steel Stud - 1 layer of 12.5mm Plasterboard - on one side only
4	+ 19 dB	50mm airgap - Steel Stud - 2 layers of 12.5mm Plasterboard - on one side only
5	+ 14 dB	25mm airgap - Wooden Battens - 1 layer of 12.5mm Plasterboard - on both sides only
6	+ 16 dB	25mm airgap - Wooden Battens - 2 layers of 12.5mm Plasterboard - on both sides

a) b) c)

Regulation E1 - Party Walls - To Corridors

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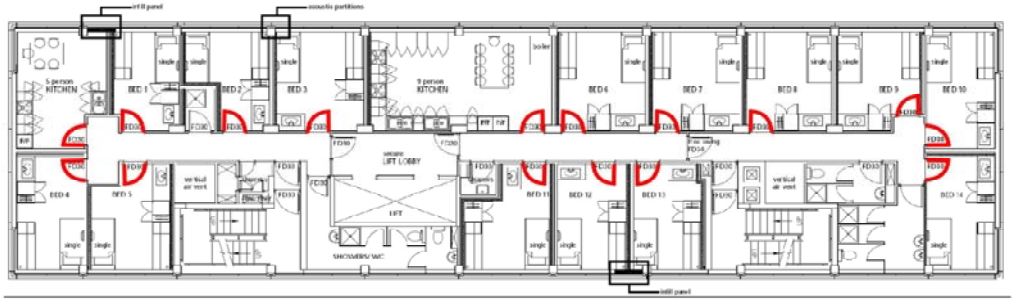
Regulation E1 - Party Walls - Doors

Affected area



Comments

The highlighted doors above are required to achieve 29 dB RW i.e. a 30 min fire door with acoustic seals.

Note, it may be possible to refurbish existing doors, since all doors on site are understood to achieve a 30min fire rating. It may also be possible to use 28 dB door as opposed to 29 dB doors such to allow a cost saving. This reduction would require to be approved by Building Control

Illustrations

Existing doors are understood to be 30min fire doors, acoustic seals could therefore be a added to these doors such to meet ADE requirements

Regulation E1 - Party Walls - Doors

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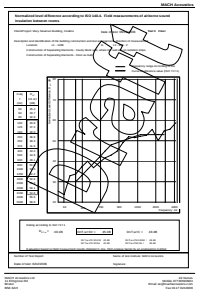
Regulation E1 - Party Floors - Airborne Sound Insulation

Affected area

Comments

To date, the single sound insulation test indicates that floors comply with ADE requirements. On the other hand, this test <u>just</u> complies with the requirement

Illustrations



The current test results for the floors within this development show that floors meet ADE requirements. On the other hand, these tests indicate that the floors only just meet the requirements with zero degrees of margin.

Regulation E1 - Party Floors - Airborne Sound Insulation

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Regulation E1 - Party Floors - Impact Sound Insulation

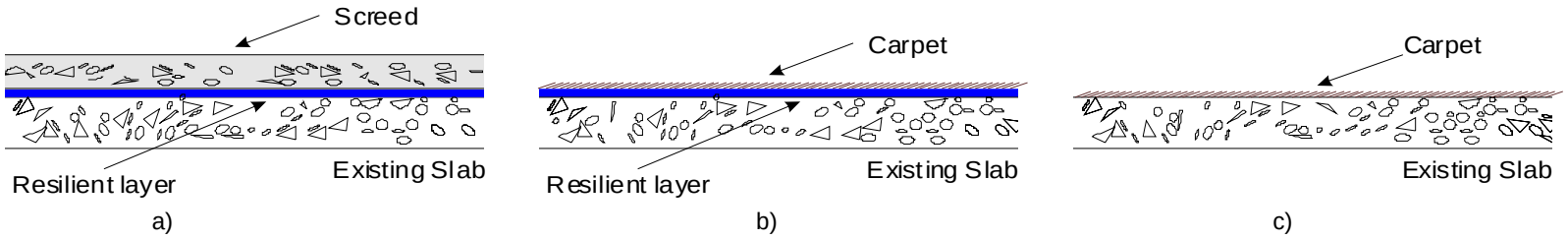
Affected area

Comments

The areas highlighted above are required to achieve ADE impact isolation levels. This is typically achieved by means of adding a resilient layer and a screed, or a wooden floating floor. See illustration A.

Two possible alternatives to the above construction are a) to bond a resilient layer to the floor, Illustration B. b) It may also be possible to achieve the impact isolation by means of carpet. Note, both these forms of isolation would require Building Control Approval

Illustrations



Regulation E1 - Party Floors - Impact Sound Insulation

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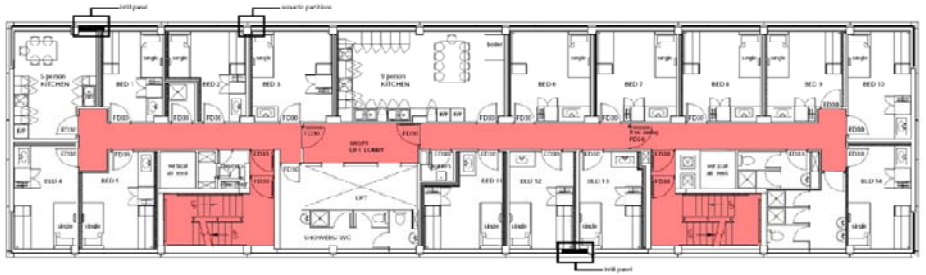
Regulation E3 - Reverberation in the common internal parts

Affected area



Comments

To comply with Regulation E3 – 'Reverberation in the common internal parts ', ceiling tiles or perforated plasterboard are required within the highlighted areas above.

Note, MACH Acoustics has in the past dispensated this requirement by means of carpet in these areas. On the otherhand, it is recommended that ceiling tiles be used within circulation spaces to reduce the acoustic requirements of doors. Note, removing this treatment would require Building Control approval.

Illustrations

Regulation E3 - Reverberation in the common internal parts

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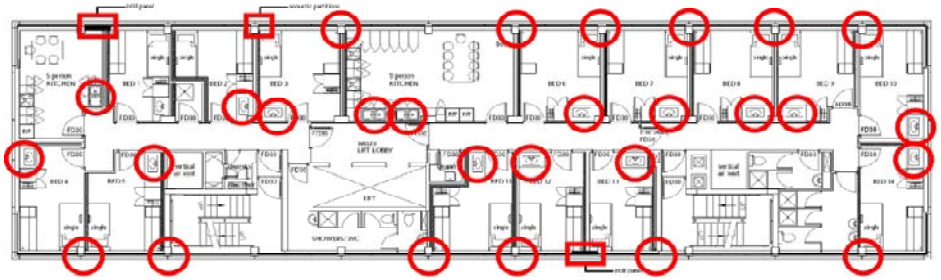
Details Affecting Sound Insulation Levels

Affected area



Comments

To ensure the sound insulation of separating elements are not compromised, all holes and details are required to be made good

All services will require to be acoustically sealed as shown within Figure xxx of the main report. All penetration in walls and floors will require to be made good

Illustrations

Gap at junction between walls and façade required to be infilled

Service Pentrations

Boxing out of services

Cable and other holes are required to be made good

Details Affecting Sound Insulation Levels

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Appendix A On site test results

Normalized level difference according to ISO 140-4. Field measurements of airborne sound insulation between rooms

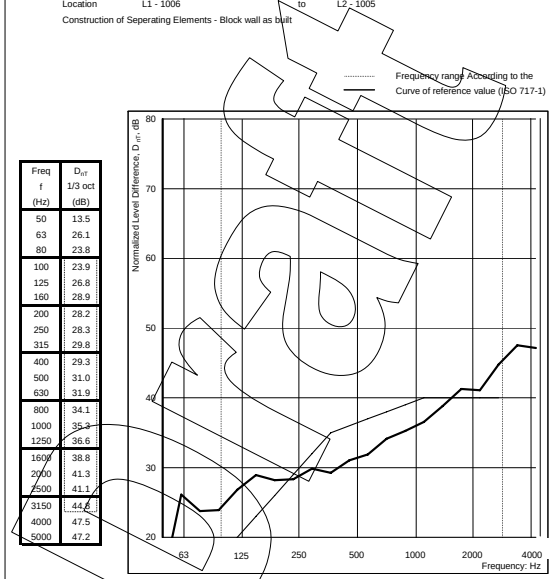
Client/Project: Mary Newman Building, Cowlins Date of test: 06/02/2006 **Test 1 Wall**

Description and identification of the building construction and test arrangement, direction of measurement

Location L1 - 1006 to L2 - 1005

Construction of Seperating Elements - Block wall as built

Freq f (Hz)	D_{nT} 1/3 oct (dB)
50	13.5
63	26.1
80	23.8
100	23.9
125	26.8
160	28.9
200	28.2
250	28.3
315	29.8
400	29.3
500	31.0
630	31.9
800	34.1
1000	35.3
1250	36.6
1600	38.8
2000	41.3
2500	41.1
3150	44.6
4000	47.5
5000	47.2



Rating according to ISO 717-1

$D_{nT,w}$ = 36 dB DnT,w+Ctr = 33 dB DnT,w+C = 35 dB

DnT,w+Ctr 50-31 32 dB DnT,w+C50-3150 = 35 dB

DnT,w+Ctr 50-5k 32 dB DnT,w+C50-5k = 36 dB

Evaluation based on field measurment results obtained in one- third-octave bands by an engineering method

Number of Test Report: Name of test institute: MACH Acoustics

Date of test: 6/02/2006 Signature:

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Normalized level difference according to ISO 140-4. Field measurements of airborne sound insulation between rooms

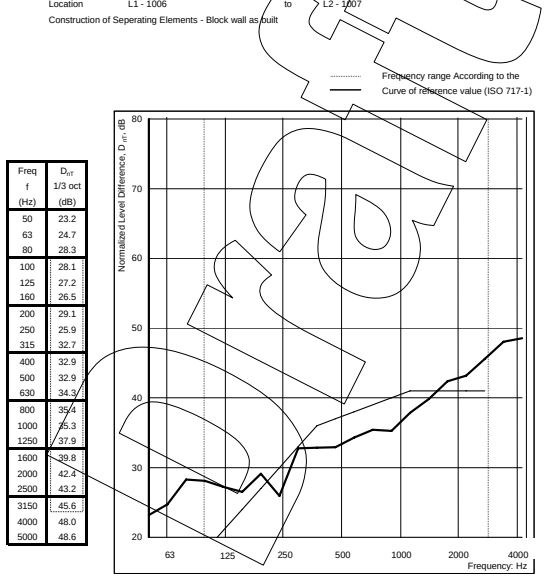
Client/Project: Mary Newman Building, Cowlins Date of test: 06/02/2006 **Test 2 Wall**

Description and identification of the building construction and test arrangement, direction of measurement

Location L1 - 1006 to L2 - 1007

Construction of Seperating Elements - Block wall as built

Freq f (Hz)	D_{nT} 1/3 oct (dB)
50	23.2
63	24.7
80	28.3
100	28.1
125	27.2
160	26.5
200	29.1
250	25.9
315	32.7
400	32.9
500	32.9
630	34.3
800	35.4
1000	35.3
1250	37.9
1600	39.8
2000	42.4
2500	43.2
3150	45.6
4000	48.0
5000	48.6



Rating according to ISO 717-1

$D_{nT,w}$ = 37 dB DnT,w+Ctr = 34 dB DnT,w+C = 36 dB

DnT,w+Ctr 50-31 33 dB DnT,w+C50-3150 = 36 dB

DnT,w+Ctr 50-5k 33 dB DnT,w+C50-5k = 37 dB

Evaluation based on field measurment results obtained in one- third-octave bands by an engineering method

Number of Test Report: Name of test institute: MACH Acoustics

Date of test: 6/02/2006 Signature:

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Normalized level difference according to ISO 140-4. Field measurements of airborne sound insulation between rooms

Client/Project: Mary Newman Building, Cowlins Date of test: 06/02/2006 **Test 3 Floor**

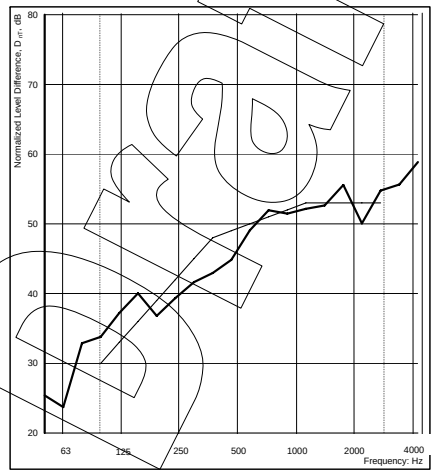
Description and identification of the building construction and test arrangement, direction of measurement

Location L1 - 1006 to L2 - 906 - 2

Construction of Seperating Elements - Cavity block wall, where the wall sits on isolation strips.

Construction of Seperating Elements - Floor as built

Freq f (Hz)	D_{nT} 1/3 oct (dB)
50	25.4
63	23.7
80	32.9
100	33.8
125	37.2
160	40.0
200	36.8
250	39.3
315	41.6
400	43.0
500	44.8
630	49.1
800	51.9
1000	51.5
1250	52.2
1600	52.6
2000	55.6
2500	50.1
3150	54.8
4000	55.6
5000	58.9



Rating according to ISO 717-1

$D_{nT,w}$ = 49 dB DnT,w+Ctr = 45 dB DnT,w+C = 48 dB

DnT,w+Ctr 50-31 42 dB DnT,w+C50-3150 = 48 dB

DnT,w+Ctr 50-5k 42 dB DnT,w+C50-5k = 49 dB

Evaluation based on field measurment results obtained in one- third-ocatave bands by an engineering method

Number of Test Report: Name of test institute: MACH Acoustics

Date of test: 6/02/2006 Signature:

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