REPORT TITLE:

13 Netherhall Gardens, NW3 5RN – Acoustic Design Brief Existing Building

CLIENT DETAILS:

Re-creo Neatherhall Gardens Ltd

DATE:

1st May 2020

REPORT REFERENCE:

PC-18-0287-RP1 Rev B

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Document Status and Revision Schedule

Issue/Revision	Description/Comments	Date	Prepared by	Approved by
-	Checked & Authorised	12/12/18	JCB	MJ
A	Additional sound reduction calculation and proposed party wall and floor acoustic review.	27/04/20	JCB	MJ
B	Minor changes	01/05/20	JCB	MJ

1. Introduction

Pace Consult Ltd was commissioned by Re-creo Neatherhall Gardens Ltd to review the acoustic requirements of the scheme and to write an acoustic design brief for the residential development at 13 Netherhall Gardens, NW3 5RN (Existing Building). The residential development is intended to achieve compliance with Building Regulations Approved Document E.

This report reviews the requirements of the proposed sound insulation of walls, floors, doors and the acoustic absorption in common areas. The report will lay out the criteria for each section and set out how these will be achieved by the design of the building.

This report has been prepared in accordance with Building Regulations Approved Document E.

The application proposes the extension of the lower ground floor level and construction of a basement level extension, external soft landscaping, cycle parking, storage and associated works. Further to this, this report considers acoustic performance in the overall building

2. Residential Internal Design Criteria

2.1 Sound Insulation

2.1.1 Party Walls and Floors

The criterion for the sound insulation of separating walls and floors is set out in the Building Regulations, Approved Document E. The performance standards from Approved Document E are shown below.

Table 1a: **Dwelling-houses and flats - performance standards for separating walls, separating floors, and stairs that have a separating function.**

	Airborne sound insulation sound insulation $D_{nT,w} + C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
Purpose built dwelling-houses and flats		
Walls	45	-
Floors and stairs	45	62
Dwelling-houses and flats formed by material change of use		
Walls	43	-
Floors and stairs	43	64

For selection purposes sound insulation performances for building elements are given in terms of the weighted sound reduction index, R_w. This is a value determined within a test laboratory.

Pre-Completion Testing must be carried out towards the end of construction to confirm compliance with Approved Document E.

Based on Part E acoustic criteria, the partition walls and floors should achieve a minimum airborne sound insulation of 43 $D_{nT,w}$ + C_{tr} and Impact sound insulation of 64 $L'_{nT,w}$ dB between the separating floors.

2.1.2 Internal Walls

Internal walls should be designed to the criteria below. These are not subject to pre-completion testing.

Table 2: **Laboratory values for new internal walls and floors within: dwelling-houses, flats and rooms for residential purposes, whether purpose built or formed by material change of use.**

	Airborne sound insulation R_w dB (Minimum values)
Walls	40
Floors	40

2.1.3 Doors

Approved document E also provides sound insulation criteria for entrance doors; this is shown in the excerpt below.

2.26 Ensure that any door has good perimeter sealing (including threshold where practical) and a minimum mass per unit area of 25kg/m2 or a minimum sound reduction index of 29dB Rw (measured according to BS EN ISO 140-3:1995 and rated according to BS EN ISO 717-1:1997).

2.2 Absorption in Common Areas

The objective is to absorb sound in corridors, entrance halls and stairwells. Regulation 7 in Approved Document Part E of the Building regulations gives the requirements for absorption in common areas. A section from the building regulations is set out below.

7.6 Two methods are described to satisfy Requirement E3, Method A and Method B.

7.7 **Method A:** Cover a specified area with an absorber of an appropriate class that has been rated according to BS EN ISO 11654:1997 Acoustics - Sound absorbers for use in buildings - Rating of sound absorption.

7.8 **Method B:** Determine the minimum amount of absorptive material using a calculation procedure in octave bands. **Method B** is intended only for corridors, hallways and entrance halls as it is not well suited to stairwells.

7.9 Where additional guidance is required, specialist advice should be sought at an early stage.

Method A

7.10 For entrance halls, corridors or hallways, cover an area equal to or greater than the floor area, with a Class C absorber or better. It will normally be convenient to cover the ceiling area with the additional absorption.

7.11 For stairwells or stair enclosures, calculate the combined area of the stair treads, the upper surface of the intermediate landings, the upper surface of the landings (excluding ground floor) and the ceiling area of the top floor. Either cover at least an area equal to this calculated area with a Class D absorber or cover an area equal to at least 50% of this calculated area with a Class C absorber or better. The absorptive material should be equally distributed between all floor levels.

It will normally be convenient to cover the underside of intermediate landings, the underside of the other landings, and the ceiling area on the top floor.

7.12 Method A can generally be satisfied by the use of proprietary acoustic ceilings. However, the absorptive material can be applied to any surface that faces into the space.

Method B

7.13 In comparison with Method A, Method B takes account of the existing absorption provided by all surfaces. In some cases, Method B should allow greater flexibility in meeting Requirement E3 and require less additional absorption than Method A.

7.14 For an absorptive material of surface area, *S* in m^2, and sound absorption coefficient, α the absorption area *A* is equal to the product of *S* and α.

7.15 The total absorption area, A_T, in square metres is defined as the hypothetical area of a totally absorbing surface, which if it were the only absorbing element in the space would give the same reverberation times as the space under consideration.

7.16 For *n* surfaces in a space, the total absorption area, A_T, can be found using the following equation.

$$A_T = \alpha_1 S_1 + \alpha_2 S_2 + ... + \alpha_n S_n$$

7.17 For entrance halls, provide a minimum of 0.20 m^2 total absorption area per cubic metre of the volume. The additional absorptive material should be distributed over the available surfaces.

7.18 For corridors or hallways, provide a minimum of 0.25 m^2 total absorption area per cubic metre of the volume. The additional absorptive material should be distributed over one or more of the surfaces.

3. Achieving the Residential Internal Design Criteria

3.1 Party & Separating Walls

3.1.1 Party Wall Performance

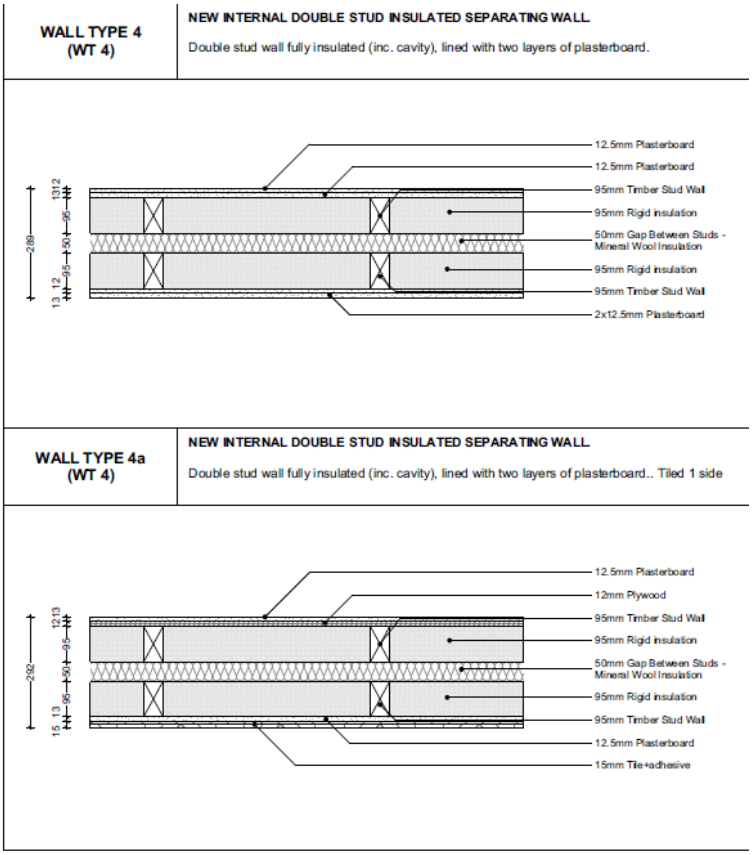
The acoustic requirements based on Part E of Building Regulations is 43 $D_{nT,w}$ + C_{tr}. The party wall should be selected based on the R_w dB value which is determined within a test laboratory. The table below shows the proposed airborne site requirement and the recommended laboratory performance.

Airborne site requirements	Recommended laboratory performance
43 $D_{nT,w}$ + C_{tr}.	R_w 50 + C_{tr} dB

The above performances assume good workmanship, with all flanking paths appropriately sealed.

Based on the above acoustic requirements the following partition between flats has been proposed.

It is understood that the proposed partition between flats is the wall type 4 (WT4)



It is highly recommended that the 12.5 mm plasterboard will be selected to be soundbloc plasterboard.

The calculated sound reduction of the proposed wall is R_w + C_{tr} 58 dB (67-9), the expected insitu sound reduction performance of this partition is $D_{nT,w}$ + C_{tr} 51 dB, which meets the acoustic criteria recommended by Part E.

The calculated sound reduction is included below.

Sound Insulation Prediction (v8.0.12)

Program copyright Marshall Day Acoustics 2015

Microsoft - Key No. 1558

Margin of error is generally within Rw +/- 3 dB

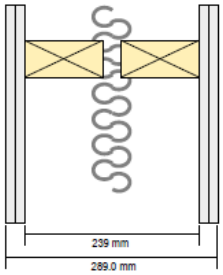
Job Name:

Job No.: Page No.:

Date: 24 Apr 20 Initials:jcblanco

File Name: Party wall.ixl

Notes:



Rw 67 dB
C -3 dB
C_{tr} -9 dB
D_{nTw} 69 dB

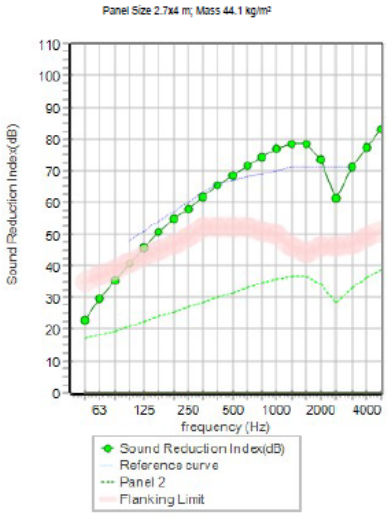
System description

Panel 1 : 2 x 12.5 mm Gyproc SoundBloc 12.5mm (ρ:848 kg/m3,E:3.8GPa,η:0.01, ρs:10.6 kg/m², fc:2462 Hz)

Cavity: Double timber stud: Stud spacing 600 mm , Infill Rockwool (33kg/m3) Thickness 50 mm (ρ:33 kg/m3, Rf:13400 Pa.s/m2)
Panel 2 + 2 x 12.5 mm Gyproc SoundBloc 12.5mm (ρ:848 kg/m3,E:3.8GPa,η:0.01, ρs:10.6 kg/m², fc:2462 Hz)

Mass-air-mass resonant frequency =32 Hz

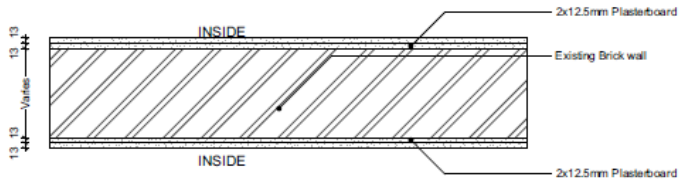
frequency (Hz)	R(dB)	R(dB)
50	23	
63	30	27
80	36	
100	41	
125	46	44
160	50	
200	55	
250	58	57
315	62	
400	65	
500	69	68
630	72	
800	74	
1000	77	76
1250	78	
1600	79	
2000	74	66
2500	61	
3150	71	
4000	77	75
5000	83	



Note, the above partition is also recommended within the residential flats and communal areas (stairs/corridors).

It is understood that wall type 3 is also proposed between flats.

WALL TYPE 3 (WT 3)	NEW INTERNAL PLASTERBOARD WALL. Two sheets of plasterboard covering existing brick wall.



The typical thickness and the density of the existing brick wall is unknown and therefore it is not possible to provide a comprehensive acoustic assessment. However, in order to provide an indicative sound reduction of the proposal, the existing wall is assumed to be 100 mm thick (1600 kg/m^3), based on this assumption the assumed sound reduction is R_w 44 dB, which is not sufficient to meet Part E of Building Regulations.

In order to upgrade acoustically the existing wall, the following details are recommended.

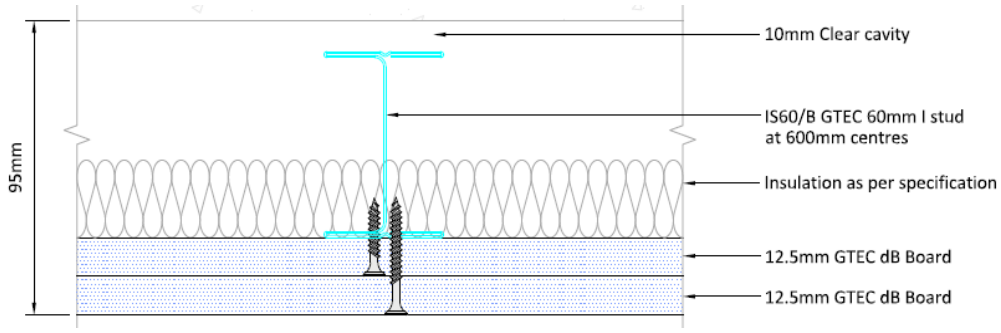
- GypLyner Universal
- 75 cavity and 50 mm mineral wool (minimum 48 kg/m^3)
- 2x12.5 mm soundbloc plasterboard.

The calculated sound reduction of the above proposal is 56 R_w + C_{tr} dB, the expected in situ acoustic performance is 51 $D_{nT,w}$ + C_{tr} dB, which is sufficient to meet Part E of Building Regulations. It should be considered that the calculated sound reduction is based on a 100 mm thick brick wall with a density of 1600 kg/m^3.

3.1.2 Detailing to Lift Cores

The lift shaft positioned next to an apartment should be acoustically upgraded using an independent wall liner (minimum 50mm 'I' stud) with a 10mm gap to the proposed partition, 50mm Isover 1200 insulation within the stud, and lined using two layers of dB Board plasterboard.

The figure below shows an example of the proposal – boards shown are given as an 'or equal approved' basis.



3.2 Internal Walls within the same flat

Building regulations state that the internal walls should have a sound reduction performance of R_w 40 dB. It is understood that the proposed internal wall construction is as follows:

- 97 mm Batt insulation
- 1 x 12.5mm soundbloc plasterboard to each side of the partition.

The calculated sound reduction of the proposed internal partition is included overleaf.

Sound Insulation Prediction (v8.0.12)

Program copyright Marshall Day Acoustics 2015

Microsoft - Key No. 1558

Margin of error is generally within Rw +/- 3 dB

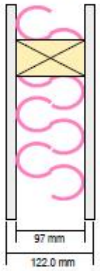
Job Name:

Notes:

Job No.: Page No.:

Date: 13 Dec 18 Initials:jcblanco

File Name: Internal wall.ixl



Rw	40 dB
C	-4 dB
C_{tr}	-11 dB
D_{nTw}	42 dB

System description

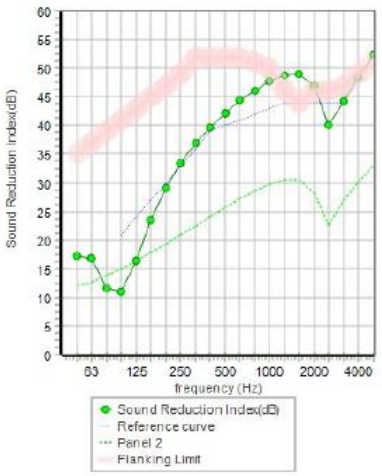
Panel 1 : 1 x 12.5 mm Gyproc SoundBloc 12.5mm (ρ:848 kg/m3,E:3.8GPa,η:0.01, ρs:10.6 kg/m², fc:2462 Hz)

Cavity: Timber stud: Stud spacing 600 mm , Infill R 1.8 Pink Batts Wall Thickness 97 mm (ρ:9 kg/m3, Rf:3000 Pa.s/m2)
Panel 2 : 1 x 12.5 mm Gyproc SoundBloc 12.5mm (ρ:848 kg/m3,E:3.8GPa,η:0.01, ρs:10.6 kg/m², fc:2462 Hz)

Mass-air-mass resonant frequency =75 Hz

frequency (Hz)	R(dB)	R(dB)
50	17	
63	17	14
80	12	
100	11	
125	16	14
160	23	
200	29	
250	34	32
315	37	
400	40	
500	42	42
630	44	
800	46	
1000	48	47
1250	49	
1600	49	
2000	47	44
2500	40	
3150	44	
4000	48	47
5000	52	

Panel Size 2.7x4 m; Mass 22.1 kg/m²



The calculated sound reduction is Rw 40 dB, which meets the recommended criteria by Part E.

3.3 Floor Airborne Sound Insulation

3.3.1 Airborne sound insulation.

The acoustic requirements based on Part E of Building Regulations is 43 $D_{nT,w}$ + C_{tr}. The party floor should be selected based on the Rw dB value which is determined within a test laboratory.

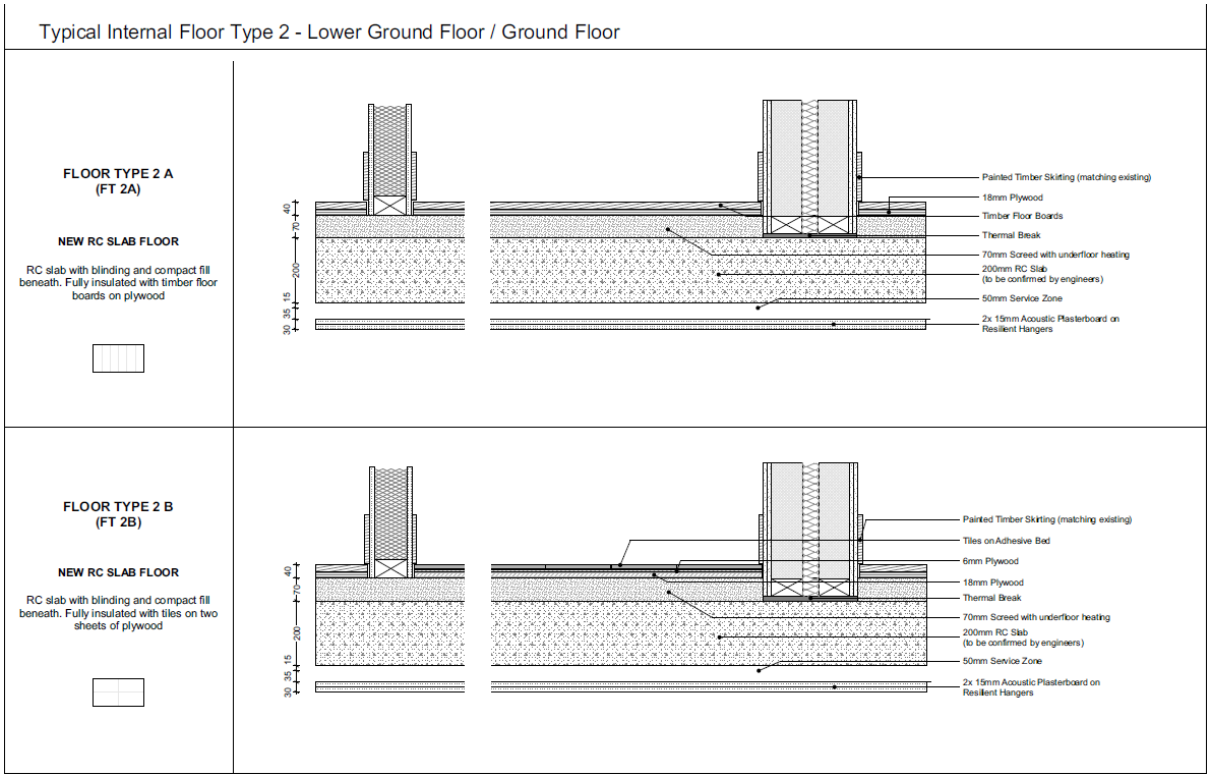
Airborne site requirements recommended laboratory performance

Airborne site requirements	Recommended laboratory performance
43 $D_{nT,w}$ + C_{tr}	R_w 50 + C_{tr} dB

The above performances assume good workmanship, with all flanking paths appropriately sealed.

The proposed party floors are included below.

Lower ground and ground floor details Floor Type 2A and 2B.



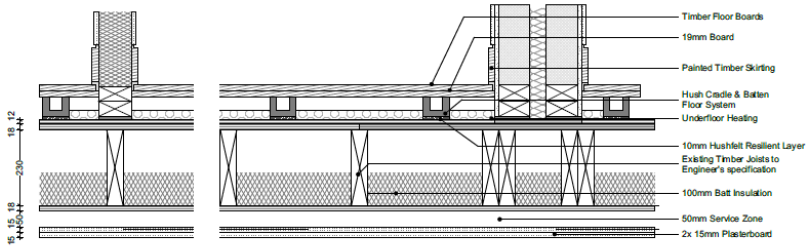
Floor Type 3 A and 3 B.

Typical Internal Floor Type 3 - First / Second Floor

FLOOR TYPE 3 A
(FT 3A)

NEW INSULATED TIMBER FLOOR

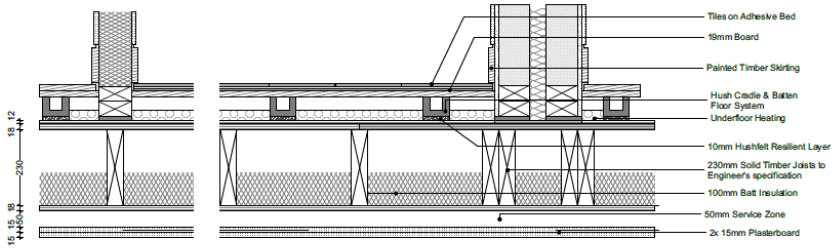
Timber floor boards on acoustic floor on two layers of plywood. Timber joists fully insulated with service zone and 2 suspended layers of plasterboard



FLOOR TYPE 3 B
(FT 3B)

NEW INSULATED TIMBER FLOOR

Tiles on a layers of plywood on top of acoustic floor on two layers of plywood. Timber joists fully insulated with service zone and 2 suspended layers of plasterboard



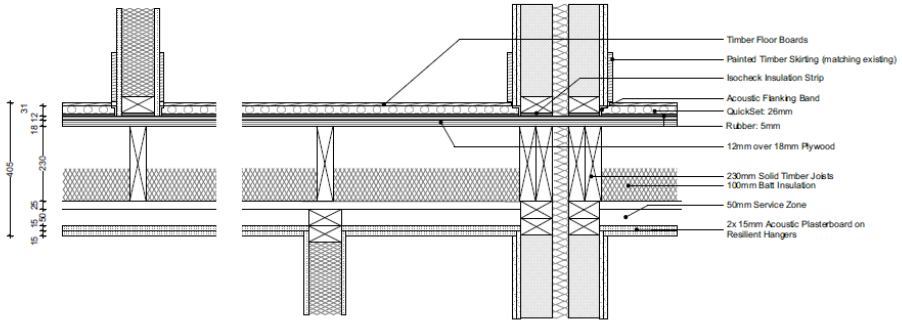
Floor Type 4 A and 4 B.

Typical Internal Floor Type 4 - Third Floor / Staircase landing

FLOOR TYPE 4 A
(FT 4A)

NEW INSULATED TIMBER FLOOR

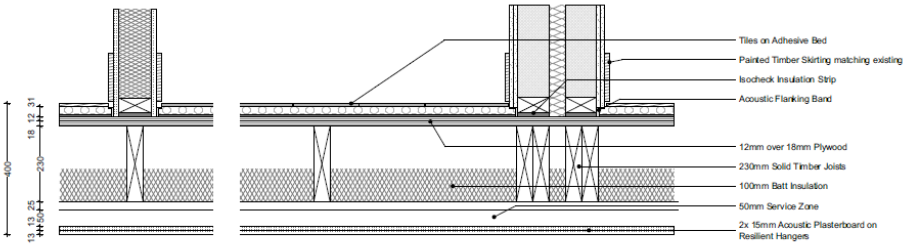
Timber floor boards on acoustic floor on two layers of plywood. Timber joists fully insulated with service zone and 2 suspended layers of plasterboard fixed with resilient hangers



FLOOR TYPE 4 B
(FT 4B)

NEW INSULATED TIMBER FLOOR

Tiles on a layers of plywood on top of acoustic floor on two layers of plywood. Timber joists fully insulated with service zone and 2 suspended layers of plasterboard fixed with resilient hangers



The calculated sound reduction of the proposed floors is included below.

Floor Type 2

The calculated sound reduction is R_w + C_{tr} 59 dB, the expected in situ performance is $D_{nT,w}$ + C_{tr} 52 dB, which is sufficient to meet Part E of Building Regulations.

Sound Insulation Prediction (v8.0.12)

Program copyright Marshall Day Acoustics 2015

Microsoft - Key No. 1558

Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.:

Date: 13 Dec 18 Initials:jcblanco

File Name: Floor type 2A.ixl

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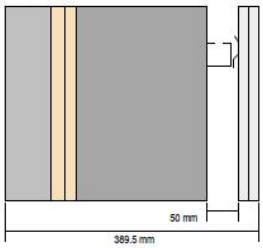


Rw 69 dB
C -4 dB
C_{tr} -10 dB
D_{nTw} 71 dB

System description

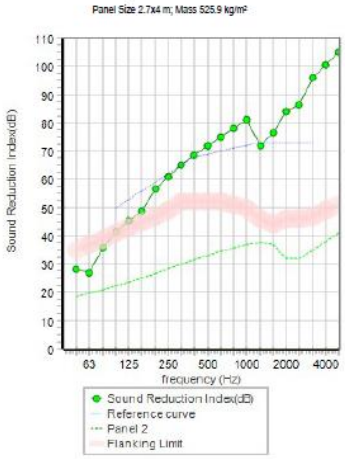
Panel 1 : 1 x 70.0 mm Kingspan KS1000 RW 50/60/70mm + 1 x 17.5 mm Plywood (μ:560 kg/m3,E:4.4GPa,η:0.01, μs:9.8 kg/m², fc:1327 Hz) + 1 x 22.0 mm Plywood (μ:560 kg/m3,E:4.4GPa,η:0.01, μs:12.3 kg/m², fc:1055 Hz) + 1 x 200.0 mm Concrete (μ:2340 kg/m3,E:11GPa,η:0.05, μs:468 kg/m², fc:150 Hz)

Cavity: Steel stud + resil. rail: Stud spacing 600 mm

Panel 2 + 2 x 15.0 mm Gyproc SoundBloc 15mm (μ:840 kg/m3,E:3.1GPa,η:0.01, μs:12.6 kg/m², fc:2246 Hz)

Mass-air-mass resonant frequency =53 Hz

frequency (Hz)	R(dB)	R(dB)
50	28	
63	27	29
80	36	
100	42	
125	45	44
160	49	
200	57	
250	61	60
315	65	
400	69	
500	72	71
630	75	
800	78	
1000	81	75
1250	72	
1600	77	
2000	84	80
2500	87	
3150	96	
4000	100	99
5000	105	

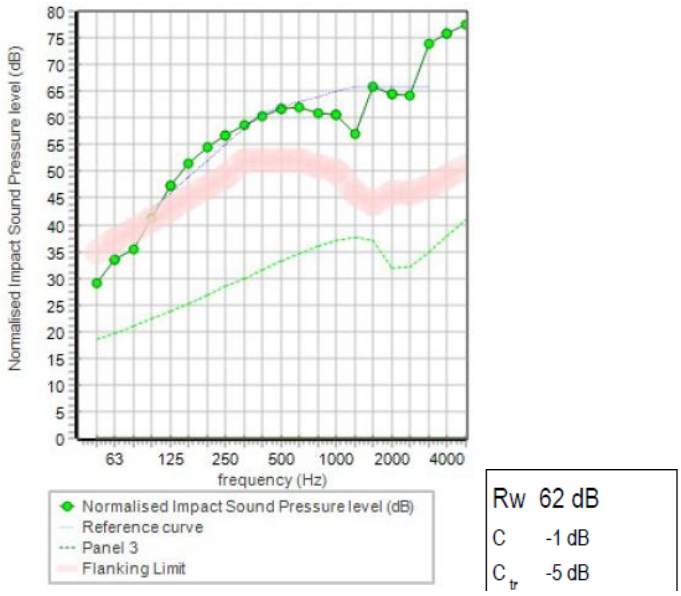


It is understood that the impact sound is going to be controlled by using a thermal break. It should be noted that in order to reduce the impact sound, this product should be flexible enough in order to be able to reduce the impact energy, if this is not the case, we would recommend to use an acoustic underlayment similar to Regupol 3912 between the thermal break and the 18 mm plywood.

Floor Type 3.

The calculated sound reduction is R_w + C_{tr} 57 dB, the expected in situ performance is $D_{nT,w}$ + C_{tr} 50 dB, which is sufficient to meet Part E of Building Regulations.

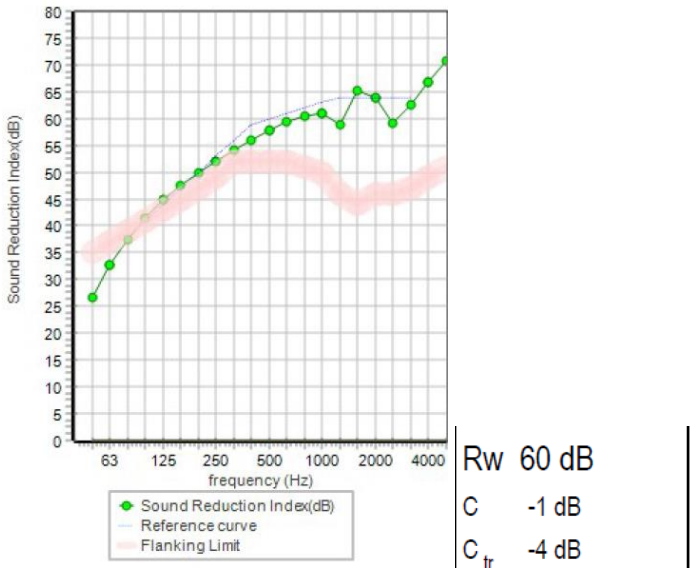
frequency (Hz)	Ln(dB)	Ln(dB)
50	29	
63	33	32
80	36	
100	41	
125	47	45
160	52	
200	55	
250	57	56
315	59	
400	60	
500	62	61
630	62	
800	61	
1000	61	59
1250	57	
1600	66	
2000	65	65
2500	64	
3150	74	
4000	76	76
5000	78	



Floor Type 4

The calculated sound reduction is R_w + C_{tr} 56 dB, the expected in situ performance is $D_{nT,w}$ + C_{tr} 49 dB, which is sufficient to meet Part E of Building Regulations.

frequency (Hz)	R(dB)	R(dB)
50	27	
63	33	30
80	38	
100	42	
125	45	44
160	48	
200	50	
250	52	52
315	54	
400	56	
500	58	58
630	59	
800	61	
1000	61	60
1250	59	
1600	65	
2000	64	62
2500	59	
3150	63	
4000	67	66
5000	71	



The impact sound will be reduced using specific sound impact materials such as 10 mm Hushfelt resilient layer (Floor type 3), and Isocheck 24 T(Floor type 4).

3.4 Door Sound Insulation

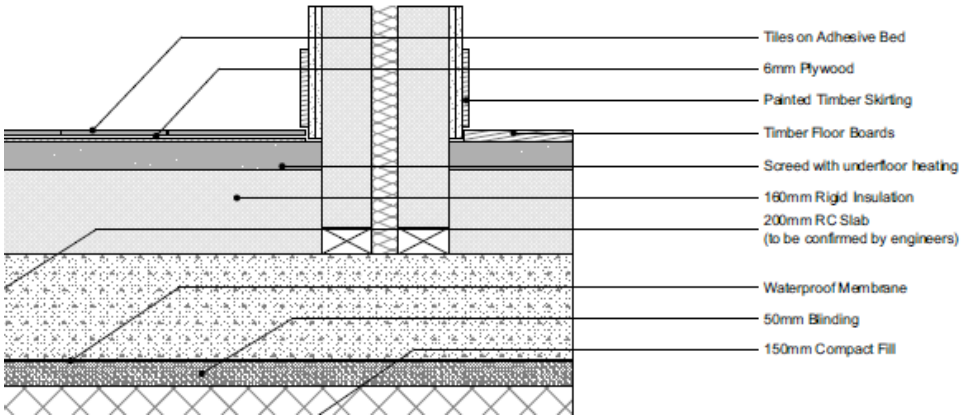
Requirement: 2.26 Ensure that any door has good perimeter sealing (including threshold where practical) and a minimum mass per unit area of 25kg/m2 or a minimum sound reduction index of 29dB Rw (measured according to BS EN ISO 140-3:1995 and rated according to BS EN ISO 717-1:1997). The sound reduction is recommended for entrance doors.

3.5 Flanking sound control.

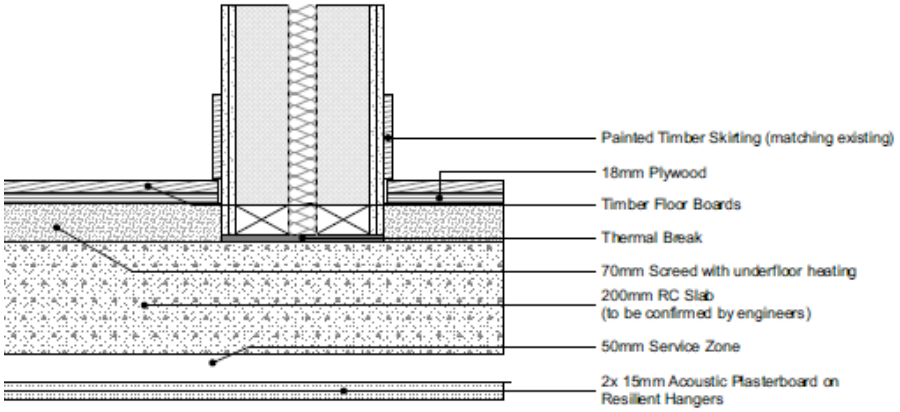
The head, base and junction details recommended by the manufacturer i.e. British Gypsum white book should be followed. However, additional junction details such as party wall/floor – external wall etc. should be provided to Pace Consult so that they can be reviewed prior to construction.

The following flanking sound across the base details have been reviewed and they are considered adequate in order to reduce the flanking sound.

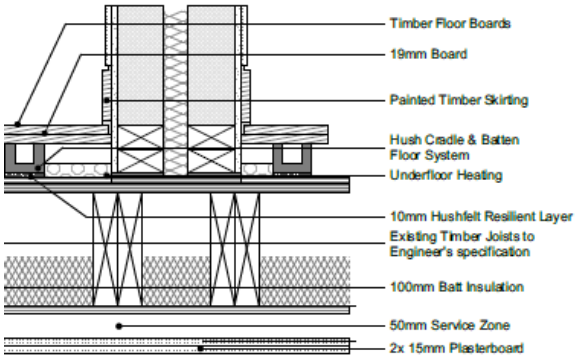
Basement floor detail.



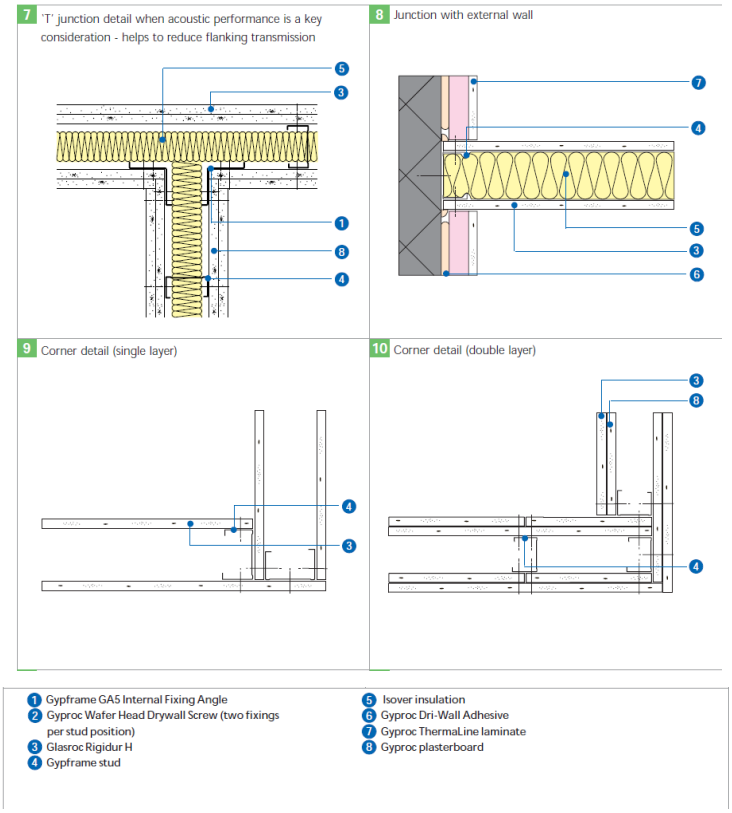
Lower ground Floor/Ground Floor detail.

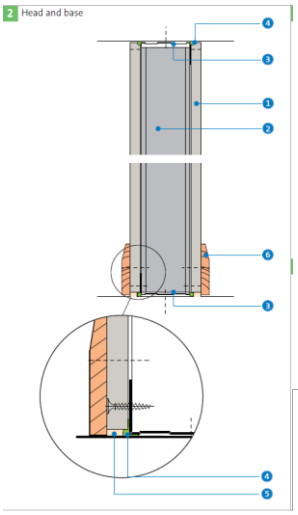


Second Floor detail.

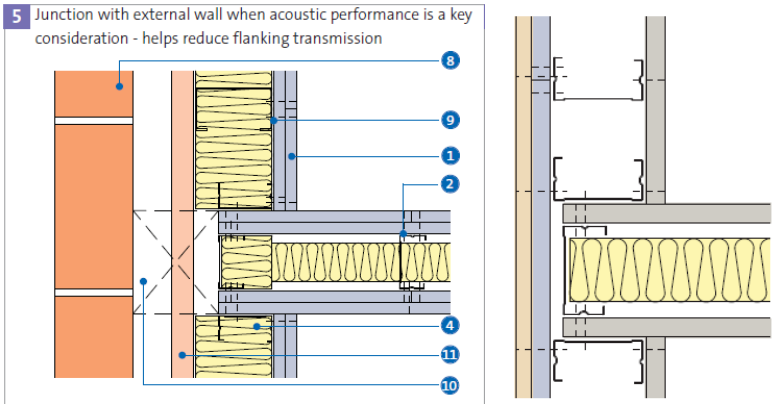


Additional flanking sound details. It is highly recommended to follow the details included below in order to mitigate sound transfer between spaces.



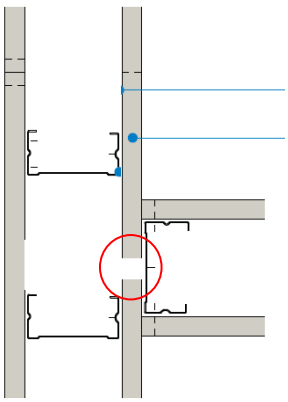


1 Gyproc plasterboard or Glasroc F specialist board
2 Gypframe 'C' Stud
3 Gypframe Floor & Ceiling Channel
4 Gyproc Sealant
5 Bulk fill with Gyproc jointing materials (where gap exceeds 5mm)
6 Skirting

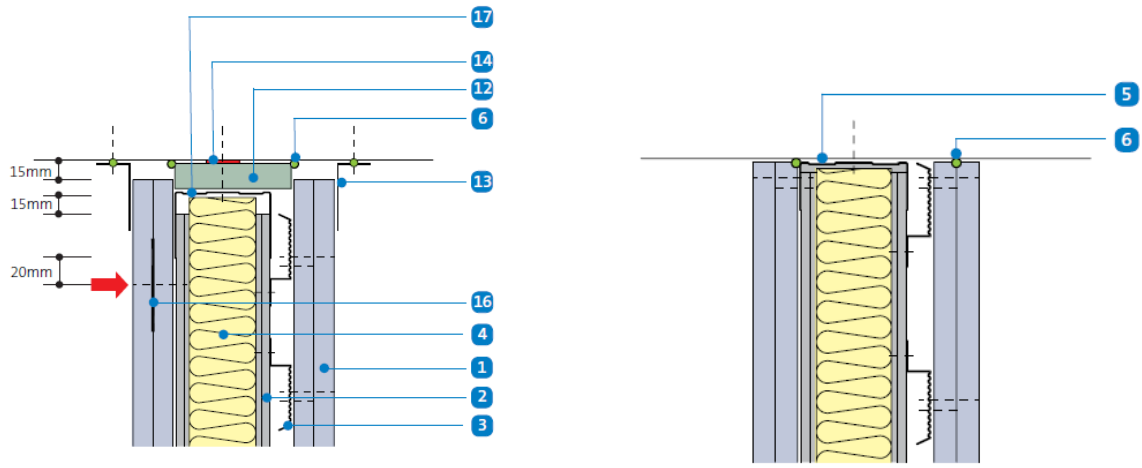


Partitions which do not require high acoustic ratings (R_w 40 – 45 dB), should be treated as below in order to prevent flanking sound.

'T' junction



Head details:

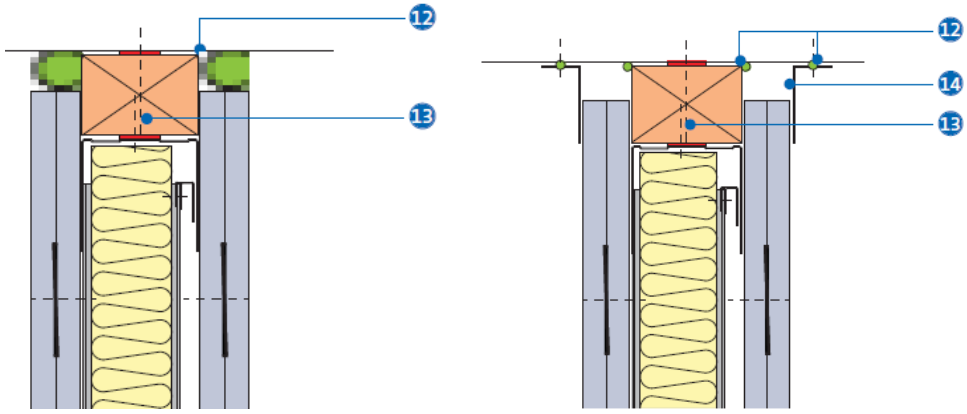


- Left: Deflection head for 15 mm downward movement and 60 minutes fire resistance. (12) = Gyproc CoreBoard, (6) = Gyproc Sealant, (14) = Gyproc FireStrip

- Right: (5) = Standard Channel, (6) = Gyproc Sealant

Alternative deflection head details are shown below.

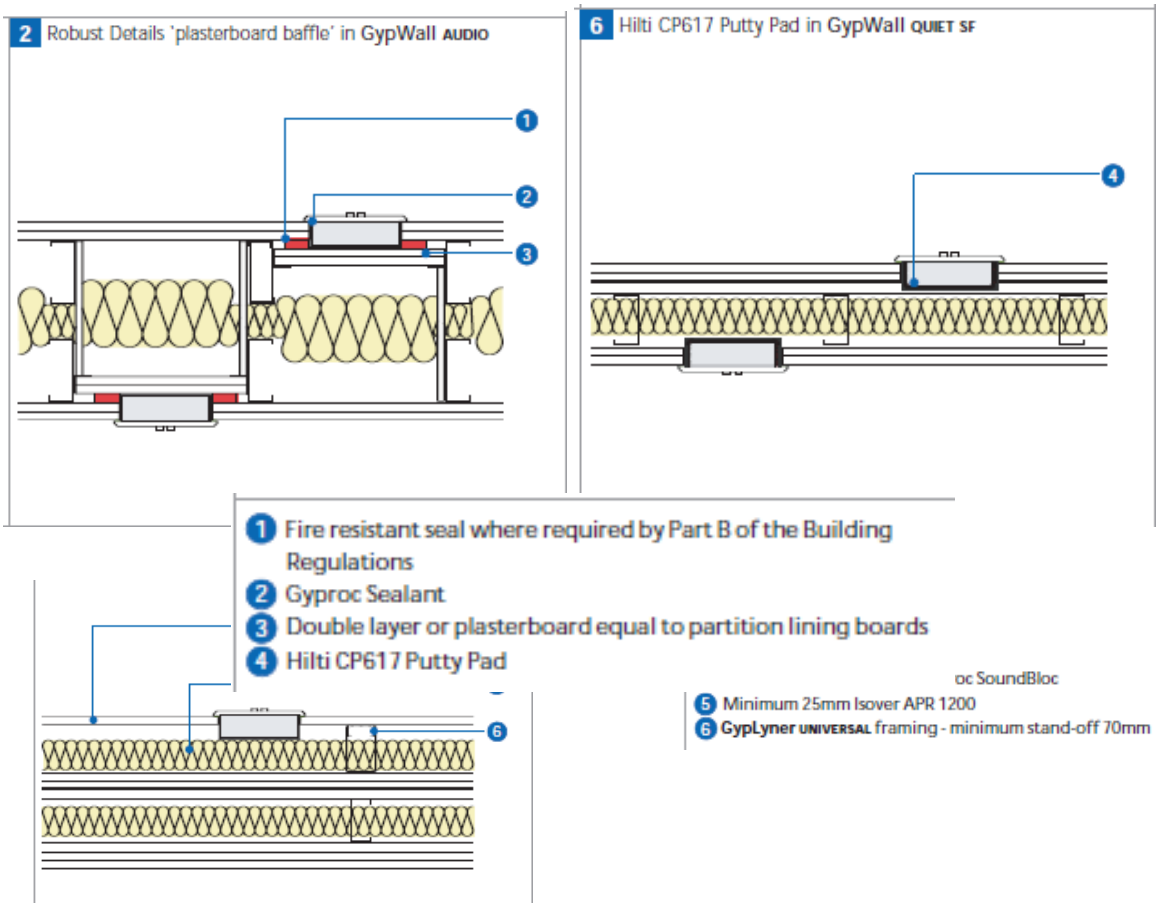
The figure below shows two types of detail to control flanking transmission.

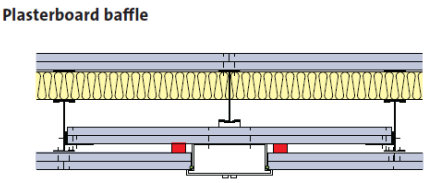


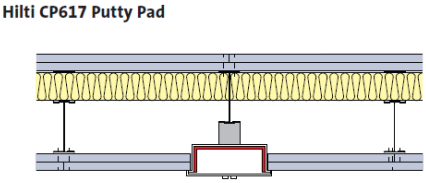
(12) = Sealant,
(13) = Timber head plate equivalent to channel width forming fire-stop,
(14) = Steel angle to minimise loss of sound insulation performance.

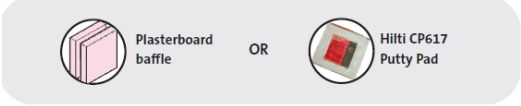
3.6 Socket detailing

The illustrations below show different socket detailing which can be used to avoid flanking problems. Note that sockets should not be installed ‘back to back’;





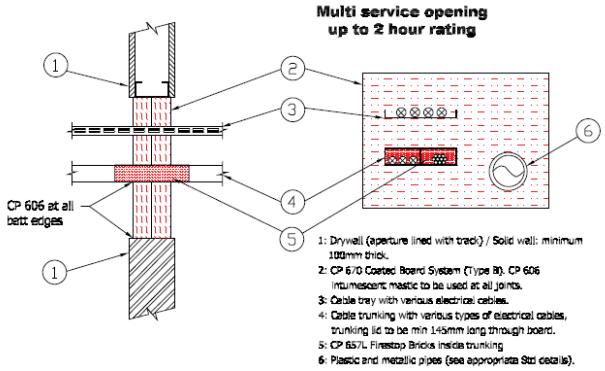




3.7 Additional Residential Sound Insulation Requirements

3.7.1 Service Penetrations

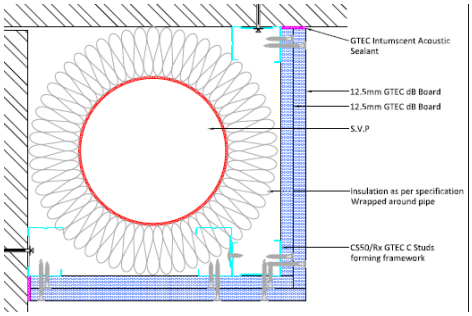
Service penetrations in party walls should be avoided where possible. Where mechanical service penetrations occur, these should be sealed well using fire batts (e.g. Hilti) and intumescent paste. (see below)



Any penetrations in party walls should be sealed using 2 x 50mm Fire Batts. Details of any penetrations should be issued to Pace Consult Ltd for review.

3.7.2 Floor Penetrations

Ducts or pipes which penetrate a floor separating habitable rooms should be in an enclosure, both above and below the floor. The material of the enclosure should have a mass of 15 Kg/m^2. Either line the enclosure or wrap the duct or pipe within the enclosure with 25 mm unfaced mineral wool. Penetrations through separating floor ducts should have fire protection in accordance with approved document B, Fire Safety. Fire stopping should be flexible and prevent rigid contact between the pipe and the floor. Where the pipes and ducts penetrate the party structures, the penetrations must be kept as small as possible and be finished with an intumescent sealant bead to both sides. It is recommended that the mineral fibre does not touch the plasterboard. The figure below shows the recommended acoustic details.



3.8 Residential Corridor sound Absorption

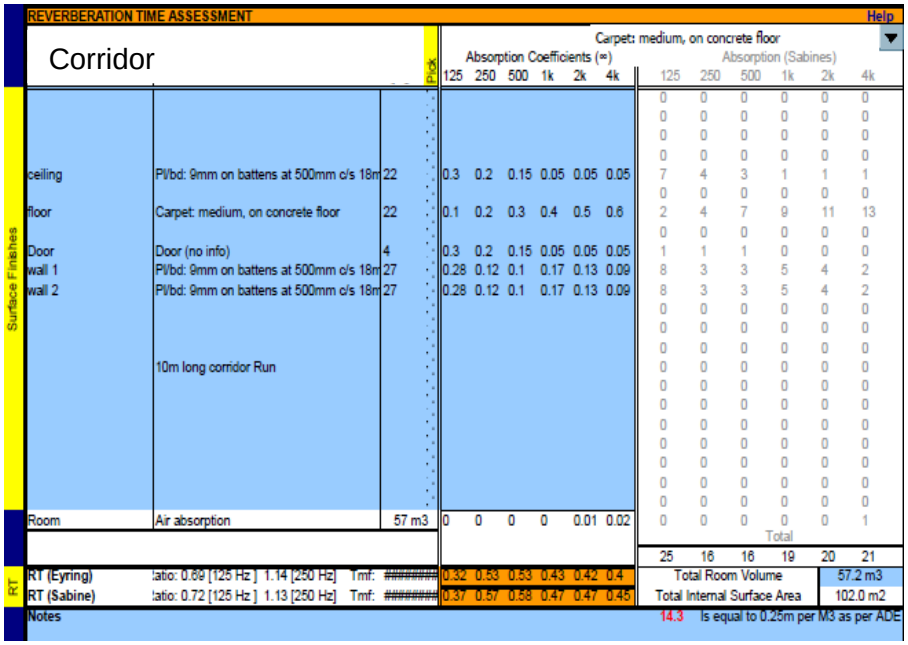
3.8.1 Proposed Finishes

There are two options in order to meet Part E of Building Regulations.

Option 1 is to treat acoustically the ceiling of the main entrance, communal corridors with an acoustic ceiling class C absorber.

Option B The floor finish should be carpet. The carpet should be 5 – 6 mm pile length, then an absorbent ceiling would not be required. This is shown in the calculation below:

Reverberation Time Assessment: Typical Corridor Run



REVERBERATION TIME ASSESSMENT — Help

Corridor

Carpet: medium, on concrete floor

Surface Finishes				Pick	Absorption Coefficients (∞) 125	250	500	1k	2k	4k	Absorption (Sabines) 125	250	500	1k	2k	4k
											0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
	ceiling	Pl/bd: 9mm on battens at 500mm c/s 18m	22		0.3	0.2	0.15	0.05	0.05	0.05	7	4	3	1	1	1
											0	0	0	0	0	0
	floor	Carpet: medium, on concrete floor	22		0.1	0.2	0.3	0.4	0.5	0.6	2	4	7	9	11	13
											0	0	0	0	0	0
	Door	Door (no info)	4		0.3	0.2	0.15	0.05	0.05	0.05	1	1	1	0	0	0
	wall 1	Pl/bd: 9mm on battens at 500mm c/s 18m	27		0.28	0.12	0.1	0.17	0.13	0.09	8	3	3	5	4	2
	wall 2	Pl/bd: 9mm on battens at 500mm c/s 18m	27		0.28	0.12	0.1	0.17	0.13	0.09	8	3	3	5	4	2
											0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
		10m long corridor Run									0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
											0	0	0	0	0	0
	Room	Air absorption	57 m3		0	0	0	0	0.01	0.02	0	0	0	0	0	1
														Total		
											25	16	16	19	20	21
RT	RT (Eyring)	!atio: 0.69 [125 Hz] 1.14 [250 Hz]	Tmf:	########	0.32	0.53	0.53	0.43	0.42	0.4	Total Room Volume					57.2 m3
	RT (Sabine)	!atio: 0.72 [125 Hz] 1.13 [250 Hz]	Tmf:	########	0.37	0.57	0.58	0.47	0.47	0.45	Total Internal Surface Area					102.0 m2
	Notes										14.3 Is equal to 0.25m per M3 as per ADE					

As can be seen above, 0.25m^2 per m^3 of volume would yield a requirement for absorption of 14.3m^2. The calculation above also shows that with a medium pile carpet (5-6mm pile) and dry-lined finishes throughout, sufficient absorption is provided to satisfy **Method B** of Section 7 of ADE.

3.8.2 Compliance in Stairwells

It should be noted that absorption must also be provided to stairwells. The methods described in the previous sections would be suitable.

Absorption can usually be omitted from stairwells if they are classed as ‘emergency use only’ however, this approach must be confirmed with Building Control.

4 Conclusion

The development has been assessed in accordance with the relevant standards and guidelines.

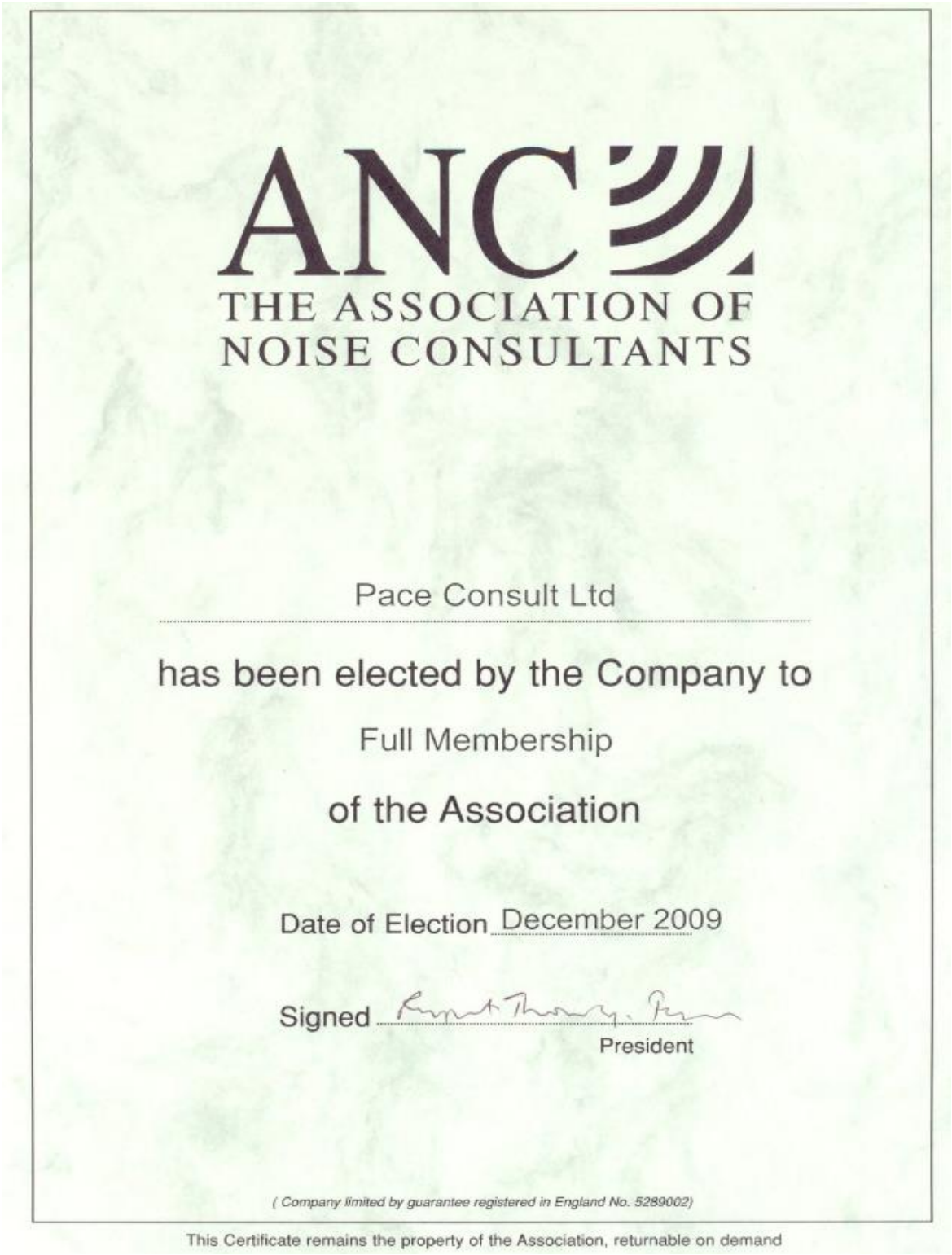
The development is intended to comply with the Building Regulation's sound insulation performance standards. Party walls and floors have been proposed and are expected to be compliant with the requirements.

The Building Regulation absorption requirements for communal corridors have been considered. Options have been provided which may be used to achieve compliance with the absorption requirement.

Initial recommendations for detailing, penetrations and sockets have been made to prevent the degradation of the sound reduction performance of the dividing structures.

Appendix 1 – ANC Membership

The author is a corporate member of the institute of acoustics (MIOA) which fulfils the BREEAM requirements for a ‘suitably qualified acoustician’.



ANC

THE ASSOCIATION OF NOISE CONSULTANTS

Pace Consult Ltd

has been elected by the Company to

Full Membership

of the Association

Date of Election December 2009

Signed

President

(Company limited by guarantee registered in England No. 5289002)

This Certificate remains the property of the Association, returnable on demand