NOISE HARVEST

Acoustic Specification

Project: The Old School, Cirencester Phase 4

Client: Speller Metcalfe Ltd

Revision:	B	Date:	05/02/2024
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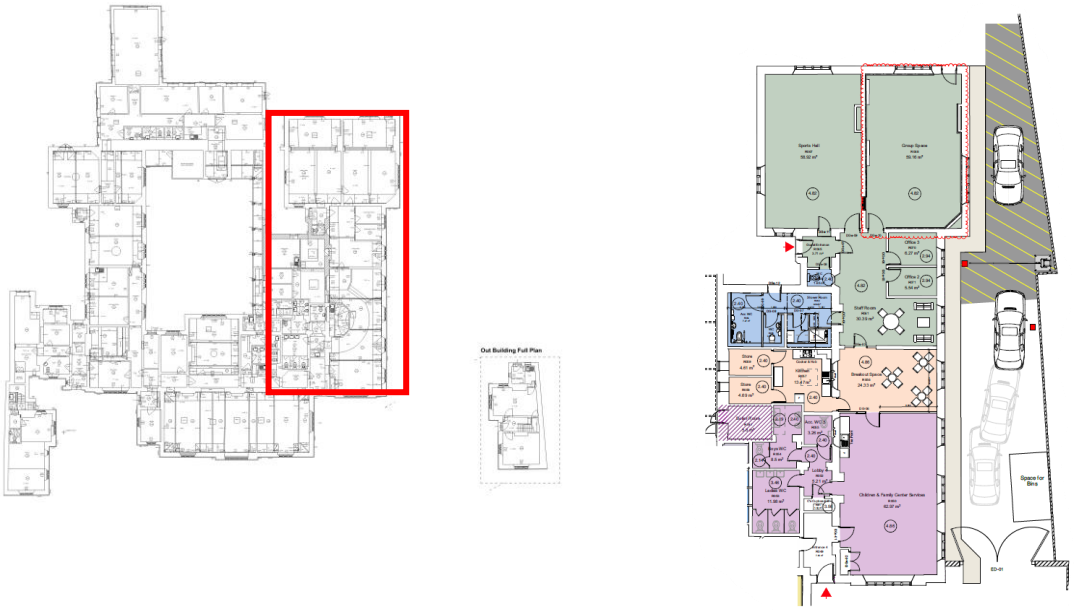
Revision	Date of issue	Purpose of issue
-	03/01/2024	First issue
A	12/01/2024	Updated rooms details
B	05/02/2024	Updated new rooms in RT calcs

1.0 Introduction

1.1 Project overview

Noise Harvest has been commissioned by Speller Mercalfe Ltd to carry out a review of the architectural and design proposals for the refurbishment of Phase 4 of The Old School, Cirencester.

The purpose of this report is to advise on internal acoustic performance requirements for the development, and comment on specific proposals or suggest design solutions as applicable. The proposals for the refurbishments can be seen in the image below with the area highlighted in red:



Existing Proposed

Figure 1 - Proposed unit

The acoustic input into the project is as follows:

- Review the results of bench mark testing in terms of the suitability of partitions;
- Review the predicted reverberation for key spaces;
- Review office spaces against relevant documentation;
- Review the proposed internal ambient noise levels.

As the external façade of the building is not being refurbished therefore no acoustic input is required.

This specification should be read in conjunction with Noise Harvest's acoustic strategy drawings:

- A0135-AS00(80)1001 - Rev P1

1.2 Design information

This specification and strategy drawing (version current at the time of writing) have been based on tender documentation received on 29 September 2023.

It is understood that the spaces in phase 4 are for different purposes and therefore the it is proposed that the following standards are used in the different spaces

Areas highlighted in blue that will be designed to BS 8233 and the FIS A guide to office acoustics.

Areas highlighted in orange will be designed to BB93.

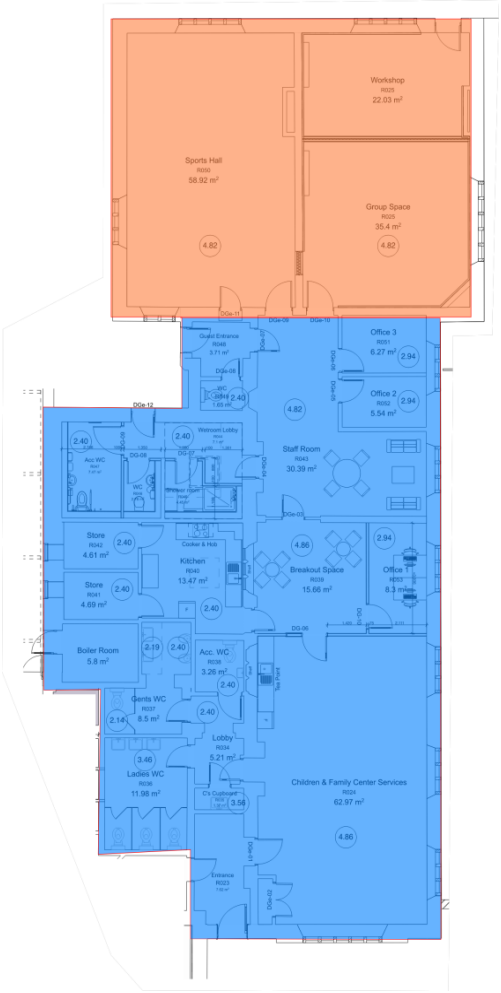


Figure 2 - Areas of different standards

1.3 Limitations

Details within this report are believed to be accurate at the time of writing. It is strongly recommended however, and considered good practice, that confirmation should be sought from specific manufacturers to see that the minimum performance requirements, as stated within this document, will be achieved by the chosen system / product / installation method.

Due allowance should be made in the design and risk contingency budget for the errors, omissions and inconsistencies that this report, and the accompanying drawings, may

contain at this stage of the project. This acoustics specification should be updated alongside design development.

The contractor should also allow for the various commissioning activities and handover documentation necessary to complete the works to the satisfaction of all relevant bodies.

This specification should be updated in line with design development.

2.0 Performance Requirements

2.1 General

The proposed phase 4 refurbishment will include impact youth centre which will be used to offer support to youths, this will also include offices, staff rooms, interview rooms and sports halls. Whilst this building is not classed as a school it is recommended that BB93 is to be used as a guide in some of the spaces as well as other standards for office spaces.

2.2 ISO 22599:2021 - Acoustic quality of open office spaces

Although this document is concerned with the acoustics of open-plan spaces there are aspects of if the document which are useful for multi person offices.

The Table below shows the predicted attenuation for dividing screens

Separating screen height (cm)	Visibility	Attenuation between workstations without absorptive treatment (plaster ceiling) (dB)	Attenuation between workstations with Class A ceiling treatment (dB)
110 (35 cm above the table)	Satisfactory for 95% of the population	1.1	3.6
120 (45 cm above the table)		1.7	4.5
130 (55 cm above the table)		2.4	5.4
140 (65 cm above the table)	Satisfactory for 5% of the population	2.9	6.3
150 (75 cm above the table)	Non existent	3.4	6.5

Table 1 - ISO 22599:2021 attenuation from desk dividers

2.3 BS8233:2014 – Medium acoustic requirement

The Table below is an extract from BS 8233:2014 and is used to calculate the required on-site performance between adjacent spaces. The values in the Table are $D_{nT,w}$ which are on-site values. Laboratory R_w values are around 5 – 7 dB higher for lightweight constructions and around 3dB for masonry constructions.

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms ≥ dB $D_{nT,w}$		
		Low	Medium	Sensitive
Confidential	Very high	47	52	57*
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57*

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms ≥ dB $D_{nT,w}$		
		Low	Medium	Sensitive
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57*
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37
*≥ 55 dB DnT,W is difficult to obtain on site and room adjacencies requiring these levels should be avoided				

Table 2 - BS 8233 privacy values

2.4 FIS – A Guide to Office Acoustics

The following table shows that target value for reverberation times for Staff rooms, breakout space Entrance lobby's, the multi person office and the Childrens and Family Centre room.

Room volume	Reverberation time RT	
m^3	Speech	Music
50	0.4	1.0
100	0.5	1.1
200	0.6	1.2
500	0.7	1.3
1000	0.9	1.5
2000	1.0	1.6

Table 3 - FIS reverberation time targets

2.5 Internal ambient noise levels

The table below shows the internal ambient noise level (IANL) for meeting rooms which have been extracted from Table 6 of BS 8233:2014.

Location	Design range (dB $L_{Aeq,T}$)
Meeting room	35-45
Executive office	35 - 40
Canteen	50 - 55

Table 4 - BS 8233 Internal ambient noise levels

2.6 BB93

Whilst the building is not strictly a school there are areas of that are understood to be used for educational needs. These are the Sports Hall and Group Space.

The objective of BB93 is to provide suitable acoustic conditions within schools that:

- facilitate clear communication of speech between teacher and student, and between students; and
- do not interfere with study activities.

The acoustic strategy drawings show the acoustics design criteria for each space within the school. The following sub-sections provide a summary of the criteria applicable:.

2.6.1 Indoor ambient noise levels (IANL)

The IANLs include contributions from:

- external noise sources (outside of the school premises), such as transportation noise, industrial and commercial premises;
- building services noise; and
- actuator and damper noise.

The IANL criteria are specified in terms of the $L_{Aeq,30mins}$ during normal teaching hours. This is the average noise level over a 30-minute period. In addition, BB93 also states that regular discrete events, e.g. aircraft or trains, should not exceed 60 dB $L_{A1,30mins}$.

The IANLs exclude noise contributions from:

- teaching activities within the school premises, including noise from staff or students and teaching equipment within the building or in the playground;
- equipment used in the space; and
- rain noise.

Condition	Ventilation system	Noise level limit
Normal [1] – ventilation for normal teaching activities	Mechanical	Values marked on acoustic strategy drawings
	Natural	Values marked on acoustic strategy drawings + 5 dB
	Hybrid	Mechanical system noise: values marked on acoustic strategy drawings
		Total noise level: Values marked on acoustic strategy drawings + 5 dB
Summertime [2] – ventilation under local control of teacher to prevent overheating, allowable during the hottest 200 hours of the year	Mechanical	Values marked on acoustic strategy drawings + 5 dB
	Natural or Hybrid	≤ 55 dB
Notes: [1] Normal condition for ventilation in natural or hybrid mode is defined as when the system is operating to limit the daily average carbon dioxide concentration to no more than 1,500 ppm with the maximum concentration not exceeding 2,000 ppm for more than 20 consecutive minutes on any day. This would normally equate to a minimum ventilation rate of approximately 5 l/s per person. For hybrid systems, the mechanical noise excluding external noise break in, should meet the values marked on the acoustic strategy drawings. [2] The 'normal' ventilation IANL can be exceeded during the hottest 200 hours in peak summertime conditions and the design should show that the 'summertime' IANLs can be met under these conditions as well as under normal operation. The ventilation must be under the local control of the teacher.		

Table 5 - Summary of ventilation strategies

2.6.2 Internal sound insulation between teaching spaces

The minimum airborne sound insulation performance of internal partitions and floors between adjacent teaching spaces is dictated by the activity noise level in the source room and the noise tolerance of the receiving room.

The performance standards for airborne sound insulation between spaces is given the notation dB $D_{nT,w}$, which is the weighted standardised level difference.

Whilst performance criteria above are given in terms of $D_{nT,w}$ (a site performance), manufacturers typically specify their systems in terms of R_w (a laboratory test rating). Because of the inevitable depreciation between quoted laboratory ratings and the required in-situ performance (due to site constraints, workmanship and flanking), an allowance needs to be made between these two values.

The following table summarises the in-situ and laboratory ratings (colours to match drawings) for each partition type for refurbished areas.

Performance criteria for partitions between adjacent teaching spaces (i.e. no doors)	Equivalent laboratory rating
30 dB $D_{nT,w}$ (yellow)	≥ 37 dB R_w
40 dB $D_{nT,w}$ (magenta)	≥ 47 dB R_w
45 dB $D_{nT,w}$ (blue)	≥ 52 dB R_w
50 dB $D_{nT,w}$ (green)	≥ 57 dB R_w

Table 6 - Partition requirements

The performance requirements for partitions and doors between teaching and learning spaces to circulation are given in terms of dB R_w, which is measured in the laboratory. Values for ventilators are quoted in terms of dB $D_{n,e,w}$, which is the weighted element-normalised level difference.

The following table summarises the ratings (colours to match drawings) for each partition type, including the ratings for walls (including any glazing), doors and any openings for ventilation.

Type of space used by students	Minimum composite R_w of wall including any glazing	Minimum R_w of doorset	Minimum $D_{n,e,w}$ performance of each of 'N' ventilators
Multi-purpose hall, SEN spaces	45 dB (blue)	35 dB	10 x $\log_{10}$(N) + 37 dB
All other spaces	40 dB (orange)	30 dB	10 x $\log_{10}$(N) + 32 dB

Notes:

The above performance values are applicable to partitions separating teaching spaces and circulation where there is a door. It does not include flanking partitions of classrooms that do not give direct access to circulation spaces.

Some general classbase partitions to circulation have been upgraded, i.e. where they are in close proximity to other teaching spaces that are located within general circulation areas. In these circumstances, it is clearly marked on the acoustic strategy drawings.

Table 7 - Composite partition values

2.6.3 Reverberation Control

The reverberation time criteria are for rooms that are finished, furnished for normal use, but unoccupied.

The reverberation time is quoted in terms of the mid-frequency reverberation time, T_{mf}, which is the arithmetic average of the reverberation times in the 500 Hz, 1 kHz and 2 kHz octave bands for standard classbases.

3.0 Sound insulation

It is understood that new partitions are proposed as part of the refurbishments as well as to improve some of the partitions. The image below shows the new partitions highlighted in blue that will be designed to BS 8233, partitions highlighted in orange are new partitions that will be designed to BB93. Partitions highlighted in yellow require improvements after the bench mark testing was carried out:

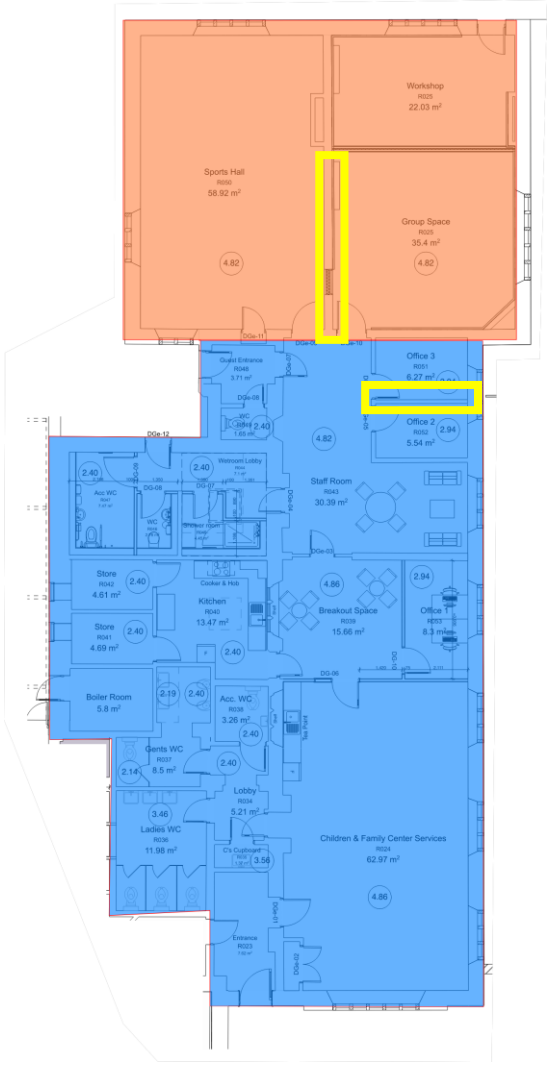


Figure 3 - Areas of refurbishment for partitions

3.1 Existing Partitions

Bench mark testing has been carried out within the building prior to any works being carried out.

The table below summarises the airborne sound insulation tests of the walls.

Test number	Source room	Receiver room	$D_{nT,w}$ dB		Result
			Required	Measured	
Partitions (BS 8233)					
A0135-231121-10	Office 3	Group Space	42	51	Pass
A0135-231121-11	Office 3	Office 2	47	25	Fail

Table 8 - Summary of benchmark testing

It should be noted that certain partitions were not tested as they had doors within them. As doors are inherent weak points in a partition and would only highlight the performance of the door.

As can be seen from the table above one of the partitions tested met their target value, with the other not meeting.

From subjective impressions on site, test 11 between the two offices failed because of a gap at the junction between the partition and the external façade shown in the image below:

Figure 4 - Flanking area of partition

Recommendations to improve the sound insulation between the paces are within the subsection below.

3.2 Partitions due to be improved

Following the bench mark testing the following partitions will need to be improved

- A0135-231121-11 Office 3 to Office 2

It is recommended that investigations are carried out to establish the size of the gap and if there are any further penetrations. If the gaps are not too large, these should be filled with non hardening mastic.

It is also understood that the partition between the Sports Hall and the Group Space currently has a door within the partition and plans are to seal the door, infill it with insulation and plasterboard (preferably two layers). This may still be the weakest point in the partition.

3.3 Partitions with doors

A door is an inherent weak point in any partition, as its performance is generally lower than the partition that surrounds it. It is not known if partitions with doors are to be improved.

If the doors are to be improved it is recommended that the appropriate doorsets are selected and with appropriate seals. Please refer to the acoustic strategy drawings for the correct acoustic performance of the door.

The Table below shows the typical performance for doorsets:

Acoustic performance	Typical construction
30 dB R_w  44 mm thick timber door, half hour fire rated	This acoustic performance can be achieved by a well fitted solid core doorset where the door is sealed effectively around its perimeter in a substantial frame with an effective stop. A 30 minute fire doorset (FD30) can be suitable. Timber FD30 doors often have particle cores or laminated softwood cores with a mass per unit area ≈ 27 kg/m² and a thickness of ≈ 44 mm. Frames for FD30 doors often have a 90 mm x 40 mm section with a stop of at least 15 mm. Compression or wipe seals should be used around the door's perimeter along with a threshold seal beneath. A drop-down or wipe type threshold seal is suitable. Doors incorporating 900 mm x 175 mm vision panels comprising 7 mm fire resistant glass can meet this acoustic performance.

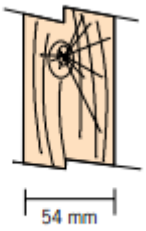
Acoustic performance	Typical construction
35 dB R_w  54 mm thick timber door, one hour fire rated	This acoustic performance can be achieved by specialist doorsets although it can also be achieved by a well fitted FD60 fire doorset where the door is sealed effectively around its perimeter in a substantial frame with an effective stop. Timber FD60 doors often have particle core or laminated softwood cores with a mass per unit area ≈ 29 kg/m² and a thickness of ≈ 54 mm. Using a core material with greater density than particle or laminated softwood can result in a door thickness of ≈ 44 mm. Frames for FD60 doors can have a 90 mm x 40 mm section with stops of at least 15 mm. Compression or wipe seals should be used around the door's perimeter along with a threshold seal beneath. A drop-down or wipe type threshold seal is suitable. Doors incorporating 900 mm x 175 mm vision panels comprising 7 mm fire resistant glass can meet this performance.

Table 9 - Door requirements

The following partitions should provide enough sound insulation providing the correct doorset is selected and should be used in conjunction with Noise Harvests acoustic strategy drawings.

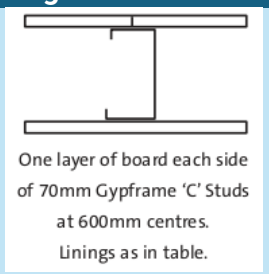
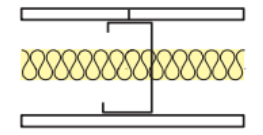
Drawing Key		Lightweight constructions
40 dB R_w	Either • 1 layer of 12.5 mm SoundBloc • 70 mm stud • 1 layer of 12.5 mm SoundBloc [BG ref. A206164, 40 dB R_w]	 One layer of board each side of 70mm Gypframe 'C' Studs at 600mm centres. Linings as in table.
	Or • 1 layer of 15 mm DuraLine • 70 mm stud • 1 layer of 15 mm DuraLine [BG ref. Q606043, 42 dB R_w]	
45 dB R_w	Either • 1 layer of 12.5 mm SoundBloc • 70 mm stud • 25 mm Isover APR 1200 • 1 layer of 12.5 mm SoundBloc [BG ref. A206196, 45 dB R_w]	 One layer of board each side of 70mm Gypframe 'C' Studs at 600mm centres. 25mm Isover APR 1200 in the cavity. Linings as in table.
	Or • 1 layer of 15 mm DuraLine • 70 mm stud • 25 mm Isover APR 1200 • 1 layer of 15 mm DuraLine [BG ref.Q606044, 47 dB R_w]	

Table 10 - Partition requirements with doors

3.4 New Partitions

3.4.1 BB93

This section should be read in conjunction with the latest marked-up acoustic strategy drawings.

The acoustic strategy drawings show the minimum airborne sound insulation requirements for all partitions and are based on partitions being full height from structural floor to soffit with no penetrations for glazing or ventilation within the dividing element, except where stated.

The following table summarises the currently proposed partition types and which in-situ ratings they are suitable for (the in-situ requirements are coloured as per the acoustic strategy drawing).

Details	Construction	> 40 dB R_w	> 45 dB R_w	> 35 dB $D_{nT,w}$ [>42 dB R_w]	> 40 dB $D_{nT,w}$ [>47 dB R_w]	> 45 dB $D_{nT,w}$ [>52 dB R_w]	> 50 dB $D_{nT,w}$ [>57 dB R_w]
61 dB R_w	▪ Inner layer of Gyproc Plank 19mm with an outer layer of Gyproc SoundBloc 12.5mm fixed to outside faces of two Gypframe 48 S 50 'C' Stud frameworks with studs at 600mm centres, cross braced using Gypframe 99 FC 50 Fixing Channel at 1200mm centres. 25mm Isover Acoustic Partition Roll (APR 1200) in the cavity. 60 minute EN fire height claim. For heights up to 6200mm.	✓	✓	✓	✓	✓	✓

Table 11 - Proposed internal partition BB93

The laboratory ratings provided by manufacturers are the maximum sound reductions capable from those partitions, excluding flanking noise. Calculations have been carried out on a number of partitions within the development to demonstrate that a maximum 7 dB difference between laboratory [R_w] and site [$D_{nT,w}$] is typically required, and has been reflected in the strategy drawings and recommendations above. It is noted however, that in order for partitions to meet their acoustic ratings in-situ, manufacturers' instructions regarding detailing must be followed.

3.4.2 BS8233

The Table of below shows the proposed partitions together with the relevant colour on the acoustic strategy drawing, the laboratory rating and the anticipated on-site performance.

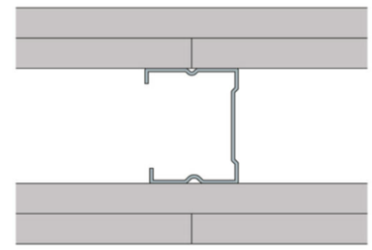
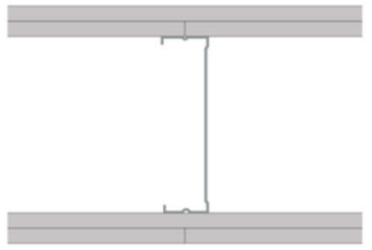
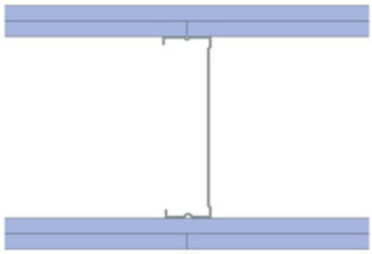
Construction		Laboratory rating dB R_w	Predicted onsite performance dB $D_{nT,w}$
Two layers 15 mm WallBoard 50 mm C Stud Two layers 15 mm WallBoard		44	37
Two layers 12.5 mm WallBoard 146 mm C Stud Two layers 12.5 mm WallBoard		49	42
2mm Thistle Multifinish Two layers 12.5 mm SoundBloc 146 mm C Stud Two layers 12.5 mm SoundBloc 2mm Thistle Multifinish		54	47

Table 12 - Suggested partitions BS8233

3.5 General Partition guidelines

In order to see that acoustic integrity and performance of partitions are maintained and controlled, the following guidance is suggested.

- Partitions should be built from the floor to the soffit to avoid noise flanking
- Penetrations for services should be avoided where possible between noise sensitive spaces. Where there is no alternative, suitable details will be needed to see acoustic performance is maintained (see Appendix).
- Electrical sockets should not be placed back-to-back within lightweight partitions, but spaced a minimum 150 mm apart.
- Electrical sockets located in partitions having a sound insulation performance requirement of $D_{nT,w}$ 42 dB or greater should be pattresses or specified with appropriate proprietary socket box covers/infills. Hilti Putty Pads, Firefly Socket Box Covers, or Knauf Putty Pads would be considered suitable products.
- Dado rails for electrical cabling are considered the best solution acoustically, as this minimises penetrations through sound resisting partitions.
- Where double layers of board are used, joints should be staggered. Facing boards should be well sealed with skim finish.

3.6 Doors

If is understood no new doorests will be installed, however if new doorsets are required the following should advice should be followed. The doors should be of proprietary type, by a specialist manufacturer such as Huet Doors. The acoustic rating of the doorset should include the door, frame, seals, hinges, any furniture, and any required glazing or vision panels.

For other doorsets, not requiring an acoustic rating, there are no specific requirement for acoustic insulation.

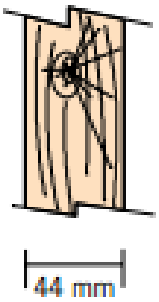
Acoustic performance	Typical construction
30 dB R_w  44 mm thick timber door, half hour fire rated	This acoustic performance can be achieved by a well fitted solid core doorset where the door is sealed effectively around its perimeter in a substantial frame with an effective stop. A 30 minute fire doorset (FD30) can be suitable. Timber FD30 doors often have particle cores or laminated softwood cores with a mass per unit area ≈ 27 kg/m² and a thickness of ≈ 44 mm. Frames for FD30 doors often have a 90 mm x 40 mm section with a stop of at least 15 mm. Compression or wipe seals should be used around the door's perimeter along with a threshold seal beneath. A drop-down or wipe type threshold seal is suitable. Doors incorporating 900 mm x 175 mm vision panels comprising 7 mm fire resistant glass can meet this acoustic performance.

Table 13 - Acoustic Door information

4.0 Reverberation control

4.1 General

Currently the area which covers Phase 4 of the building does not have any reverberation control and the only reduction in reverberation time comes from furniture or diffusion within the room. A typical room is shown in the image below.

It is therefore proposed that all areas will require reverberation control.

Figure 5 - Current spaces

Calculations have been based on products manufactured by Ecophon. However, the required reverberation control could be achieved by equal and approved alternative manufacturers' products.

It is understood the current proposal is for Acoustic Rafts and wall panels to be used to control reverberation. The rafts and wall panels used in the calculations are Class A and been based on Ecophon Solo Square rafts and Ecophon Akusto shown in the image below.

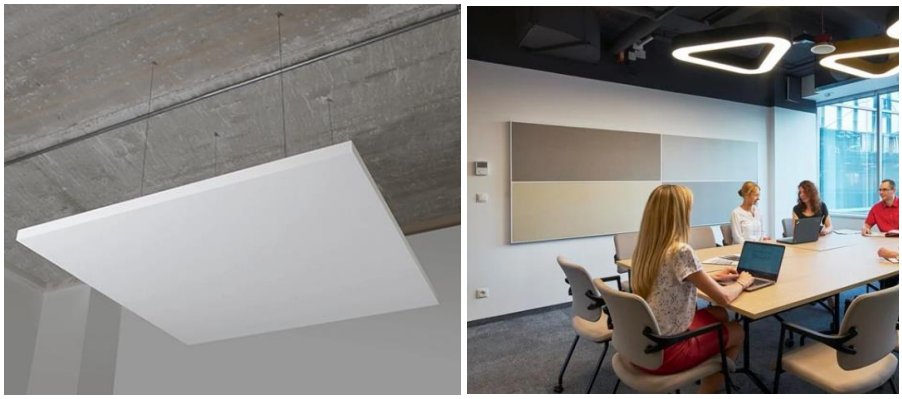


Figure 6 - Suggested acoustic raft and wall panels

The following table summarises the acoustic data for the rafts used in calculations:

Manufacture	Frequency Hz						Class
	125	250	500	1000	2000	4000	
Ecophon Solo Square	0.5	1.4	2.0	2.4	2.3	2.3	A

Manufacture	Frequency Hz						Class
Ecophon Akusto*	0.2	0.7	1.0	1.0	1.0	1.0	A

Table 14 - Suggested raft and wall panel acoustic absorption

*Akusto Wall A will require Super G surface in the Sports Hall to make it impact resistant.

4.2 Reverberation times of rooms to comply with BB93

Reverberation time calculations have been carried out in the following areas:

- Sports Hall
- Group Space

Calculations have been based on the Table 6 from BB93.

The reverberation time has been calculated to the middle frequencies 500 Hz, 1000 Hz and 2000 Hz (T_{mf}).

Room	Target reverberation time T_{mf}	Measured reverberation time T_{mf}	Required rafts	Wall panels required (m^2)
Group Space	(≤ 1.0)	1.4	10	-
Sports Hall	(≤ 2.0)	2.14	-	2

Table 15 - Summary of reverberation control for room to comply with BB93

4.3 Reverberation times for cellular rooms FIS

Reverberation time calculations have been carried out in the following areas:

- Children and Family Centre
- Breakout Space
- Lobby
- Staff Room
- Office 2
- Office 3

Calculations have been based on the Table in Section 2 taken from the FIS document, 'A Guide to Office Acoustics'.

The reverberation time has been calculated to 500 Hz.

Items such as screen dividers, furniture and diffusion have been taken account of in the calculation due to bench mark testing that has been carried out.

It is recommended that the rafts are positioned above desks as much as possible to try to prevent reflections.

The following Table shows the room location the target reverberation time, the measured reverberation time from the bench mark testing and the amount of rafts required to meet the target.

Room	Target reverberation time 500 Hz	Measured reverberation time 500 Hz	Required rafts
Children and Family Centre	0.5	1.2	24
Breakout Space	0.5	N/A	10
Lobby	0.4	0.3	0
Staff Room	0.4	0.7	6
Office 2	0.4	0.4	0
Office 3	0.4	0.5	1

Table 16 - Summary of reverberation control for cellular rooms

4.4 Absorption between desks

It was noted that at least one of the offices will have more than one desk. It is recommended that desk dividers are used. These are around 400 mm above the desk. If the rafts are installed this should increase the effectiveness of their barrier effect by up to 2.8 dB, as shown in the table below.

Separating screen height (cm)	Visibility	Attenuation between workstations without absorptive treatment (plaster ceiling) (dB)	Attenuation between workstations with Class A ceiling treatment (dB)
120 (45 cm above the table)	Satisfactory for 95% of the population	1.7	4.5

Table 17 - Current desk dividers

It is recommended that acoustic absorptive desk dividers are continued to be installed between desks to improve privacy as much as possible.

Desk dividers should be installed along the length of the desk as a minimum.

5.0 IANL

The following is advice for future improvements as it is understood that items relating to the internal ambient noise levels are not part of the refurbishment.

It is understood that this part of the building is naturally ventilated with heating units that generate noise, shown in the image below.

Figure 7 - Current heating unit

If mechanical ventilation is to be used to meet the IANL requirements it should be noted that whilst these are upper limits, the building services plant should not be over attenuated, resulting in noise levels that are too low. Background noise that is anonymous, such as mechanical services noise, is important to provide masking noise that can improve speech privacy between open plan areas, but also between meeting rooms etc. It is recommended therefore that building services plant noise levels are not more than 5 dB below the recommended criteria in the acoustic strategy drawings.

In areas that are confidential that do not have mechanical ventilation a noise masking system could be used such as Applesound that generates random noise. Noise break in from external sources should be kept as low as feasibly possible.

The Table below shows the measured IANL from the benchmark testing.

Test number	Room	Target Indoor ambient noise level dB $L_{Aeq,T}$	Measured Indoor ambient noise level dB $L_{Aeq,T}$	Result
1	Children and Family Centre	<50-55	42	Pass
2	Lobby	< 45-55	30	Pass
3	Staff Room	<50-55	45	Pass
4	Office 2	<35-40	31	Pass
5	Office 3	<35-40	34	Pass
6	Group Space	<40	50	Fail*
7	Sports Hall	< 45	49	Fail*
8	Washroom Lobby	< 45-55	34	Pass

Table 18 - IANL results of the benchmark testing

*Noise from construction work

As can be seen a majority of spaces meet their requirements. The spaces that exceed were due to construction noise from within the site.

6.0 Other considerations

Within multi use offices and spaces it is recommended that management encourage the following etiquette:

- speak quietly on the phone and with colleagues;
- avoid talking when walking;
- hold conference calls and meetings in a dedicated space;
- avoid discussions with distant workstations, favour instant messaging or meeting rooms;
- reduce level of landline ringtone, favour light indicators;
- do not use the telephone loudspeaker;
- set mobile phones to vibrate mode;
- avoid individual briefings or training at a workstation;
- do not affix documents to low dividers or acoustic wall panels if installed.

7.0 Service penetrations

The following details assume that the size of penetration is only slightly larger than the service passing through the partition. In the case where larger holes have been made to allow services to pass, they will require additional treatments.

Partition Type:	R_w 40 or $D_{nT,w}$ 37 dB	$D_{nT,w}$ 42 dB	$D_{nT,w}$ 47 dB
Mechanical Services	See Table below		
Single metal/plastic pipe 15 – 110mm		A	A
Ventilation ducting – circular/rectangular		B	B
Tray with refrigerant lines and cables		C	C
Electrical Services			
Conduit		A	A
Single cable (fire alarm)		A	A
Tray/basket with cables 50 – 300mm		C	C
Trunking with lid and cables 50 – 100mm		C	C
Dado trunking		C	C

Detail #A

Penetration should be packed with mineral wool and well-sealed with non-hardening mastic

Detail #B

Penetration should be packed with mineral wool and well-sealed with non-hardening mastic

Crosstalk attenuator should be fitted where a common duct serves vents in multiple rooms

Detail #C

Penetration should be packed with mineral wool and well-sealed with non-hardening mastic

Tray/trunking/basket can pass through partition

Room 1	Room 2	Treatment to R_w rated partitions
Office	WC	2x 50 mm mineral fibre batt, sealed with non-hardening mastic
Office	Corridor	1x 50 mm mineral fibre batt, sealed with non-hardening mastic
WC	Corridor	No acoustic requirement