HERONSBRIDGE SEN SCHOOL BRIDGEND

ACOUSTIC DESIGN ASSESSMENT
RIBA STAGE 3

REPORT PREPARED FOR

KIER CONSTRUCTION LTD
CONWAY HOUSE
ST MELLONS BUSINESS PARK
CARDIFF
CF3 0EY

R1806.1 V1
HER-RTL-01-ZZ-T-U-000004
S3 Suitable for Review and Comment

13th March 2026

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CONTENTS…

1.0 INTRODUCTION…

Red Twin Limited has been requested by Kier Construction Limited to undertake an assessment of the proposed three-storey (ground, lower ground and first floor) school currently known as Heronsbridge SEN School, against relevant design criteria relating to acoustics and to document the expected acoustic performance.

The replacement school is to provide education for 300 students with special educational needs (SEN) from aged 5-18. We have based our assessment on the guidance provided in Approved Document E Regulation E4 and BB93 (Building Bulletin 93) and the acoustic requirements for SEN are included where appropriate.

The residential units associated with this project are considered under a separate review entitled 'Residential Acoustic Design Review' (ref: L1806.1 V1).

This study is focused on ascertaining the minimum performance requirements and documenting the extent of compliance with the relevant criteria.

We have summarised the applicable performance standards and where necessary we have named products to enable demonstration of compliance. It is noted that alternative equivalent products may be selected and used.

This report contains elements of technical detail to show how the acoustic design is implemented into the building design. It is also intended to provide the basis on which the Client can provide acceptance of any alternative performance standards to what is set out in the requirements.

2.0 DESIGN STANDARDS…

2.1 Design Brief

The preparation of this report has been undertaken without sight of a school specific brief.

The minimum performance standards are the statutory requirements for acoustic performance in schools and relevant British Standard guidance.

2.2 School Premises Regulations

The regulations apply to all schools maintained by local authorities in England and Wales and came into force on 31st October 2012. The document provides a description of the expectation of school premises in a number of key areas. Of particular relevance is clause 7 which states,

> *7. The acoustic conditions and sound insulation of each room or other space must be suitable, having regard to the nature of the activities which normally take place therein.*

We note that the building is defined as a school.

2.3 Building Regulations Requirements

Approved Document E of the building regulations covers acoustic performance and specifically covers school buildings with the following Regulation E4(1),

> "*E4(1) Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use.*"

The approved document goes on to state in Section 0, clause 0.12,

> "*0.12 In the Secretary of State's view the normal way of satisfying Requirement E4 will be to meet the values for sound insulation, reverberation time and indoor ambient noise which are given in Section 1 of Building Bulletin 93 'The Acoustic Design of Schools', produced by DfES*"

(Note the Department for Education and Skills, DfES is now DfE).

2.4 Building Bulletin 93

As mentioned above, the normal way to satisfy the building regulation is to achieve the performance standards set out in section 1 of Building Bulletin 93 (also known as *Acoustic Design of Schools: Performance Standards*).

This assessment has been prepared using the 2014 edition of BB93 (with February 2015 updates).

BB93 Section 1 provides a detailed statement of the expected information required for submittal for Building Control Body review which are relevant to this project, and which include:

- Indoor ambient noise levels in unoccupied spaces (See Section 3.1)
- Airborne sound insulation between spaces (See section 3.2)
- Airborne sound insulation between circulation spaces and other spaces (See section 3.3)
- Impact sound insulation of floors (See section 3.4)

- Reverberation in teaching and study spaces (See section 3.5)
- Reverberation and acoustic absorption in sports halls and swimming pools (See section 3.6)
- Sound absorption in corridors and stairwells (See section 3.7)
- Open plan teaching and learning (See section 3.8)

Additional non-statutory aspects of the assessment include:

- Open plan teaching and learning (See section 3.8)
- Rain noise guidance

Within Section 2.2 of BB93, there is a clause permitting deviations from the specified performances, which states,

> *"In some circumstances alternative performance standards may be appropriate for specific areas within individual schools for particular educational, environmental or health and safety reasons… In these cases, the following information should be provided to the building control body:*
>
> - *a written report by a specialist acoustic consultant clearly identifying (a) all areas of non-compliance with the performance standards (b) the proposed alternative performance standards and (c) the technical basis upon which these alternative performance standards have been chosen*
> - *written confirmation from the school client body of areas of non-compliance, together with the justification for the need and suitability of the APS in each space"*

It is noted that BB93 specifically identifies that the regulations do not apply to administration and ancillary spaces, but guidance is given for such areas. The BB93 criteria for rain noise, and speech intelligibility in open plan teaching spaces are provided for guidance only.

3.0 DESIGN ASSESSMENT…

3.1 Internal Noise Levels in Teaching Spaces

3.1.1 Requirement

The BB93 objective is to provide suitable indoor ambient noise levels for:

- Clear communication of speech between teacher and student and between students
- Learning and study activities

The BB93 criteria for indoor noise should include contributions from (but not limited to):

- External sources outside of the school premises (e.g. road, rail and air transport, commercial and industrial and commercial premises etc),
- Building services noise
- Actuator and damper noise

The BB93 criteria excludes noise contributions from the following:

- Teaching activities within the school, including noise staff, students and equipment within the building or playground
- Equipment used within the spaces (e.g. machine tools, CADCAM machines, dust and fume extraction, compressors, computers, projectors etc)
- Rain noise

For sites affected by quiet conditions with sporadic noisy events, BB93 provides additional criteria and states:

> *"…In order to protect students from regular discrete noise events, e.g. aircraft or trains, indoor ambient noise levels should not exceed 60 dB LA1,30mins. This is achieved by default for spaces with IANLs up to 40 dB LAeq,30min, but requires assessment in spaces with higher IANL limits, eg, 45 and 50 dB."*

We would note that no further definition is provided for "*regular*".

Building Bulletin 101 (BB101) was published in June 2006 and superseded the original BB93 guidance on noise ingress. The current version of BB93 has now incorporated recent changes to other building design codes and defines various design cases as summarised in Table 1.

Condition	Ventilation System	Noise Level Limit
Normal – ventilation for normal teaching and learning activities	Mechanical	BB93 Table 1 value
	Natural	BB93 Table 1 value plus 5 dB
	Hybrid	Mechanical system noise: BB93 Table 1 value
		Total noise level: BB93 Table 1 value + 5 dB
Summertime – ventilation under local control of teacher to prevent overheating – allowable during the hottest 200 hours of the year {1}	Mechanical	BB93 Table 1 value plus 5 dB
	Natural or Hybrid	≤ 55 dB
Intermittent Boost	Mechanical	BB93 Table 1 value plus 5 dB
	Natural	≤ 55 dB

TABLE 1: SUMMARY OF NOISE LEVEL LIMITS UNDER VENTILATION CONDITIONS

{Note 1} The relaxation for the summertime condition does not apply to SEN teaching spaces and therefore this exemption is not applicable.

3.1.2 Design Approach

We understand the building is to be ventilated via an HVHR system in SEN rooms, and MVHR units in ancillary rooms and rooms with no windows.

It should be noted that systems which are not providing ventilation, such as re-circulating cooling/heating units are classified as "*equipment used within the spaces*" and are not subject to the noise limits.

To assess the resulting internal noise levels, we used data obtained from an environmental noise survey.

3.1.3 External Noise Climate

Full details of the survey and the results of the survey are provided in Appendix A.

A previous survey, undertaken by others (Hydrock), has been provided and is entitled 'Heronsbridge ALN School dated 22nd August 2023. The report in conjunction with the survey concluded that the site is not suitable for a single-sided and cross/roof stack natural ventilation in terms of noise break-in to critical teaching spaces.

We have, however, progressed our assessment on the basis of our own survey and include reference to the previous survey by others for information purposes only.

BB93 defines the internal ambient noise level as an equivalent continuous sound pressure level over a 30-minute period, denoted $L_{Aeq,30min}$ in the absence of school activity. BB93 also defines a value for regular noisy events in certain room, as the sound pressure level exceeded for 1% of the time within a 30-minute period, denoted $L_{A1,30mins}$.

We have established the external $L_{Aeq,30min}$ considered representative of the normal school hours in the absence of school activity, which is summarised in Table 2.

Location	Period		Parameter dB(A)		
		L_{AFmax}	L_{Aeq}	L_{A1}	L_{A90}
1	Worst-Case Day Time 30 min period	87	54	67	39

TABLE 2: DESIGN DATA FOR REPRESENTATIVE 30 MINUTE PERIOD DURING SCHOOL HOURS (FREE-FIELD)

3.1.4 Design Assessment

The proposed construction of the external envelope is understood to be as follows:

External Walls	Part facing brick and part seamed cladding with insulated SFS full mineral wool insulation, sheathing board and 2 x 12.5 mm plasterboard construction
External Windows	Double glazed Part L compliant windows e.g. Euroclad Vieo
Roof	Composite concrete roof slab with an inverted hot-melt roof system above
Ventilation	The SEN rooms are to be ventilated via HVHR units with room side attenuation (yet to be determined)

The reduction of external sound passing through the ventilation system has been assessed using laboratory measured sound reduction values for the proposed units. The external sound level at the façade is taken to be 3 dB(A) greater than measured in a free field.

The windows are openable to allow the occupants choice over the level of ventilation. It should be recognised that opening the window will result in an increase of the internal noise level.

The reduction of external noise passing through an open window is a complex subject and commonly approximated following the guidance from the World Health Organisation that states an open window will reduce the external noise level measured 2 m from the façade by 10 to 15 dB(A). Napier University has conducted extensive research into the effects of window openings and concluded a similar level of attenuation, with dependencies on the type of opening, of between 12-18 dB(A) to traffic noise. We have used a value of 17 dB(A) reduction from the façade noise level for open window assessment.

When the windows are closed, the sound insulation is expected to be dominated by the openings for the ventilation system. A building external envelope containing an HVHR ventilation system is expected to lead to a sound level difference of approximately 20-25 dB $D_{new}+C_{tr}$ per unit. Manufacturer data will be reviewed in detail at the next stage. Typically, a standard classroom will have two HVHR units penetrating the external façade with larger/smaller rooms having proportionally more/less.

We have based our assessment on the use of an **HVHR system achieving a 27 dB Dnew + Ctr outdoor-to-indoor level difference** with windows in the closed position. This performance value should be used to determine the appropriate room-side attenuation. Where a room contains more than one unit, **additional room-side attenuation will be required** in proportion to the number of units serving that space. For the purposes of this assessment, we have applied an additional 3 dB attenuation for rooms containing two units, and an additional 6 dB attenuation for rooms containing three units.

These allowances reflect the cumulative effect of multiple units operating within the same room

Table 3 shows the predicted noise ingress levels, due to external sound, against the design requirements without the contribution of any building services noise.

The criteria values indicate a maximum noise level, and *italic text* indicates the criteria are not mandatory but are included for guidance.

Elevation	Room Type	BB93 Maximum IANL (dB $L_{Aeq,30min}$)	Expected IANL From External Sources (dB $L_{Aeq,30min}$)	Compliant (Y/N)
All	Library	30	30	Yes
	Classrooms	30	30	Yes
	Group Room	30	30	Yes
	Sensory Room	30	30	Yes
	Group Rooms [2]	30	30	Yes
	Hygiene Room [2]	30	30	Yes
	Main Halls	30	30	Yes
	Life Skills	30	30	Yes
	Cafe	30	30	Yes
	Staff Room [1]	*40 (35+5)*	*40*	*Yes*
	Offices / Ancillary [1]	*45 (40+5)*	*40*	*Yes*
	Pools	50	30	Yes

TABLE 3: PREDICTED INTERNAL NOISE LEVELS DUE TO EXTERNAL SOURCES

{Note 1} We have included the BB93 relaxation for when systems are operating in natural ventilation mode, with windows and vents set to provide a carbon dioxide

concentration of 1500 ppm or less for the design mid-season weather condition. The relaxation allows the IANL to be increased by up to 5 dB.

{Note 2} These rooms are land-locked and cannot be ventilated naturally. The noise ingress from outside will be very low and the outcome will be dominated by the sound of the mechanical systems.

The relaxation of the noise levels during boost ventilation/overheating does not apply to SEN rooms.

The internal limit of 60 dB(A) L_{A1} is achieved by default for all room types in this building with the anticipated reduction in external noise through the ventilation system and through opening windows.

The level of internal noise due to external sources is expected to achieve the internal ambient noise design requirements in the condition of using an HVHR system in all rooms and hence the concept design is compliant with BB93 at this stage.

3.1.5 HVHR Noise Levels

The operation of the ventilation systems generates sound. The level of sound depends on the duty the system is operating, and the detailed design is currently being developed. We have based our assessment on there being two HVHR units installed in each classroom, with 1 No in the smaller rooms such as group rooms and life skills. Manufactures' data of typical units suggest the internal noise level of two units operating simultaneously is 27 dB. On this basis, the following noise ratings are predicted within each room.

To assist the design, the noise limits for each room type resulting from the HVHR system are summarised in Table 3.

Rooms shown in italics in Table 4 have internal noise level guidance, but achievement of the guidance is not mandatory to demonstrate compliance with the design objectives.

Room Type	BB93 Maximum IANL (dB(A) $L_{Aeq,30min}$)	Max. Noise Rating NR (dB)	Compliant (Y/N)
Library	30	24	Yes, subject to detailed M&E design
Classrooms	30	21	
Group Room	30	24	
Sensory Room	30	24	
Group Rooms [1]	30	24	
Hygiene Room [1]	30	24	
Main Halls	30	21	
Life Skills	30	24	
Cafe	30	21	
Staff Room	*40 (35+5)*	24	
Offices / Ancillary	*45 (40+5)*	*24*	
Pools	50	*24*	

TABLE 4: MAXIMUM INTERNAL AMBIENT NOISE LEVELS (IANL) DUE TO MECHANICAL SOURCES

{Note 1} These rooms are mechanically ventilated. The noise from outside will be low and the building services will likely contribute most of the observed internal noise levels.

The NR level for M&E sources has been converted from L_{Aeq} dB(A) based on an approximate 6 dB(A) correction between L_{Aeq} and NR values as detailed in BS8233:2014 and is for indicative purposes only. The 6 dB(A) correction is, in our opinion, often conservative and will be valid provided there are no strong low frequency components in the sound.

3.1.6 Compliance with Requirements

The design can be demonstrated to achieve the design objectives taken from BB93.

3.2 Noise Transfer Between Teaching Spaces

3.2.1 Requirements

The BB93 objective is to attenuate airborne sound transmitted between spaces. The effect of internal glazing, doors, structure-borne and flanking transmission on sound transmission must be considered.

The sound insulation is assessed in terms of the standardised level difference D_{nT} in accordance with BS EN ISO 16283-1 and the results are weighted and expressed as a single-number quantity, $D_{nT,w}$ in accordance with BS EN ISO 717-1.

For the purposes of the assessment the reference reverberation time T may be either:

- the upper limit for the mid-frequency reverberation time, T_{mf} for the receiving room type applied to all one-third octave bands from 100 Hz to 3.15 kHz;

or, for commissioning measurements:

- the measured reverberation time in each third octave band, provided that the mid frequency reverberation time, T_{mf}, complies with the requirements and is representative of the reverberation times expected when the room is finished and unfurnished.

The performance of walls and floors separating circulation space is covered separately in section 3.3.

3.2.2 Design Approach

The on-site performance requirement cannot be used to specify constructions or products.

When calculating the laboratory specification for the internal walls and floors a conversion into dB R_w is needed (R_w is the Weighted Sound Reduction Index and is a unit of measurement used by industry to compare sound insulation performance of products and elements).

We have calculated the sound reduction index and included a tolerance for construction weaknesses, flanking and workmanship of 5 dB as recommended by BB93.

3.2.3 Elemental Performance Requirements – Walls

Table 5 summarises the wall performances used for assessment of the building design. Note that mandatory requirements can be subject to alternative performance standards.

The performance values indicate a minimum performance, and italic text indicates the criteria are not mandatory but are included for guidance.

Separation Between		Minimum $D_{nT,w}$ On-Site (dB)	Min Laboratory Performance R_w (dB)	Separating Construction from Table 6	Compliant (Y/N)
Room Type 1	Room Type 2				
Lower Ground Floor					
LV Switch [P]	Soft Play	55	56	4	Y
SEN Class Base	LV Switch Room [P]	55	56	4	Y
SEN Class Base	SEN Class Base	50	51	4	Y
SEN Class Base	Group Room	50	45 [2]	2	Y
SEN Class Base	Group Room	50	53	4	Y
SEN Class Base	Stairwell	50	51	4	Y
Group Room	Group Room	50	54	4	Y
Group Room	Hygiene Room	50	51	4	Y
SEN Class Base	Hygiene Room	50	53	4	Y
Life Skills	Group Room	50	51	4	Y
Life Skills	Sensory Room	55	57	5	Y
Rebound	Office	55	57	5	Y
Office	Office	40	47	3	Y
Nurse Base	Office	40	48	3	Y
Office	WC	45	45 [2]	2	Y
Meeting	Meeting	45	49	3	Y
Pool Plant [P]	Family Room	50	56	4	Y
Hydro Pool	Plant [P]	45	45 [2]	4	Y
Staff Work	Office	40	49	3	Y
SEN Classroom	WC	50	40 [1]	1	Y
Pool	Changing	45	53 [2]	2	Y
Ground Floor					
Hygiene Room	Sensory Room	55	57	5	Y
SEN Class Base	Hygiene Room	45	51	4	Y
SEN Class Base	Group Room	50	45 [2]	2	Y
SEN Class Base	SEN Class Base	50	51	4	Y
SEN Class Base	WC	50	50	3	Y
SEN Class Base	Hygiene Room	50	53	4	Y
Art Classroom	ICT	50	52	4	Y
Food Tech	Digital	50	56	4	Y
ICT	Music Practice	55	62	5	Y
Music Practice	Music Room	55	45 [2]	2	Y
Pool	Food Tech	50	55	4	Y
Hydro Pool	Resource Support	50	53	4	Y
Café	Life Skills	50	56	4	Y
Kitchen	Dining	{Servery}		--	--
Kitchen	Sensory	55	62	5	Y
Soft Play	Plant [P]	55	56	4	Y
Rebound	SEN Class Base	55	58	5	Y
Staff Work Base	Art Classroom	50	53	4	Y
First Floor					
Leavers Common	WC	55	51	4	Y
Leavers PMLD	Sensory	55	60	5	Y
Group Room	Sensory	55	59	5	Y
Leavers Common Room	Dining	55	59	5	Y
Leavers Classroom	Hygiene Room	50	45 [2]	2	Y
Leavers Classroom	Hygiene Room	50	55	4	Y
Leavers Classroom	Staff Work Base	50	53	4	Y

Ancillary Offices	Ancillary Offices	40	48	3	Y

TABLE 5: SUMMARY OF PERFORMANCE REQUIREMENTS – SEPARATING WALLS TO TEACHING SPACES

{Note P} The plant room space is not recognised in BB93. In this building the plant room is located adjacent to a teaching space. We have assessed the airborne sound insulation to the plant room based on the plant room having a "High" noise source categorisation. On the basis that the building is lightly serviced this is considered a conservative approach.

{Note 1} In our experience, a wall separating a WC within an SEN classroom can be proposed as a lower performing wall type as the space is typically considered part of the classroom and under the control of the same team of teaching staff.

{Note 2} The separation between these rooms contains a connecting door. This is an allowable exception within BB93 (Clause 1.2.3). These doors are required to achieve at least 35 dB R_w and the wall a minimum 45 dB R_w.

{Servery} Serving hatches between kitchens and multi-purpose halls used for dining should be avoided where practicable. Where this is not possible, serving hatches should be designed to have as high a level of sound insulation as practicable (not less than 18 dB R_w) and, if necessary, use of the hall space timetabled so that noise sensitive activities do not take place in the hall when the kitchen is in use.

3.2.4 Proposed Constructions – Walls

It is proposed to incorporate lightweight walls throughout the project, and our understanding of the separating walls is summarised in Table 6.

Wall Type Ref.	Construction Description	Min Laboratory Performance R_w (dB)	Substantiation Reference
1	1 x 15 mm Megadeco board either side of single GTEC CS70Rx C stud at 600mm centres	40	Siniat RUP 001
2	1 x 15 mm Megadeco board either side of single GTEC CS70Rx C stud at 600 mm centres with 25 mm insulation	45	Siniat RMP 003
3	1 x 15 mm Megadeco board either side of single AS90/Rx stud at 600 mm centres with 75 mm insulation	52	Siniat AMP 138
4	2 x 15 mm GTEC dB Board either side of single GTEC AS70Rx acoustic stud at 600 mm centres with 25 mm insulation	57	Siniat ASP 013
5	Twin metal GTEC CS50/Rx C stud at 600 mm centres with 2 x 15 mm GTEC dB board either side. With 25 mm insulation. GTEC V-braced at 1500 mm centres	63	Siniat RSP 038
M	Movable partition capable of laboratory tested sound reduction index of at least 58 dB Rw, measured in accordance with the BS EN ISO 10140, with performance substantiation made available for review prior to placement of an order.	58	TBC by manufacturer

TABLE 6: CONSTRUCTION PERFORMANCES OF WALLS

The walls have been assessed based on generic drywall systems available from Siniat as an example. Other manufacturers such as British Gypsum and Knauf will likely offer similar performance for similar constructions, but any changes should be reviewed.

Provision of a construction which exceeds the minimum sound insulation identified is also acceptable.

Achieving the sound insulation is dependent on suitable control of flanking paths.

A marked-up plan is provided in Appendix B to indicate the locations of the wall types proposed for achievement of the acoustic requirements.

3.2.5 Elemental Performance Requirements – Floors

Table 7 summarises the floor performances used for assessment of the building design.

Note that mandatory requirements can be subject to alternative performance standards and the performance values indicate a minimum performance.

Separation Between		Minimum $D_{nT,w}$ On-Site (dB)	Min Laboratory Performance R_w (dB)	Separating Construction from Table 9	Compliant (Y/N)
Room Type 1	Room Type 2				
First Floor to Ground Floor					
Staff Social	MP Practical	45	52	1	Y
Office	MP Practical	45	54	1	Y
Leavers Classroom	Hydo Pool	55	59	1	Y
Staff Work base	Resource Support	45	55	1	Y
Leavers Classroom	Cafe	55	57	1	Y
Leavers Classroom	Life Skills	50	55	1	Y
Hygiene	Circulation	45	50	1	Y
Leavers PMLD	Staff Work base	45	53	1	Y
Sensory	Rebound	55	62	1	N
Group Room	Rec. Classroom	50	55	1	Y
Leavers Common	Kitchen	55	59	1	Y
Leavers Common	Dining	55	52	1	Y
Ground Floor to Lower Ground Floor					
Staff Work base	LV Switch	50	58	1	Y
Hygiene	Soft play	50	54	1	Y
Class Base	Class Base	50	55	1	Y
Group Room	Group Room	50	55	1	Y
Food Tech	Changing	50	49	1	Y
Store	Sensory	50	54	1	Y
MP Practical	Staff Work base	45	53	1	Y
Art Classroom	Class Base	50	55	1	Y
ICT	Group Room	50	56	1	Y
Music Practice	Class Base	55	58	1	Y
Music Room	Class Base	55	59	1	Y
ICT	Wellbeing	45	52	1	Y
Resource Support	Plant	55	56	1	Y
Resource Support	Family Room	50	50	1	Y
Café	General Office	50	58	1	Y
Primary Hall	Meeting	50	58	1	Y
Secondary Hall	Ancillary Office	50	57	1	Y

Secondary Hall	Rebound	44	62	1	N

TABLE 6: SUMMARY OF PERFORMANCE REQUIREMENTS – SEPARATING FLOORS TO TEACHING SPACES

The design of the separating floors is summarised in Table 7.

Floor Type Ref.	Construction Description	Laboratory Performance R_w (dB)	Substantiation Reference
1	Sand/cement screed (nominal thickness 70 mm), Rigid board insulation (nominal thickness 70 mm), 150 mm Comflor 60 power floated slab	59	Estimate

TABLE 7: CONSTRUCTION PERFORMANCES – FLOORS

Review of the current design indicates the proposed floor structure offers suitable airborne sound insulation in all areas except for the Rebound (LGF) room and Secondary Main Hall (GF), and the Rebound Room (GF) and Sensory Room (FF).

In these two areas, we recommend a mass barrier ceiling is installed in the ceiling build-up of the lower rooms consisting of a 12.5 mm layer of dense plasterboard on a metal frame. With this mitigation in place, we would expect the shortfall in performance to be achieved in all scenarios.

Provision of a construction which exceeds the minimum sound insulation identified is also acceptable.

Achieving the sound insulation is dependent on suitable control of flanking paths.

3.2.6 Compliance with Requirements

The proposed designs of the internal separating walls and floors, at this stage, is compliant with the requirements of BB93, subject to our recommendations.

3.3 Noise Transfer Between Teaching and Circulation Spaces

3.3.1 Requirement

The objective is to attenuate airborne sound transmitted between circulation spaces (e.g. corridors, stairwells etc.) and other spaces used by students, for the purposes of minimising disturbance to teaching and learning spaces.

This applies where the separating construction contains doors and/or glazed elements.

BB93 identifies minimum weighted sound reduction indices of door sets, and the composite weighted sound reduction index of wall and glazing (with and without ventilators). The weighted sound reduction index is measured in accordance with BS EN ISO 140-3 and rated in accordance with BS EN ISO 717-1.

The sound insulation of ventilators is specified in terms of the weighted element-normalised level difference, $D_{ne,w}$-$10\log_{10}(N)$, where N is the number of ventilators with airborne sound insulation D_{new}. The weighted element-normalised level difference is measured in accordance with BS EN ISO 10140-10 and rated in accordance with BS EN ISO 717-1.

3.3.2 Assessment of Walls to Circulation

Table 8 summarises the wall construction and performances used for assessment of the building design.

The laboratory performance values indicate a minimum performance.

Separation Between		Minimum $D_{nT,w}$ (dB)	Minimum Laboratory Performance R_w (dB)	Construction from Table 6	Compliant (Y/N)
Room Type 1	Room Type 2				
Ancillary Rooms	Circulation Space / Corridor	n/a	40	1	Yes
SEN Rooms	Circulation Space / Corridor	n/a	45	2	Yes

TABLE 8: SUMMARY OF CORRIDOR WALLS CONSTRUCTION

3.3.3 Assessment of Doors to Circulation

Doors to ancillary and non-teaching spaces have no acoustic performance requirement and we recommend using a solid core timber door set (See Type 1 doors in Table 9).

Doors to SEN rooms from circulation areas, are proposed to be installed as acoustically rated door sets (See Type 2 doors in Table 9) that achieve a minimum 35 dB R_w in accordance with BB93. The requirement is for a laboratory tested door set.

Doors which link two independent teaching spaces together are classified as “connecting doors”. BB93 provides an elemental specification for connecting doors to achieve at least 35 dB R_w, and these are proposed as an acoustically rated door sets (See Type 2 doors in Table 9).

Similar specification doors from other manufacturers can be expected to offer similar performance.

Door Type Ref	Minimum Requirement R_w (dB)	Typical Construction Description (Examples only)
1	30	30 dB R_w laboratory tested door set, typically a 45 mm solid core door set (23 kg m^{-2}) with smoke seals
2	35	35 dB R_w laboratory tested door set, typically a 45 mm solid core door set (38 kg m^{-2}) with smoke seals

TABLE 9: TYPICAL CONSTRUCTIONS FOR DOORS TO ALL AREAS

The proposed door products have not been confirmed. However, the performance is readily achievable, and compliance is expected.

3.3.4 Assessment of Internal Glazing to Circulation

Within this building we understand that there are numerous internal windows used between rooms and the circulation spaces, which are generally limited to the area surrounding doorways.

An internal window provides borrowed light and passive supervision and in our opinion is good design where noise egress will not cause disruption to adjacent areas.

The acoustic performance requirements for internal windows to circulation areas are summarised in Table 10.

Separation Between		Minimum Composite Performance R_w (dB)	Minimum Door Specification R_w (dB)	Minimum Glazing Specification R_w (dB)	Requirement Achieved
Room Type 1	Room Type 2				
Ancillary Rooms	Circulation Space/Corridor	40	30 (Type 1)	30 {1}	Yes
SEN Rooms	Circulation	45	35 (Type 2)	35 {1}	Yes

TABLE 10: SUMMARY OF PERFORMANCE FOR INTERNAL GLAZING TO CIRCULATION

{Note 1} Providing the glazed units achieve the same specification as the entrance door they will not lead to a reduction in the achieved separation between the circulation areas and the teaching rooms since the door is already forming a considerable acoustic weakness.

An example specification of compliant windows to achieve the derived performance values is given in Table 11.

Glass Type Ref	Minimum Requirement R_w (dB)	Typical Construction Description (Example only)
1	30	Basic double-glazed configuration in a notional 4 mm float glass, 16 mm airspace, 4 mm float glass configuration.
2	35	Basic double-glazed configuration in a notional 4 mm float glass, 16 mm airspace, 8 mm float glass configuration.

TABLE 11: TYPICAL CONSTRUCTION FOR INTERNAL GLAZING TO CIRCULATION

3.3.5 Assessment of Cross-Flow Ventilator Units

There are no cross-flow ventilators. This section is not relevant to this project.

3.3.6 Compliance with Requirements

Windows, doors and ventilators are expected to be compliant, but we cannot confirm compliance at this stage.

3.4 Impact Sound Insulation

3.4.1 Requirement

The BB93 objective is to control impact sound (e.g. from footsteps and movement of furniture) transmitted into spaces via the floor above.

It does not address issues such as slamming doors or large impacts.

BB93 provides maximum permissible weighted standardised impact sound pressure levels L'_{nTw} dB measured in accordance with BS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.

For the purposes of the assessment the reference reverberation time T may be either:

- the upper limit for the mid-frequency reverberation time, $T_{mf,max}$ for the receiving room type applied to all one-third octave bands from 100 Hz to 3.15 kHz;

or, for commissioning measurements:

- the measured reverberation time in each third octave band, provided that the mid frequency reverberation time, T_{mf}, complies with the requirements and is representative of the reverberation times expected when the room is finished and unfurnished.

3.4.2 Design Approach

When calculating the laboratory specification for the internal floor types in terms of dB L_{nw}, we have used the procedure set out in BB93 V1 section 3.11.

The calculation includes a 5 dB tolerance for the differences between laboratory installation and site installation which is reflective of our own experience.

3.4.3 Elemental Performance Requirements

We have used floor finishes that, in our experience, are typical for the room types within this project, but note that this would be finalised in our Stage 4 review.

Table 12 summarises the floor performances used for assessment of the building design. The performance values indicate a maximum value.

Separation Between		Maximum $L'_{nT,w}$ On-Site (dB)	Maximum Laboratory Performance $L_{n,w}$ (dB)	Separating Construction from Table 13	Floor Finish	Compliant? (Y/N)
Upper Floor	Room on Lower Floor					
First Floor to Ground Floor						
Staff Social	MP Practical	55	57	1	1+C	Y
Office	MP Practical	55	57	1	1+C	Y
Leavers Classroom	Hydo Pool	65	65	1	1+V	Y
Staff Work base	Resource Support	60	58	1	1+C	Y
Leavers Common Room	Cafe	65	67	1	1+aV	Y
Leavers Classroom	Life Skills	55	57	1	1+aV	Y
Hygiene	Circulation	65	62	1	1+aV	Y
Leavers PMLD	Staff Work base	60	57	1	1+aV	Y
Sensory	Rebound	60	57	1	1+C	Y
Group Room	Rec. Classroom	55	58	1	1+aV	Y
Leavers Common	Kitchen	65	63	1	1+V	Y
Leavers Common	Dining	65	67	1	1+V	Y
Ground Floor to Lower Ground Floor						
Staff Work base	LV Switch	65	63	1	1+C	Y
Hygiene	Soft play	60	57	1	1+C	Y
Class Base	Class Base	55	58	1	1+aV	Y
Group Room	Group Room	55	50	1	1+aV	Y
Food Tech	Changing	65	54	1	1+aV	Y
MP Practical	Staff Work base	60	57	1	1+aV	Y
Art Classroom	Class Base	55	58	1	1+aV	Y
ICT	Group Room	55	49	1	1+C	Y
Music Practice	Class Base	55	58	1	1+C	Y
Music Room	Class Base	55	58	1	1+C	Y
ICT	Wellbeing	60	51	1	1+C	Y
Resource Support	Plant	65	59	1	1+C	Y
Resource Support	Family Room	60	54	1	1+C	Y
Café	General Office	65	62	1	1+V	Y
Primary Hall	Meeting	60	54	1	1+SF	Y
Secondary Hall	Ancillary Office	65	56	1	1+SF	Y
Secondary Hall	Rebound	60	56	1	1+SF	Y

TABLE 12: SUMMARY OF PERFORMANCE REQUIREMENTS – SEPARATING FLOORS TO TEACHING SPACES

3.4.4 Proposed Constructions – Floors

The current design of the internal separating floors is summarised in Table 13.

Floor Type Ref.	Construction Description	Laboratory Performance $L_{n,w}$ (dB)	Substantiation Reference
1	Sand/cement screed (nominal thickness 70 mm), Rigid board insulation (nominal thickness 70 mm), 150 mm Comflor 60 power floated slab	67	Estimate
1+C	Carpet tile finish to provide $\Delta L_{n,w}$ of 20 dB	47	Estimate
1+V	Standard vinyl or similar to provide $\Delta L_{n,w}$ of 4 dB	63	Estimate
1+aV	Acoustic vinyl or similar to provide $\Delta L_{n,w}$ of 18 dB (e.g. Standard vinyl with 4.5 mm Regupol SonusMulti underlay)	49	Estimate
1+SF	Sprung Floor e.g. Komfort Plus or similar to provide $\Delta L_{n,w}$ of 13 dB {1}	54	Estimate

TABLE 13: CONSTRUCTION PERFORMANCES – SEPARATING FLOORS (IMPACT SOUND)

{Note 1} The manufacturers data sheet does not provide impact sound reduction performance specification and therefore this remains to be reviewed during Stage 4.

3.4.5 Compliance with Requirements

The design of the separating floors to control impact sound is compliant with the design brief at this stage, subject to the provision of the floor finishes recommended.

3.5 Reverberation Time in Teaching & Study Spaces

3.5.1 Requirement

The BB93 objective is to provide suitable reverberation times (RTs) for

a) Clear communication of speech between teacher and students, and between students, in teaching and study spaces, and
b) Music teaching and performance

The performance requirements in BB93 are provided in terms of the mid frequency reverberation time, T_{mf}, which is the arithmetic average of the reverberation times in the 500, 1000 and 2000 Hz 1/1 Octave bands, or the arithmetic average of the reverberation times in the on-third octave bands from 400 Hz to 2500 Hz.

These values are for rooms that are finished, furnished for normal use, but unoccupied.

3.5.2 Design Approach

When calculating the reverberation time for an enclosed space we have used the procedure and relationship between quantities set out in the IOA/ANC guidance which defines the following, (also known as the Sabine formula),

$$T_{band} = 0.161 \times \text{Room Volume} / A_{band}$$

Where

T_{band} is the reverberation time in seconds in a specified frequency band

A_{band} is the totally absorbing area in the room, estimated from the summation of the practical sound absorption coefficients of the surfaces (α_p) multiplied by their surface area (m^2) for the frequency band.

It is noted in the IOA/ANC guidance that this relationship holds when the sound field within the room is diffuse i.e. the sound intensity is well distributed throughout the room volume. This assumption is not valid for unfurnished classrooms or where acoustic treatment is installed on only the ceiling or walls.

The limitations of the calculation process are evident in test results obtained in unfurnished rooms, with an increase in the reverberation time of 0.2 to 0.3 seconds commonly observed without furniture.

3.5.3 Design Assessment

Table 14 details the predicted reverberation times for the various spaces. The room modelling has included the known finishes at this stage, with all rooms modelled unfurnished and unoccupied.

The assessment of an unfurnished room is expected to be conservative as furniture provides acoustic absorption. In our experience the furniture in schools adds little absorption, providing only scattering surfaces which helps to bring the measured results closer to the predicted outcome.

We have assessed the ceilings to be clip-in Class A ceiling tiles in all teaching spaces, Class C in Ancillary spaces such as offices and have stated the required additional absorption to target the requirements of BB93.

We have, at this stage, incorporated the floor finishes as described below. However, it should be noted that if carpets were installed in place of vinyl, it is likely that the amount of additional absorption can be reduced. Conversely, should a hard floor finish, such as vinyl, be installed in rooms we have

modelled with carpet, then this would likely result in an increase in additional absorption being required.

The finishes are understood to be as follows:

Lower Ground Floor

- Soft Play
  - Floor – Soft Floor (padded)
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Padded, glazing and doors
  - Additional Absorption – 4 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Class Base
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 15 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Group Room / Wellbeing
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 2 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Food Tech
  - Floor – Hard Floor e.g. vinyl
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors
  - Wall treatment – 10 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted at high level on two non-opposing walls

- Sensory Room
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Additional Absorption – 3 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Life Skills
  - Floor – Hard Floor e.g. vinyl
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors
  - Additional Absorption – 8 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Offices
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class C ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors

- Staff Work Base
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class C ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors

- Assisted Changing
  - Floor – Hard Floor e.g. ceramic tiles
  - Ceilings – Class C ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors

- Pool
  - Floor – Hard Floor e.g. ceramic tiles
  - Ceilings – Exposed steel deck
  - Walls – Full height Whiterock or similar and doors
  - Additional Absorption – 38 No Rockfon Eclipse Rafts (1800 mm x 1200 mm) on 50 mm suspension, or similar, **and** 15 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Hydro Pool
  - Floor – Hard Floor e.g. ceramic tiles
  - Ceilings – Ceilings – Exposed steel deck
  - Walls – Full height Whiterock or similar and doors
  - Additional Absorption – 16 No Rockfon Eclipse Rafts (1800 mm x 1200 mm) on 50 mm suspension, or similar, **and** 10 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Rebound
  - Floor – Soft Floor (predominantly padded)
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – predominantly padded and doors
  - Additional Absorption – 5 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

<u>Ground Floor</u>

- Staff Work Base
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class C ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors

- Offices
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class C ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors

- Wellbeing
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Additional Absorption – 1 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Class Base
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors
  - Additional Absorption – 15 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Group Room
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 3 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- MP Practical
  - Floor – Hard Floor e.g. vinyl
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 8 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Art
  - Floor – Hard Floor e.g. vinyl
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 8 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- ICT
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 6 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Music Practice
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 2 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Music Room
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 10 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Food Tech
  - Floor – Hard Floor e.g. vinyl
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors

- Wall treatment – 12 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Digital Green
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 8 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Resource Support
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 10 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Cafe
  - Floor – Hard Floor e.g. vinyl
  - Ceilings – Class C clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 8 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Life Skills
  - Floor – Hard Floor e.g. vinyl
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors
  - Additional Absorption – 9 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Rebound
  - Floor – Soft Floor (padded)
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Additional Absorption – 6 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Sensory Room
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Padded and doors
  - Additional Absorption – 5 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Soft Play
  - Floor – Soft Floor (padded)
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Padded, glazing and doors
  - Additional Absorption – 4 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Hygiene
  - Floor – Hard Floor e.g. Vinyl

  - Ceilings – Class C ceiling covering 100 % of the available area
  - Walls – Full height Whiterock or similar and doors

- Dining
  - Floor – Hard Floor e.g. vinyl
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 45 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Primary Hall
  - Floor – Semi-Sprung floor e.g. Komfort Plus sports floor
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 35 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Secondary Hall
  - Floor – Semi-Sprung floor e.g. Komfort Plus sports floor
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 55 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

<u>First Floor</u>

- Staff Social
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class C ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors

- Offices
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class C ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors

- Wellbeing
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Additional Absorption – 3 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Leavers Classroom
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors
  - Additional Absorption – 15 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Leavers Common Room
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors

- Additional Absorption – 20 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Leavers PMLD
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard, glazing and doors
  - Additional Absorption – 18 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Sensory Room
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Additional Absorption – 5 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

- Group Room
  - Floor – Soft Floor e.g. carpet
  - Ceilings – Class A clip-in ceiling covering 100 % of the available area
  - Walls – Plasterboard and doors
  - Wall treatment – 7 m^2 of Class A wall panels rated to ISO11654, evenly distributed on walls, and mounted as close to head height as practicably possible

Where products are named, it should be noted that alternative products with equal acoustic performance would provide similar results.

Room Type	Approx. Volume (m^3)	Design T_{mf} (s)	Predicted T_{mf} (s)	Predicted RT (s) at Octave Band Centre Frequencies (Hz)						Comply (Y/N)
				125	250	500	1k	2k	4k	
Lower Ground Floor										
Soft Play	67	≤ 0.4	0.4	0.5	0.4	0.3	0.3	0.3	0.3	Y
Class Base	146	≤ 0.4	0.3	0.5	0.4	0.4	0.4	0.4	0.4	Y
Group Rooms / Wellbeing	26	≤ 0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	Y
Food Tech	119	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	Y
Sensory Room	48	≤ 0.4	0.3	0.5	0.4	0.4	0.3	0.3	0.3	Y
Life Skills	76	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	Y
Offices	27	≤ 1.0	0.5	0.7	0.5	0.5	0.5	0.4	0.4	Y
Staff Work Base	81	≤ 1.0	0.5	0.9	0.7	0.6	0.5	0.4	0.4	Y
Assisted Changing	76	≤ 1.0	0.6	0.9	0.7	0.6	0.6	0.6	0.6	Y
Pool	1174	≤ 2.0	1.0	1.1	1.1	1.0	0.9	0.8	0.7	Y
Hydro Pool	565	≤ 2.0	1.0	0.9	1.0	1.0	0.9	0.8	0.7	Y
Meeting Rooms	41	≤ 1.0	0.5	0.8	0.6	0.5	0.5	0.4	0.4	Y
Rebound	48	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.3	Y
Ground Floor										
Staff Work Base	81	≤ 1.0	0.5	0.9	0.7	0.6	0.5	0.4	0.4	Y
Offices	27	≤ 1.0	0.5	0.7	0.5	0.5	0.5	0.4	0.4	Y
Wellbeing	17	≤ 0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	Y
Class Base	172	≤ 0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.4	Y
Group Rooms	32	≤ 0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	Y
MP Practical	115	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	Y

Art	105	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	Y
ICT	82	≤ 0.4	0.4	05	0.4	04	0.4	0.4	0.4	Y
Music Practice	21	≤ 0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	Y
Music	98	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	Y
Food Tech	160	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	Y
Digital Green	78	≤ 0.4	0.3	0.5	0.4	0.3	0.3	0.3	0.3	Y
Resource Support	119	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	Y
Café	159	≤ 1.0	0.5	0.8	0.7	0.5	0.5	0.8	0.8	Y
Life Skills	131	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	Y
Rebound	61	≤ 0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.3	Y
Sensory Room	54	≤ 0.4	0.3	0.5	0.4	0.4	0.3	0.3	0.3	Y
Soft play	57	≤ 0.4	0.4	0.5	0.4	0.3	0.3	0.3	0.3	Y
Hygiene	46	≤ 1.0	0.6	0.7	07	0.6	06	0.6	0.5	Y
Dining	769	≤ 1.0	0.8	1.0	0.9	0.8	0.8	0.7	0.7	Y
Primary Hall	620	0.8 – 1.2	0.8	1.0	0.8	0.8	0.8	0.7	0.7	Y
Secondary Hall	1092	0.8 – 1.2	0.8	1.1	0.9	0.8	0.8	0.8	0.7	Y
First Floor										
Staff Social	134	≤ 1.0	0.5	1.0	0.8	0.6	0.6	0.5	0.4	Y
Offices	27	≤ 1.0	0.5	0.7	0.5	0.5	0.5	0.4	0.4	Y
Wellbeing	38	≤ 0.4	0.3	0.5	0.4	0.3	0.3	0.3	0.3	Y
Hygiene	36	≤ 1.0	0.6	0.8	0.6	0.6	0.6	0.6	0.5	Y
Leavers Classroom	158	≤ 0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.4	Y
Leavers Common	238	≤ 0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.4	Y
Leavers PMLD	212	≤ 0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.4	Y
Sensory Room	52	≤ 0.4	0.3	0.5	0.4	0.4	0.3	0.3	0.3	Y
Group Room	96	≤ 0.4	0.4	0.5	0.4	0.4	0.3	0.3	0.3	Y

TABLE 14: SUMMARY OF PREDICTED REVERBERATION TIMES FOR UNFURNISHED TEACHING SPACES

{Note 1} The target reverberation times for the pools is discussed in more detail in section 3.6.

There are many products available and means of adding absorption to a room. The solutions offered could be achieved via alternatives provided the equivalent sound absorption performance is achieved. It is recommended that alternatives are reviewed prior to installation.

3.5.4 Compliance with Requirements

The design can be demonstrated as compliant with the design brief and BB93, subject to our recommendations.

3.6 Reverberation and Acoustic Absorption in Sports Halls and Swimming Pools

The BB93 objective is to provide suitable reverberation times (RTs) for:

a) Clear communication of speech between teacher and students, and
b) Clear communication between students.

The performance requirements in BB93 are provided in terms of the mid frequency reverberation time, T_{mf}. Which is the arithmetic average of the reverberation times in the 500, 1000 and 2000 Hz 1/1 Octave bands, or the arithmetic average of the reverberation times in the one-third octave bands from 400 Hz to 2500 Hz.

For teaching spaces for use by students with special hearing or communication needs, the required reverberation time is expressed as the arithmetic average of the reverberation times in the 125 Hz to the 4 kHz octave bands, or the arithmetic average of the reverberation times in the one-third octave bands from 100 Hz to 5 kHz.

These values are for rooms that are finished, furnished for normal use, but unoccupied. The maximum reverberation time for swimming pools is 2.0 seconds T_{mf} and demonstration of compliance is to be by either:

a) Execution of a design in accordance with Acoustics of Schools: A Design Guide, 2015
b) Measurement of the mid-frequency reverberation time in accordance with the ANC Good Practice Guide – Acoustic Testing of Schools.

We understand that method a) above refers to the design described in Appendix 4 of section 2 of BB93 which was published in November 2015.

The design described in BB93 Section 2 is summarised as follows:

> *Use of the Sabine method to calculate both the T_{mf} and T_{1kHz}, to demonstrate achievement of the maximum T_{mf}, subject to the following restrictions on distribution of absorptive treatment:*
> - *A minimum of 25% of the totally absorbing area in the 1k Hz octave band is evenly distributed over two non-opposite walls with the material no higher than 75% of the room height above finished floor level, and*
> - *A minimum of 30% of the totally absorbing area in the 1k Hz octave band be evenly distributed on the soffit, and*
> - *The remaining 45% of the required absorption in the 1k Hz octave band be provided on any of the room surfaces.*

We note that BB93 does not include a specific design target for swimming pools for SEN users.

There are two pools within this school i.e. the swimming pool and the hydrotherapy pool. The Hydrotherapy pool is, in our opinion, likely to function in a different manner to the swimming pool with respect to BB93, and is considered more like a therapy room.

The assessment of the two pools is included in section 3.5.

3.7 Sound Absorption in Corridors and Stairwells

3.7.1 Requirement

The objective is to absorb sound in corridors, entrance halls and stairwells so that it does not interfere with teaching and study activities in adjacent rooms.

The amount of absorption should be calculated according to Approved Document E Section 7, which describes two calculation methods, Method A and Method B for controlling reverberation in common parts of domestic buildings.

The two design approaches can be summarised 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.

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.

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. Method B is only recommended for Corridors, Hallways and Entrance halls. The requirement is for 0.25 m^2 of totally absorbing area per 1 m^3 of volume in Corridors and Hallways, and 0.2 m^2 of totally absorbing area per 1 m^3 of volume in entrance halls in each of the octave bands between 125 to 4k Hz inclusively.

3.7.2 Design Approach

We have followed the methodology detailed in ADE Section 7 to demonstrate compliance.

3.7.3 Design Assessment

The circulation areas are to include a clip-in Class C ceiling system covering 100% of the area which is considered appropriate to satisfy the requirements of BB93 Method A.

Using any ISO Class C rated ceiling finish to 100% of the soffit will satisfy the requirements of BB93 by design following Method A.

3.7.4 Compliance with Requirements

The current design provides sufficient acoustic treatment to common areas to satisfy the requirements of Method A of Section 7 of ADE and hence satisfies the requirements of BB93.

3.8 Open Plan Teaching and Learning

This section is not relevant to this project as there are no open plan learning areas.

3.9 Additional Acoustic Design Considerations

3.9.1 Assessment of Connecting Doors Between Teaching Spaces

The inclusion of door to link teaching spaces is a common issue in a school which gives an educational and functional benefit. The current design has numerous teaching rooms directly linked by a door, specifically the following doors:

- Class base to Group Room

With connecting doors there is a practical limit to the separation that can be achieved by a door in a school environment.

Within BB93 there is an allowable exception to the normal acoustic performance requirements for when a door links adjacent controlled spaces which states:

> *1.2.3 exceptions b) where is it essential to link a teaching space a with another occupied room via an interconnecting door for operational or safety purposes, a doorset should be used with a rating of at least 35 dB R_w. The surrounding wall (including any glazing) should have a composite sound insulation rating of at least 45 dB R_w.*

All connecting doors described above can be expected to achieve 35 dB R_w (see Door Type 2 in Table 9), with the wall achieving 45 dB R_w (see Wall Type 2 in Table 6)

3.9.2 Hoist Track

The inclusion of a hoist is a feature of a modern SEN school.

The inclusion of a hoist will compromise the sound insulation achieved between spaces due to the penetration for the track and the associated space beneath for passage of the patient.

In most cases the penetration will occur within a corridor wall where the requirement is for a composite performance to achieve at least 45 dB R_w under laboratory conditions. No on-site performance requirements apply to the corridor wall, although it is possible that flanking could occur between adjacent rooms and compromise the room-to-room separation.

The achieved performance from the hole for the track is likely to be 0 dB R_w, and the composite performance of the whole wall to be of the order of 10-15 dB R_w; some 30 dB below the performance required by BB93.

The doors to include this facility are:

- 2 No between changing rooms and swimming pool on LGF
- 2 No between changing rooms and hydro pool on LGF
- 1 No between leavers PMLD classroom and Hygiene on FF

An alternative performance standard is proposed for this aspect of the design on the grounds of the benefit to the health and safety of the school staff and the educational needs of the students.

4.0 CONCLUSIONS…

This report has set out the acoustic design objectives taken from Building Bulletin 93 as the proposed means of compliance.

This assessment identifies specific criteria for scenarios and for each type of room use, the means of achieving general compliance and areas of alternative performance.

The proposed design is expected to achieve the requirements of BB93 subject to the recommendations stated.

APPENDIX A – SURVEY DETAILS…

Address: New Heronsbridge SEN School, Land adjacent to Bridgend Science Park, Bridgend.

Date: 2nd 4th March 2026

Measurement Location

Location 1 The monitoring equipment was set up to the West of the site at a location considered representative of the Northern façade of the proposed new school building. The microphone was pole mounted at 2.5 m above local ground level and in free-field conditions as indicated in Figure 1.

Equipment

Location 1 (Green kit)

Brüel & Kjær 2250 hand-held analyser, serial No 2832395, with a Brüel & Kjær Type 4189 Microphone, serial No 3005055. The microphone was fitted with a UA-1650 windshield. The hand-held analyser and microphone were laboratory calibrated on 9th April 2024 (Certificate No. 47434) and the calibrator was laboratory calibrated on 6th October 2025 (Certificate No. U52280). The hand-held analyser sensitivity was checked before and after the measurements using the calibrator and a drift of +0.05 dB was observed, which is not significant and no adjustments to the measurements have been made to the data.

Personnel

The survey was set up and managed by Dr Ashley Punter of Red Twin Limited.

Weather

The weather was suitable for noise measurement with sunny / part cloud conditions. There was no precipitation at any time during or immediately prior to the survey. Wind speeds were generally low (<<5 m s^{-1}) and were suitable for noise surveying.

Conditions were acceptable for noise measurement work and in full accordance with BS7445.

Survey Comments

The background and ambient sound at site are considered to be dominated by the noise from the local road network (repairs taking place with temporary traffic lights), passing airplanes, occasional passing trains, and construction noise / tree work taking place on neighbouring land.

Location	Start Time	Duration	Parameter dB(A)			
			L_{AFmax}	L_{Aeq}	L_{A1}	L_{A90}
1 Day 1	13:00:00	00:30:00	69	47	56	43
	13:30:00	00:30:00	60	47	54	44
	14:00:00	00:30:00	71	50	63	44
	14:30:00	00:30:00	72	53	66	45
	15:00:00	00:30:00	64	49	57	46
	15:30:00	00:30:00	63	50	56	47
	16:00:00	00:30:00	64	51	57	47
	16:30:00	00:30:00	69	50	57	47
	17:00:00	00:30:00	63	48	56	45
	17:30:00	00:30:00	69	49	57	46
	18:00:00	00:30:00	54	48	51	46

	18:30:00	00:30:00	63	47	56	44
	19:00:00	00:30:00	64	50	61	45
	19:30:00	00:30:00	66	50	62	43
	20:00:00	00:30:00	52	43	47	41
	20:30:00	00:30:00	57	45	50	42
	21:00:00	00:30:00	53	46	50	42
	21:30:00	00:30:00	60	46	52	42
	22:00:00	00:30:00	62	45	52	40
	22:30:00	00:30:00	53	43	49	39
1 Day 2	07:00:00	00:30:00	64	50	58	48
	07:30:00	00:30:00	71	49	53	47
	08:00:00	00:30:00	65	49	55	47
	08:30:00	00:30:00	57	47	51	46
	09:00:00	00:30:00	70	49	55	47
	09:30:00	00:30:00	64	**54**	59	48
	10:00:00	00:30:00	61	50	56	45
	10:30:00	00:30:00	73	**54**	67	45
	11:00:00	00:30:00	70	51	58	47
	11:30:00	00:30:00	73	53	59	48
	12:00:00	00:30:00	78	**54**	59	52
	12:30:00	00:30:00	76	53	58	47
	13:00:00	00:30:00	68	49	58	46
	13:30:00	00:30:00	67	48	54	45
	14:00:00	00:30:00	67	50	55	46
	14:30:00	00:30:00	79	52	57	49
	15:00:00	00:30:00	69	50	56	45
	15:30:00	00:30:00	67	50	57	46
	16:00:00	00:30:00	65	50	55	45
	16:30:00	00:30:00	62	47	52	46
	17:00:00	00:30:00	63	48	54	46
	17:30:00	00:30:00	69	50	60	46
	18:00:00	00:30:00	57	47	51	46
	18:30:00	00:30:00	55	46	50	45
	19:00:00	00:30:00	53	46	48	44
	19:30:00	00:30:00	62	46	51	44
	20:00:00	00:30:00	52	44	46	43
	20:30:00	00:30:00	53	44	47	43
	21:00:00	00:30:00	52	44	48	43
	21:30:00	00:30:00	57	44	48	41
	22:00:00	00:30:00	50	43	46	42
	22:30:00	00:30:00	56	43	48	40
1 Day 3	07:00:00	00:30:00	62	49	54	48
	07:30:00	00:30:00	67	50	55	49
	08:00:00	00:30:00	70	51	59	49
	08:30:00	00:30:00	77	51	59	47
	09:00:00	00:30:00	87	53	57	46
	09:30:00	00:30:00	76	48	56	45
	10:00:00	00:30:00	60	50	55	45

TABLE 15: MEASURED NOISE DATA – (FREE-FIELD)

FIGURE 1: PHOTOGRAPH OF SURVEY MEASUREMENT LOCATION NO 1 (LOOKING NORTH)

APPENDIX B – SITE LOCATION PLAN…

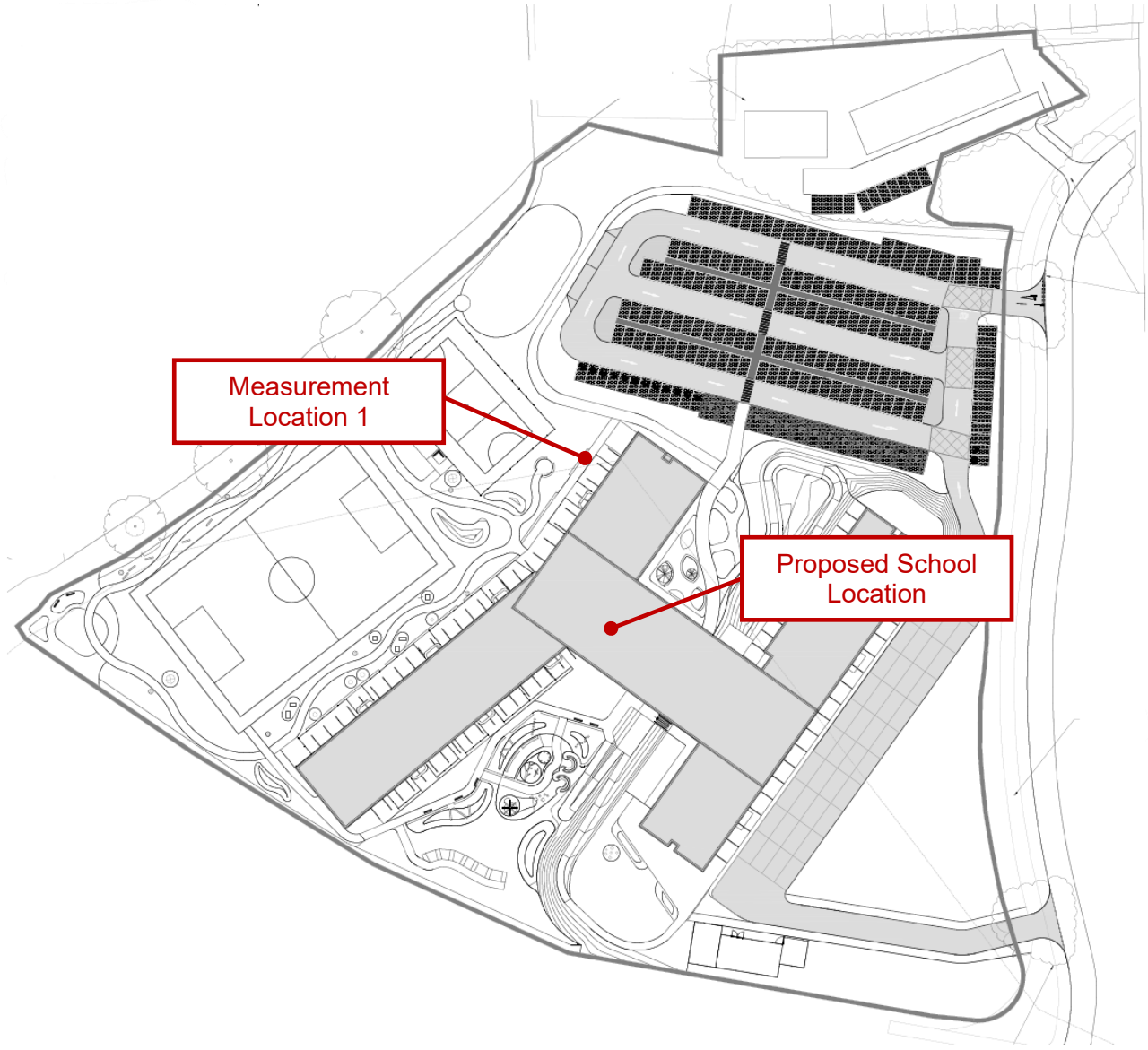

FIGURE 2: SITE LOCATION SHOWING KEY LOCATIONS

APPENDIX C – PLAN MARK-UP OF ACOUSTIC DESIGN INTENT…

Wall Type Ref.	Construction Description	Min Laboratory Performance R_w (dB)	Substantiation Reference
1	1 x 15 mm Megadeco board either side of single GTEC CS70Rx C stud at 600mm centres	40	Siniat RUP 001
2	1 x 15 mm Megadeco board either side of single GTEC CS70Rx C stud at 600 mm centres with 25 mm insulation	45	Siniat RMP 003
3	1 x 15 mm Megadeco board either side of single AS90/Rx stud at 600 mm centres with 75 mm insulation	52	Siniat AMP 138
4	2 x 15 mm GTEC dB Board either side of single GTEC AS70Rx acoustic stud at 600 mm centres with 25 mm insulation	57	Siniat ASP 013
5	Twin metal GTEC CS50/Rx C stud at 600 mm centres with 2 x 15 mm GTEC dB board either side. With 25 mm insulation. GTEC V-braced at 1500 mm centres	63	Siniat RSP 038
M	Movable partition capable of laboratory tested sound reduction index of at least 58 dB Rw, measured in accordance with the BS EN ISO 10140, with performance substantiation made available for review prior to placement of an order.	58	TBC by manufacturer

Key	Door Type Ref	Typical Construction Description (Examples only)	Minimum Requirement R_w (dB)
●	1	A 45 mm solid core door set (23 kg m^{-2}) with smoke seals	30
●	2	A 45 mm solid core door set (38 kg m^{-2}) with smoke seals	35

FIGURE 3: LOWER GROUND FLOOR ACOUSTIC STRATEGY

FIGURE 4: GROUND FLOOR ACOUSTIC STRATEGY

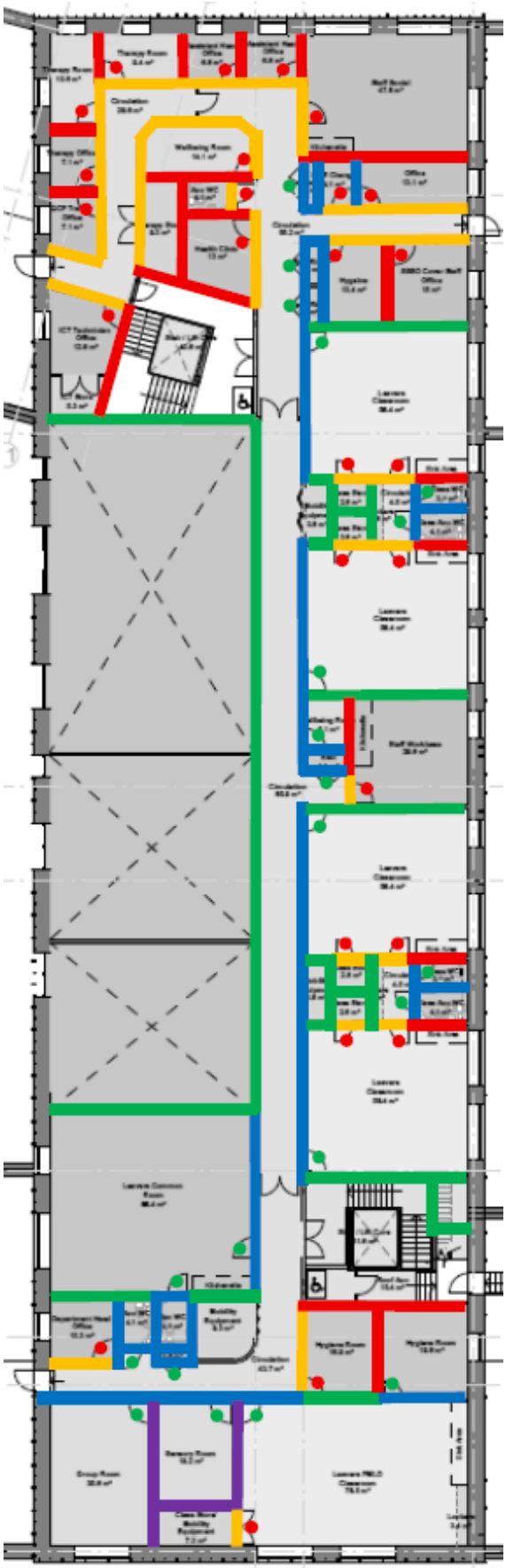

FIGURE 5: FIRST FLOOR ACOUSTIC STRATEGY