



THINKING **DIFFERENTLY**

## HULLAVINGTON PRIMARY SCHOOL

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Acoustic Design Report

Stepnell

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## Acoustic Design Report

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## 1.0 PROJECT OVERVIEW

The purpose of this document is to provide information related to the acoustic strategy for demonstrating compliance with BB93 and any employers’ requirements for the proposed Hullavington Primary School.

This report provides an overview of the performance standards on which the acoustic design of the development will be assessed.

### 1.1 Performance Requirements

The table below outlines the various performance standards and guidance documents which have formed the basis of the acoustic performance targets and subsequent design guidance.

| Document                                                 | Comments                                                       |
|----------------------------------------------------------|----------------------------------------------------------------|
| BB93: Acoustic Design of Schools – Performance Standards | Compliance mandatory under Approved Document E, Regulation E4. |
| Acoustics of Schools: A Design Guide                     | Supplementary good practice design guidance to support BB93.   |

Table 1.1: Performance Standards Used

### 1.2 Project Summary Table

| Project Summary               |                                                |
|-------------------------------|------------------------------------------------|
| Level of information provided | Design                                         |
| Client                        | Stepnell                                       |
| Construction                  |                                                |
| No. storeys                   | 1                                              |
| Build type                    | Refurbishment / New Build                      |
| Frame                         | Cavity Wall                                    |
| Scheme                        |                                                |
| BREEAM                        | N/A                                            |
| DfE                           | N/A                                            |
| Ventilation strategy          | Mixed mode – Passive / MVHR                    |
| Noise Climate                 |                                                |
| Survey conducted by           | MACH                                           |
| Climate                       | Quiet (< 55 dB)                                |
| Outdoor amenity assessment    | No outdoor amenity assessment included         |
| Façade specification          | Simple                                         |
| CadnaA                        | N/A                                            |
| Non-standard Spaces           |                                                |
| HCD spaces                    | No HCD spaces within development               |
| Large unfurnished spaces      | No large unfurnished spaces within development |
| Open plan spaces              | No open plan spaces within development         |
| Music spaces                  | No music spaces within development             |
| Bespoke classifications       | No bespoke classifications within development  |
| Sound insulation              |                                                |
| High noise areas              | NR limits for high noise areas to be provided  |
| Flanking                      |                                                |
| Curtain walling               | N/A                                            |

Table 1.2: Project Summary Table

### 1.3 Room Classifications – BB93

As the development is an extension for existing primary school, the basis of room classifications has been based on the BB93 room classification provided.

## 2.0 INDOOR AMBIENT NOISE LIMITS

Building Bulletin 93 – Acoustic Design of Schools: Performance Standards (2015) specifies maximum indoor ambient noise levels in terms of an  $L_{Aeq,30min}$ , where these noise limits are dependent on specific room classifications and ventilation method.

These noise levels apply to unoccupied, fully operational buildings and are seen to be the overall noise levels which is predominantly the sum of both:

- External noise ingress
- Building services noise

BB93 also sets a maximum “L1” noise level of 60 dB  $L_{A1,30min}$  in teaching spaces and is used to assess short transient noise levels associated with aircraft, railways and other similar sources. **This is achieved by default for spaces with indoor ambient noise levels up to 40 dB  $L_{Aeq,30min}$** , but requires assessment in spaces with indoor ambient noise level targets of 45dB  $L_{Aeq,30min}$  or above.

These classifications and criteria have been applied to each room within this development and are presented in Appendix A.

### 2.1 BB93 Relaxations

In addition to the normal limits, BB93 also permits a number of relaxations to indoor ambient noise limits depending on the ventilation system and condition for the building.

| Condition                                                                                                                                                                                                | Ventilation System        | Internal Ambient Noise Limit Relaxation                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------|
| Normal - ventilation for normal teaching and learning activities                                                                                                                                         | Mechanical                | No relaxation                                                                         |
|                                                                                                                                                                                                          | Natural                   | + 5 dB                                                                                |
|                                                                                                                                                                                                          | Hybrid                    | Mechanical system noise: No relaxation                                                |
|                                                                                                                                                                                                          |                           | Total noise level: + 5 dB                                                             |
| Summertime - ventilation under the local control of teacher to prevent overheating - allowable during the hottest 200 hrs of the year                                                                    | Mechanical                | + 5 dB                                                                                |
|                                                                                                                                                                                                          | Natural or Hybrid         | ≤ 55 dB                                                                               |
| Intermittent boost - ventilation under the local control of teacher for dilution of fumes during practical activities as in practical spaces for science, art, food technology and design and technology | Mechanical                | + 5 dB                                                                                |
|                                                                                                                                                                                                          | Natural or Hybrid         | ≤ 55 dB                                                                               |
| Process - extract can be automatic ventilation for safety and/or under local control of teacher                                                                                                          | Mechanical and/or natural | See IoA/ANC guide ‘Acoustics of Schools: a design guide’ for operational noise levels |

**Table 2.1: summary of ventilation condition, system type and associated IANL tolerance**

#### 2.1.1 Natural/Hybrid Ventilation

Where a natural ventilation strategy is to be employed, the indoor ambient noise limits can be relaxed by 5dB  $L_{Aeq,30min}$  where the “normal condition” is achieved. However, this does not apply to spaces with an indoor ambient noise limit of 45dB  $L_{Aeq,30min}$  or higher. For hybrid ventilation systems, the mechanical system noise component must comply with the limits set out in Table 1 of BB93, however the overall noise limit can also be relaxed by 5dB  $L_{Aeq,30min}$ .

BB93 states that the normal condition for a natural or hybrid ventilation mode is defined as when the system is operating to limit the daily average CO<sub>2</sub> 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.

#### 2.1.2 Summertime/Intermittent Boost Ventilation

BB93 also permits a further relaxation during the summertime. Summertime is defined as the hottest 200 hours in peak summertime. During summertime, natural and hybrid ventilation systems are permitted to relax indoor ambient noise limits to an upper limit of 55 dB  $L_{Aeq,30min}$ . The ventilation must be under the local control of the teacher so that the noise level can be reduced to normal levels when needed. Mechanical ventilation systems are permitted to relax indoor ambient noise limits by 5dB  $L_{Aeq,30min}$ . However, this does not apply to spaces with an indoor ambient noise limits of 45 dB  $L_{Aeq,30min}$  or higher. Summertime noise limit relaxation does not apply to classrooms intended specifically for students with special hearing and communication needs, or to speech therapy rooms.

The peak summertime condition is defined as the 200 hottest hours that occur using the design summer year (DSY) weather file during normal daily school operating hours including the summer holiday period. Thermal modelling and assessment of acoustic performance should be carried out as if the school were occupied through the summer holiday period. This corresponds to a much lower number of hours during normal term time (equivalent to typically 40 teaching hours in a school year) as most of the hottest hours occur during the holiday period.

## 2.2 Internal Ambient Noise Limit Criteria

The table below details the BB93 internal ambient noise limit criteria as per the room classification, for both new build and refurbished development. These classifications and criteria have been applied to each room within this development and are presented in APPENDIX A.

| BB93 Room Classification                                                                         | Internal Ambient Noise Limit<br>L <sub>Aeq, 30min</sub> [dB] |               |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------|
|                                                                                                  | New Build                                                    | Refurbishment |
| Classroom (Nursery / Primary / Secondary)                                                        | 35                                                           | 40            |
| Open-Plan Teaching / Resource Area                                                               | 40                                                           | 45            |
| Music Room (Classroom / Practice / Group / Performance / Recital)                                | 35                                                           | 40            |
| Ensemble Room (Music)                                                                            | 30                                                           | 35            |
| Recording Studio                                                                                 | 30                                                           | 35            |
| Control Room (Music / Recording)                                                                 | 35                                                           | 40            |
| Lecture Room                                                                                     | 35                                                           | 40            |
| Teaching space intended specifically for students with special hearing and communication needs   | 30                                                           | 35            |
| SEN Calming Room                                                                                 | 35                                                           | 35            |
| Study Room (Individual Study, Withdrawal, Remedial Work, Teacher Preparation)                    | 40                                                           | 45            |
| Libraries: Quiet Study Areas                                                                     | 40                                                           | 45            |
| Libraries: Resource Areas                                                                        | 40                                                           | 45            |
| Science Laboratory                                                                               | 40                                                           | 45            |
| Drama Studio                                                                                     | 35                                                           | 40            |
| Resistant Materials, CAD/CAM Areas                                                               | 40                                                           | 45            |
| Electronics/Control, Textiles, Food, Graphics, Design/Resource Area, ICT Room, Art               | 40                                                           | 45            |
| Assembly /Multi-Purpose Hall (Drama, PE, Audio/Visual Presentations, Assembly, Occasional Music) | 35                                                           | 40            |
| Atrium, Circulation Space not intended for teaching and learning                                 | 45                                                           | 50            |
| Sports Hall                                                                                      | 40                                                           | 45            |
| Dance Studio                                                                                     | 40                                                           | 45            |
| Gymnasium/Activity Studio                                                                        | 40                                                           | 45            |
| Swimming Pool                                                                                    | 50                                                           | 55            |
| Meeting Room, Interviewing/Counselling Room, Video Conference Room                               | 40                                                           | 45            |
| Dining Room                                                                                      | 45                                                           | 50            |
| Kitchen <sup>1</sup>                                                                             | 50                                                           | 55            |
| Office, Medical Room, Staff Room <sup>1</sup>                                                    | 40                                                           | 45            |
| Corridor, Stairwell, Coats and Locker Area <sup>1</sup>                                          | 45                                                           | 55            |
| Changing Area <sup>1</sup>                                                                       | 50                                                           | 55            |
| Toilet <sup>1</sup>                                                                              | 50                                                           | 55            |
| <sup>1</sup> Considered administration or ancillary, therefore, guidance only                    |                                                              |               |

**Table 2.2: Internal Ambient Noise Limit Criteria**

## 2.3 Building Services Noise Limits

Noise from building services must be considered as a contributor towards indoor ambient noise levels, therefore targets specific to building services noise are presented in APPENDIX A.

3.0 EXTERNAL NOISE BREAK-IN ASSESSMENT

3.1 Noise Survey by MACH

To establish the existing environmental noise levels on site, a noise survey was conducted between 11:40 on the 04/03/2026 and 14:10 on the 05/03/2026. For more information on the methodology of this survey, site information and survey data, see APPENDIX C

3.2 Site Description

The site is located at and is situated in Hullavington. The site is situated in a rural town, approximately 420 m from a railway track, 1.25 km from the A429 and 3.2 km from the M4

3.3 Site Map

Figure 3.1 below shows a map of the site, with closest noise-sensitive receivers shown in context.



Figure 3.1 - Proposed Development (Red), Existing school site (Orange) and Nearest Noise Sensitive Receivers (Blue)

3.4 Summary of LAeq,30min Noise Levels (MACH)

Based on the results of the environmental noise survey as outlined within APPENDIX C, the LAeq, 30mins noise levels representative of the local noise climate of the eastern façade is summarised below.

| Location | Date       | Start | End   | Duration | LAeq,30min (dB) |
|----------|------------|-------|-------|----------|-----------------|
| FP1      | 04/03/2026 | 11:40 | 12:10 | 00:30    | 57*             |
|          |            | 12:10 | 12:40 | 00:30    | 58*             |
|          |            | 12:40 | 13:10 | 00:30    | 55              |
|          |            | 13:10 | 13:40 | 00:30    | 53              |
|          |            | 13:40 | 14:10 | 00:30    | 54              |
|          |            | 14:10 | 14:40 | 00:30    | 59*             |
|          |            | 14:40 | 15:10 | 00:30    | 59*             |
|          |            | 15:10 | 15:40 | 00:30    | 59*             |
|          |            | 15:40 | 16:10 | 00:30    | 56*             |
|          |            | 16:10 | 08:40 | 00:30    | 50              |
|          | 05/03/2026 | 08:40 | 09:10 | 00:30    | 54              |
|          |            | 09:10 | 09:40 | 00:30    | 55              |
|          |            | 09:40 | 10:10 | 00:30    | 55              |
|          |            | 10:10 | 10:40 | 00:30    | 52              |
|          |            | 10:40 | 11:10 | 00:30    | 55              |
|          |            | 11:10 | 11:40 | 00:30    | 55              |
|          |            | 11:40 | 12:10 | 00:30    | 55              |
|          |            | 12:10 | 12:40 | 00:30    | 55              |
|          |            | 12:40 | 13:10 | 00:30    | 50              |
|          |            | 13:10 | 13:40 | 00:30    | 52              |
|          |            | 13:40 | 14:10 | 00:30    | 55              |
|          |            | 14:10 | 14:40 | 00:30    | 53              |
|          |            | 14:40 | 15:10 | 00:30    | 56*             |
|          |            | 15:10 | 15:40 | 00:30    | 55              |
|          |            | 15:40 | 14:10 | 00:30    | 53              |

Table 3.1: LAeq, 30mins Summary

\*Periods of higher noise owed to intermittent construction work on the 04/03/2026 and use of the outside field have been excluded.

As shown in the table above, 55 dB LAeq, 30min is the highest typical representative measurement is considered to be LAeq, 30mins noise level at the fixed measurement position.

### 3.5 Summary of Background Noise Levels, $L_{A90}$

The table below presents representative measured noise levels of the  $L_{A90}$  values measured on site. These will be discussed further in the plant noise impact assessment to ensure a representative value will be used in relation to the proposed operational hours.

| Measurement Position         | $L_{A90,T}$ Method | Background Noise Level $L_{A90,T}$ |                               |
|------------------------------|--------------------|------------------------------------|-------------------------------|
|                              |                    | Daytime<br>(07:00 – 23:00)         | Night-Time<br>(23:00 – 07:00) |
| Fixed Measurement Location 1 | Min. Modal         | 41                                 | 37                            |

**Table 3.2: Summary of Background Noise Level Measurements**

### 3.6 Façade Noise Levels

The noise levels at fixed position 1 are considered representative of the noise levels at the proposed façade. Therefore, as detailed in APPENDIX C the façade levels are predicted to not exceed 55 dB.

## 4.0 EXTERNAL NOISE BREAK-IN ASSESSMENT

### 4.1 Design Targets

The most onerous internal ambient noise level target provided by BB93 for this development is anticipated to be  $\leq 35$  dB  $L_{Aeq,30min}$  for the nursery and reception classrooms. With the additional natural ventilation relaxation of +5 dB, that means the most onerous indoor ambient noise level requirement for this development is 40 dB  $L_{Aeq,30min}$ .

### 4.2 Façade Specification & Suitable Ventilation Strategies

#### 4.2.1 Natural Ventilation Feasibility

An open window typically provides of the order of 10-15 dB attenuation. Subtracting this figure from the predicted façade noise level gives a predicted internal noise level.

| Layout Option                                     | Internal Ambient Noise Limit (dB $L_{Aeq,30min}$ ) | Predicted Façade Noise Levels (dB $L_{Aeq,30min}$ ) | Open Window Attenuation (dB) | Predicted Internal Ambient Noise Level (dB $L_{Aeq,30min}$ ) |
|---------------------------------------------------|----------------------------------------------------|-----------------------------------------------------|------------------------------|--------------------------------------------------------------|
| Nursery Classrooms, New-build                     | 40                                                 | 55                                                  | 15                           | 40                                                           |
| *includes +5dB relaxation for natural ventilation |                                                    |                                                     |                              |                                                              |

**Table 4.1: Natural Ventilation Feasibility**

As the table shows, based on a standard openable window ventilation strategy, the predicted internal noise level is seen to be just at the design limit. A natural ventilation strategy is considered just feasible for the development.

### 4.3 Façade Specification

As site noise level are not especially loud, the solid elements of the façade are likely to be sufficient as fairly standard ratings. The minimum recommended façade specifications are likely to be sufficient as follows:

- External Wall - 43dB  $R_w$
- Window - 32dB  $R_w$
- Roof - 40dB  $R_w$

### 4.4 Façade Review

The minimum level of sound insulation is considered to be achieved by both wall types:

- W01 – Facing Brickwork wall-build-up
- W02 – Timber Cladding on Blockwork wall build up

Based on proposed constructions as provided in: 2425-FTP-XX-MSZZ-DR-A-4102\_Proposed Detailed Section\_P02\_Information

## 5.0 RAIN NOISE

### 5.1 Rain Noise Criteria

Rain noise is considered separate to other forms of external noise ingress and as such is assessed in isolation. The criteria stated in the table below shall be demonstrated through laboratory test and/or calculation, and includes any glazing, or lightweight structure. A roof construction with a surface mass less than 150 kg/m<sup>2</sup> is considered to be lightweight.

Any repairs to existing roofs are exempt from this requirement, however, any new roofing elements must comply. Compliance with requirements should be demonstrated through calculation.

| Rain Type (as defined by BS EN ISO 140-18) | Rain Noise Limit (dB L <sub>Aeq,30min</sub> ) |
|--------------------------------------------|-----------------------------------------------|
| Heavy Rainfall                             | ≤ Indoor Ambient Noise Limit* + 25 dB         |

**Table 5.1: Rain Noise Limits**

\* Indoor ambient noise limits are detailed in Section 2.2.

### 5.2 Rain Noise Requirements

The spaces with the lowest indoor ambient noise limits within the development, and thus the most sensitive to rain noise are listed below along with their respective rain noise targets.

| Room / Room Type            | Internal Ambient Noise Limit (dB L <sub>Aeq,30min</sub> ) | "Heavy" Rain Noise Limit (dB L <sub>Aeq,30min</sub> ) | Minimum Roof Performance (dB L <sub>iA</sub> ) |
|-----------------------------|-----------------------------------------------------------|-------------------------------------------------------|------------------------------------------------|
| Year 2/3 Classroom          | 35                                                        | 60                                                    | ≤ 52                                           |
| Group Room                  | 35                                                        | 60                                                    | ≤ 52                                           |
| Reception/ Year 1 Classroom | 35                                                        | 60                                                    | ≤ 54                                           |

**Table 5.2: Rain Noise Limits**

### 5.3 Rain Noise Design Guidance – Example Roof Constructions

The table below provides example roof constructions and here corresponding rain noise performance. The roof performance will determine the roof suitability to achieve the rain noise criteria detailed in

| Room / Room Type            | Internal Ambient Noise Limit (dB L <sub>Aeq,30min</sub> ) | "Heavy" Rain Noise Limit (dB L <sub>Aeq,30min</sub> ) | Minimum Roof Performance (dB L <sub>iA</sub> ) |
|-----------------------------|-----------------------------------------------------------|-------------------------------------------------------|------------------------------------------------|
| Year 2/3 Classroom          | 35                                                        | 60                                                    | ≤ 52                                           |
| Group Room                  | 35                                                        | 60                                                    | ≤ 52                                           |
| Reception/ Year 1 Classroom | 35                                                        | 60                                                    | ≤ 54                                           |

Table 5.2.

| Construction                                                                                                      | Performance (dB L <sub>iA</sub> ) | Performance with lay-in-grid Ceiling * (dB L <sub>iA</sub> ) |
|-------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------|
| Single-ply membrane<br>100mm Rigid PIR Insulation<br>Profiled Metal Deck                                          | ≤ 60                              | ≤ 53                                                         |
| Fleece Backed single ply membrane<br>110mm Rigid PIR Insulation<br>Profiled Metal Deck with Vapour control layer  | ≤ 56                              | ≤ 49                                                         |
| 0.9mm Aluminium<br>160mm compressed to 155mm mineral wool<br>0.7mm steel liner sheet                              |                                   |                                                              |
| Single-ply membrane<br>150mm Hardrock Dual Density Roofing Board<br>Profiled Metal Deck with Vapour control layer | ≤ 52                              | ≤ 45                                                         |
| 0.9mm Aluminium<br>250mm compressed to 240mm mineral wool<br>0.7mm steel liner sheet                              |                                   |                                                              |
| * Full lay in grid ceiling (minimum 10 dB Rw)                                                                     |                                   |                                                              |

**Table 5.3: Example Roof Construction(s)**

Please note, that any rooflights specified in any spaces should also be at least double glazed and should achieve a rain noise intensity of ≤52 dB L<sub>iA</sub>. In ALN spaces the rooflight should not exceed 2m<sup>2</sup>.

Please note: This guidance only assesses the roof construction regarding rain noise in isolation. The construction may have other performance requirements that will need to be achieved in combination with the rain noise criteria (e.g., airborne sound insulation from external noise).

#### 5.3.1 Rooflights

Please note, that any rooflights specified in any spaces should also be at least double glazed and should typically achieve a rain noise intensity of at least ≤ 52 dB L<sub>iA</sub>.

This is typically a sufficient level of rain noise mitigation, however, should there be a significant area of rooflights within a space, then this may not be sufficient and may require further review to ensure that rain noise is suitably mitigated.

## 5.4 Rain Noise Review

Three roof types are proposed at Hullavington:

- R01 – Pitched roof build-up
- R02 – Green Roof build-up
- R03 – Mono pitched roof build-up

Roof types R01 and R02 would not typically be considered light-weight, and would be suitable in terms of minimising rain noise and suitably reaching the targets outlined in Table 5.2

Roof Type R03 does not appear to be proposed above the teaching spaces being considered, where noise-sensitive is most critical.

## 6.0 INTERNAL SOUND INSULATION

### 6.1 Internal Sound Insulation – Design Criteria

#### 6.1.1 Airborne Sound Insulation Criteria – $D_{nT,w}$

The onsite acoustic performance criteria for the airborne sound insulation ( $D_{nT,w}$ ) of walls and floors are dependent on the room classification of the source and receiving rooms.

The table below presents the minimum airborne sound insulation design criteria between rooms based upon the Activity Noise and Noise Tolerance of each room for new build developments.

| New Build Minimum $D_{nT,w}$ (dB) |        | Activity Noise in Source Room |         |      |           |
|-----------------------------------|--------|-------------------------------|---------|------|-----------|
|                                   |        | Low                           | Average | High | Very High |
| Noise Tolerance in Receiving Room | High   | n/a                           | 35      | 45   | 50        |
|                                   | Medium | 40                            | 45      | 50   | 55        |
|                                   | Low    | 45                            | 50      | 55   | 55        |

**Table 6.1: New build design criteria for airborne sound insulation between spaces**

BB93 provides relaxed targets for refurbished buildings as detailed below. The targets are also what should be considered the minimum requirements for any alternative performance standards.

| Refurbishment Minimum $D_{nT,w}$ (dB) |        | Activity Noise in Source Room |         |      |           |
|---------------------------------------|--------|-------------------------------|---------|------|-----------|
|                                       |        | Low                           | Average | High | Very High |
| Noise Tolerance in Receiving Room     | High   | n/a                           | 30      | 35   | 45        |
|                                       | Medium | 30                            | 40      | 45   | 45        |
|                                       | Low    | 35                            | 40      | 50   | 50        |

**Table 6.2: Refurbishment design criteria for airborne sound insulation between spaces**

Each room classification has an Activity Noise and Noise Tolerance rating. These classifications and criteria have been applied to each room within this development and are presented in APPENDIX A.

#### 6.1.2 Exceptions Permitted Within BB93

| Exception | Scenario                                                                                                          | Element(s)                                         | Minimum Requirements                 |
|-----------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------------------|
| A         | Doors and service hatches between kitchens and multi-purpose halls (not dedicated dining spaces)                  | Serving hatch                                      | $\geq 18$ dB $R_w$ <sup>1</sup>      |
| B         | Interconnecting door between teaching space and another occupied room                                             | Doorset                                            | $\geq 35$ dB $R_w$                   |
|           |                                                                                                                   | Composite sound reduction (wall, door and glazing) | $\geq 45$ dB $R_w$                   |
| C         | Folding partitions between teaching spaces and halls                                                              | Operable wall                                      | $\geq 40$ dB $D_{nT,w}$ <sup>2</sup> |
| D1        | Vision panels between multi-purpose halls, music rooms and control rooms requiring visual communication only      | Solid vision panel                                 | $\geq 45$ dB $R_w$                   |
|           |                                                                                                                   | Separating partition                               | $\geq 55$ dB $R_w$                   |
| D2        | Vision panels between multi-purpose halls, music rooms and control rooms requiring visual and audio communication | Sliding vision panel                               | N/A                                  |
|           |                                                                                                                   | Separating partition                               | $\geq 45$ dB $R_w$                   |

<sup>1</sup> Adjacency should be avoided where possible, or a servery included between kitchen and hall, recommend timetabling use of hall so noise sensitive activities, e.g., exams, do not take place in the hall when the kitchen is in use.

<sup>2</sup> Performance of operable wall may not facilitate simultaneous independent use of adjacent spaces

**Table 6.3: Allowed Sound Insulation Exceptions**

Where any of these exceptions apply, this has been highlighted in the relevant subsequent sections and the appropriate exception sound reduction requirements have been applied.

#### 6.1.3 Walls To Circulation Spaces

Where there is a door and partition between a shared circulation spaces and other spaces used by students, the targets below are applicable. These classifications and criteria have been applied to each room within this development and are presented in the appendix.

| Area                                                                                                                                                                                  | Requirements               |           |                     |                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------|---------------------|---------------------------------------------------------|
|                                                                                                                                                                                       | Wall & Glazing (dB $R_w$ ) |           | Doorset (dB $R_w$ ) | Ventilators * (dB $D_{n,e,w} + 10\log N$ <sup>1</sup> ) |
|                                                                                                                                                                                       | New                        | Refurb    |                     |                                                         |
| Secondary School Music Room<br>Control Room for Recording<br>Drama Room<br>Multi-Purpose Hall<br>Teaching space specifically for students with special hearing or communication needs | $\geq 45$                  | $\geq 40$ | $\geq 35$           | $\geq 37$                                               |
| Primary Music Room<br>All other rooms used for teaching or learning                                                                                                                   | $\geq 40$                  | $\geq 35$ | $\geq 30$           | $\geq 32$                                               |

<sup>1</sup> Where N is the number of ventilators with airborne sound insulation  $D_{n,e,w}$

\* Please note that in any instance where the wall and door performance has been increased to 45 dB  $R_w$  and 35 dB  $R_w$  respectively to mitigate noise transfer into teaching space that the ventilator specification should also be increased to 37 dB  $D_{n,e,w}$ , such that not compromise the sound insulation specified."

**Table 6.4: Sound Insulation Requirements to Circulation Spaces**

### 6.1.4 High Noise Areas

Any spaces that have the potential to generate relatively high noise levels have the potential to disturb nearby noise sensitive spaces.

Therefore, any instances where this occurs, the noise breakthrough from the high noise generating area will be assessed against the indoor ambient noise limit set within any adjacent noise sensitive spaces, where the separating partition will be specified along with any noise limits within the noise generating space that should not be exceeded.

## 6.2 Internal Sound Insulation – Wall Specification

The table below details the minimum on-site requirements ( $D_{nT,w}$ ), and the subsequent calculated performance requirements of the floor ( $R_w$ ), as calculated based on the equation provided within “Acoustics of Schools A Design Guide”, noting any instances where a BB93 exception has been applied. Partitions that are included as movable walls have also been noted as these will require additional design consideration.

Please note that the table below is not exhaustive, therefore please refer to the sound insulation markups presented within APPENDIX B.

| Room 1                  | Room 2                           | Minimum On-site Requirement (dB $D_{nT,w}$ ) | Calculated SRI Requirement for Partition (dB $R_w$ ) | Simplified SRI Requirement for Partition (dB $R_w$ ) |
|-------------------------|----------------------------------|----------------------------------------------|------------------------------------------------------|------------------------------------------------------|
| 0.03 Year 2/3 Classroom | 0.03 Year 2/3 Classroom          | 45                                           | 50                                                   | 50                                                   |
| 0.03 Year 2/3 Classroom | Circulation                      | 45                                           | 50                                                   | 50                                                   |
| 0.08 Group Room         | WC                               | 45                                           | 50                                                   | 50                                                   |
| 0.08 Group Room         | 0.01 Reception/ Year 1 Classroom | 45                                           | 50                                                   | 50                                                   |
| 0.13 Small Hygiene Room | 0.11 Group Room                  | 45                                           | 55                                                   | 55                                                   |
| 0.13 Small Hygiene Room | 0.01 Reception/ Year 1 Classroom | 45                                           | 55                                                   | 55                                                   |
| 0.02 Nursery Classroom  | WC                               | 45                                           | 42                                                   | 45                                                   |
| 0.16 Group Room         | Circulation                      | 45                                           | 55                                                   | 55                                                   |
| 0.16 Group Room         | WC                               | 45                                           | 52                                                   | 55                                                   |
| 0.23 Staff Room         | 0.22 Kitchenette                 | 40                                           | 54                                                   | 55                                                   |

**Table 6.5: Wall Specification Summary**

The above table is not exhaustive, please refer to the sound insulation markups for further information.

## 6.3 Separating Walls – Design Guidance

### 6.3.1 Separating Partitions (Masonry)

| Construction                                                                                                                                                                           | Thickness (no skim) (mm) | Calculated Laboratory Rating (dB $R_w$ ) | Suitable for Walls Rated to Achieve; (dB $R_w$ ) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------|--------------------------------------------------|
| 100 mm Concrete Block (1400 kg/m <sup>3</sup> )                                                                                                                                        | 100                      | 42                                       | 40                                               |
| 140 mm Concrete Block (1400 kg/m <sup>3</sup> )                                                                                                                                        | 140                      | 46                                       | 45                                               |
| 200 mm Concrete Block (1400 kg/m <sup>3</sup> )                                                                                                                                        | 200                      | 52                                       | 50                                               |
| 100 mm Concrete Block (1400 kg/m <sup>3</sup> )<br>70 mm Metal Studs (600 mm centres), 25 mm mineral wool (min. 10 kg/m <sup>2</sup> )<br>1 x 12.5 mm Wallboard (8 kg/m <sup>2</sup> ) | 183                      | 56                                       | 55                                               |
| 100 mm Concrete Block (1400 kg/m <sup>3</sup> )<br>70 mm Metal Studs (600 mm centres), 25 mm mineral wool (min. 10 kg/m <sup>2</sup> )<br>2 x 15 mm Wallboard (9.8 kg/m <sup>2</sup> ) | 200                      | 60                                       | 60                                               |
| 200 mm Concrete Block (1400 kg/m <sup>3</sup> )<br>70 mm Metal Studs (600 mm centres), 25 mm mineral wool (min. 10 kg/m <sup>2</sup> )<br>2 x 15 mm Wallboard (9.8 kg/m <sup>2</sup> ) | 300                      | 66                                       | 65                                               |

**Table 6.6: Example Masonry Wall Constructions**

### 6.3.2 Internal Doors

BB93 provides guidance on typical door constructions capable of achieving different levels of sound insulation.

- $R_w$  30 doors typically have a minimum surface density of 27kg/m<sup>2</sup> and are at least 44mm thick.
- $R_w$  35 doors typically have a minimum surface density of 29kg/m<sup>2</sup> and are at least 54mm thick.

Both doors would typically have the following features:

- Solid core, or laminate, door leaf.
- Perimeter seals, including the threshold.
- A latching mechanism ensuring adequate compression of all door seals, and gentle contact with the door frame, devoid of noise, or structural impact.

Where vision panels can be installed in doors, the size of the glazing and performance of the glazing must be such that it has an equal performance to that of the door slug.

### 6.3.3 Riser Doors

Riser doors should be at least 44mm thick and formed from a solid or laminate core. Acoustic compressions seals should be installed between the door leaf and rebated frame around the entire perimeter. There are no acoustic requirements relating to these doors, however, should a riser link two occupied spaces, this would introduce risk of sound transfer through the riser between the spaces, which may require additional mitigation measures to not compromise the overall sound insulation.

### 6.3.4 Internal Screens

The table below provides example of glazing configurations for different  $R_w$  requirements. Constructions provided are based on data published by Saint Gobain, but other manufacturers may provide similar systems.

| $R_w$ Rating | Description                                                |
|--------------|------------------------------------------------------------|
| 35           | 4mm Glass / 20mm Void / 6mm Glass                          |
| 40           | 6mm Glass / 27mm Void / 10mm Glass                         |
| 45           | 10mm Glass / 16mm Void / 8.4mm Laminated Glass             |
| 50           | 8.8mm Laminated Glass / 24mm Void / 12.8mm Laminated Glass |

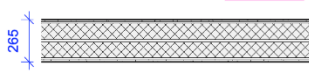
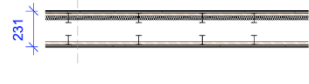
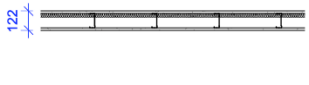
**Table 6.7: Glazing Configurations and Corresponding  $R_w$  Ratings**

### 6.3.5 Hand Dryers

It is understood that no hand dryers are proposed for the scheme.

## 6.4 Proposed Wall Type Review

MACH has reviewed the proposed wall types, which the wall type constructed and assessed sound insulation performance is detailed in the table below.

| Ref     | Illustration of Construction                                                          | Description                                                                                                                                                                                                                                                                  | Predicted Performance dB ( $R_w$ ) |
|---------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Type 01 |    | <ul style="list-style-type: none"> <li>1x 15mm Gyproc DuraLine</li> <li>215mm Thermalite Hi-Strength 7 Blockwork/ 2x 100mm dense blockwork**</li> <li>1x 15mm Gyproc DuraLine</li> </ul>                                                                                     | -                                  |
|         | Modelled Description                                                                  | INSUL 2x 15mm Gyproc DuraLine(SM: 27.8 kg/m <sup>2</sup> ) + 2x 100mm concrete block (SM: 376 kg/m <sup>2</sup> )                                                                                                                                                            | 56                                 |
| Type 02 |    | <ul style="list-style-type: none"> <li>1x 15mm Gyproc DuraLine</li> <li>140mm dense blockwork**</li> <li>1x 15mm Gyproc DuraLine</li> </ul>                                                                                                                                  | -                                  |
|         | Modelled Description                                                                  | INSUL 2x 15mm Gyproc DuraLine (SM: 27.8 kg/m <sup>2</sup> ) + 1x 140mm concrete block (SM: 263.2 kg/m <sup>2</sup> )                                                                                                                                                         | 52                                 |
| Type 03 |  | <ul style="list-style-type: none"> <li>1x 15mm Gyproc DuraLine</li> <li>Gyframe 60 I 50 at 600mm centres</li> <li>25mm Isover Acoustic Partition Roll (APR 1200)</li> <li>200mm cavity</li> <li>Gyframe 60 I 50 at 600mm centres</li> <li>1x 15mm Gyproc DuraLine</li> </ul> | -                                  |
|         | Modelled Description                                                                  | INSUL 1 x 15mm Gyproc Duraline (SM: 13.9 kg/m <sup>2</sup> ) + Steel stud (0.55mm) in 200mm empty cavity + 26mm fibreglass (10kg/m <sup>3</sup> ) + 1 x 15mm Gyproc Duraline (SM: 13.9 kg/m <sup>2</sup> )                                                                   | 54                                 |
| Type 04 |  | <ul style="list-style-type: none"> <li>1x 15mm Gyproc DuraLine</li> <li>Gyframe 92 S 60 'C' Studs at 600mm centres</li> <li>25mm Isover Acoustic Partition Roll (APR 1200)</li> <li>1x 15mm Gyproc DuraLine</li> </ul>                                                       | -                                  |
|         | Modelled Description                                                                  | INSUL 1 x 15mm Gyproc Duraline (SM: 13.9 kg/m <sup>2</sup> ) + Steel stud (0.55mm) + 26mm fibreglass (10 kg/m <sup>3</sup> ) + 1 x 15mm Gyproc Duraline (SM: 13.9 kg/m <sup>2</sup> )                                                                                        | 52                                 |

\*Calculated sound insulation performance from INSUL should be taken with a tolerance of  $\pm 3$  dB.  
\*\*Surface masses for various blockworks have been assumed for the assessment. This will require further confirmation from structural engineer.

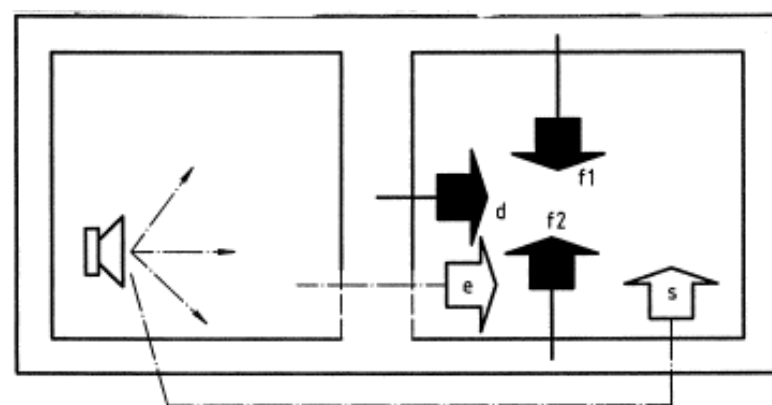
**Table 6.8: Proposed Wall Types**

The proposed wall types assessed above are required to be specified in appropriate locations in order to achieve the sound insulation requirements detailed in Section 6.2 and in the markups in APPENDIX B.

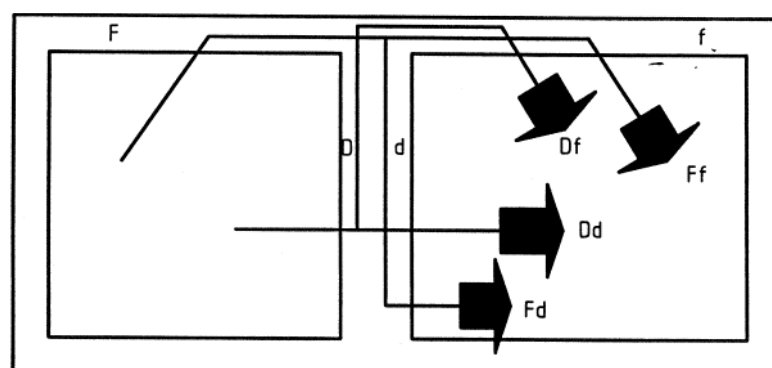
## 7.0 FLANKING SOUND

### 7.1 Flanking Sound Introduction

Flanking sound can be described as the transmission of sound which does not pass through the main separating element such as a separating wall or separating floor, where the sound flanks around the main separating element. BS EN 12354-1:2000 'Estimation of acoustic performance of buildings from the performance of elements' demonstrates the contributions to the sound transmission within a room and various flanking paths as shown in the figures below.



**Figure 7.1: Illustration of the different contributions to the total sound transmission to a room: d - radiated directly from the separating element, f1 and f2 - radiated from flanking elements, e - radiated from components in the separating element, s - indirect transmission.**



**Figure 7.2: Sound transmission paths between rooms**

The above figures can be treated as a section or plan view indicating flanking around the side of a partition between rooms or over the top/under a partition into a neighbouring room.

### 7.2 Flanking Sound Detailing

Due to the potentially significant contribution flanking sound can make to sound separation between adjacent spaces, all junctions and interfaces between building elements, need to be appropriately detailed to ensure that these sound paths are sufficiently mitigated, and they do not introduce a flanking sound path that compromises the on site sound insulation.

Should additional support in this area be required, MACH can provide this support upon request.

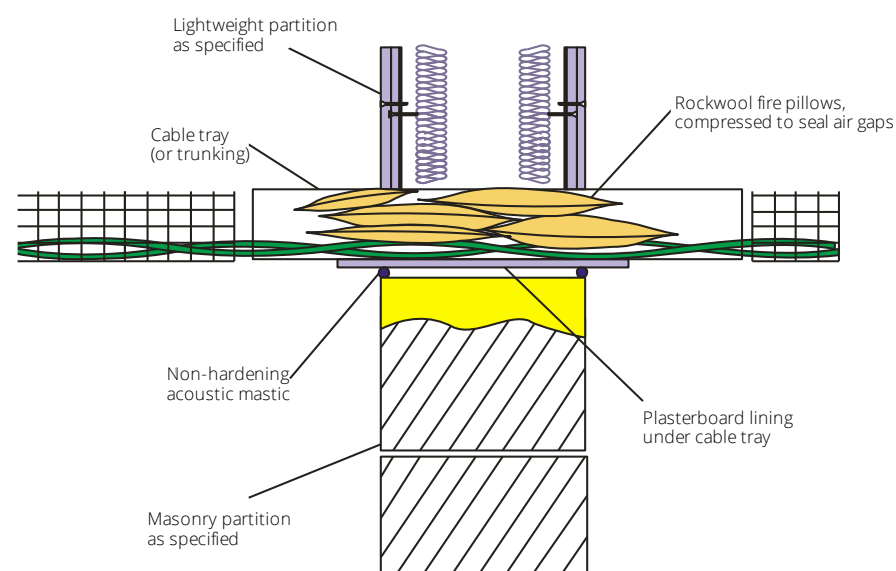
## 8.0 PENETRATION DETAILING

### 8.1 Cable Trays and Trunking

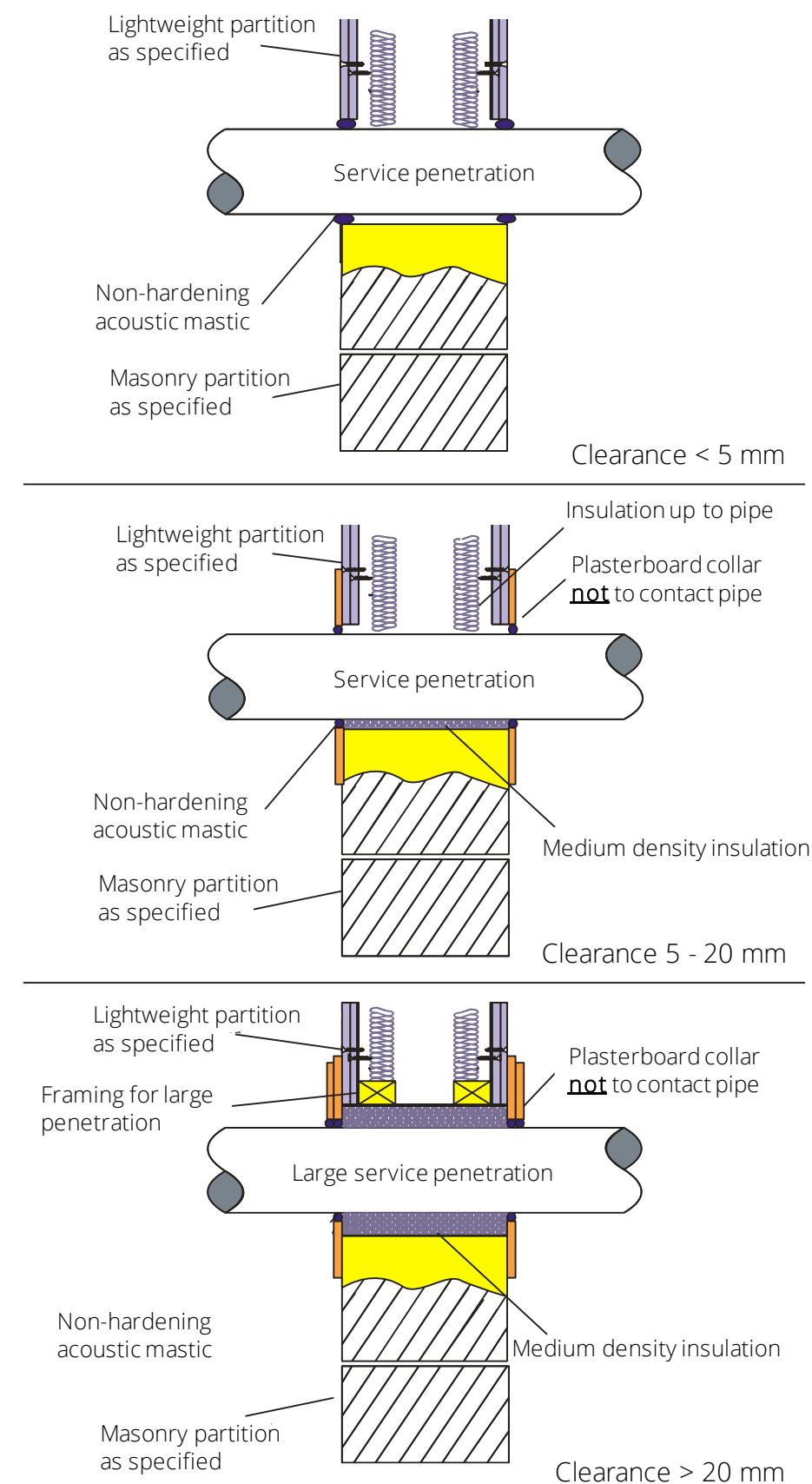
No service penetrations should be made through separating floors, i.e. between occupied spaces, and all services should enter the room via a corridor, and not pass directly from room to room. The table and figures below outline ways to maintain the acoustic integrity. For each figure, the upper half of each image should be used for penetrations within lightweight constructions, and the lower half for masonry.

| Penetration type                     | Detailing                                                                                                                                                                      | Figure ref |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Cable tray & trunking                | Tightly pack rockwool fire pillows into opening<br>Insert plasterboard lining under tray<br>Seal with non-hardening mastic                                                     | Figure 8.1 |
| Penetration with < 5 mm clearance    | Seal with non-hardening mastic                                                                                                                                                 | Figure 8.2 |
| Penetration with 5 – 20 mm clearance | Pack gap between wall and penetration with insulation<br>Reduce gap around penetration to $\leq 5$ mm with plasterboard<br>Seal remaining gap with non-hardening mastic        | Figure 8.2 |
| Penetration with > 5 mm clearance    | Pack gap between wall and penetration with insulation<br>Reduce gap around penetration to $\leq 5$ mm with plasterboard collar<br>Seal remaining gap with non-hardening mastic | Figure 8.2 |

**Table 8.1: Penetration Detailing**



**Figure 8.1: Cable Tray and Trunking Detailing**



**Figure 8.2: Service Penetration Detailing**

## 8.2 Recessed Sockets and Switches

Recessed plug sockets located back to back either side of separating walls may compromise the sound insulation of the partition. Therefore, all sockets and switches should be staggered by 150 mm, and be detailed and sealed in such a way that the acoustic integrity of the separating partition is not compromised.

The table below outlines possible options to maintain the acoustic integrity.

| Separating Wall Scenario                           | Detailing Options                                                                                                                                                                                                  |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sound insulation requirement $\leq 45$ dB $R_w$    | <b>Putty Pad</b> , note, any gaps or openings around a putty pad compromise the sound insulation performance.<br><b>Acoustic Back Box</b><br><b>Plasterboard backing</b> , as per Robust Standard Details guidance |
| Sound insulation requirement $> 45$ dB $R_w$       | <b>Acoustic Back Box</b><br><b>Plasterboard backing</b> , as per Robust Standard Details guidance                                                                                                                  |
| Sockets/switches back-to-back, or $< 150$ mm apart | <b>Plasterboard backing</b> , as per Robust Standard Details guidance                                                                                                                                              |

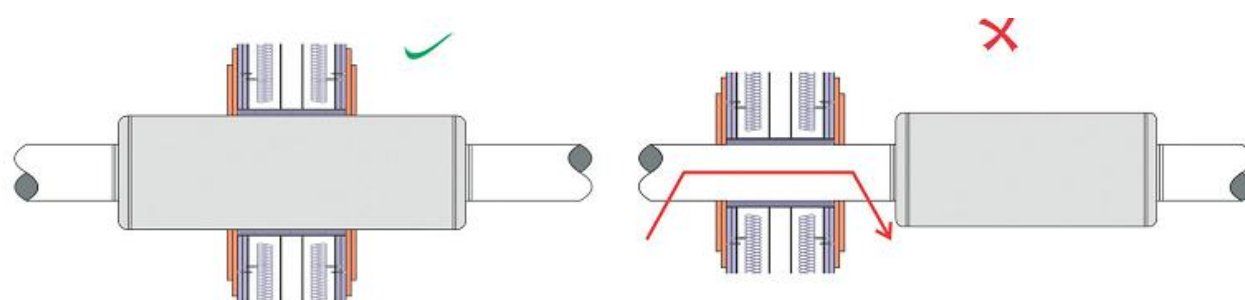
**Table 8.2: Recessed socket/switch detailing**

## 8.3 Cross Talk Through Ventilation Systems

If ventilation ducts link two spaces, cross talk attenuators will be required. To ensure the acoustic integrity of separating structures, the passage of sound through ventilation systems is required to achieve  $D_{new}$  values at least 7 dB higher than the  $D_{nT(mf,max)w}$  ratings provided within the airborne sound insulation table.

The above  $D_{n,e,w}$  figures are provided purely as guidance, and it is seen to be the responsibility of the M&E engineer/contractor to ensure that appropriate levels of cross talk attenuation are added to ventilation systems.

The figure below provides an example penetration detail for cross talk attenuators and the key concepts to be considered.



**Figure 8.3: Crosstalk Attenuator Penetration Detail**

## 9.0 ROOM ACOUSTICS – STANDARD SPACES

Standard spaces are any spaces that BB93 applies a reverberation time limit across the mid frequencies ( $T_{mf}$ ) to that does not have any additional requirements to be met for room acoustic performance. Spaces that also have set acoustic treatment quantities to be included, expressed as a percentage of the floor area are also covered within this section.

### 9.1 Reverberation Time Targets – Standard Spaces

BB93 sets maximum reverberation limits where the  $T_{mf}$  is the arithmetic average of the octave bands 500Hz, 1 kHz and 2 kHz, unless stated otherwise. The table below details the BB93 reverberation time criteria as per the room classification, for both new build and refurbished development. These classifications and criteria have been applied to each room within this development and are presented in the room classifications appendix.

| BB93 Room Classification                                                                                                                                                              | Reverberation Time Targets $T_{mf}$ [s] |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------|
|                                                                                                                                                                                       | New Build                               | Refurbishment |
| Primary / Nursery School: Classroom, Class Base, General Teaching Area, Small Group Room                                                                                              | $\leq 0.6$                              | $\leq 0.8$    |
| Secondary School: Classroom, Teaching Area, Seminar / Tutorial Room, Science Lab, Resistant Materials, CAD/CAM, Electronics/Control, Textiles, Food, Graphics, Design, ICT Room, Art. | $\leq 0.8$                              | $\leq 1.0$    |
| Music Room, Performance / Recital Room                                                                                                                                                | $\leq 1.0$                              | $\leq 1.0$    |
| Small Practice/Group Room (Music) (<30m <sup>3</sup> )                                                                                                                                | $\leq 0.6$                              | $\leq 0.8$    |
| Large Practice/Group Room (Music) (>30m <sup>3</sup> )                                                                                                                                | $\leq 0.8$                              | $\leq 1.0$    |
| Ensemble Room (Music)                                                                                                                                                                 | $\leq 0.6$                              | $\leq 0.6$    |
| Recording Studio / Control Room                                                                                                                                                       | $\leq 0.5$                              | $\leq 0.6$    |
| SEN Calming Room                                                                                                                                                                      | $\leq 0.6$                              | $\leq 0.8$    |
| Study Room (Individual Study, Withdrawal, Remedial Work, Teacher Preparation)                                                                                                         | $\leq 0.8$                              | $\leq 1.0$    |
| Libraries:                                                                                                                                                                            | $\leq 1.0$                              | $\leq 1.2$    |
| Drama Studio                                                                                                                                                                          | $\leq 1.0$                              | $\leq 1.0$    |
| Assembly / Multi-Purpose Hall (Drama, PE, Audio/Visual Presentations, Assembly, Occasional Music)                                                                                     | $\leq 0.8$                              | $\leq 0.8$    |
| Atrium, Circulation Space not intended for teaching and learning                                                                                                                      | $\leq 1.5$                              | $\leq 2.0$    |
| Sports Hall / Swimming Pool                                                                                                                                                           | 1.5 – 2.0                               | $\leq 2.0$    |
| Dance Studio                                                                                                                                                                          | $\leq 1.2$                              | $\leq 1.5$    |
| Gymnasium/Activity Studio                                                                                                                                                             | $\leq 1.5$                              | $\leq 2.0$    |
| Meeting Room, Interviewing/Counselling Room, Video Conference Room                                                                                                                    | $\leq 0.8$                              | $\leq 0.8$    |
| Dining Room                                                                                                                                                                           | $\leq 1.0$                              | $\leq 1.5$    |
| Kitchen <sup>1</sup>                                                                                                                                                                  | $\leq 1.5$                              | $\leq 2.0$    |
| Office, Medical Room, Staff Room <sup>1</sup>                                                                                                                                         | $\leq 1.0$                              | $\leq 1.2$    |
| Coats and Locker Area, Changing Area <sup>1</sup>                                                                                                                                     | $\leq 1.5$                              | $\leq 2.0$    |

<sup>1</sup> Considered administration or ancillary, therefore, guidance only

**Table 9.1: Reverberation Time Targets – Standard Cellular Spaces**

## 9.2 Corridors, Stairwells and Circulation Spaces

The amount of absorption required in corridors, entrance halls and stairwells should be calculated as per Section 7 of Approved Document E (ADE). Method A within Section 7 of ADE states the following.

| Area                      | Absorption Provision Requirements                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Corridors, entrance halls | An area equal to the floor area should be covered with a Class C absorber or better.                                                                                                                                                                                                                                                                                                                                       |
| Stairwells                | <p>An area equal to 50% of the sum of the following areas should be covered with a Class C absorber or better.</p> <ul style="list-style-type: none"> <li>stair treads,</li> <li>upper surface of intermediate landings</li> <li>upper surface of landings (excluding the ground floor)</li> <li>ceiling area of top floor</li> </ul> <p>Alternatively, 100% of the above area may be covered with a Class D absorber.</p> |

**Table 9.2: Minimum Absorption Requirements for Circulation Spaces**

## 9.3 Minimum Acoustic Treatment Quantities – Standard Spaces

The following table outlines acoustic treatment requirements for standard spaces within the development.

**Please note:** Acoustic treatment quantities are presented as different options, i.e. Class A OR Class C etc.

| Room                             | Floor Area (m <sup>2</sup> ) | Height (m) | Floor Finish | $T_{mf}$ Target (s) | Acoustic Treatment Required (m <sup>2</sup> ) |           |         |           | Acoustic Treatment Required (Number of units) |
|----------------------------------|------------------------------|------------|--------------|---------------------|-----------------------------------------------|-----------|---------|-----------|-----------------------------------------------|
|                                  |                              |            |              |                     | Class A                                       | <u>OR</u> | Class C | <u>OR</u> | Rafts*                                        |
| 0.03 Year 2/3 Classroom          | 63.7                         | 2.7        | Soft         | $\leq 0.6$          | 34                                            |           | 50      |           | 10                                            |
| 0.08 Group Room                  | 11.8                         | 2.7        | Soft         | $\leq 0.6$          | 7                                             |           | 10      |           | 2                                             |
| 0.01 Reception/ Year 1 Classroom | 61.9                         | 3.9        | Hard         | $\leq 0.6$          | 66                                            |           | 96      |           | 18                                            |
| 0.11 Group Room                  | 11.0                         | 2.7        | Soft         | $\leq 0.6$          | 6                                             |           | 8       |           | 2                                             |
| 0.13 Small Hygiene Room          | 9.1                          | 2.7        | Hard         | $\leq 1.0$          | 4                                             |           | 5       |           | 1                                             |
| 0.02 Nursery Classroom           | 68.8                         | 3.9        | Hard         | $\leq 0.6$          | 73                                            |           | 107     |           | 21                                            |
| 0.16 Group Room                  | 8.6                          | 2.7        | Soft         | $\leq 0.6$          | 5                                             |           | 7       |           | 2                                             |
| 0.23 Staff Room                  | 11.3                         | 2.7        | Soft         | $\leq 1.0$          | 3                                             |           | 4       |           | 1                                             |
| 0.22 Kitchenette                 | 5.4                          | 2.7        | Hard         | $\leq 1.0$          | 3                                             |           | 44      |           | 1                                             |

**Table 9.3: Minimum Acoustic Treatment Requirements – Standard Spaces**

## 9.4 Additional Design Guidance

### 9.4.1 Suspended Treatment

For suspended treatment, both the layout and the suspension height(s) can influence their performance. The suspension height should be no less than what has been stated in the treatment table and layouts should ensure that treatment is spaced apart such that gaps between them and any walls on at least two edges is at least the smallest dimension of the treatment. For example, 2400 mm x 1200 mm rafts should be at least 1200 mm from any other rafts or walls, on at least two edges.

## 9.5 Acoustic Treatment Review – Standard Spaces

This section will be completed at a later stage.

## 10.0 NOISE POLLUTION

### 10.1 Assessment Method

BS 4142:2014 “Methods for rating and assessing industrial and commercial sound” describes a method of determining the level of noise of an industrial nature, together with the procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. As such, an assessment to BS 4142 is typically called for within planning conditions.

The likelihood of complaints in response to a noise depends on various factors. BS 4142 assesses the likelihood of complaints by considering the margin by which the noise in question exceeds the background noise level.

### 10.2 Design Target

It is currently unknown whether the local authority has specific plant noise limits; therefore, the plant noise rating level limits at the nearest noise sensitive receptor will be set at a later date in accordance with any planning conditions set for this development by the local authority.

This will be assessed against the existing background noise levels,  $L_{A90}$ . For the purposes of assessment, MACH Acoustics has used statistical analysis of commonly occurring background noise levels to establish the minimum representative daytime and night-time background noise levels. For more information on the methodology, please refer to APPENDIX C.

| Position | Time Period                | Assessed Background Noise Level (dB $L_{A90}$ ) |
|----------|----------------------------|-------------------------------------------------|
| Fixed    | Daytime (07:00 - 23:00)    | 41                                              |
|          | Night-Time (23:00 - 07:00) | 37                                              |

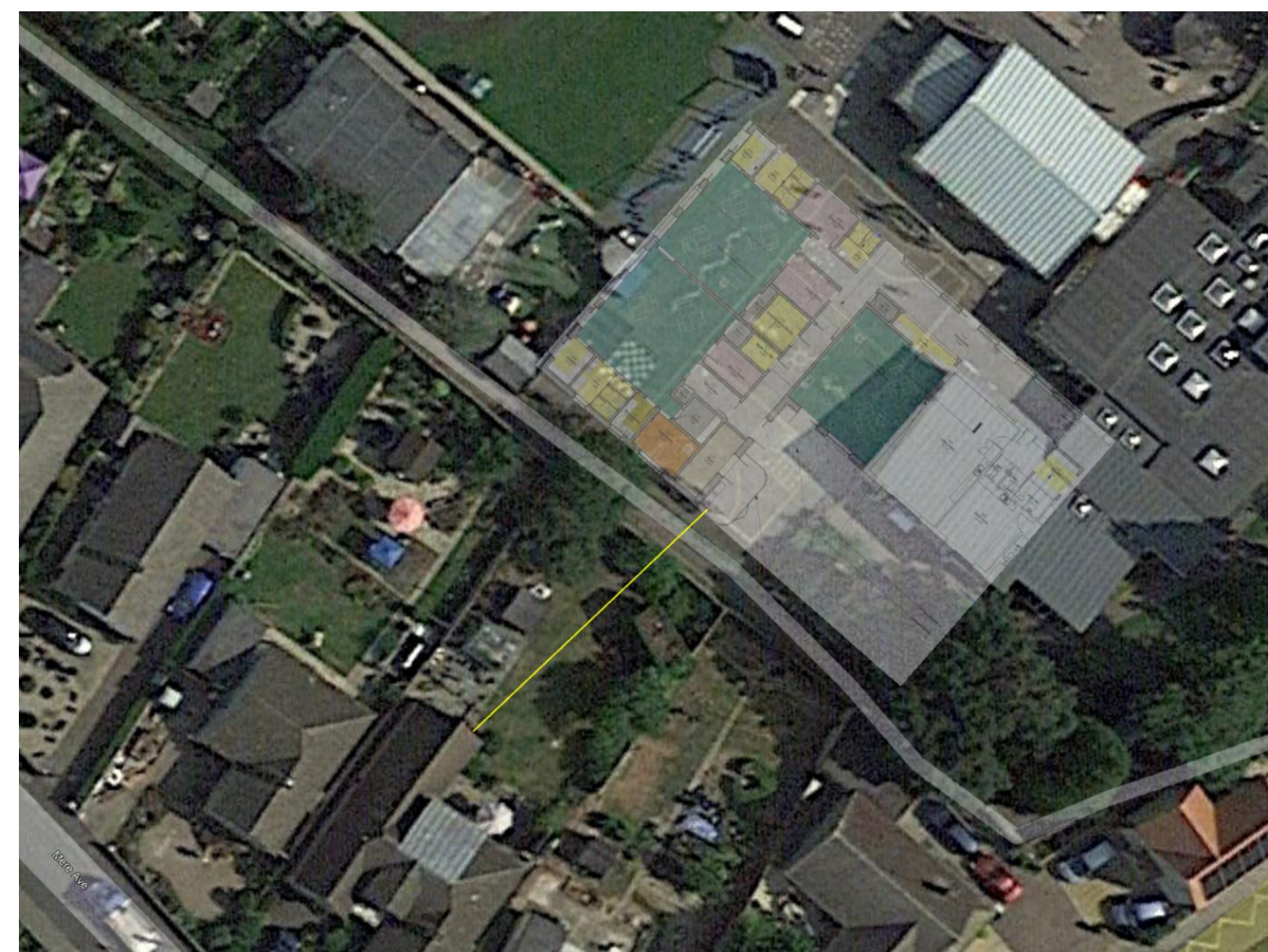
**Table 10.1:  $L_{A90}$  Background Noise Levels for Plant Noise Break-out Assessment**

### 10.3 Items of Noise Generating Plant

The development is to include two Air Source Heat Pumps in an external enclosure to the west of the proposed extension. The assessment will incorporate the specification once final selection of plant units is confirmed.

### 10.4 Plant Noise Impact Assessment

There is approximate 23m between intended plant unit location and noise sensitive receptor windows, as shown below in Figure 10.1



**Figure 10.1: Source and Receiver in context**

For a point source propagating hemispherically, approximately 35 dB of attenuation would be anticipated over a distance of 23m.

Without taking attenuation provided by the enclosure into account, it would be recommended that the combined sound power level of both units not exceed 76 dB(A) during the daytime or 72 dB(A) during the night-time, so as to not exceed the existing lowest typical background noise level.

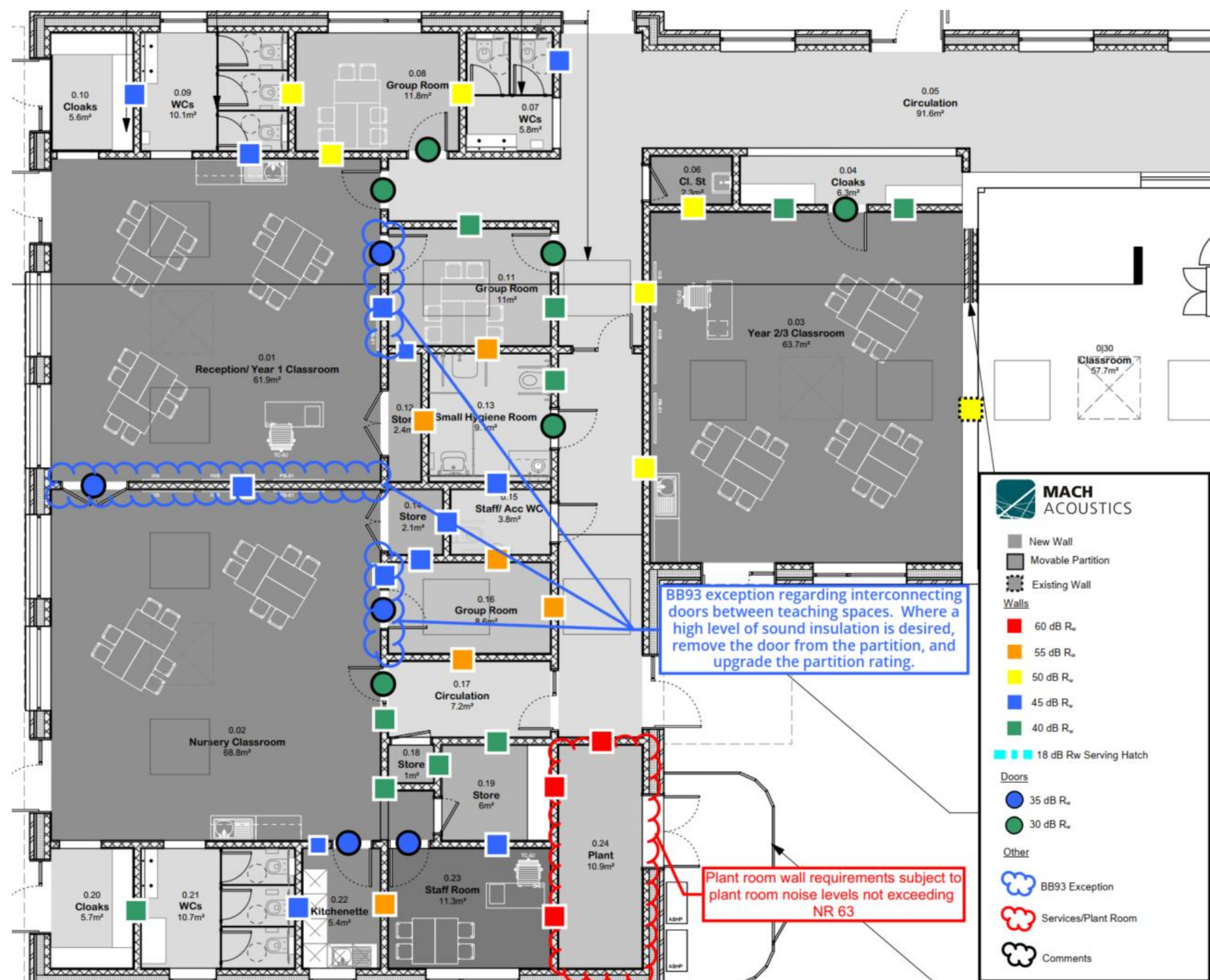
In practice, higher levels may be permissible based on the design and performance of the enclosure, which is to be reviewed. It is considered that this criterion can be readily achieved based on known sound power levels of typical ASHP units and typical attenuation from plant enclosures.

**APPENDIX A      ROOM CLASSIFICATIONS**

| Room                             | BB93 Classification                                                            | Indoor Ambient<br>Noise Limit (dB<br>L <sub>Aeq,30min</sub> ) | Services<br>Noise Limit<br>(dB L <sub>Aeq,30min</sub> ) | Reverberation<br>Limit (s T <sub>mf</sub> ) | Impact Sound<br>Limit (dB L' <sub>nTw</sub> ) | Activity<br>Noise | Noise<br>Tolerance | To Circulation                             |                               |                                       |
|----------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------|-----------------------------------------------|-------------------|--------------------|--------------------------------------------|-------------------------------|---------------------------------------|
|                                  |                                                                                |                                                               |                                                         |                                             |                                               |                   |                    | Walls &<br>Glazing<br>(dB R <sub>w</sub> ) | Doors<br>(dB R <sub>w</sub> ) | Ventilators<br>(dB D <sub>new</sub> ) |
| Standard Spaces                  |                                                                                |                                                               |                                                         |                                             |                                               |                   |                    |                                            |                               |                                       |
| Circulation                      | Corridor, Stairwell, Coats and Locker Area <sup>1</sup>                        | ≤ 45                                                          | ≤ 42                                                    | -                                           | ≤ 65                                          | Average           | High               | -                                          | -                             | -                                     |
| Stairs                           | Corridor, Stairwell, Coats and Locker Area <sup>1</sup>                        | ≤ 45                                                          | ≤ 42                                                    | -                                           | ≤ 65                                          | Average           | High               | -                                          | -                             | -                                     |
| WC                               | Toilet <sup>1</sup>                                                            | ≤ 50                                                          | ≤ 47                                                    | ≤ 1.5                                       | ≤ 65                                          | Average           | High               | -                                          | -                             | -                                     |
| 0.03 Year 2/3 Classroom          | Primary School: Classroom, Class Base, General Teaching Area, Small Group Room | ≤ 35                                                          | ≤ 32                                                    | ≤ 0.6                                       | ≤ 60                                          | Average           | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |
| 0.08 Group Room                  | Primary School: Classroom, Class Base, General Teaching Area, Small Group Room | ≤ 35                                                          | ≤ 32                                                    | ≤ 0.6                                       | ≤ 60                                          | Average           | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |
| 0.01 Reception/ Year 1 Classroom | Primary School: Classroom, Class Base, General Teaching Area, Small Group Room | ≤ 35                                                          | ≤ 32                                                    | ≤ 0.6                                       | ≤ 60                                          | Average           | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |
| 0.11 Group Room                  | Primary School: Classroom, Class Base, General Teaching Area, Small Group Room | ≤ 35                                                          | ≤ 32                                                    | ≤ 0.6                                       | ≤ 60                                          | Average           | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |
| 0.13 Small Hygiene Room          | Office, Medical Room, Staff Room <sup>1</sup>                                  | ≤ 40                                                          | ≤ 37                                                    | ≤ 1.0                                       | ≤ 65                                          | Low               | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |
| 0.02 Nursery Classroom           | Primary School: Classroom, Class Base, General Teaching Area, Small Group Room | ≤ 35                                                          | ≤ 32                                                    | ≤ 0.6                                       | ≤ 60                                          | Average           | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |
| 0.16 Group Room                  | Primary School: Classroom, Class Base, General Teaching Area, Small Group Room | ≤ 35                                                          | ≤ 32                                                    | ≤ 0.6                                       | ≤ 60                                          | Average           | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |
| 0.23 Staff Room                  | Primary School: Classroom, Class Base, General Teaching Area, Small Group Room | ≤ 35                                                          | ≤ 32                                                    | ≤ 0.6                                       | ≤ 60                                          | Average           | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |
| 0.22 Kitchenette                 | Office, Medical Room, Staff Room <sup>1</sup>                                  | ≤ 40                                                          | ≤ 37                                                    | ≤ 1.0                                       | ≤ 65                                          | Low               | Medium             | ≥ 40                                       | ≥ 30                          | ≥ 32                                  |

<sup>1</sup> Considered administration or ancillary, therefore, guidance only

## APPENDIX B SOUND INSULATION MARKUPS



## APPENDIX C ENVIRONMENTAL NOISE SURVEY

To establish the existing environmental noise levels on site, a noise survey was conducted between 11:30 on the 04/03/2026 and 11:30 on the 05/03/2026.

This site assessment was undertaken by Owen McLain of MACH Group.

### C.1 Site Description

The site is located at Hullavington C of E Primary School and is situated in Hullavington. The site is situated in a rural town, approximately 420 m from a railway track, 1.25 km from the A429 and 3.2 km from the M4

#### C.1.1 Subjective Noise Climate (On-site)

| Noise Type                | Noise Characteristics                                       | Sources                                          |
|---------------------------|-------------------------------------------------------------|--------------------------------------------------|
| Dominant                  | A primary contributor of noise levels on the site.          | Construction Noise<br>School Noise<br>Road Noise |
| Other Noise Contributions | Contributors to the remainder of the noise climate on site. | Brid Song<br>Train Noise                         |

**Table C.1.2 Subjective Summary of the Noise Sources**

#### C.1.2 Non-Representative Noise Sources

During the survey, no noise events occurred which would be deemed as atypical of the site location.

### C.2 All Measurement Locations

To help with the understanding of the site and measurement locations all the measurement positions are presented on the map below. Photos of the locations in situ are in the following sections.



**Figure C.2.2 All Measurement Locations on a Map**

## C.3 Fixed Measurement

A fixed microphone position was used to record noise levels between 11:45 on the 04/03/2026 and 15:45 on the 05/03/2026, where the fixed long-term meter was set to measure consecutive 'A' weighted 5-minute time samples.

To help with the understanding of the site and the measurement locations, the figures below present the location of the microphone position(s) in situ.

### C.3.1 Fixed measurement Location – F1



Figure C.3.3 Fixed measurement location in situ

### C.3.2 Fixed Measurement Results

The following graph presents the noise levels recorded over the measurement period at the fixed location (F1).

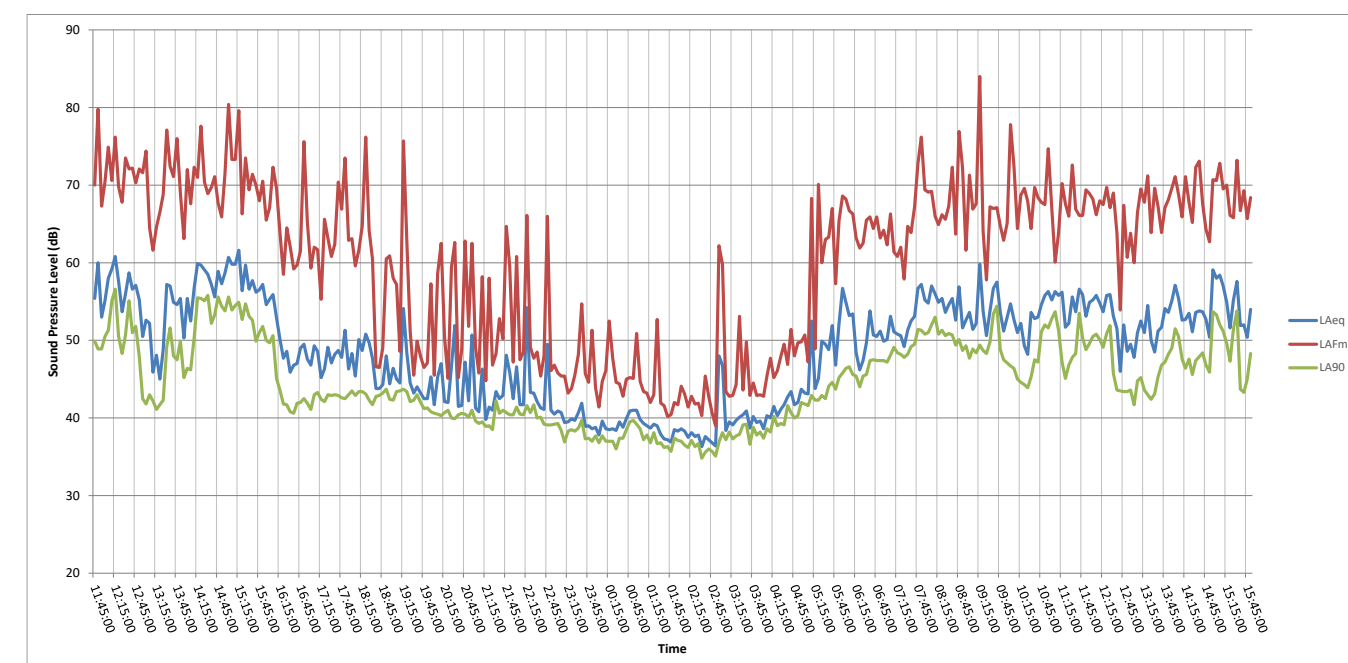


Figure C.3.4 Sound Pressure Level at fixed location, F1

## C.4 Spot Measurement

Spot measurements help quantify existing noise levels at different points around the site.

The figures below present the location of the microphone position(s) in situ.

The results of the measured levels at these location(s) are also presented in section C.5 Table C.5.3.

### C.4.1 Spot Measurement - S1

This spot measurement was taken between 13:34 and 13:50 on 25/02/2026.



**Figure C.4.5 - Spot Measurement S1 in situ**

### C.4.2 Spot Measurement – S2

This spot measurement was taken between 14:55 and 15:10 on 26/02/2026.



**Figure C.4.6 - Spot Measurement S2 in situ**

### C.4.3 Spot Measurement – S3

This spot measurement was taken between 13:54 and 14:10 on 25/02/2026.



Figure C.4.7 - Spot Measurement S3 in situ

### C.4.4 Spot Measurement – S4

This spot measurement was taken between 11:50 and 12:05 on 04/03/2026.



Figure C.4.8 - Spot Measurement S4 in situ

## C.5 All Spot Measurement Results

The LAeq, LAFmax, and LA90 levels measured from all spot measurements are shown in Table 4.2 below.

| Spot Measurement Position | Date       | Start | End   | Duration | L <sub>Aeq, T</sub> (dB) | L <sub>AFmax</sub> | L <sub>A90</sub> |
|---------------------------|------------|-------|-------|----------|--------------------------|--------------------|------------------|
| 1                         | 25/02/2026 | 13:34 | 13:35 | 00:00:48 | 57                       | 65                 | 50               |
|                           |            | 13:35 | 13:40 | 00:05:00 | 61                       | 80                 | 50               |
|                           |            | 13:40 | 13:45 | 00:05:00 | 60                       | 80                 | 53               |
|                           |            | 13:45 | 13:50 | 00:05:00 | 60                       | 77                 | 54               |
|                           |            | 13:50 | 13:50 | 00:00:03 | 57                       | 58                 | 56               |
| 2                         | 26/02/2026 | 14:55 | 15:00 | 00:04:56 | 54                       | 70                 | 47               |
|                           |            | 15:00 | 15:05 | 00:05:00 | 48                       | 59                 | 44               |
|                           |            | 15:05 | 15:10 | 00:05:00 | 46                       | 57                 | 43               |
|                           |            | 15:10 | 15:10 | 00:00:02 | 46                       | 50                 | 43               |
| 4                         | 04/03/2026 | 11:50 | 11:55 | 00:04:44 | 67                       | 97                 | 44               |
|                           |            | 11:55 | 12:00 | 00:05:00 | 50                       | 63                 | 42               |
|                           |            | 12:00 | 12:05 | 00:05:00 | 55                       | 71                 | 47               |
|                           |            | 12:05 | 12:05 | 00:00:03 | 54                       | 60                 | 51               |
| 3                         | 25/02/2026 | 13:54 | 13:55 | 00:00:56 | 63                       | 74                 | 43               |
|                           |            | 13:55 | 14:00 | 00:05:00 | 61                       | 81                 | 43               |
|                           |            | 14:00 | 14:05 | 00:05:00 | 57                       | 74                 | 40               |
|                           |            | 14:05 | 14:10 | 00:05:00 | 60                       | 78                 | 39               |
|                           |            | 14:10 | 14:10 | 00:00:01 | 68                       | 69                 | 66               |

**Table C.5.3 - Spot Measurement Results Table**

## C.6 Measurement Equipment

| Item                                | Serial No.   | Certificate No. | Last Calibration | Calibration Due |
|-------------------------------------|--------------|-----------------|------------------|-----------------|
| NTI Precision Sound Analyser XL2 TA | A2A-18713-E0 | 237087          | 28/03/2025       | 28/03/2027      |
| NTI Pre-amplifier MA220             | 9517         | 237087          | 28/03/2025       | 28/03/2027      |
| NTI Microphone Capsule MC230A       | A19763       | 237061          | 17/03/2025       | 17/03/2027      |
| Svantek Acoustic Calibrator SV33A   | 64140        | 254482          | 01/12/2025       | 01/12/2026      |
| NTI Precision Sound Analyser XL2 TA | A2A-15207-E0 | 233716          | 24/02/2025       | 24/02/2027      |
| NTI Pre-amplifier MA220             | 7856         | 233716          | 24/02/2025       | 24/02/2027      |
| Cirrus Microphone Capsule MK:224    | 219415D      | 233672          | 24/02/2025       | 24/02/2027      |
| NTI Precision Sound Analyser XL2 TA | A2A-08695-E0 | 248443          | 01/09/2025       | 01/09/2027      |
| NTI Pre-amplifier MA220             | 7182         | 248443          | 01/09/2025       | 01/09/2027      |
| Cirrus Microphone Capsule MK:224    | 217326D      | 248408          | 01/09/2025       | 01/09/2027      |

**Table C.6.4 Measurement Equipment**

## C.7 Meteorological Conditions

Data Taken from: <https://www.timeanddate.com/weather/>

| Date       | Time (hh:mm) | Temperature (High / Low) (°C) | Humidity (%) | Pressure (hPa) | Wind Speed (m/s) | Wind Direction | Conditions |
|------------|--------------|-------------------------------|--------------|----------------|------------------|----------------|------------|
| 04/03/2026 | 06:00        | 9 / 5                         | 89           | 1024           | 5.3              | E              | Clear      |
|            | 12:00        | 14 / 10                       | 74           | 1021           | 4.7              | ESE            | Clear      |
|            | 18:00        | 11 / 6                        | 85           | 1019           | 3.4              | E              | Clear      |
| 05/03/2026 | 00:00        | 8 / 5                         | 90           | 1015           | 4.4              | ESE            | Haze       |
|            | 06:00        | 12 / 7                        | 87           | 1014           | 4.4              | ESE            | Clear      |
|            | 12:00        | 15 / 13                       | 75           | 1013           | 3.6              | SE             | Clear      |

**Table C.7.5 Meteorological Conditions**