Hydrock

Llantrisant Health Park

RIBA Stage 3 Acoustic Design Strategy

For *Cwm Taf Morgannwg University Health Board*

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1. Introduction

Hydrock, now Stantec has been instructed by Cwm Taf Morgannwg University Health Board to provide acoustic engineering services for the re-development of the former British Airways facility in Llantrisant. The current proposals are for the existing office and manufacturing buildings to be demolished and replaced with a new structure for a health park.

This report has been prepared to support the development to RIBA Stage 3 of the design. It provides the project's acoustic performance criteria for the development, which have been selected to meet the client requirements.

Outline advice on construction specification and acoustic detailing has been provided herein to achieve the requirements and to assist Stride Treglown (the architect) and the design team at RIBA Stage 3 of the design. This report identifies areas of potential risk within the design and provides further acoustic design advice, as required.

This report is broken down into seven sections, where information is demarcated to relevant members of the design team. These sections are described below:

- **Section 2: Project Requirements:** This section details the criteria which has been used to form a foundation for the acoustic design.
- **Section 3: External Building Fabric:** This section is intended to assist with the external architectural design of the building envelope and details requirements for external sound insulation.
- **Section 4: Internal Sound Insulation:** This section is intended to assist with the internal architectural design and details our recommendations related to airborne and impact sound insulation.
- **Section 5: Room Acoustics:** This section is intended to assist with the internal architectural design features related to the control of reverberation and other acoustic comfort features.
- **Section 6: Building Services (MEP):** This section provides guidance for the building services design to achieve a desirable acoustic environment. This section also details our advice around ventilation requirements.
- **Section 7: Remaining Items:** This section is intended to provide a concise summary of remaining items to be reviewed.

This report is technical in nature, therefore a glossary of terminology is included in Appendix A to assist in interpretation.

1.1 Design Overview

The new health park is to provide dedicated services for the following areas:

- Day Surgery
- General Surgery + In-patient accommodation for recovery
- Endoscopy + Endoscopy Training Academy
- Diagnostics CDC services

The new health park will be split into three zones:

- **Zone 1** will provide the main entrance into the buildings, and will house endoscopy, MRI and CT scanning equipment
- **Zone 2** will accommodate ward areas
- **Zone 3** will accommodate the specialist operating theatres

All Zones will accommodate the servicing requirements for these areas, such as offices, stores, etc. with enclosed roof plant space in all areas.

1.2 Supporting Documentation

This report provides a review of the design team documentation for RIBA Stage 3, and where required provides methods to achieve the acoustic criteria set out in previous RIBA stages. The RIBA Stage 2 Acoustic Design Strategy document (29762-HYD-XX-XX-RP-Y-1001-P01, dated 3rd October 2024) should be read in conjunction with this report, which includes details of the baseline noise survey (undertaken in February 2024).

2. Project Requirements

This section provides a summary of the acoustic requirements relevant to the development, including numerical criteria. The acoustic requirements for sound insulation are also presented on the Acoustic Design Strategy drawings provided in Appendix B.

2.1 Client Brief

No specific client brief has been confirmed above the minimum requirements stated in the regulatory guidance presented in the following section. It is also understood that BREEAM UK New Construction 2018 Hea 05 (3 no. credits) and Pol 05 (1 no. credits) are being targeted.

Discussions with Stride Treglown have been undertaken to establish the unique requirements of the Health Park above the minimum performances stated in regulatory guidance through a series of design team work shops, these are summarised in Section 2.3.1.

2.2 Relevant Guidance and Standards

The following standards, guidance and legislation documents have been considered at this stage of the design:

- Department of Health: Specialist Services: Health Technical Memorandum 08-01: Acoustics 2013 (hereafter referred to as HTM-08-01)
- British Council for Office Guide to Specification – Acoustics
- Building Bulletin 93: Acoustic Design of Schools (hereafter referred to as BB93
- British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings (hereafter referred to as BS8233)
- British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (hereafter referred to as BS4142)
- British Standard 6472-1: 2018 Guide to Evaluation of Human Exposure to Vibration in Buildings, Part 1: Vibration Sources Other Than Blasting (hereafter referred to as BS6472)
- The Building Regulations Approved Document F, 2010
- Chartered Institution of Building Services Engineers: CIBSE Guides (CIBSE)
- BREEAM UK New Construction Non-Domestic Buildings (2018)

2.3 HTM-08-01: Acoustics

The HTM-08-01 provides advice and guidance on the design and operation of healthcare schemes with respect to acoustics.

The memorandum covers the acoustic criteria that are important for healthcare premises, and addresses issues such as the provision of temporary healthcare facilities, refurbishments, and for the control of noise and vibration during construction. It also provides a set of requirements for pre-completion commissioning testing.

HTM-08-01 provides criteria and/or commentary on the following:

- Internal ambient noise levels (IANL)
- Airborne and impact sound insulation between spaces
- Control of reverberation and speech intelligibility within spaces
- Control of vibration from activity including footfall
- Control of vibration from plant

2.3.1 Interpretations, Innovations and Alternative Performance Standards

Every facility is different, and the application of regulatory guidance should be considered in the context of the use of the space, and surrounding spaces. This Section details where the design strategy goes above the minimum requirements due to specific requirements or where for example, the adjacencies are different to those envisaged in regulatory guidance.

1. Toilets/WCs/changing areas (**Interpretation**): For the purposes of this design adjacent toilets are considered to form a single room, rather than being individual rooms. Within a single toilet block, a reduced level of privacy is usually expected. A reading of HTM-08-01 where every cubicle is considered separately would result in overly onerous specification of wall types and mechanical extract systems which could have spatial implications.
2. 'Acoustically unimportant rooms' (**Interpretation**): HTM-08-01 makes reference to 'acoustically unimportant rooms' in relation to sound absorption requirements for healthcare spaces but provides little description as to what might be important or unimportant (except as relates to stores). Our interpretation of space which fall into this category (in specific relation to this project) is discussed in detail in Section 5. It should be noted that these spaces are listed as 'unimportant' only as relates to internal room acoustics (and therefore requiring absorptive finishes).
3. Educational Spaces **(Innovations and Alternative Performance Standards**): the Health Park has very specific research and educational facilities in Zone 1 at second floor level, HTM-08-01 provides limited guidance for these types of spaces. More specific performance standards are therefore proposed such as Building Bulletin 93: Acoustic Design of Schools to provide a greater level of acoustic protection. This is supplemented with our own industry experience of these types of spaces.
4. Offices (**Innovations and Alternative Performance Standards**): Similar to the above, British Council for Office Guide to Specification – Acoustics guidance has been used for dedicated office areas (not including offices within a ward environment).
5. Emergency Testing of Generators **(Interpretation):** As per HTM-08-01 external building services are required to meet the internal services noise (NR) criteria in sensitive spaces which is typically lower than the ambient noise requirements. For emergency generator testing, in line with HTM-08-01 Para 2.49 a relaxation of acoustic criteria is proposed for testing of standby generators to the internal ambient noise thresholds.
6. Impact Noise Requirements **(Interpretation):** Impact noise treatments are recommended to certain areas (see Section 4.2) where space classifications are sensitive or are below areas with significant potential for impact activity. These will be incorporated into the architectural design once confirmation from user groups is identified.

These interpretations should be read in conjunction with the acoustic design strategy presented in Appendix B, and should be confirmed by the relevant Stakeholders prior to the commencement of the Stage 4 design. The alternative performance standards are listed in the following sections.

2.4 British Council for Offices Guide to Specification – Acoustics

The British Council for Offices ("BCO") provides a range of best practice guidelines for the commercial property sector, supplementing advice provided in BS 8233:2014. The BCO Guide to Specification 2019 includes guidance regarding the acoustic environment of offices including guidance on finishes, external noise intrusion, internal sound insulation, building services noise, emergency plant noise, and vibration.

Guidance is based on existing guidelines taken from relevant British, European and International standards including BS 8233:2014, BS EN ISO 140-18:2006, BS 6472-1:2008 and the Association of Noise Consultants Guidelines ANC 9701:1997-Part 1: Noise from building services and ANC 9801:1998 -Part 2: Noise from external sources within buildings.

2.5 Building Bulletin 93: Acoustic Design of Schools

BB93 provides acoustic performance standards for new-build and refurbished schools, and is published by the Department of Education. BB93 is deemed to provide valuable commentary and acoustic criteria for educational spaces proposed at the health care facility, and this guidance document is therefore considered for relevant room types (e.g. teaching rooms and seminar rooms).

2.6 Design Targets

The HTM-08-01 classifications and proposed criteria are provided in Table 1, and are shown on the acoustic design strategy document provided in Appendix B.

Table 1: HTM Classifications and Criteria for Internal Spaces

Room Types	HTM Classification	Indoor Ambient Noise Level		Services Noise Limit, NR	Rain Noise Limit, dB $L_{Aeq,1hr}$	Impact Sound Insulation	Privacy	Activity Noise	Sensitivity
		dB $L_{Aeq,1hr}$	dB $L_{AMax,F}$						
Single Bedrooms, Patient Cabins	Ward – Single Person	40 (Day), 35 (Night)	45 (Night)	NR 30	55	65	Confidential	Typical	Medium
Multi-Bed Open Plan Wards	Ward – Multi-Bed	45 (Day), 35 (Night)	45 (Night)	NR 30	55	65	Moderate	Typical	Medium
Treatment Rooms, Imaging Rooms (CT & MRI), Clinic Rooms, Consult Exam Rooms, Screening Rooms, Endoscopy Procedure Rooms, Physio Rooms, X-Ray	Consulting/Examination/ Treatment Room	40	N/A	NR 35	60	65	Confidential	Typical	Medium
Counselling Rooms	Counselling/Bereavement Room	40	N/A	NR 35	60	65	Confidential	High	Medium
Interview Rooms, Consent Rooms	Interview Room	40	N/A	NR 35	60	65	Confidential	Typical	Medium
Day Case Theatres, Arthroplasty Theatres (& Ancillary Areas)	Operating Theatres	40	N/A	NR 40	60	65	Private	Typical	Sensitive
Skills Lab Area	Laboratories	45	N/A	NR 40	65	65	Moderate	Typical	Medium
Dirty Utility Rooms	Dirty Utility/Sluice	45	N/A	NR 40	65	N/A	Not Private	High	Not Sensitive
Clean Utility Rooms	Clean Utility	45	N/A	NR 40	65	N/A	Not Private	Low	Not Sensitive
Corridors, Circulation Areas, Stairwells	Corridor (No Door)	50	N/A	NR 40	65	N/A	Not Private	Typical	Not Sensitive
Café	Dining	50	N/A	NR 40	65	N/A	Not Private	High	Not Sensitive
WCs, Shower Rooms	Toilets (Not Cubicles)	50	N/A	NR 45	65	N/A	Moderate	Typical	Not Sensitive
Waiting Areas (>20 People)	Waiting (Large, >20 People)	50	N/A	NR 40	65	N/A	Not Private	High	Not Sensitive
Waiting Areas (≤20 People)	Waiting (Small, ≤20 People)	50	N/A	NR 40	65	N/A	Not Private	Typical	Not Sensitive
Kitchen & Pantry Areas	Ward Kitchen/Pantry	50	N/A	NR 40	65	N/A	Not Private	Typical	Not Sensitive
Store Rooms, Linen	Storeroom	N/A	N/A	N/A	65	N/A	Not Private	Low	Not Sensitive
Staff Rest & Breakout Areas	Rest Room	40	N/A	NR 35	60	65	Moderate	High	Medium
Male/Female/Unisex Changing Rooms, Locker Rooms	Locker/Changing Room	55	N/A	NR 45	65	N/A	Moderate	Typical	Not Sensitive
Teaching Rooms (>35m²), Seminar Rooms (>35m²), Training Rooms (>35m²)	Large Training/Seminar (>35m²)	35	N/A	NR 30	55	65	Private	High	Medium

Room Types	HTM Classification	Indoor Ambient Noise Level		Services Noise Limit, NR	Rain Noise Limit, dB $L_{Aeq,1hr}$	Impact Sound Insulation	Privacy	Activity Noise	Sensitivity
		dB $L_{Aeq,1hr}$	dB $L_{AMax,F}$						
Simulator Room, Teaching Rooms (<35m²), Seminar Rooms (<35m²), Training Rooms (<35m²)	Small Training/Seminar (<35m²)	40	N/A	NR 35	60	65	Private	Typical	Medium
Offices, Innovation/Clinical/Booking Hub, Nurse Manager	Multi-Person Office (2-4 People)	40	N/A	NR 35	60	65	Moderate	Typical	Medium
Multi-Faith/Quiet Room	Multi-Faith/Chapel	50	N/A	NR 40	65	65	Private	High	Sensitive
Plant Rooms, Technical MRI Rooms	Plant Room*	50	N/A	N/A	65	N/A	Not Private	High	Not Sensitive
IT Rooms, Electrical Switch Rooms, EER Rooms, IPS Rooms, UPS Rooms	Electrical Room*	50	N/A	NR 35	65	N/A	Not Private	High	Not Sensitive

**Note:* *Classification not specified in HTM-08-01, criteria developed based on project-specific requirements.*

2.6.1 HTM Classifications

The HTM classifications outlined in Table 1 should be reviewed against each room by the client or their representative so that each room may operate as intended, with respect to acoustics.

2.6.2 Airborne Sound Insulation

The sound insulation performance of separating building elements is determined by both the direct sound transference through the partition and any indirect noise transmission through walls, floors and junctions, known as flanking noise transmission.

Advice on flanking sound transmission will be reviewed by Hydrock, now Stantec Acoustics during RIBA Stage 4.

Acoustic requirements for partitions and separating floors are set out in Table 1 and Table 2. Table 1 gives the privacy of a source room, anticipated levels of noise generation and the sensitivity of the spaces. Table 2 is then used to select the standard of sound insulation required based on these parameters in terms of the weighted standardised level difference ($D_{nT,w}$). This parameter is measured on site.

The criteria in Table 2 are in terms of the on-site sound level difference achieved between spaces ($D_{nT,w}$), taking account of all sound-transfer paths. Partitions are normally rated in terms of the laboratory sound insulation rating (R_w). Therefore, to aid selection of suitable partitions, R_w ratings that can achieve the required on-site performance are outlined in Section 4.1. The on-site sound level difference ($D_{nT,w}$) will depend on the partitions rating (R_w) and many other factors including: the installed area of the partition, flanking sound paths, and the receiver room volume and sound absorption area.

Room privacy and sensitivity ratings are defined as follows:

- **Confidential (C)**– raised speech would be audible but not intelligible, and normal speech would be inaudible.
- **Private (P)** – normal speech would be audible but not intelligible.
- **Moderate (M)** – normal speech would be audible and intelligible but not intrusive.
- **Not private (N)** – normal speech would be clearly audible and intelligible.
- **Sensitive** – room cannot accommodate any noticeable noise from rooms next door.
- **Medium sensitivity**– room generally needs to be free from noise of other rooms.
- **Not sensitive** – noise from other rooms does not affect the use of the receiving room.

Raised voices are to be reasonably expected in rooms where medical consultation takes place.

For occupants to retain adequate privacy (including those with hearing impairment), bedrooms, consulting rooms, examination rooms and treatment rooms have been classed "confidential". Raised speech would be audible but not intelligible in adjacent rooms.

Table 2: Summary of Airborne Sound Insulation Criteria ($D_{nT,w}$)

Privacy Requirement of Source Room	Noise Generation of Source Room	Noise Sensitivity of Receiving Room		
		Not Sensitive	Medium Sensitivity	Sensitive
Confidential	Very High	47	52	Avoid
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Private	Very High	47	52	Avoid
	High	42	47	52
	Typical	42	42	47
	Low	37	42	42
Moderate	Very High	47	52	Avoid
	High	37	42	47
	Typical	37	37	42
	Low	No Rating	No Rating	37
Not Private	Very High	47	52	Avoid
	High	No Rating	42	47
	Typical	No Rating	No Rating	42
	Low	No Rating	No Rating	37

Adjacencies which are recommended to be avoided (i.e. very high source room noise, sensitive receiver room) should alternatively achieve 57dB $D_{nT,w}$ at a minimum which can be hard to achieve.

A door in a partition will significantly downgrade the partitions performance. There is no benefit to a partition performance that is more than 10dB greater than that of the door set within it. Therefore, as a typical door set will have a performance of 30-35dB R_w, corridor walls with a door require a rating no greater than 40-45dB R_w.

Design criteria have been selected in order to best meet client requirements as they are currently understood, and as per guidance and regulation. If there are any alternative project specific design criteria, Hydrock should be advised accordingly.

2.6.3 Vibration (from Mechanical Systems and Activity Induced Vibration)

HTM 08-01 sets out the acoustic criteria for the design and management of new healthcare facilities, considering continuous and intermittent vibration impact on people, as well as vibration impact on sensitive equipment.

Continuous vibration (e.g. from mechanical plant) should be assessed in terms of the root mean square (RMS) acceleration value (W_g) weighting, in accordance with BS 6841. The base value of frequency-weighted acceleration is 0.005 ms^{-2}. The frequency weighted RMS acceleration is divided by this base value to determine the multiplying factor which is then compared to the criteria in Table 3.

Table 3: Summary of Continuous Vibration Multiplying Factors

Space	Multiplying Factor
Operating theatre, precision laboratory, audiometric testing booth	1
Wards	2
General laboratories	4
Offices, consulting rooms	8

It should be noted that the multiplying factor is in terms of a defined source excitation point and receiver location. In most cases the excitation point will be a corridor adjacent to the vibration sensitive space. Service walkways that are coordinated with the space can usually be excluded. For ward environments there is typically no defined excitation location so in these areas the assessment is done in and at the same location.

For intermittent vibration, HTM-08-01 advises if the duration and frequency of occurrence of events are known, the vibration dose value (VDV) may be used. VDV is defined in BS6472, and values corresponding to a low probability of adverse comments for different types of accommodation are provided in HTM-08-01 and are reproduced in Table 4.

Table 4: HTM-08-01 VDV Criteria

Usage	Criteria, VDV
Wards	0.2 $ms^{-1.75}$
General Laboratories, treatment areas	0.4 $ms^{-1.75}$
Offices, consulting rooms	0.8 $ms^{-1.75}$

The assessment of vibration on sensitive equipment should be carried out with respect to the vibration criterion curves (VC) or information from the manufacturer.

Construction vibration

Construction vibration can affect existing health care facilities. HTM 08-01 advises a strategy be prepared to control vibration as per BS5228-1, which states the following:

> *'Vibration, even of very low magnitude, can be perceptive to people and can interfere with the satisfactory conduct of certain activities, e.g. delicate procedures in hospital operating theatres, use of very sensitive laboratory weighing equipment. Vibration nuisance is frequently associated with the assumption that, if vibration can be felt, then damage is inevitable; however, considerably greater levels of vibration are required to cause damage to buildings and structures (see, for example BS7385-2) or to cause computers and similar electronic equipment to malfunction BS6472-1 quotes that half the population would be able to percept a vertical weighted (Wb) peak acceleration of 0.015ms^{-2} , a quarter of a population would be able to perceive 0.01ms^{-2}, and the least sensitive population would be able to detect 0.02ms^{-2}. Perception thresholds are slightly higher for vibration durations of less than 1 second.*

Specific Requirements (Specialist Areas)

Arup provided typical vibration performance requirements in healthcare buildings within their due diligence report for the Vacated British Airways Facility (REP/001/DD/293377, dated 9th February 2023).

The typical vibration performance requirements provided within the Arup due diligence report are summarised in Table 5. These values are in-part derived from the continuous vibration requirements given in Health Technical Memorandum 08-01: Acoustics.

Table 5: Typical Vibration Performance Requirements in Healthcare Buildings (Arup Due Diligence Report)

Description	Vibration Performance	Comment
Offices/Consultant Rooms	Rf = 8	Distinctly perceptible; 8 x human perception
General Labs/Treatment Rooms	Rf = 4	Perceptible; 4 x human perception
Ward Spaces	Rf = 2	Barely perceptible; 2 x human perception; HTM ward spaces
X-Ray/Ultrasound/ Endoscopy/Mammography	Rf = 2	Barely perceptible; 2 x human perception; HTM ward spaces
Operating Theatre	Rf = 1	Threshold of human perception; HTM operating theatre space
Detailed Lab Space*	VC-A	Beyond perception; 0.5 x human perception
CT	VC-B	Beyond perception; 0.25 x human perception
MRI	VC-C	Beyond perception; 0.125 x human perception

2.6.4 *Internal Mechanical Plant Noise (MEP)*

HTM-08-01 provides recommended noise limits from mechanical services and plant, given as a Noise Rating (NR) defined in ISO 1996-1:2016. These limits are suitable to achieve the internal ambient sound levels specified if external noise is controlled as designed. A summary of the NR values is presented in Table 1.

The NR levels are specified as the $L_{Aeq,30s}$ at 1.2 m above the floor level (unless otherwise stated) at a position no closer than 1 m from a wall in the absence of activity noise and noise ingress. The NR levels apply to the spatially averaged reverberant noise levels within the space and at the bed head in bedrooms.

It is acceptable for noise levels 1m from a diffuser to exceed the limit by up to 4 dB provided the average level across the space, and at the bedhead in bedrooms (if provided), comply with the NR limit. Internal MEP noise levels should generally be measured my making a series of 30 second samples of the equivalent continuous noise level (L_{eq}) in locations across the space, not closer than 1m from a wall. A longer sampling time may be required if noise varies by more than 3dB over the 30 second interval.

2.6.5 *Atmospheric Plant Noise Emissions*

The atmospheric noise emissions limits for all fixed building services plant (with the exception of emergency plant i.e. back-up generators) are outlined in Section 6.6.

2.7 BREEAM UK New Construction 2018

It is understood that BREEAM Hea 05 (3 no. credits) and BREEAM Pol 05 (1 no. credit) are being targeted. The criteria to achieve the relevant BREEAM credits are outlined below:

BREEAM Hea 05: Sound Insulation (First Credit)

Achieve the airborne sound insulation performance standards set out in Section 2 of HTM08-01: Acoustic design requirements, 2013 determined according to the privacy requirements using both Table 3 and Table 4 from HTM08-01. The weighted standardised impact sound pressure level ($L_{nT,w}$) must not exceed 65 dB for floors over noise-sensitive rooms, following the guidance in HTM08-01.

BREEAM Hea 05: Indoor Ambient Noise Levels (Second Credit)

The indoor ambient noise requirements for noise intrusion from external sources in Table 1 of HTM08-01 are not exceeded. The values for internal noise from mechanical and electrical services in Table 2 of HTM08-01 are not exceeded.

BREEAM Hea 05: Room Acoustics (Third Credit)

Acoustic environment (Control of reverberation and sound absorption): Achieve the requirements relating to sound absorption set out in Section 2 of HTM08- 01.

BREEAM Pol 05: Reduction of Noise Pollution (Credit)

1 There are no noise-sensitive areas within the assessed building or within 800 m radius of the assessed site.

OR

2 Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS4142:2014(231) is commissioned. Noise levels must be measured or determined for:

2.a Existing background noise levels:

2.a.i at the nearest or most exposed noise-sensitive development to the proposed assessed site

2.a.ii including existing plant on a building, where the assessed development is an extension to the building

2.b Noise rating level from the assessed building.

3 The noise impact assessment must be carried out by a suitably qualified acoustic consultant.

4 The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5dB lower than the background noise throughout the day and night.

5 If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.

2.8 Commissioning Requirements

BREEAM Hea 05 and Pol 05 outlines the following commissioning requirements:

BREEAM Hea 05: Sound Insulation (First Credit)

A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the requirements of Section 7 of HTM08-01.

BREEAM Hea 05: Indoor Ambient Noise Levels (Second Credit)

A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the Section 7 of HTM08-01: Acoustics.

BREEAM Hea 05: Room Acoustics (Third Credit)

Installation of a specification compliant with the HTM08-01 criteria demonstrations compliance. A site inspection by the developer or SQA is required to confirm that a compliant specification has been installed.

BREEAM Pol 05: Reduction of Noise Pollution (Credit)

At the design stage of assessment, where noise-sensitive areas or buildings are present, actual measurement is unlikely to be possible due to the planned but non-existent installation. In such situations, compliance can be demonstrated through the use of acousticians' calculations or by scale model investigations.

For such cases, BS4142 states 'Determine the specific sound level by calculation alone if measurement is not practicable, for example if the source is not yet in operation. In such cases, report the method of calculation in detail and give the reason for using it'. Where prediction methods are not possible, measurement will be necessary using either a noise source similar to that proposed or measurement of the actual noise from the installation (once installed). Compliance with the latter approach requires a written commitment to appoint a suitably qualified acoustician to carry out the required measurements post-installation, and a further commitment to attenuate the noise source in compliance with criteria 4 above and 5 above (if proved necessary by the measurements).

As per the BREEAM testing requirements outlined above, the commissioning schedule will cover:

- Airborne and impact sound insulation;
- A set of internal ambient noise levels (resulting from external noise ingress only);
- Internal measurements of mechanical plant;
- Environmental measurements of plant at existing receptors.

Ambient noise measurements should cover a full 8-hour night-time and 16-hour daytime period. Maximum noise levels are to be determined between 11pm and 7am. Maximum levels should be taken with a sample duration of no greater than 1 minute i.e. dB $L_{AMax,F,1minute}$.

Measurements of building services noise, including ventilation and comfort cooling systems, should be taken with services operating at their design duty.

3. External Building Fabric

This section is intended to assist with the external architectural design of the building envelope and provides advice on the sound insulation of the external building fabric to achieve the IANL requirements.

3.1 Measured External Noise Levels

A noise survey was undertaken at the proposed site between the 8th and the 16th February 2024, as detailed in the Stage 2 Acoustic Design Strategy document (29762-HYD-XX-XX-RP-Y-1001-P01, dated 3rd October 2024). A summary of the measured daytime and night-time average ambient external noise levels at the long-term monitoring position is shown in Table 6.

Table 6: Measured Daytime and Night-time Average Ambient Noise Levels ($L_{Aeq,T}$)

Position	Period	Equivalent Measured Ambient Noise Level dB $L_{Aeq,T}$								
		8th Feb 2024	9th Feb 2024	10th Feb 2024	11th Feb 2024	12th Feb 2024	13th Feb 2024	14th Feb 2024	15th Feb 2024	16th Feb 2024
LT1	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	57*	56	56	54	56	57	56	57	56*
	Night-time $L_{Aeq,8hr}$ (23:00-07:00)	49	48	47	50	49	50	50	48	N/A

***Note:** Indicates partial measurement periods.*

An analysis of the measured ambient noise levels averaged across 1-hour ($L_{Aeq,1hr}$) is presented in Table 7.

Table 7: Analysis of Average Ambient Noise Levels ($L_{Aeq,1hr}$)

Position	Period	Average Ambient Noise Level dB $L_{Aeq,1hr}$			
		Mean	Mode	Range	80th Percentile
LT1	Daytime (07:00-23:00)	56	57	47 – 60	58
	Night-time (23:00-07:00)	49	45	42 – 56	50

The survey measurement results are used to derive the façade sound insulation requirements. Note that maximum noise events (L_{Amax}) and the corresponding design criteria are not deemed to be a driving requirement for the façade insulation.

3.2 Plant Noise from Proposed Units

Calculated noise emissions from plant which serves the facility (e.g. air source heat pumps, chillers, condenser units, air handling units, water source heat pumps) has also been considered as part of the façade noise intrusion calculations. This has been combined with the ambient (measured) noise level on site for each assessment period.

Details of the SoundPlan 9.1 noise model are discussed in Section 6.6.

3.3 Façade Insulation

The IANLs in HTM-08-01 should be assessed against external noise ingress only. They are a function of the noise level at the façade, the construction of the external wall, the acoustic performance of glazing and ventilation openings, and the parameters of the internal room(s).

3.3.1 External Wall Construction

It is understood that three external wall constructions are proposed, which are outlined in Table 8. All external wall constructions are expected to achieve a minimum acoustic performance of 45dB R_w.

Table 8: External Wall Constructions

Ref. Code	Description	Acoustic Performance
EXWT 01	Rainscreen Cladding to Siniat Thru Wall SFS System	45dB R_w [1)]
EXWT 02	Rainscreen Cladding to Concrete Structural Shear Wall	60dB R_w [2)]
EXWT 03	Brickslip Cladding to Siniat Thru Wall SFS System	45dB R_w [1)]

[1)] Manufacturer-stated acoustic performance
[2)] Minimum predicted acoustic performance based on 250mm concrete wall

3.3.2 External Roof Construction

It is understood that the external roof construction will include a 200mm hollow core plank structure with a 150mm concrete topping. The external roof construction is expected to provide a minimum sound insulation performance of 60dB R_w, meaning noise intrusion via the roof is likely to be minimal. The acoustic performance of the roof is factored into the façade insulation calculations.

3.3.3 Glazing Specification

To determine the minimum required glazing specification, an assessment has been undertaken based on achieving the HTM-08-01 noise intrusion criteria for the most critical room types, which includes the following:

- Teaching and Seminar Rooms in Zone 1 at Second Floor Level
- Single Bedrooms in Zone 2 at Ground and First Floor Level
- Patient Cabins in Zone 3 at Ground Floor Level

Based on the façade insulation calculations, it is indicated that the minimum glazing requirements outlined in Table 9 should be adopted to comfortably achieve the HTM-08-01 noise intrusion criteria at all locations.

Table 9: Minimum Glazing Requirements

Example Glazing Configuration	Minimum Sound Reduction Index dB 'R' (BS EN ISO 10140-2:2010) @ Octave Band Centre Frequency (Hz)							R_w
	63	125	250	500	1k	2k	4k	
6mm/12as/4mm Double Glazing*	16	22	21	30	40	41	42	34

***Note:** The example glazing configuration is provided for indicative purposes only. An alternative glazing configuration could be implemented, provided it can achieve the minimum octave-band sound reduction index figures outlined above.*

The façade measures outlined above are deemed suitable to achieve the internal ambient noise level requirements of HTM-08-01, and are therefore sufficient to achieve the second credit of BREEAM Hea 05 (Indoor Ambient Noise Levels).

3.3.4 Ventilation Strategy

The development is to be ventilated via mechanical means for non-acoustic reasons. Therefore, passive ventilators within the window frame have not been included as part of the external building fabric calculations. An attenuator schedule will be developed at Stage 4 to control internal noise levels in-line with the HTM-08-01 internal ambient noise level criteria, which is discussed further in Section 6.

4. Internal Sound Insulation

This section is intended to assist with the internal architectural design and details our recommendations related to airborne and impact sound insulation.

4.1 Separating Walls

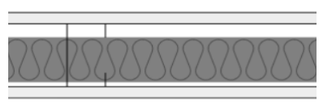
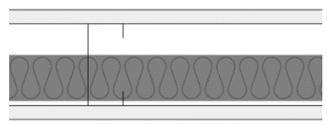
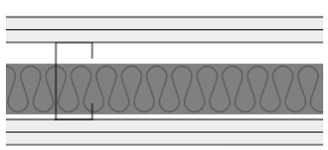
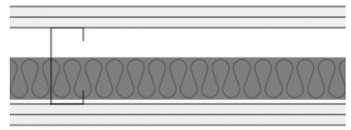
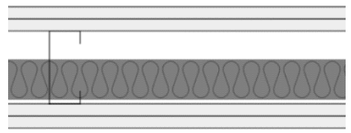
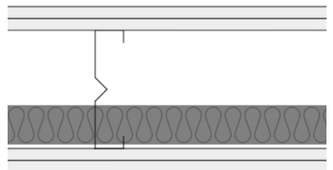
The internal airborne sound insulation requirements are shown in Appendix B.

To assist in the selection of suitable partitions, a suggested minimum partition rating has been provided in terms of the laboratory tested sound reduction index (R_w). However, installing a suitably rated partition does not guarantee compliance; junction detailing, structural flanking paths, beam and column encasements, services routes, and riser locations & details should be reviewed by an acoustic consultant during RIBA Stage 4. Final partition, floor and ceiling types should also be reviewed. Finally, site inspections from an acoustic consultant are also recommended during construction.

Where there is at least one door or opening in a partition, the requirement is in terms of the laboratory sound insulation rating only.

An example schedule of new wall types with R_w values is provided in Table 10**.** The ratings in Table 10 assume acceptable control of flanking sound paths and reasonable workmanship.

Table 10: Partition Schedule

Partition Schedule	Concept Configuration (Not to Scale)
Partition Requirement: ≤40dB R_w	
• 1 x 12.5mm plasterboard (>8kg/m² per board). • 70mm metal C stud (600mm centres) with 50mm unfaced mineral or glass wool insulation (10-30kg/m³). • 1 x 12.5mm plasterboard (>8kg/m² per board).	
Partition Requirement ≤45dB R_w	
• 1 x 15mm plasterboard (>10kg/m² per board). • 90mm metal C stud (600mm centres) with 50mm unfaced mineral or glass wool insulation (10-30kg/m³). • 1 x 15mm plasterboard (>10kg/m² per board).	
Partition Requirement ≤50dB R_w	
• 2 x 12.5mm plasterboard (>8kg/m² per board). • 70mm metal C studs (600mm centres) with 50mm unfaced mineral or glass wool insulation (10-30kg/m³). • 2 x 12.5mm plasterboard (>8kg/m² per board).	
Partition Requirement: ≤53dB R_w	
• 2 x 12.5mm plasterboard (>8kg/m² per board). • 90mm metal C studs (600mm centres) with 50mm unfaced mineral or glass wool insulation (10-30kg/m³). • 2 x 12.5mm plasterboard (>8kg/m² per board).	
Partition Requirement ≤57dB R_w	
• 2 x 15mm plasterboard (>10kg/m² per board). • 90mm metal C stud (600mm centres) with 50mm unfaced mineral or glass wool insulation (10-30 kg/m³). • 2 x 15mm plasterboard (>10kg/m² per board).	
Partition Requirement ≤62dB R_w	
• 2 x 15mm plasterboard (>12.5kg/m² per board). • 150mm acoustic C stud (600mm centres) with 50mm unfaced mineral or glass wool insulation (10-30kg/m³). • 2 x 15mm plasterboard (>12.5kg/m² per board).	

Once drylining configurations have been finalised these should be reviewed by a suitably qualified acoustic engineer during Technical Design.

The internal sound insulation measures outlined above are in-line with the requirements of HTM-08-01, and are therefore sufficient to achieve the first credit of BREEAM Hea 05 (Sound Insulation).

4.1.1 Workmanship

The acoustic criteria are specified in terms of an on-site performance requirement rather than a laboratory rating. Since the acoustic performance of constructions in situ depends on many factors outside Hydrock's control, it is not possible to provide indemnity. The acoustic performance requirements for each building element, together with proposed forms of construction detailed in this Report, should (with appropriate avoidance of flanking paths, acoustic decoupling where appropriate and intimate site supervision) satisfy the acoustic performance requirements. It shall be the responsibility of the contractor, however, to comply with the requirements.

4.2 Separating Floors

It is advised that the separating floor construction is designed to achieve a minimum airborne sound insulation performance of 57dB R_w and a minimum impact sound insulation performance of 65dB $L'_{nT,w}$ to satisfy the requirements of HTM-08-01.

It is understood that the following separating floor construction is under consideration:

- 150mm Concrete Topping
- 200mm Hollow Core Plank
- Suspended Light Steel Grid forming min. 250mm Void
- Approx. 15mm Mineral Fibre Tile or Plasterboard Ceiling

The hollow core plank separating floor construction is shown in Figure 1.

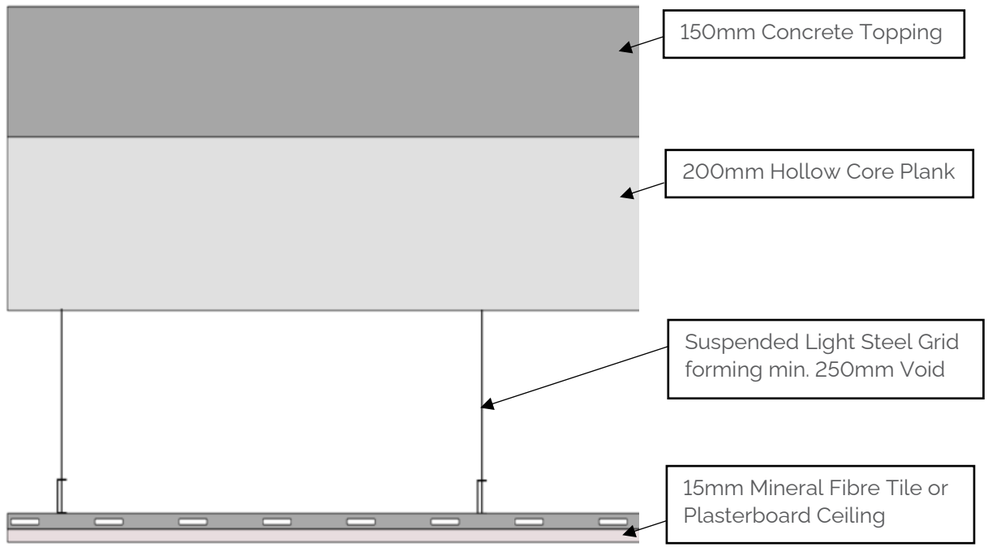


Figure 1: Hollow Core Plank Separating Floor Construction

The hollow core plank separating floor construction is predicted to achieve the minimum airborne sound insulation performance requirement of 57dB R_w,

The minimum impact sound insulation performance requirement of 65dB $L'_{nT,w}$ is predicted to be achieved although this is a minimum requirement that will not be protective of certain more sensitive spaces. Instances where additional treatment may be required includes the below:

- Circulation spaces above wards (HTM-08-01 Para. 2.103)
- Floors which are above educational and research spaces (note that all currently proposed educational and research spaces are located on the top floor)
- Floors which are above high sensitivity spaces such as multi-sensory/snoezelen areas, operating theatres and multi-faith rooms (HTM-08-01 Para. 2.104)
- Floors below where a high degree of movement is required, e.g. physio spaces
- Roof terrace to prep/counselling/consent rooms (Zone 1), it assumed that the standard terrace construction is suitable to achieve the rating but this will be coordinated at the next stage of the design

Areas where additional impact treatments are recommended are shown on the acoustic design strategy in Appendix B.

The degree of the impact isolation will depend on the activity sources and sensitivity of the space below. Options to improve the impact noise performance include resilient underlay or integral resilient floor which can often achieve ΔL_w of 15dB or greater.

5. Room Acoustics

5.1 Overview

Appropriate acoustic treatments can have a dramatic effect on the acoustic comfort in a room. However, the treatments have to be used with care because of the potential implications of infection control, cleaning, impact damage etc.

HTM-08-01 states the following regarding where sound absorption is required:

> *Sound-absorbent treatment should be provided in all areas (including all corridors), except acoustically unimportant rooms (for example storerooms etc), where cleaning, infection-control, patient-safety, clinical and maintenance requirements allow.*
>
> *The absorbent treatment will normally be a ceiling. However, floor finishes (for example carpet) or absorptive wall panels may also be considered. Washable, acoustically-absorbent materials will be required in some areas within the infection-control regime.*

Based on the guidance presented in HTM-08-01, the room types deemed to be 'acoustically unimportant' are listed below. All other room types should have sound-absorbent treatment.

- Store rooms
- Clean utility and dirty utility (where there are no noise producing items)
- Toilet cubicles (not including those in lobby areas)
- Back of house goods areas
- Electrical rooms
- Plant rooms*

**Note:* *Absorption is required within internal plant room areas housing WSHPs to control external noise emissions. The reverberation time criteria for internal plant room areas housing WSHPs is discussed in Section 6.6.6, and the absorption strategy for these areas is to be finalised at Stage 4.*

HTM-08-01 recommends that rooms requiring sound-absorbent treatment should have a minimum Class C rated absorption area that is equivalent to at least 80% of the floor area, however also notes that a smaller absorption area is required in rooms with Class A or Class B rated absorptive treatment.

HTM-08-01 states the following regarding reverberation time in large open spaces:

> *Acoustic absorption is likely to be needed in large open spaces such as atria, particularly in localised areas within it (for example reception areas and cafeterias). A reverberation-time criterion should be agreed depending on the specific requirements for use of the space.*

In the absence of a reverberation time criterion for atria in HTM-08-01, it is advised to adopt the atrium reverberation time criterion specified in BB93: Acoustic Design of Schools (February 2015). BB93 states that a new-build atrium space should have a reverberation time of ≤1.5s T_{mf}.

The mitigation measures outlined in this section are in-line with the requirements of HTM-08-01, and are therefore sufficient to achieve the third credit of BREEAM Hea 05 (Room Acoustics).

5.2 General Absorption Strategy

Almost all rooms at the proposed development (except 'acoustically unimportant' rooms and those noted in the following sections) are shown to have either a Class A rated ceiling tile (Rockfon Medicare Standard or Rockfon Medicare Plus) or Class B rated ceiling tile (Rockfon Medicare Air).

Based on the Class A and Class B rated ceiling tile areas shown in the reflected ceiling plans provided, all rooms with a Class A or Blass B rated ceiling tile should meet the minimum absorption requirements of HTM-08-01 (except for the Staff Rest and Pre-Discharge Lounge areas at Building C, discussed separately in Section 5.4). No other additional absorbent treatments (i.e. carpet floor finish, absorptive wall panels) should be required in spaces with a Class A or Class B rated ceiling tile.

5.3 MRI Imaging Rooms

Due to the specialist non-acoustic requirements of MRI spaces, it is understood that the MRI imaging rooms will have a primary suspended grid ceiling system (Rockfon Chicago Metallic Alu 740), and a secondary plasterboard ceiling system above the primary ceiling system.

To achieve the absorption requirements of HTM-08-01, it is advised that a Class A or Class B rated ceiling tile is implemented on the primary suspended grid ceiling system within the MRI imaging rooms (e.g. Rockfon Medicare Standard/Plus/Air). No other additional absorbent treatments should be required.

5.4 Rooms with Plasterboard Ceiling

The following spaces are shown to have a standard plasterboard ceiling:

- Waiting Area + Wheelchair Space (Building A, 1F)
- Pre-Discharge Lounge (Building A, 1F)
- Staff Base (Building C, GF)
- Pre-Discharge Lounge* (Building C, GF)
- Self Check-In and Wait (Building C, GF)
- Lobby (Building C, GF)
- Staff Rest* (Building C, 1F)

**Note:* *The Pre-Discharge Lounge and Staff Rest areas at Building C are shown to have a partial Class A ceiling tile, however the Class A ceiling tile areas shown are not predicted to be sufficient to achieve the sound-absorbent treatment requirements of HTM-08-01.*

The rooms listed above are generally considered to fall under the 'acoustically important' categorisation, although there is room for interpretation of this categorisation since it is not discussed in detail in HTM-08-01. For example, the Staff Rest area at Building C could be considered acoustically unimportant.

To easily achieve the sound-absorbent treatment requirements of HTM-08-01, it is recommended that all spaces listed above (provided they are considered to be acoustically important) are specified to have a Class A or Class B rated ceiling tile, covering an area equivalent to at least 80% of the floor area. If this is not feasible, absorptive Class A wall panels or acoustic baffles/rafts may need to be considered at Stage 4.

6. Building Services (MEP)

6.1 Building Services Noise & Vibration Limits

A summary of the projects required noise limits from mechanical services and plant, given as a Noise Rating (NR) defined in ISO 1996-1:2016, are summarised in Table 1.

It is the responsibility of the principal contractor and MEP subcontractor undertaking the building works to achieve the design limits. The assessor should consider the cumulative effect of noise from building services and external noise intrusion.

In addition to complying with the noise limits, the MEP subcontractor should ensure that MEP noise is normally free from distinctive characteristics such as rattles, tones, bangs or other characteristics that are not typical of MEP systems.

The requirements for plant noise from other parts of the building will be achieved if plant room noise levels are controlled to < NR70, and the specified level of sound insulation of partitions and floors is achieved.

Smoke extract systems shall be designed so as not to exceed NR55 in any internal area to ensure emergency alarms/announcements are clearly audible. In car parks, noise levels could be higher provided emergency alarms/announcements are clearly audible.

6.1.1 Lift Installation

Additional specification for the lift installation is set out in Appendix C. Noise limits for lifts are terms of the maximum sound pressure level (SPL). That is the highest 125ms reverberant RMS SPL from operation of the lift only in the stated room.

The above requirements should be considered by the lift installer and will be achieved by suitable equipment selections, partitions, and vibration isolation of lift motors from the building structure. Partitions between lifts and apartments will generally require a *fully independent* plasterboard wall lining (with no structural connections to the shaft wall) even where solid masonry shaft walls are used.

6.1.2 Vibration Isolation

Vibration transfer from M&E services to internal occupied areas shall not exceed the threshold of perception, defined as 0.015 m/s^2 peak vertical acceleration, W_b weighted, within BS 6472-1: 2008.

To achieve this mounting of rotating equipment on lightweight roofs or directly on light-weight plant room partitions, soffits and floors should be avoided, and plant on concrete roofs and within plant rooms should be fitted with vibration isolators to control the transmission of vibration to the building structure.

General guidance on adequate anti-vibration mount selection for various items of equipment is included in CIBSE Guide B4 "Noise and vibration control for building services systems ".

6.1.3 General Measures

The following general advice should be adopted by the mechanical design engineer where practicable, or other mitigation measures implemented:

- The principal method of noise control should be plant selection as this will limit the amount of noise control measures required to meet the criteria. Fans should operate as near as possible to the rated peak efficiency when handling the required airflow and static pressure. Fans should be selected to generate the lowest possible noise at the design conditions.
- Where practicable use variable-speed volume control instead of volume control dampers.
- The HVAC system should be designed to minimise flow resistance and turbulence, as high flow resistance increases required fan pressure which results in higher noise at low frequencies.
- Duct transitions should not exceed an included expansion angle of 15-30° to avoid the production of duct rumble.
- Place grilles and diffusers with sufficient distance from elbows and branch take offs.
- To reduce airflow generated nose we recommend the following design limits for typical office environments (40 - 45 dB L_{Aeq}):
  - Main duct runs[1]
    - Above plasterboard ceiling or in shaft/riser: 10 m/s
    - Above low-med acoustic ceiling tiles: 7 m/s
    - Without ceiling: 5 m/s
  - Neck of supply diffusers/returns
    - Supply: 2.5 m/s
    - Return: 3.0 m/s
- To reduce airflow generated nose we recommend the following design limits for more sensitive noise environments (30 - 35 dB L_{Aeq}):
  - Main duct runs[1]
    - Above plasterboard ceiling or in shaft/riser: 7 m/s
    - Above low-med acoustic ceiling tiles: 5 m/s
    - Without ceiling: 4 m/s
  - Neck of supply diffusers/returns
    - Supply: 1.5 m/s
    - Return: 2 m/s

Note [1]: This advice relates to rectangular ductwork, typically air velocities can be in the order of 30% greater for circular ductwork.

Mechanical services plant should be placed away from sensitive areas where practicable to reduce the risk of breakout noise from the casing of the fans.

6.2 Service Risers & Pipework

Pipes (e.g. SVPs but excluding gas pipes) are required to be enclosed (full height) where they penetrate a floor. The pipe should be separated from the room with two layers of board (total min. 15 kg/m^2) and 25mm mineral wool. Access to pipes will be via destructive means only.

If there is a desire for noise from the pipes to be approaching inaudibility, we should be notified as additional treatment would be required (e.g. use of acoustic HDPE soil pipes, etc).

Pipework within risers shall be supported in a manner which prevents structure borne noise transmission to walls and floors. This can be achieved by adopting the following measures:

- Supporting off masonry elements (e.g. via unistrut off slabs if required) so that pipes are fully independent of lightweight walls (min. 10 mm clearance).
- Using oversized brackets containing neoprene inserts.
- Incorporating acoustic dampeners where pipework is suspended from floor slabs.
- Using rubber lined pipe brackets.

Bends in pipework should be avoided be avoided. Where bends are present acoustic HDPE is required with flexible connections, together with dense lagging around the pipe, to reduce noise transfer.

6.3 Penetration Detailing

Penetrations details are required to maintain the performance of the partition and so therefore most cable and duct penetrations are required to be sealed. The detail depends on the size of the opening, the acoustic performance requirement of the wall, and whether the penetration is concealed above a lay in grid/plasterboard ceiling.

As general guidance, all penetrations of separating wall/floor constructions (including corridor walls) by ducts, pipework, electrical cables, etc. should also be as small as practically possible, and penetrations in separating walls should be avoided. Large cable trays should branch from the corridors into each room and compressed pillows should be used to seal the penetration.

Outline guidance on the required acoustic detail is presented in Table 11.

Table 11: Services Penetration Guidance

Service Penetrations	Guidance
Clearance <5mm	Seal entire gap with non-hardening acoustic mastic.
Clearance >5mm	Pack insulation between the wall and penetration; Reduce gap to 5mm with plasterboard collar; Seal remaining gap with non-hardening acoustic mastic,

Ductwork penetrating a shared wall will require to be treated as per the above detail in the table above, and the pipe work wrapped in dense lagging e.g Muftilag. R102 (30dB R_w). i.e. extractions from first floor toilet penetrating the shared observation room wall and traversing the ceiling void.

6.4 Recessed Sockets and Switch Back Boxes

In partitions rated >45dB R_w, back-to-back recessed sockets and light fittings should be avoided. Where they are back-to-back they should be staggered by at least 600mm and the back boxes fitted with acoustic putty pads. Where multiple sockets are located back-to-back, i.e. plug sockets, TV, internet, phone and other utilities, a plasterboard liner will be required in the cavity to maintain the performance of the partition, enabling the wall to perform to its design intent, in acoustic terms.

6.5 Cross Talk Attenuators

For each sound insulation requirement of a partition, where ductwork is branched and therefore forms a path between adjacent sensitive spaces the following guidance is suggested regarding crosstalk attenuation. The below should be read in conjunction with the acoustic strategy in Appendix B and the M&E services layout drawings. It should be noted that the ductwork configuration is subject to change, and small changes in configuration can result in different attenuation requirements. The below table should be seen as guidance only and final verification shall be undertaken by an acoustic engineer at Stage 4.

Table 12: Crosstalk Attenuator Specification

Partition requirement	Suggested Crosstalk Attenuator Insertion Loss (500Hz-4kHz) (Per branch where services shared between sensitive adjacencies)
≥45dB Rw	600mm/ 22dB IL
≥49dB Rw	900mm/ 26dB IL
≥53dB Rw	Up to 1250mm/ 27dB IL
≥57dB Rw	Up to 1250mm/ 30dB IL
≥63dB Rw	Shared ductwork between spaces not recommended.

It shall be the responsibility of the MEP subcontractor to procure suitable crosstalk attenuation.

Crosstalk attenuation is likely to be required where ducts connect “private”, “confidential” or “sensitive” rooms (e.g. consultant rooms, MRI, etc). The attenuators should not be placed in-series in a main duct, as there are likely to cause significant pressure drops and result in airflow noise. The attenuators should be placed in the final branch leading to grilles.

6.6 Atmospheric Plant Noise Emissions

6.6.1 Plant Noise Emissions Limit

Atmospheric noise emissions limits for all fixed building services plant (with the exception of emergency plant i.e. back-up generators), are established based on an analysis of existing background sound levels (L_{90}) measured on-site during daytime and night-time hours.

The cumulative noise from all fixed plant associated with the development should not exceed the limits at the nearest noise-sensitive receptors (NSR) so as to avoid the potential for impact in accordance with BS4142 and to achieve the BREEAM Pol 05 credit.

Table 13: Plant Noise Emission Limits

Time Period	Representative Background Sound Level, dB L_{A90}	Plant Noise Emission Limit, dB $L_{A,T}$
Daytime (07:00 – 23:00)	51	≤ 46
Night-time (23:00 – 07:00)	41	≤ 36

The plant level limits in apply at the façade of the nearest third-party sensitive receptor and should account for the character of the sound at the receptor location in accordance with BS4142. Should the plant not be perceived as intermittent, tonal, impulsive, or otherwise distinctive against the existing acoustic environment then no correction feature should be applied. The responsibility to achieve the above would fall to the principal contractor.

The plant noise emission limits outlined above are in-line with the requirements of BREEAM Pol 05, and are therefore sufficient to achieve the BREEAM Pol 05 credit provided they are adhered to.

6.6.2 SoundPLAN 9.1 Noise Model

Based on the Stage 3 plant specifications provided by Hydrock, now Stantec's MEP division, a SoundPLAN 9.1 noise model has been produced to predict the cumulative noise level at the nearest noise sensitive receptors due to plant associated with the proposed development. The noise model is used to predict compliance with the night-time plant noise emissions limit outlined in Table 13.

The results of the preliminary noise model calculations are summarised in Table 14. Note that the results are calculated on the assumption that the mitigation measures outlined in the following sections are adopted.

Table 14: External Plant Noise Model Results

Noise Sensitive Receptor	Highest Predicted Noise Level at Noise Sensitive Receptor, dB $L_{Ar,T}$	Night-time Plant Noise Emission Limit, dB $L_{A,T}$
Premier Inn (Hotel, East)	36	≤ 36
Pine Ct (Residential, Southwest)	29	≤ 36
Royal Glamorgan Hospital (North)	29	≤ 36
Ely Valley Road (Residential, Southwest)	26	≤ 36

6.6.3 Air Handling Unit Attenuators

To achieve the night-time plant noise emission limit at the nearest noise-sensitive receptors, all air handling unit (AHU) exhaust and supply terminals (i.e. ducted to atmosphere) should have an attenuator applied which can achieve the minimum insertion loss requirements outlined in Table 15.

Table 15: AHU Attenuator Minimum Insertion Loss Requirements

AHU Attenuator: Minimum Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
3	7	14	21	27	26	17	12

6.6.4 Acoustic Barrier for External Rooftop Plant Areas

Acoustic louvres are currently shown to enclose plant areas containing the air source heat pump units on the Building A and Building B rooftops, as shown in Figure 2 and Figure 3 respectively.

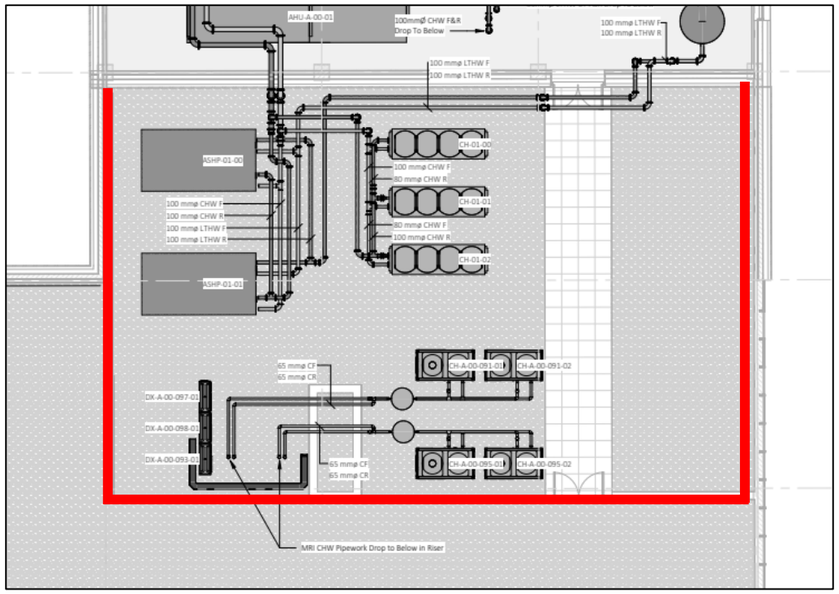


Figure 2: Building A Rooftop ASHP Enclosure

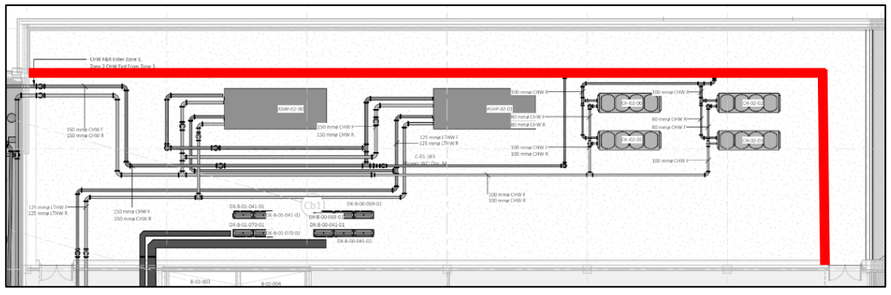


Figure 3: Building B Rooftop ASHP Enclosure

To achieve the night-time plant noise emission limit at the nearest noise-sensitive receptors, the enclosure should comprise an acoustic barrier which has a minimum height of 2.4m and a minimum surface mass of 10kg/m^2. The barrier should fully enclose the plant area, with no gaps or holes within the barrier that could compromise the acoustic performance of the partition.

Alternatively, the Configured Platforms acoustic barrier solutions (Soundshield or Acoustic+) could be considered to control plant noise emissions.

6.6.5 *Acoustic Louvres for Internal Plant Room Areas*

Internal plant room areas containing water source heat pumps (WSHPs) require acoustic louvres than can achieve the minimum insertion loss requirements outlined in Table 16.

Table 16: Acoustic Louvre Minimum Insertion Loss Requirements

Acoustic Louvre: Minimum Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
7	9	12	24	31	33	29	30

Note: *For budgetary guidance, the acoustic louvre requirements shown above are based on the performance values of the IAC Slimshield SL-600 acoustic louvre, however an alternative louvre could be considered provided it can achieve the minimum insertion loss values at each octave band centre frequency.*

6.6.6 *Absorption for Internal Plant Room Areas*

To control excessive reverberant noise build-up, internal plant room areas containing water source heat pumps (WSHPs) should achieve a reverberation time criterion of ≤1.5 seconds. A typical specification might be as follows with the quantities reviewed at the next stage of design.

The entire soffit of the plantroom shall be acoustically lined in order to reduce the reverberant build up of noise. All joints shall be neatly butted and there shall be no interruptions or gaps.

The acoustic lining should comprise 100mm thick mineral wool slabs having a minimum density of 80kg/m3 The mineral wool slabs should be faced with either fibreglass cloth or glass fibre tissue and be inert, rot proof, vermin proof, and non-hygroscopic. The slabs shall be retained behind a suitable protective facing such as perforated steel sheet (minimum free area of 23%). Flattened-expanded ("Expamet") sheet shall only be used if all edges of the sheet are mechanically fixed to the casing and galvanised steel cover strips are used to prevent rivet heads pulling through the perforated sheet (trapping the Expamet between two solid steel layers).

The acoustic media shall not comprise materials which are generally composed of mineral fibres, either man made or naturally occurring, which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not sealed or otherwise stabilised to ensure fibre migration is prevented.

6.7 Emergency Generator Compound

An emergency generator compound housing 4 no. emergency generators is located opposite Zone 2, as shown in Figure 4.

Figure 4: Emergency Generator Compound Location

Emergency plant is not required to achieve the proposed plant noise limits outlined in Table 15, however noise emissions from the emergency generator compound at the nearby bedroom windows in Zone 2 should be considered as routine testing will likely be undertaken during the daytime.

The internal layout of the emergency generator compound is shown in Figure 5.

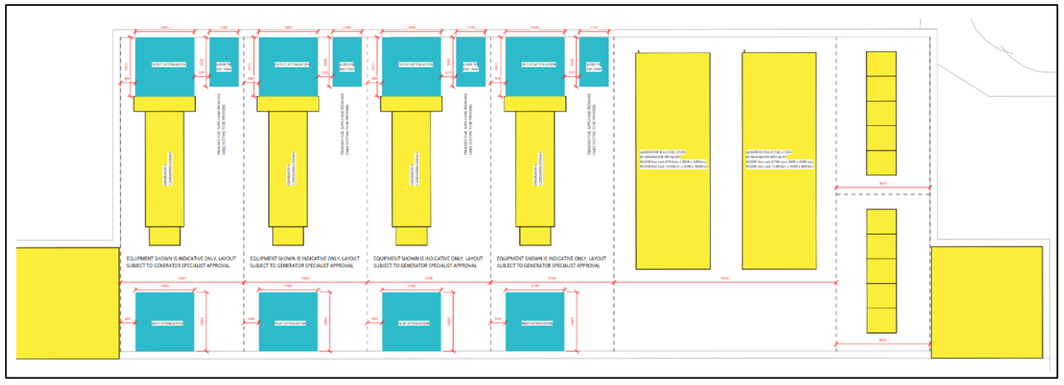


Figure 5: Emergency Generator Compound Internal Layout

A preliminary assessment has been undertaken based on the following assumptions:

- Plant room has brick cavity external walls, capable of achieving 53dB R_w
- Plant room has 140mm concrete roof structure, capable of achieving 50dB R_w
- Plant room has uprated acoustic doors, capable of achieving 51dB R_w
- Plant room attenuators have a minimum length of 1.8m (2.4m currently shown in the internal layout) and can achieve the insertion loss performance values outlined in Table 17
- Exhaust noise is assumed to be attenuated such that it is does not positively increase the overall sound incident on the façade
- Generators are assumed as a worse case to be tested simultaneously for an hour (this is unlikely to be the case)

Table 17: Generator Compound Attenuator Insertion Loss Performance Values

Example Attenuator Specification	Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
40% Free Area, 1800mm Length	6	13	25	37	44	43	30	20

Based on the assessment assumptions outlined above, noise emissions from the emergency generator plant room at the external façade of the worst-affected bedroom is predicted to be 63dB $L_{Aeq,1hr}$, which would result in an internal noise level of 38dB $L_{Aeq,1hr}$ within the worst-affected bedroom. A more realistic scenario would be only one generator being tested at a time, which would reduce external and internal noise levels by up to 6dB. Therefore, from a spatial coordination standpoint adequate allowance for attenuation has been provided. Exact details for the generator enclosure specifications will be developed in the next stage of the design.

7. Further Items for Acoustic Review

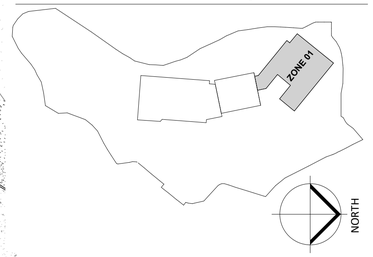
The following items have been identified as outstanding or important to the Stage 3 design. These items should therefore be reviewed during the Stage 4 design.

- Finalise separating floor construction (i.e. hollow core plank construction or alternative), analysis of critical flanking performance areas.
- Resolution of wall types which have no test data for internal partitioning systems and where appropriate pre-testing of a select number of partitions to minimise project risk.
- Review internal mechanical plant selections to determine the requirement for attenuators and/or other measures to control internal noise levels due to plant emissions
- Review of terrace isolation structures
- Review of architectural details incorporating the advice in Section 4 to show the following:
  - Wall to Corridor junctions for single stud and twin stud partitions
  - Wall to Façade junction for single stud and twin stud partitions
  - Wall/Soffit interface showing the deflection head requirements detailed, particularly for areas without a suspended ceiling.
  - Architectural penetration detailing
  - Vertical sections for each façade type showing the floor-ceiling interface and curtain wall systems.
  - Door installation details, and requirements for packing around door frames.
  - Details of fixing of services to internal partitions, such as waste water and or building services ductwork.
- Details of fixings of mechanical plant to partitions and vibration isolation methods.
- Joinery details, in particular where these might result in additional coupling/blocking for resilient walls.

Appendix A Glossary of Technical Terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
R_w	R_w is the single-number quantity which characterizes the sound insulating properties of a given material over a range of frequencies. This is typically measured in a laboratory in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	$D_{n,e,w}$ is the single number quantity which characterizes the airborne sound insulation performance across a given 'element' and is typically used to describe the acoustic performance of trickle ventilators etc.
C_{tr}	C_{tr} is a correction term applied to single-number sound insulation values (R_w, $D_{n,e,w}$ etc.) to afford additional weighting against low frequency performance.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, it is measured outside and at least 3m from buildings.

Appendix B Acoustic Design Strategy



Key

- 40dB R_w
- 45dB R_w
- 50dB R_w
- 53dB R_w
- 57dB R_w
- 62dB R_w
- 30dB R_w
- 35dB R_w
- Additional impact treatment advised

INCOMING FOOD
INCOMING DELIVERIES
OUTGOING
EXIT TO AMBULANCE BAY
MAIN CDH ENTRANCE
COFFEE SHOP
COURTYARD GARDEN
Switch Room B2 26.7 m²
Incoming Food 31.7 m²
Cleaners Room 7.1 m²
Facilities Circulation 23.4 m²
Till point & Servery 14.1 m²
Café 38.3 m²
Stair Core 01 39.7 m²
FM Lift 7.4 m²
Stair Lobby 29.8 m²
Patient Lift 7.6 m²
Main Entrance Lobby 57.0 m²
Digital Check-in 12.6 m²
General Office 16.8 m²
Waiting Area + Wheelchair Space 36.0 m²
Stair Core 03 33.3 m²
Stair Lobby 8.6 m²
Main Radiology Office 17.3 m²
Clinic Room 17.8 m²
Clinic Room 18.0 m²
Clinic Room 18.0 m²
Clinic Room 17.9 m²
Staff Base 9.0 m²
Diagnostic Clinic Subwait 14.1 m²
Diagnostics Circulation 108.1 m²
Cleaners Room 4.9 m²
Multi Faith/Quiet Room 8.7 m²
WC: Ind. Wheelchair 5.7 m²
Ensuite to 1No U/S Room 7.2 m²
Clinic Room 19.0 m²
Dirty Utility 10.8 m²
Intervention Clinic Room 20.9 m²
Intervention Clinic Room 19.6 m²
Intervention Clinic Room 19.9 m²
Clean Utility 12.7 m²
Discharge lounge 15.0 m²
Circulation 5.9 m²
Incoming Electrical Switch Room B 24.2 m²
Facilities Circulation 34.1 m²
Central Pharmacy Hub 34.8 m²
Pharmacy Office 12.0 m²
Pharmacy Stock Receipt 10.9 m²
Central Fluid Store 13.2 m²
Incoming Goods Bay 28.9 m²
Central Consumables 37.0 m²
Outgoing Linen 6.4 m²
Outgoing Food 6.6 m²
Disposal Hold 22.3 m²
Mechanical Ventilation Riser 4.2 m²
Mechanical Services Riser 4.1 m²
Oxy. Riser A1 1.4 m²
Oxy. Riser A2 1.4 m²
MCWS Riser 4.6 m²
Cleaners 11.0 m²
Patient Lift 8.0 m²
Stair Lobby 14.5 m²
Stair Core 02 47.8 m²
FM Circulation 54.0 m²
WC: Ind. Wheelchair 5.6 m²
WC: Ind. Wheelchair 5.5 m²
Store 5.0 m²
WC: Ind. Wheelchair 5.5 m²
Female Staff Communal Changing 25.5 m²
Male Staff Communal Changing 25.5 m²
Facilities Management Office 14.5 m²
Electrical Room/ Riser 7.3 m²
Incoming Linen 8.4 m²
Patient Aid Provision 21.8 m²
CT Clean Utility 9.9 m²
Edge Equipment Room (EER) 1 9.6 m²
Mechanical Ventilation Riser 3.5 m²
CT Store 3.2 m²
Resus Trolley Bay 1.7 m²
Hot Desking Office 20.3 m²
Staff Circulation 51.4 m²
CT Circulation 51.6 m²
Staff Pods 3.7 m²
Staff Pods 3.2 m²
Staff Rest & Mini Kitchen 29.1 m²
Kitchenette 8.3 m²
Unisex Changing Cubicles 31.5 m²
CT Doc M WC 4.2 m²
CT Dirty Utility 8.2 m²
Disposal Hold 2.9 m²
Linen 4.3 m²
WC: Ind. Wheelchair 5.5 m²
WC: Semi Amb 2.9 m²
Staff WC: Amb. 3.1 m²
Imaging Room: CT 44.6 m²
CT Tech Room 8.3 m²
Control Room: CT 9.4 m²
Control Room: CT 9.3 m²
Imaging Room: CT 45.8 m²
CT Tech Room 8.4 m²
Incoming Electrical Switchroom A 42.1 m²
Shared MRI/CT Screening Room 8.7 m²
Shared MRI/CT Screening Room 9.0 m²
Shared MRI/CT Cannulation Room 8.7 m²
Shared MRI/CT Cannulation Room 9.0 m²
Lobby 9.6 m²
Imaging Circulation 48.4 m²
Imaging Circulation 18.9 m²
Subwait 15.8 m²
Staff Base 1.7 m²
Shared MRI/CT Screening Room 9.6 m²
Shared MRI/CT Screening Room 9.0 m²
Shared MRI/CT Cannulation Room 8.7 m²
Shared MRI/CT Cannulation Room 8.9 m²
WC: Semi Amb 3.1 m²
Circulation 131.9 m²
Subwait 15.4 m²
Mechanical Ventilation Riser 7.7 m²
Electrical DB Room 4.6 m²
Electrical Riser 6.8 m²
Disposal Hold 2.1 m²
Staff WC: Amb. 3.4 m²
WC: Semi Amb. 3.4 m²
UPS Room A 7.2 m²
UPS Room B 10.8 m²
Electrical Room A 17.1 m²
Edge Equipment Room (EER) 2 11.7 m²
Mechanical Ventilation Riser 6.5 m²
Mechanical Ventilation Riser 4.3 m²
Consult Exam Room: Ultrasound 16.2 m²
Consult Exam Room: Ultrasound 16.5 m²
Consult Exam Room: Ultrasound 15.8 m²
Recovery Circulation 24.0 m²
MRI Controlled Lobby 10.0 m²
MRI Controlled Circulation 56.4 m²
Linen 1.8 m²
1st Stage Recovery Bay 12.7 m²
1st Stage Recovery Bay 11.3 m²
1st Stage Recovery Bay 11.3 m²
MRI Dirty Utility 8.2 m²
MRI Store 3.3 m²
MRI Doc M WC 4.2 m²
MRI Clean Utility 9.8 m²
Imaging Room: MRI 39.8 m²
Control Room: MRI 18.0 m²
1.1 m² CPD Cupboard
Technical Room: MRI 8.1 m²
Technical Room: MRI 8.0 m²
CPD Cupboard 1.2 m²
Control Room: MRI 16.1 m²
Imaging Room: MRI 39.7 m²

Guide rails on side walls rather than rear wall to avoid independent lining

Glazed areas should achieve min. 40dB R_w

Glazed areas should achieve min. 50dB R_w

STATUS	REV	DATE	DESCRIPTION
S2	P24	05/03/25	GA and Ceiling Plans to Acoustician
S2	P18	18/02/25	Current GA Plan Issue
S0	P17	04/02/25	Issued for coordination
S0	P16	31/01/25	WIP Fire Strategy Plans
S0	P15	29/01/25	Work in Progress Department Plans
S0	P14	23/01/25	First Issue
S0	P13	17/01/25	WIP Fire Strategies to NWSSP

CLIENT
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REVISED BY: IB
CHECKED BY: EG
ORIGINATOR NO: 155750

CONSULTANT
STRIDE TREGLOWN
www.stridetreglown.com

PROJECT
Llantrisant Health Park
Pontyclun CF72 8XL

DRAWING TITLE
Zone 01 - Ground Floor GA Plan - Diagnostics

STATUS CODE: S0 - WORK IN PROGRESS
SCALE: 1 : 100 @A1

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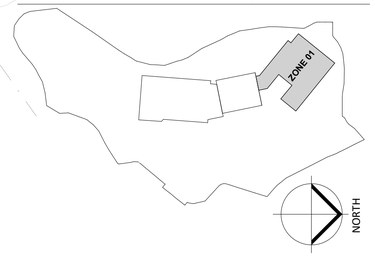

Glazed area should achieve min. 40dB R_w

High rated curved walls will require coordination with manufacturer as this could limit plasterboard types, it is recommended that all curved walls are reviewed

Glazed area should achieve min. 40dB R_w

Key

- 40dB R_w
- 45dB R_w
- 50dB R_w
- 53dB R_w
- 57dB R_w
- 62dB R_w
- 30dB R_w
- 35dB R_w
- Additional impact treatment advised

STATUS	REV	DATE	DESCRIPTION
S2	P24	05/03/25	GA and Ceiling Plans to Acoustician
S2	P18	18/02/25	Current GA Plan Issue
S0	P17	04/02/25	Issued for coordination
S0	P16	31/01/25	WIP Fire Strategy Plans
S0	P15	29/01/25	Work in Progress Department Plans
S0	P14	23/01/25	First Issue
S0	P13	17/01/25	WIP Fire Strategies to NWSSP

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PROJECT

Llantrisant Health Park
Pontyclun CF72 8XL

DRAWING TITLE

Zone 01 - First Floor GA Plan - Endoscopy

STATUS CODE: S2 - SUITABLE FOR INFORMATION

SCALE: 1 : 100 @A1

PROJECT - ORIGINATOR - FUNCTION - SPATIAL - FORM - DISCIPLINE - NUMBER: W550-STL-01-01-DR-A-10001

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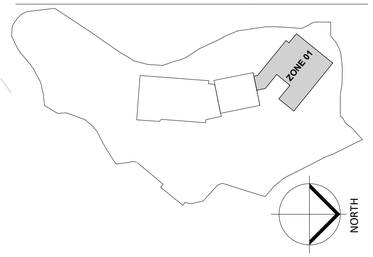

EXTERNAL PLANT LINKED TO ZONE 2

ENCLOSED PLANT LINK TO ZONE 2

Door rating to be reviewed at Stage 4

Door rating to be reviewed at Stage 4

ROOF TERRACE

LIGHTWELL

Locker Room 20.3 m²
WC: Semi Amb. 3.0 m²
WC: Semi Amb. 2.9 m²
WC: Semi Amb. 3.0 m²
WC: Semi Amb. 2.9 m²
Lobby 17.3 m²
WC: Ind. Wheelchair 5.5 m²
WC: Semi Amb. 2.9 m²
Stair Core 01 35.8 m²
Cleaners 5.4 m²
Store 5.1 m²
FM Lift 7.4 m²
Stair Lobby 28.1 m²
Patient Lift 7.6 m²
Teaching room (Non-Clinical) 47.5 m²
Teaching room (Non-Clinical) 46.1 m²
Seminar/IT Room (Non-Clinical) 39.3 m²
Support Office 27.6 m²
Oxy. Riser A1 1.4 m²
Oxy. Riser A2 1.4 m²
Mechanical Ventilation Riser 4.0 m²
Mechanical Ventilation Riser 4.2 m²
Mechanical Services Riser 4.1 m²
Break-Out Circulation 85.1 m²
Open Plan Hub Entrance/Break out 63.6 m²
Kitchen 14.5 m²
2.9° Fall (1:20)
MCWS Riser 4.6 m²
Delegate Break-Out Space 13.7 m²
Patient Lift 8.0 m²
Stair Lobby 13.9 m²
Stair Core 02 47.8 m²
Electrical Riser 4.1 m²
Edge Equipment Room (EER) 5 5.7 m²
Simulator Room 15.1 m²
Electrical Room 8.2 m²
Disposal Hold (+Freezer) 8.1 m²
Dirty Utility 11.8 m²
Skills Lab Circulation 54.7 m²
Skills Area 1
Skills Area 2
Skills Lab Area 99.9 m²
Skills Area 3
Skills Area 5
Skills Area 4
Mechanical Ventilation Riser 5.9 m²
Linen Bay 2.7 m²
Store Room: Cold 2.2 m²
Hot Desking Office 23.5 m²
Technician office 14.8 m²
Store Room: Academy/admin/skill lab 14.1 m²
Tissue Preparation Area 17.9 m²
Plant Lobby 7.2 m²
Domestic Water Plant 56.6 m²
Stair Core 03 32.8 m²
Stair Lobby 8.0 m²
Plant 547.3 m²
Plant 452.2 m²
Riser 8.5 m²
Riser 5.0 m²
Riser 7.8 m²
Riser 4.9 m²
Riser 7.0 m²

Key

- 40dB R_w
- 45dB R_w
- 50dB R_w
- 53dB R_w
- 57dB R_w
- 62dB R_w
- 30dB R_w
- 35dB R_w
- Additional impact treatment advised

STATUS	REV	DATE	DESCRIPTION
S2	P24	05/03/25	GA and Ceiling Plans to Acoustician
S2	P18	18/02/25	Current GA Plan Issue
S0	P17	04/02/25	Issued for coordination
S0	P16	31/01/25	WIP Fire Strategy Plans
S0	P15	29/01/25	Work in Progress Department Plans
S0	P14	23/01/25	First Issue
S0	P13	17/01/25	WIP Fire Strategies to NWSSP

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ORIGINATOR NO: 155750

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PROJECT

Llantrisant Health Park
Pontyclun CF72 8XL

DRAWING TITLE

Zone 01 - Second Floor GA Plan - Skills Hub Academy

STATUS CODE: S2 - SUITABLE FOR INFORMATION

SCALE: 1 : 100 @A1

PROJECT - ORIGINATOR - FUNCTION - SPATIAL - FORM - DISCIPLINE - NUMBER: W550-STL-01-02-DR-A-10002

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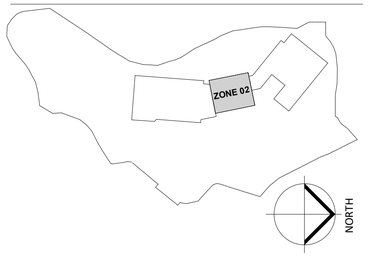

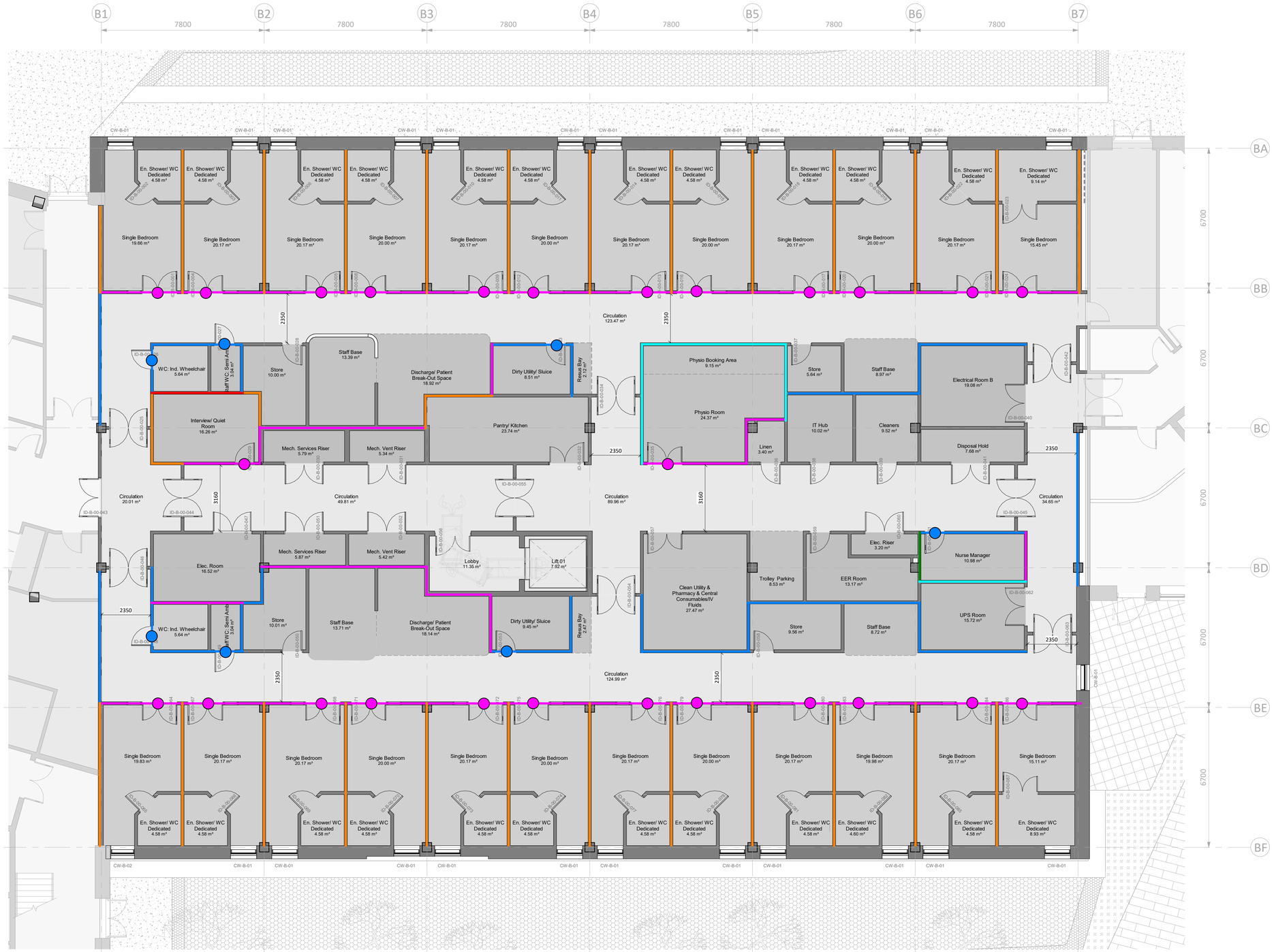

Key

- 40dB R_w
- 45dB R_w
- 50dB R_w
- 53dB R_w
- 57dB R_w
- 62dB R_w
- 30dB R_w
- 35dB R_w
- Additional impact treatment advised

STATUS	REV	DATE	DESCRIPTION
S2	P24	05/03/25	GA and Ceiling Plans to Acoustician
S2	P18	18/02/25	Current GA Plan issue
S0	P17	04/02/25	Issued for coordination
S0	P16	31/01/25	WIP Fire Strategy Plans issued
S0	P15	29/01/25	Work in Progress Department Plans
S0	P13	17/01/25	WIP Fire Strategies to NWSSP
S5	P10	08/01/25	GA Plans for RIBA 3 Sign-Off by CTMUHB

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REVISED BY: IB

CHECKED BY: EG

ORIGINATOR NO: 155750

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Llantrisant Health Park
Pontyclun CF72 8XL

DRAWING TITLE

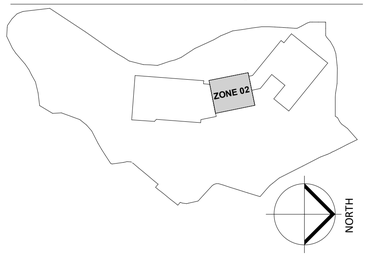
Zone 02 - Ground Floor GA Plan - Arthroplasty Recovery (Beds)

STATUS CODE: S5 - SUITABLE FOR REVIEW & ACCEPTANCE

SCALE: 1 : 100 @A1

PROJECT - ORIGINATOR - FUNCTION - SPATIAL - FORM - DISCIPLINE - NUMBER: W550-STL-02-00-DR-A-10000

STATUS_REVISION: S2_P24



B1 B2 B3 B4 B5 B6 B7 — 7800

BA BB BC BD BE BF — 6700

Trolley Bay M11 12.58 m²
Trolley Bay M10 12.72 m²
Trolley Bay M7 12.72 m²
Trolley Bay M6 12.72 m²
Trolley Bay M3 12.72 m²
Trolley Bay M2 12.73 m²
Recovery Circ. 24.55 m²
Recovery Circ. 24.55 m²
Recovery Circ. 24.55 m²
Trolley Bay M12 14.01 m²
Trolley Bay M9 14.01 m²
Trolley Bay M8 14.01 m²
Trolley Bay M5 14.01 m²
Trolley Bay M4 14.01 m²
Trolley Bay M1 14.00 m²
En. Shower/ WC Dedicated 4.58 m²
En. Shower/ WC Dedicated 4.58 m²
En. Shower/ WC Dedicated 4.58 m²
Single Bedroom 20.17 m²
Single Bedroom 20.17 m²
Single Bedroom 19.96 m²

Female Wing Circulation 123.48 m²

Shower Room 9.57 m²
WC: Ind. Wheelchair 5.54 m²
Store 5.00 m²
Staff Base 13.18 m²
Discharge/ Patient Break-Out Space 17.67 m²
Dirty Utility 8.53 m²
Reuse Bay 12.47 m²
Store 2.78 m²
Staff WC: Semi Amb 4.18 m²
Interview Room 7.29 m²
Mech. Services Riser 5.57 m²
Mech. Vent Riser 5.34 m²
Pantry Kitchen 23.70 m²

Physio Booking Area 9.15 m²
Physio Room 24.37 m²
WC: Ind. Wheelchair 5.64 m²
Staff Base 8.97 m²
Treatment/ Training Room 19.08 m²
Linen 3.40 m²
IT Hub 10.02 m²
Cleaners 9.52 m²
Disposal Hold 7.68 m²

Circulation 29.93 m²
Circulation 39.89 m²
Circulation 89.94 m²
Circulation 35.47 m²

Staff WC: Semi Amb 4.18 m²
Elec. Room 7.35 m²
Mech. Services Riser 5.87 m²
Mech. Vent Riser 5.42 m²
Lobby 11.35 m²
Lift 01 7.62 m²
Store 2.86 m²
Shower Room 9.53 m²
WC: Ind. Wheelchair 5.77 m²
Store 4.74 m²
Staff Base 13.23 m²
Discharge/ Patient Break-Out Space 18.17 m²
Dirty Utility/ Sluice 9.45 m²
Reuse Bay 24.47 m²

Clean Utility & Pharmacy & Central Consumables/IV Fluids 27.47 m²
Trolley Parking 8.54 m²
Elec. Riser 3.20 m²
Electrical Room 13.17 m²
Nurse Manager 10.98 m²
Store 3.53 m²
WC: Ind. Wheelchair 5.70 m²
Staff Base 8.72 m²
UPS Room 15.72 m²

Male Wing Circulation 125.50 m²

Trolley Bay 13.36 m²
Trolley Bay 13.39 m²
Trolley Bay 13.39 m²
Trolley Bay 13.39 m²
Trolley Bay 13.39 m²
Trolley Bay F1 13.47 m²
Recovery Circ. 24.01 m²
Recovery Circ. 24.55 m²
Recovery Circ. 24.55 m²
Trolley Bay 13.36 m²
Trolley Bay 13.34 m²
Trolley Bay 13.34 m²
Trolley Bay 13.34 m²
Trolley Bay 13.34 m²
Trolley Bay 13.42 m²
Single Bedroom 20.00 m²
Single Bedroom 20.17 m²
Single Bedroom 19.39 m²
En. Shower/ WC Dedicated 4.58 m²
En. Shower/ WC Dedicated 4.58 m²
En. Shower/ WC Dedicated 4.58 m²

CW-B-03 CW-B-04

Key

- 40dB R_w
- 45dB R_w
- 50dB R_w
- 53dB R_w
- 57dB R_w
- 62dB R_w
- 30dB R_w
- 35dB R_w
- Additional impact treatment advised

STATUS	REV	DATE	DESCRIPTION
S2	P24	05/03/25	GA and Ceiling Plans to Acoustician
S2	P18	18/02/25	Current GA Plan issue
S0	P17	04/02/25	Issued for coordination
S0	P16	31/01/25	WIP Fire Strategy Plans issued
S0	P15	29/01/25	Work in Progress Department Plans
S0	P13	17/01/25	WIP Fire Strategies to NWSSP
S5	P10	08/01/25	GA Plans for RIBA 3 Sign-Off by CTMUHB

CLIENT

Bwrdd Iechyd Prifysgol Cwm Taf Morgannwg University Health Board

REVISED BY: TR/CM

CHECKED BY: CM/ACP

ORIGINATOR NO: 155750

CONSULTANT

STRIDE TREGLOWN

www.stridetreglown.com

PROJECT

Llantrisant Health Park
Pontyclun CF72 8XL

DRAWING TITLE

Zone 02 - First Floor GA Plan - Arthroplasty Recovery (Trolleys)

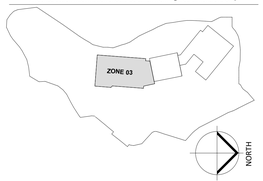
STATUS CODE

S5 - SUITABLE FOR REVIEW & ACCEPTANCE

SCALE: 1 : 100 @A1

PROJECT - ORIGINATOR - FUNCTION - SPATIAL - FORM - DISCIPLINE - NUMBER: W550-STL-02-01-DR-A-10001

STATUS_REVISION: S2_P24



Key

- 40dB R_w
- 45dB R_w
- 50dB R_w
- 53dB R_w
- 57dB R_w
- 62dB R_w
- 30dB R_w
- 35dB R_w
- Additional impact treatment advised

Exit bay risers to be reviewed at Stage 4

Glazed area should achieve min. 40dB R_w

Consider paper towels instead of hand dryer to avoid noise disturbance to adjacent rooms

STATUS	REV	DATE	DESCRIPTION
S2	P24	05/03/25	GA and Ceiling Plans to Acoustician
S2	P18	18/02/25	Current GA Plans to Client
S0	P17	03/02/25	Revised GA Plans following Client change
S0	P16	31/01/25	WIP Fire Strategy Plans
S0	P15	29/01/25	Work in Progress Department Plans
S0	P13	17/01/25	WIP Fire Strategies to NWSSP
S5	P10	08/01/25	GA Plans for RIBA 3 Sign-Off

CLIENT

Bwrdd Iechyd Prifysgol Cwm Taf Morgannwg University Health Board

REVISED BY: TR/KG/CM
CHECKED BY: CM/ACP
ORIGINATOR NO: 155750

CONSULTANT

STRIDE TREGLOWN

www.stridetreglown.com

PROJECT

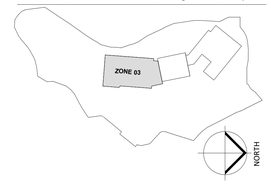
Llantrisant Health Park
Pontyclun CF72 8XL

DRAWING TITLE

Zone 03 - Ground Floor GA Plan - Day Case Surgery

STATUS CODE	SCALE
S5 - SUITABLE FOR REVIEW & ACCEPTANCE	1 : 100 @A0

PROJECT - ORIGINATOR - FUNCTION - SPATIAL - FORM - DISCIPLINE - NUMBER	STATUS_REVISION
W550-STL-03-00-DR-A-10000	S2_P24



Key

- 40dB R_w
- 45dB R_w
- 50dB R_w
- 53dB R_w
- 57dB R_w
- 62dB R_w
- 30dB R_w
- 35dB R_w
- Additional impact treatment advised

Consider paper towels instead of hand dryer to avoid noise disturbance to adjacent rooms

STATUS	REV	DATE	DESCRIPTION
S2	P24	05/03/25	GA and Ceiling Plans to Acoustician
S2	P18	18/02/25	Current GA Plans to Client
S0	P17	03/02/25	Revised GA Plans following Client change
S0	P16	31/01/25	WIP Fire Strategy Plans
S0	P15	29/01/25	Work in Progress Department Plans
S0	P13	17/01/25	WIP Fire Strategies to NWSSP
S5	P10	08/01/25	GA Plans for RIBA 3 Sign-Off

CLIENT

GIG CYMRU NHS WALES — Bwrdd Iechyd Prifysgol Cwm Taf Morgannwg University Health Board

REVISED BY: TR/KG/CM
CHECKED BY: CM/ACP
ORIGINATOR NO: 155750

CONSULTANT

STRIDE TREGLOWN

PROJECT

Llantrisant Health Park
Pontyclun CF72 8XL

DRAWING TITLE

Zone 03 - First Floor GA Plan - Arthroplasty Surgery

STATUS CODE: S5 - SUITABLE FOR REVIEW & ACCEPTANCE
SCALE: 1 : 100 @A0

PROJECT - ORIGINATOR - FUNCTION - SPATIAL - FORM - DISCIPLINE - NUMBER: W550-STL-03-01-DR-A-10001
STATUS_REVISION: S2_P24

Appendix C Specification for Lift Installations

The ride quality of passenger lifts is to be measured using approved* precision grade vibration and sound recording equipment, fitted with the latest software.

A series of measurements are to be made following the methodology of BS ISO 18738: 2003 over different journeys in both directions of travel, including a full height run; a run over approximately half travel and a number of single floor journeys. All measurements are to be taken over a full lift cycle defined as a single journey starting when the lift doors commence closing on one floor to the point when they are fully open on the destination floor.

To ensure accurate assessment of the noise from door equipment, all measurements are to be made with the voice module, landing gongs and other audible signals muted. Measurements shall also clearly identify the direction of travel and the journey details.

The results of the noise and vibration measurements shall demonstrate compliance with the following criteria:

Maximum Noise Level in Lift Car	55 $L_{Amax(fast)}$
Maximum Noise Level in Lift Lobby	55 $L_{Amax(fast)}$
Maximum Noise into Areas through Lift Shaft Walls	30 $L_{Amax(fast)}$
Maximum Noise from In Car Announcement and Arrival Gongs	65 $L_{Amax(fast)}$

Note: The maximum noise values specified above shall be measured with any in-car mechanical ventilation devices both switched "on" and switched "off". Noise levels shall be measured at 1m from the Lift Door or Shaft Wall as appropriate.

Maximum Acceleration	1.2m/sec^2
Maximum Jerk	1.8m/sec^3
Maximum Horizontal Vibration	0.12m/sec^2 (12mg)
Maximum Vertical Vibration	0.15m/sec^2 (15mg)

Note: The maximum vibration values specified above are the peak-to-peak levels using the ISO ride quality filter.

The maximum vibration levels measured on the floor slabs in occupied areas shall not exceed the following Vibration Dose Value (VDV), as defined in BS 6472-1 : 2008.

Night-time 8 hours	0.1m/sec$^{1.75}$
Daytime 16 hours	0.2m/sec$^{1.75}$

In order to meet the above criteria it is suggested that consideration be given to the following items.

All lift equipment (including the lift motor, starter electrical cabinet, car controllers, reactors and motors generators) should be suitably vibration isolated as appropriate. All connections, such as electrical grounding, shall be formed from flexible cable/conduit.

- In the case of hydraulic lift installations, pipework shall be fitted with in-line silencers in order to effectively control noise transmission to areas outside the lift motor room via hydraulic fluid pipes.
- All support steelwork for the installation is to be selected to avoid any resonances forced by the lift motor and the natural frequencies of steelwork should therefore fall between the dominant system frequencies.
- The steelwork, in particular beams supporting diverter sheaves and pulleys, should be as stiff as possible and suitably vibration isolated from the main structural building elements. The mounting arrangements for the beams should be carefully considered to ensure that the beams are not less stiff than the proposed method of isolation. To this end, long span beams should be avoided and beams should terminate as closely as possible to columns rather than other horizontal beams. The stiffness of the beam support member should be at least 3 time greater than the stiffness of the beam.
- Rope hole penetrations shall be acoustically treated (if required) so as to ensure lift motor room noise breakout is controlled to ensure acceptable noise levels in the 'lift lobby' area as defined above.
- (f) The car and counterweight guides shall be so joined and fixed to their brackets that they do not deflect by more than 1.0mm under normal operating conditions, and for all panoramic passenger and goods lifts the fixings shall be at floor level only.