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BREEAM HEA5 & POL5

Prepared: 6th September 2024

Report No	22418-1-R1
Client	Darwin Group
Site	Dewsbury District Hospital Halifax Road Dewsbury, WF13 4HS

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1. Quality Management

Report Number	22418-1-R1
Issue	Revision 1
Prepared	6 th September 2024
Prepared By	Jonathan Seiffert BSc, MIOA
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3. Executive Summary

3.1.1. An environmental noise assessment has been carried out for a proposed new hospital building at Dewsbury District Hospital, Dewsbury, WF13 4HS ("Proposed Development").

3.2. Measurement, Assessment and Evaluation

3.2.1. The survey was carried out to BS7445-1:2003¹ and BS7445-2:1991² which are covered under our UKAS Accreditation.

3.2.2. The interpretation of the data and the specification of suitable mitigation or treatment are outside the scope of our UKAS accreditation but is covered in our 17025 Quality Management System and reporting procedure.

3.2.3. The person responsible for this report is Bill Whitfield. He holds a Master's degree in Environmental Engineering and a PhD in Acoustics from the University of Liverpool and has more than 30 years' experience in acoustics and is a full corporate member of the Institute of Acoustics.

3.3. Scope

- 3.3.1. This report covers all aspects of the noise survey, including:
- the identification of acoustic design criteria;
 - an objective sound pressure level survey of the existing site;
 - analysis of the data;
 - the design of any mitigation to meet the required internal noise criteria
 - assessment of proposed specific sound sources

¹ BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Description of quantities and procedures"

² BS7445-2:1991 "Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use"

3.4. Results Summary

- 3.4.1. The single figure glazing and ventilator performance requirements in order to achieve the internal design criteria are summarised in Table 1. The glazing performance has been specified in terms of the road traffic corrected weighted sound reduction index, $R_w + C_{tr}$, and the ventilator performance has been specified in terms of the road traffic corrected element normalised level difference $D_{ne,w} + C_{tr}$.

Glazing specification
Specification 1: Ward – single person, Ward – Multi-bed, Small office, Small meeting rooms, Operating theatres
7dB $R_w + C_{tr}$ / 13dB $D_{ne,w} + C_{tr}$
Specification 2: Open clinician space, Personal hygiene (en-suite), Laboratories
2dB $R_w + C_{tr}$ / 8dB $D_{ne,w} + C_{tr}$
Specification 3: Small kitchens, Public areas
N/A
Specification 4: Circulation Space, Large kitchens, Personal hygiene (public & staff)
N/A

Table 1 – Required facade sound insulation (Glazing/Ventilator)

- 3.4.2. Table 12 in section 12.4 gives the results of the prediction of specific sound level from proposed rooftop plant equipment. Although the POL05 criteria of 5dB below the background sound level is exceeded during the night-time, the target criteria of 27dB(A) is considered a low sound pressure level and the predicted specific sound level is significantly below the existing measured $L_{Aeq,8hour}$ at this location. This suggests that the specific sound level from the proposed equipment will not have a contribution to the overall sound pressure level at the receiver position and therefore it is suggested that the BREEAM POL05 credit should be awarded on this basis.

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5. Background

5.1. Noise Policy Statement for England

- 5.1.1. The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to *“promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”*.
- 5.1.2. This long-term vision is supported by the following aims; through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
- Avoid significant adverse impacts on health and quality of life;
 - Mitigate and minimise adverse impacts on health and quality of life;
 - Where possible, contribute to the improvement of health and quality of life.
- 5.1.3. The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise).

5.2. National Planning Policy Framework

- 5.2.1. The National Planning Policy Framework (NPPF) was published on 19th June 2019 and sets out the Government’s planning policies for England and how these are expected to be applied. The framework states that the planning system should contribute to and enhance the natural and local environment by:
- “preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”*.
- 5.2.2. The NPPF requires that new developments be appropriate to their locations such that the effects of pollution on health have been taken into account. Planning policies and decisions should aim to:
1. avoid noise giving rise to significant adverse impacts on health and the quality of life;
 2. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development; and,
 3. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.
- 5.2.3. Existing businesses near to proposed development should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

5.3. National Planning Practice Guidance

- 5.3.1. The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) which was updated on the 24th June 2021 to reflect the changes made to the NPPF and make it more accessible.³

³ <http://planningguidance.communities.gov.uk/>

- 5.3.2. It advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated and noise is listed as a specific category. A summary of the effects of noise exposure (in terms of health and quality of life) associated with both noise generating developments and noise sensitive developments is presented within the PPG and reproduced in Table 2.

Perception	Examples of outcomes	Effect level	Action
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect (NOAEL)	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very intrusive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 2 – Noise exposure hierarchy

- 5.3.3. There are a number of factors that determine whether a noise could be a concern to a receptor. These include: the absolute level of the noise and when it occurs, whether it is existing or new to the area, temporal characteristics, spectral content and the acoustic absorption in the area.
- 5.3.4. It is emphasised in the PPG that the planning process should be used to mitigate and minimise the impact of noise. This could include: engineering the noise sources to be quiet, minimising the impact of noise through layout, using conditions/obligations to restrict activities, mitigating the impact in places where noise is likely to be experienced (e.g. using facade sound insulation).

6. Introduction

6.1.1. An environmental noise survey has been carried out for a proposed new hospital building at Dewsbury District Hospital, Dewsbury, WF13 4HS.

6.2. Proposed Development

6.2.1. An image showing the proposed location and layout of the Proposed Development is given in Figure 1.



Figure 1 - Plan showing the location and layout of the Proposed Development

6.3. Noise Climate

6.3.1. At the time of the survey visits the technician noted that the noise climate was dominated by road traffic noise from Halifax Road.

7. Assessment Criteria

BREEAM New Construction 2018 ('Industrial, Retail, Prisons and Other Buildings')

- 7.1.1. BREEAM is a sustainability rating scheme that aims to mitigate the life-cycle impacts of buildings on the environment and provide a credible way to rate and label them. The rating system is comprised of a number of credits which span the range of issues that affect the environmental impact of a building including: management, health and wellbeing, energy, transport, water, materials, waste, land use and ecology, pollution and innovation.
- 7.1.2. Within the range of issues there are two credit issues that have implications to noise and buildings: HEA05 Acoustics and POL 05 Reduction of Noise Pollution.

HEA 05: Acoustics

- 7.1.3. Noise within buildings can come from various sources, including: building systems, occupants, equipment and external sources. Excessive noise can have a range of adverse effects on building users including: inconvenience and annoyance, loss of concentration, decreased productivity and sleep disturbance. Therefore, the management of noise within a building is important to maximise occupant, comfort, occupant efficiency and to provide privacy. As a result, building acoustics are an important consideration in the design, operation and construction of buildings. The aim of the HEA 05 credit is to ensure the building is capable of providing an appropriate acoustic environment to provide comfort for building users.
- 7.1.4. There are up to four credits available in the HEA05 credit issue; however, only three credits are available for buildings outside of the education category.
- 7.1.5. In order to achieve the HEA5 credits the development must comply with the following criteria from BS8233:1999:⁴
 - Credit 1: Sound insulation (targeted)
 - Credit 2: Internal ambient noise (targeted)
 - Credit 3: Reverberation time

⁴ BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

7.2. Guideline Values: Acoustics

Internal Ambient Noise Criteria

- 7.2.1. HTM 08-01 contains target criteria for internal levels to be met from external noise sources depending on the function of specific spaces. The criteria given in Table 1 in HTM 08-01 has been reproduced in Table 3.

Room Type	Example	Criteria (dB)
Ward – single person	Single bed ward, single bed recovery areas and on-call rooms, relatives' overnight stay	40 $L_{Aeq,1hr}$, daytime 35 $L_{Aeq, 1hr}$ night 45 L_{Amax} , f night
Ward – multi-bed	Multi-bed wards, recovery areas	45 $L_{Aeq, 1hr}$ daytime 35 $L_{Aeq, 1hr}$ night 45 L_{AFMAX} night
Small office-type space	Private offices, small treatment rooms, interview rooms, consulting rooms	40 $L_{Aeq, 1hr}$
Open clinical areas	A&E	45 $L_{Aeq, 1hr}$
Circulation spaces	Corridors, hospital street, atria	55 $L_{Aeq, 1hr}$
Public areas	Dining areas, waiting areas, playrooms	50 $L_{Aeq, 1hr}$
Personal hygiene (en-suite)	Toilets, showers	45 $L_{Aeq, 1hr}$
Personal hygiene (public and staff)	Toilets, showers	55 $L_{Aeq, 1hr}$
Small food-preparation areas	Ward kitchens	50 $L_{Aeq, 1hr}$
Large food-preparation areas	Main kitchens	55 $L_{Aeq, 1hr}$
Large meeting rooms (>35 m ² floor area)	Lecture theatres, meeting rooms, board rooms, seminar rooms, classrooms	35 $L_{Aeq, 1hr}$
Small meeting rooms ($\leq$ 35 m ² floor area)	Meeting rooms, seminar rooms, classrooms, board rooms	40 $L_{Aeq, 1hr}$
Operating theatres	Operating theatres	40 $L_{Aeq, 1hr}$ 50 L_{AFMAX}
Laboratories	Laboratories	45 $L_{Aeq, 1hr}$

Table 3 - Table 1 from HTM 08-01

Internal Sound Insulation

7.2.2. The sound insulation criteria from HTM-08-01 is specified to prevent noise activities interfering with the need for quiet in adjacent rooms and to prevent private conversations being overheard. In order to specify the required level of sound insulation, each room type is assigned a rating for confidentiality, noise generation and noise sensitivity. These ratings are combined to devise the in-situ sound insulation performance between each room pair. These criteria are applicable to partition and floor sound insulation. Additional requirement for impact sound insulation is specified for floors. Table 3 and 4 of HTM08-01 details the acoustic requirements for partitions and floors. These have been reproduced below.

Room	Privacy requirement for source room	Noise Generation of the source room	Noise sensitivity of receiving room
Clinical areas			
Single-bed/on-call room	Confidential	Typical	Medium
Multi-bed room	Moderate	Typical	Medium
Children & older people (single bed)	Private	High	Medium
Children & older people (multi-bed)	Moderate	High	Medium
Consulting room	Confidential	Typical	Medium
Examination room	Confidential	Typical	Medium
Treatment room	Confidential	Typical	Medium
Counselling/bereavement room	Confidential	High	Medium
Interview room	Confidential	Typical	Medium
Operating theatre suite	Private	Typical	Sensitive
Nurseries	Moderate	Very high	Medium
Birthing room	Private	Very high	Medium
Laboratories	Moderate	Typical	Medium
Dirty utility/sluite	Not Private	High	Not sensitive
Clean utility	Not Private	Low	Not sensitive
Speech and language therapy	Confidential	High	Sensitive
Snorezen/multi-sensory room	Confidential	High	Sensitive
Public areas			
Multi-faith/chapel	Private	High	Sensitive
Corridor (no door)	Not private	Typical	Not sensitive
Atrium	Not private	High	Not sensitive
Dining	Not private	High	Not sensitive
Toilets (not cubicles)	Moderate	Typical	Not sensitive
Waiting (large >20 people)	Not private	High	Not sensitive
Waiting (small .20 people)	Not private	Typical	Not sensitive
Staff areas			
Toilets (not cubicles)	Moderate	Typical	Not sensitive
Main kitchen	Not private	Very high	Not sensitive
Ward kitchen, pantry	Not private	Typical	Not Sensitive
Storeroom	Not private	Low	Not sensitive
Rest room	Moderate	High	Medium
Locker/changing room	Moderate	Typical	Not sensitive

Room	Privacy requirement for source room	Noise Generation of the source room	Noise sensitivity of receiving room
Large training/seminar (>35 m ²)	Private	High	Medium
Small training/seminar (.35 m ²)	Private	Typical	Medium
Lecture theatre	Private	High	Sensitive
Library/archiving room	Moderate	Low	Sensitive
Single-person office	Private	Typical	Medium
Multi-person office (2.4 people)	Moderate	Typical	Medium
Open-plan office (.5 people)	Not private	Typical	Medium
Boardroom	Confidential	High	Medium
Large meeting room (>35 m ²)	Private	High	Medium
Small meeting room (.35 m ²)	Private	Typical	Medium

Table 4 - Sound-insulation parameters of rooms

Privacy requirement for source room	Noise generation of the source room	Noise sensitivity of receiving room		
		Not sensitive	Medium sensitivity	Sensitive
Confidential	Very high	47	52	*
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Private	Very high	47	52	*
	High	42	47	52
	Typical	42	42	47
	Low	37	42	42
Moderate	Very high	47	52	*
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	*
	High	No rating	42	47
	Typical	No rating	No rating	42
	Low	No rating	No rating	37

Notes: These adjacencies should be avoided by layout planning. Where this is not possible, $D_{nT,w}$ 57 dB needs to be achieved as a minimum. In practice this is extremely difficult, as it would need very wide partitions and place onerous demands on the building structure to control flanking noise sufficiently.

Table 5 – Sound-Insulation ratings (dB $D_{nT,w}$) to be achieved on site

- 7.2.3. Where there are doors and/or glazed elements present in a partition, the sound insulation performance will be limited by the weakest element; therefore, a lower performing partition will be sufficient.

- 7.2.4. HTM-08-01 provides guidance on partitions that contain doorsets or glazed elements. Sections 2.66 and 2.67 of HTM-08-01 are given below:

2.66 - A door in a partition will significantly downgrade the partition's performance. There is no benefit in specifying a partition performance with an R_w that is more than 10dB higher than the R_w of the doorset within it. As a typical doorset will have an R_w of 30-35dB, this means that where there is a door, there is no acoustic benefit in providing partitions with an R_w higher than 40-45dB, unless especially high performance doorsets or lobbied doors are used.

2.67 – Where observation windows are included between adjacent rooms, partitions (including the glass should ideally achieve the target ratings given in Tables 4 and 5. However, it can be difficult to fit windows that meet the full acoustic specification into the width of partitions. In this case, as a minimum, the glazing configuration alone should achieve an R_w that is no more than 10dB below that of the R_w for the partition alone. This will reduce the sound insulation by an amount that depends on the size of the observation window in relation to the size of the partition.

- 7.2.5. Impact noise should be controlled at source wherever possible. Healthcare planning should separate heavily trafficked corridors from sensitive spaces such as wards. Wards should not be under heavily-trafficked corridors. If this is unavoidable, impact isolation treatments should be provided. A weighted standardised impact sound pressure level ($L_{nT,w}$) of 65 dB is considered a reasonable

POL5: Reduction of noise pollution

- 7.2.6. There is a single credit available for the POL5 credit issue. The credit seeks to protect existing nearby sensitive receivers from any potential new environmental noise sources on the proposed scheme such as fixed mechanical and electrical plant. Nearby sensitive receivers could include: residential areas, healthcare facilities, education establishments, libraries, places of worship, wildlife areas and parks.
- 7.2.7. Where there are no noise sensitive areas or buildings within 800m of the assessed site the credit can be awarded by default. Where there are noise sensitive areas or buildings within 800m of the site, one credit can be awarded where a noise impact assessment in compliance with BS7445^{5,6,7} has been carried out and:
- The existing background sound pressure level and expected rating sound level of the new noise sources have been compared
 - The noise level from the assessed building, as measured at the nearest noise sensitive receiver, must be at least 5dB lower than background level throughout the day and the night.
 - If this is not that case, mitigation will be applied to ensure that the above criteria are adhered to.
- 7.2.8. The noise impact assessment must be carried out by a suitably qualified acoustics consultant holding a recognised acoustics qualification and membership of an appropriate professional body.

⁵ BS7445-1:2003, 'Description and measurement of environmental noise – Part 1: Guide to quantities and procedures'

⁶ BS7445-2:1991, 'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'

⁷ BS7445-3:1991, 'Description and measurement of environmental noise – Part 3: Guide to the application of noise limits'

BS7445 (Parts 1-3)

- 7.2.9. BREEAM 2018 requires the environmental noise assessment for the POL5 credit to be compliant with the BS7445 series of standards. The aim of the BS7445 series is to provide material for the description of noise in community environments.
- 7.2.10. BS7445-1:2003 defines the basic quantities to be used for the description of noise in community environments and describes base procedures for the determination of these quantities. It standardises the quantities and procedures for measuring noise from rail, road, aircraft and industrial plant. The standard specifies the use of the A-weighted equivalent continuous sound pressure level, “LAeq,T”, to quantify the sound pressure levels of mixed sources over a time period, T. The results are always expressed in terms of this quantity even if supplemented by corrections or other descriptors that, in certain cases, may be deemed appropriate.
- 7.2.11. BS7445-2:1991 describes the methods to be used for measuring and describing environmental noise relevant to general land use. The document uses the concept of a rating level to determine a sound pressure level corrected for on-time, tone audibility, impulsivity and meteorological effects. Percentile levels may be used where the distribution of A-weighted sound pressure levels are of interest (such as the determination of a background sound pressure level).
- 7.2.12. Extensive guidance on outdoor sound measurement is also provided, this includes:
- Location of monitoring equipment
 - Appropriate measurement period relative to reference time interval
 - Suitable meteorological conditions for a survey
 - Sampling techniques used to minimise measurement time
 - Information to be reported
- 7.2.13. BS7445-3:1991 gives guidance on the application of noise limits. It gives details on the information required for specifying noise limits for specific noise sources based on the typical activity of the source and receiver, the sources operating conditions and its location.

BS4142:2014

- 7.2.14. BS4142 provides methods for rating and assessing **specific sound sources** of an industrial and/or commercial nature, which includes: industrial and manufacturing processes, fixed services plant, sound generated by the loading/unloading of goods and sound from mobile plant/vehicles associated with industrial/commercial premises (e.g. fork-lift trucks). The **assessment location** is outside a residential receptor.
- 7.2.15. The standard is specifically precluded from being used to assess the likely impact inside a building or from the assessment of various sound sources for which other (more relevant) guidance exists, including: music/entertainment noise, noise from people and construction noise.
- 7.2.16. The foundation of the assessment is to establish the following quantities, either by measurement or prediction:
- **Ambient sound:** The overall sound at the assessment location
 - **Residual sound:** The ambient sound without the specific sound source operating
 - **Specific sound:** The ambient sound with the specific sound source operating, corrected for residual sound
 - **Background sound:** Residual sound present for 90% of the time
- 7.2.17. How these quantities relate to the sound that would be measured during a survey has been illustrated in Figure 2.

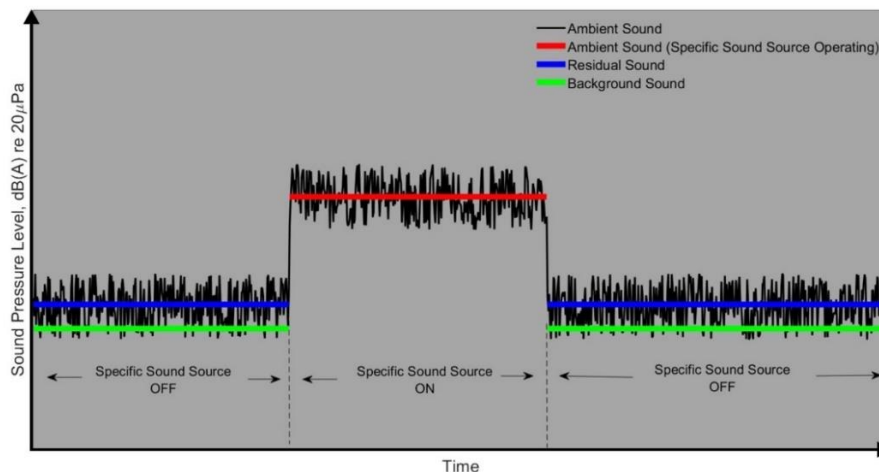


Figure 2 –
Diagrammatic
illustration of the
definitions of ambient,
residual, specific and
background sound

7.2.18. Once the specific sound level has been determined, this must be corrected for the presence of acoustic features that are audible at the assessment location to determine the **rating level**:

$$\text{Rating Level} = \text{Specific Sound Level} + \text{Character Corrections}$$

7.2.19. Normally it is possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:

- Tonality: +2dB for a 'just perceptible' tone, +4dB for 'clearly perceptible', and rising to +6dB for 'highly perceptible' tones.
- Impulsivity (rapidity of change and overall change in level): +3 dB for 'just perceptible' impulsivity, +6dB for 'clearly perceptible', rising to +9 dB for 'highly perceptible' impulsivity.
- Intermittency: if the on/off-time of the specific sound is readily distinctive at the noise-sensitive receivers, +3dB.

7.2.20. It should be noted that, where one feature is clearly perceived as dominant, it may be appropriate to apply a single correction. Where multiple features are likely to affect perception and response, each should be added arithmetically.

7.2.21. An estimate of the magnitude of the impact is evaluated by subtracting the measured background sound level at the assessment location from the rating level

$$\text{Assessment Level} = \text{Rating Level} - \text{Background Sound Level}$$

7.2.22. Typically, the greater the difference between the background and rating level, the greater the magnitude of impact, although BS 4142 emphasises that this is highly context-specific. As an initial estimate, BS4142 states that:

- A difference (between the background and rating level) of around +10 dB or more is likely to be indicative of significant adverse impact, depending on context
- A difference (between the background and rating level) of around +5 dB or more is likely to be indicative of adverse impact, depending on context
- Where the rating level does not exceed the background level, this is an indication that the specific sound will have a low impact, depending on context.

7.2.23. Where the initial estimate of the impact needs to be modified due to the context, other factors should be considered, including: absolute sound levels, the character and level of the residual sound and the sensitivity of the receiver, which includes the effect of building façade sound insulation.

8. Survey

8.1. Measurement Locations

- 8.1.1. Fixed position monitoring took place at one position to determine the representative background sound level at the nearest sensitive receiver and also to measure the road traffic noise generated by Halifax Road. The monitoring equipment was located 1.5m from the ground and at least 3m from the next nearest reflecting surface. The monitoring position is shown in Figure 3.



Figure 3 - Noise monitoring locations on site

- 8.1.2. The measurement instrumentation used during the survey is detailed in the appendix. The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003⁸ before and after the surveys. The calibration details are also detailed in the appendix.

8.2. Meteorology

- 8.2.1. During the survey the weather information was noted. This is summarised in Table 6.

	7 th February 2023	9 th February 2023
Roads(Wet/Dry)	Dry	Dry
Wind Speed (ms ⁻¹)/Direction	5 / W	4 / W

Table 6 - Meteorological data noted during the survey

⁸ BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures"

8.3. Measurement and Timescale

8.3.1. Unattended monitoring was carried out between 7th February 2023 and 9th February 2023. The measurements that have been made are summarised in Table 7.

Monitoring position	Date	Type	Quantity
1	7 th February 2023 – 9 th February 2023	Fixed/unattended	$L_{Aeq,15min}$ / $L_{A90,15min}$

Table 7 – Measurements made at the site of the Proposed Development

8.3.2. Sound pressure measurements were subsequently averaged into hourly, daytime and night-time periods. The acoustic measurements and their interpretation have been in accordance with BS 7445: Parts 1, and 2⁹. All sound pressure levels are in dB (re 20μPa).

8.4. Results Summary

8.4.1. The fixed position external measurement results are summarised in Table 8.

Measurement location	Daytime dB, $L_{Aeq,16hr}$	Night-time dB, $L_{Aeq,8hr}$
1	59.3	51.5

Table 8 - Summary of the external sound pressure levels measured (free field)

8.5. Background sound pressure level at nearby residential receiver: POL5

8.5.1. The graph in Figure 4 shows the results of the background sound pressure level survey.

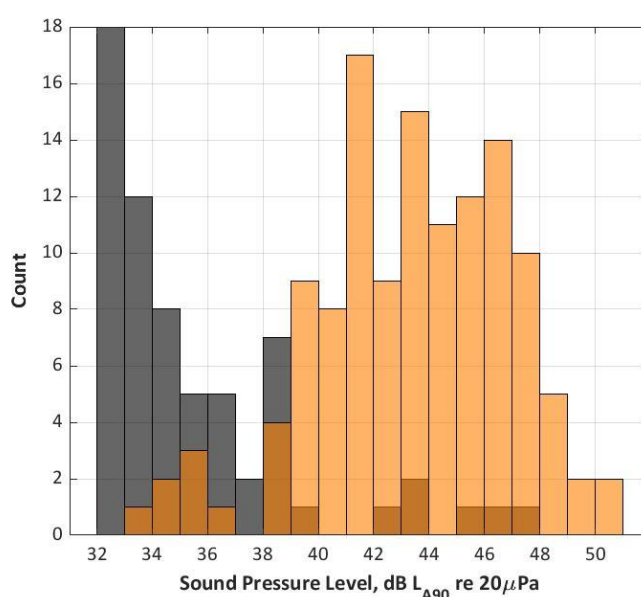


Figure 4 - Day & Night background noise measured at the monitoring position.

Daytime represented in **Orange**

Night-time represented in **Grey**

8.5.2. NOTE: The data has been presented in terms of frequency of occurrence to the nearest whole decibel.

8.5.3. It is shown that the daytime levels range between 33dB(A) and 51dB(A), the night-time levels range from 32dB(A) to 48dB(A). Representative background levels are taken to be 41dB(A) during the daytime and 32dB(A) during the night-time.

⁹ BS7445-2:1991 "Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use"

8.6. Specific Sound Sources

8.6.1. Information has been provided by the client regarding the proposed rooftop plant. The plant and the proposed operational information is summarised below:

Equipment	Daytime operation	Night-time operation	Sound power level, $L_{w(A)}$
Diesel Generator	Emergency only	Emergency only	N/A
ASHP 1-3 (HTG)	Yes (1 unit on standby)	Defrost only (1 unit on standby)	85.0dB
ASHP 4-6 (DHW)	Yes (1 unit on standby)	Yes (1 unit on standby)	82.3dB
CHW 1-3	Yes (1 unit on standby)	Yes (1 unit on standby)	83.5dB
AHU 1-5	Yes	No	81.2dB

8.6.2. Where units in the above table are noted to be for emergency use, defrost only or standby for other units, the contribution has not been included in the assessment.

9. 3D Noise Model

9.1.1. A 3D noise model has been constructed using SoundPLAN™ in order to predict the propagation of sound across the site of the Proposed Development. The calculation procedure has been used from ISO9613-2:1996¹⁰ to predict the propagation of sound from source to receiver, taking into account distance, screening, and atmospheric and ground conditions.

9.1.2. Terrain data has been taken from DEFRA. For the purposes of this assessment all external noise has been assumed to be due to road traffic noise. The results of the 3D noise model are shown in Figure 5.

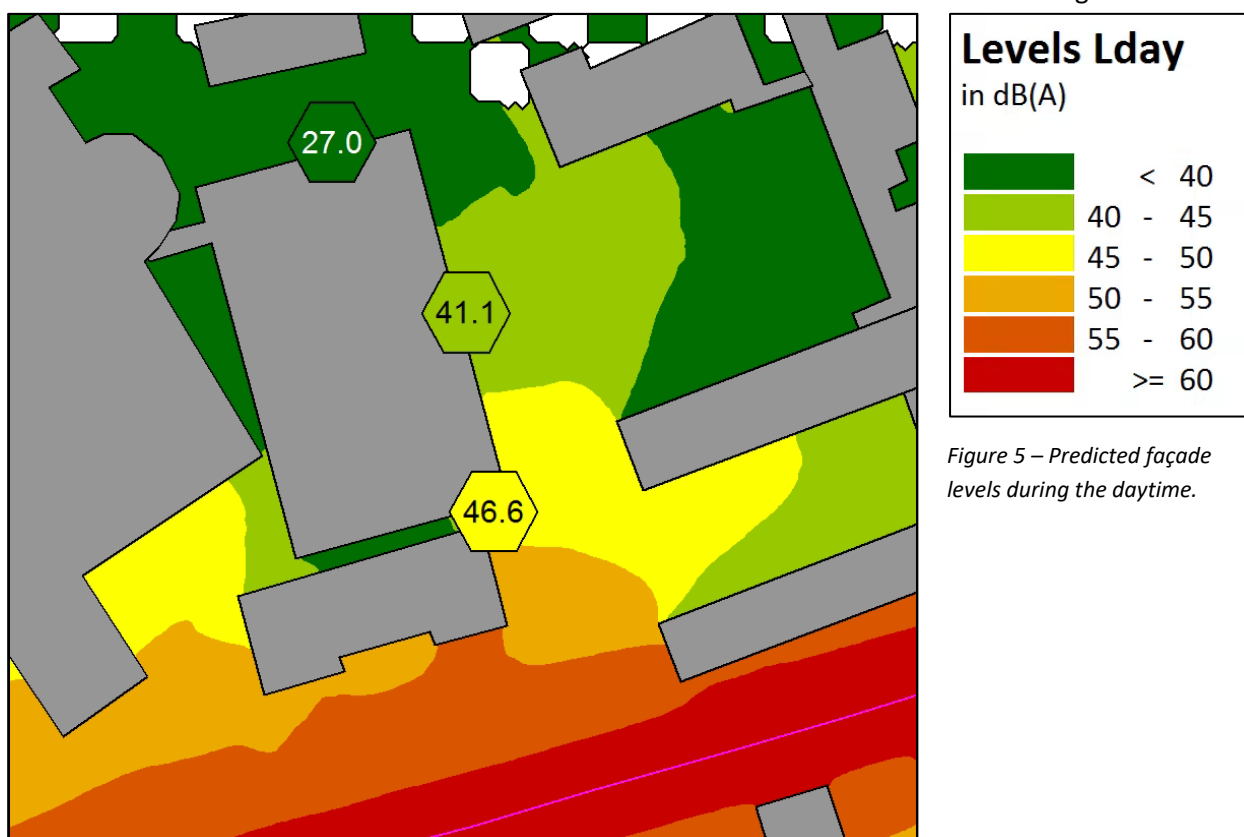


Figure 5 – Predicted façade levels during the daytime.

9.1.3. The worst case predicted sound pressure level incident on the façade of the new building is 46.6dB(A). This value has been used for the purposes of the specification of façade sound insulation.

¹⁰ ISO9613-2:1996 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation"

10. Indoor Ambient Noise Levels

10.1. Methodology

- 10.1.1. Based on the measured and predicted free-field sound pressure levels at the worst affected facades, the simple calculation method from BS8233:2014 has been used to determine the necessary sound reduction to meet the guideline values. Standard forms of construction are assumed such that the glazing is likely to be the lowest performing facade element along with any façade ventilation penetrations.

10.2. Required Mitigation

- 10.2.1. The single figure glazing and ventilator performance requirements in order to achieve the internal design criteria are summarised in Table 9. The glazing performance has been specified in terms of the road traffic corrected weighted sound reduction index, $R_w + C_{tr}$, and the ventilator performance has been specified in terms of the road traffic corrected element normalised level difference $D_{ne,w} + C_{tr}$.

Glazing specification
Specification 1: Ward – single person, Small office, Small meeting rooms, Operating theatres
7dB $R_w + C_{tr}$ / 13dB $D_{ne,w} + C_{tr}$
Specification 2: Ward – Multi-bed, Open clinical areas, Personal hygiene (en-suite), Laboratories
2dB $R_w + C_{tr}$ / 8dB $D_{ne,w} + C_{tr}$
Specification 3: Small kitchens, Public areas
N/A
Specification 4: Circulation Space, Large kitchens, Personal hygiene (public & staff)
N/A

Table 9 – Required facade sound insulation (Glazing/Ventilator)

10.3. Glazing and Ventilator Specifications

- 10.3.1. The glazing and ventilator performance has been specified based on the performance data provided by Saint-Gobain and Greenwood Airvac. These are suggested configurations and any other glazing and vent combination can be used provided it achieves the minimum performance levels given in Table 9. The recommended glazing specification is given in Table 10.

Glazing specification
Specification 1 – 4:
Saint Gobain 4(12) 4

Table 10 - Our recommended glazing configurations

- 10.3.2. It is assumed that this development would use mechanical ventilation, however should penetrations be required for ventilation purposes our recommended ventilator configurations, calculated to work in conjunction with the above glazing specifications, are summarised in Table 11. The specification provides an equivalent area of at least 5000mm². It should be checked by a suitably qualified person that this ventilator specification meets the requirements of Approved Document F.¹¹

Glazing specification
Specification 1 – 4:
Greenwood 5000EA

Table 11 - Our recommended ventilator configurations.

- 10.3.3. Given the assumptions in this method the information in this section should be treated as general guidance only. The acoustic performance of third-party products cannot be guaranteed by noise.co.uk.
- 10.3.4. It should be noted that, in order to meet the internal ambient noise criteria in these areas, the windows will need to remain closed. They should not be fixed shut and should remain openable for ventilation requirements at the discretion of the occupants.

¹¹ Approved Document F: Means of Ventilation (2010 Edition)

11. Sound Insulation

11.1. Internal Layouts

11.1.1. The client has provided a general arrangement plan showing which rooms will be present on this development. Figure 6 shows the internal layout of the proposed building.



Figure 6 - Internal layout of proposed development

11.1.2. A marked up plan is available in the appendix showing the required sound insulation for each room adjacency based on the matrices given in HTM-08-01.

12. BS4142 Assessment

12.1. 3D Noise Model

- 12.1.1. A 3D noise model has been created in SoundPLAN to predict the specific sound level for the plant area on the roof of the proposed building. It is noted that it is proposed to have louvred screens surrounding the plant area, but there is no detailed information available on the equipment of screens to be used at this stage. The louvred screens have not been included in this assessment and therefore the below describes a worst case assessment.
- 12.1.2. BREEAM requires the outcome of the BS4142 assessment to be 5dB below the prevailing background sound level. In this case the target rating level for the daytime period is 36dB(A) and 27dB(A) for the night-time period.

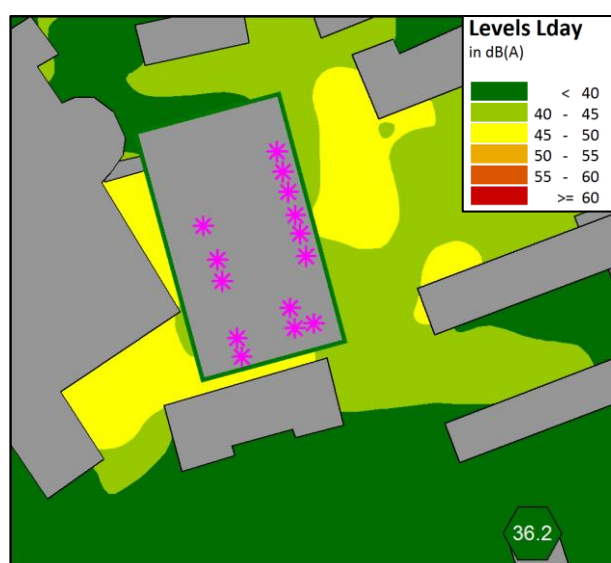


Figure 7 - Prediction of plant noise propagation - Daytime (07:00-23:00)

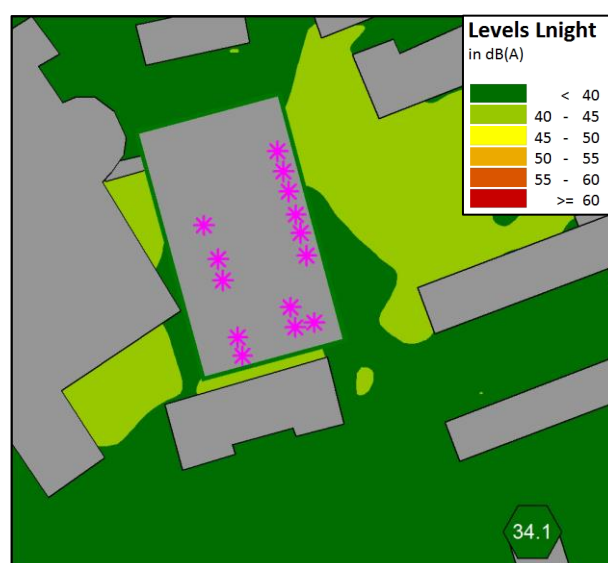


Figure 8 - Prediction of plant noise propagation – Night-time (23:00-07:00)

- 12.1.3. The predicted specific sound levels from the rooftop plant equipment are 36dB(A) in the daytime period and 34dB(A) in the night-time period.

12.2. Rating Level

- 12.2.1. No information of fixed mechanical plant has been provided; it is therefore not possible to make a subjective judgment of the character of the specific sound. Character corrections have been applied based on experience of similar items of plant.

Tonality

- 12.2.2. Most items of heating, ventilation and air conditioning plant have rotating components that would be likely to produce modest tones. It would not be expected tones generated from the new specific sources will be perceived at the noise sensitive receptor given the distance from the proposed building. No correction has been made for tonality.

Impulsivity

- 12.2.3. The items of plant would be expected to emit continuous sound. No correction has been made for impulsivity

Intermittency

- 12.2.4. It is possible that the fixed plant will not operate 100% of the time. However, in any 1-hour daytime or 15-min night-time reference period the plant would not be expected to switch on and off more than once. Therefore, no correction for intermittency has been made.

12.3. Target Rating Level

	Level, dB	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Background sound level, dB $L_{A90,15min}$	41	32
Pol 05 criteria	-5	-5
Target background sound level, dB $L_{A90,15min}$	36	27
Acoustic feature corrections		
Tonality	0	0
Impulsivity	0	0
Intermittency	0	0
Predicted rating level		
Specific sound level + corrections	36	34
Assessment Level		
Rating level – Background sound level	-5	+2
<i>“Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context”</i>		

Table 12 – Derivation of the target specific sound level using the assessment procedure from BS4142

12.4. Context

- 12.4.1. The site proposed for development is an existing hospital, and the general noise environment in the area already includes noise associated with hospital activity. Therefore this development is not expected to have significant impact on the character of noise in the area.
- 12.4.2. It should be noted that the target rating level for the night-time of 27dB(A) is a very low level and the predicted specific sound level is significantly below the existing measured $L_{Aeq,8hour}$ of 51.5dB(A). This suggests that the specific sound level from the proposed equipment will not have a contribution to the overall sound pressure level at the receiver position and therefore it is suggested that the BREEAM POL05 credit should be awarded on this basis.

13. Conclusions

- 13.1.1. An environmental noise survey has been carried out at the site of a proposed commercial development at Dewsbury District Hospital , Dewsbury, WF13 4HS to determine typical ambient sound levels. The sound levels have been used to calculate the required facade sound insulation to meet the guideline internal levels from HTM 08-01.
- 13.1.2. Table 9 in section 9.1.3 gives the required facade sound reduction by any glazing and ventilator combination to be compliant with the guideline values.
- 13.1.3. Table 12 in section 12.4 gives the results of the prediction of specific sound level from proposed rooftop plant equipment. Although the POL05 criteria of 5dB below the background sound level is exceeded during the night-time, the target criteria of 27dB(A) is considered a low sound pressure level and the predicted specific sound level is significantly below the existing measured $L_{Aeq,8hour}$ at this location. This suggests that the specific sound level from the proposed equipment will not have a contribution to the overall sound pressure level at the receiver position and therefore it is suggested that the BREEAM POL05 credit should be awarded on this basis.
- 13.1.4. We strongly recommend that this report be passed to the local planning authority for approval prior to any works being carried out.

14. Appendix

APPENDIX A: Summary Information

Required ISO Test Report Information (cross referenced where required)			
		Measurements carried out to:	Analysed to:
A	Standards	BS 7445-1: 2003 BS 7445-2: 1991	HTM 08-01 BS4142:2014
B	Organisation performed the measurements	noise.co.uk Ltd, The Haybarn, Newnham Grounds, Kings Newnham Lane, Bretford, Coventry, CV23 0JU.	
C	Name of Client	Darwin Group	
D	Full site address	Dewsbury District Hospital Halifax Road Dewsbury, WF13 4HS	
E	Date of surveys	Survey Date: 7 th February 2023 – 9 th February 2023	
F	Description & identification of Proposed Development	It is proposed to develop the site for industrial use	
G	Brief Description of details of Procedure & equipment	See Section 5 of this report.	

APPENDIX B: Technical Appendix

Measurements were made using the following equipment:

Monitoring Position	Sound Level Meter (Serial Number)	Calibrator (Serial Number)
1	SoftdB Piccolo 2 (PO221070105)	BSWA CA114 (590010)

The equipment has traceable calibration. The sound level meter was calibrated immediately prior to and immediately after the measurements were carried out.

Sound Level Meter	Before	After
SoftdB Piccolo 2 (PO221070105)	94.0 dB	94.0 dB

There was no adverse deviation.

APPENDIX C: Internal Sound Insulation Markup



- 14.1.1. Where there are doors and/or glazed elements present in a partition, the sound insulation performance will be limited by the weakest element; therefore, a lower performing partition will be sufficient. See paragraph 7.2.4 of this report
- 14.1.2. Note that the values given in the markup are $D_{nT,w}$ values as given in HTM-08-01. HTM-08-01 recommends a +7dB margin is included to allow for workmanship and flanking. It is recommended that these values are converted to R_w for the purposes of specification. The R_w values that correspond to the $D_{nT,w}$ values in the above markup are given in Table 13.

$D_{nT,w}$	Corresponding R_w
52dB $D_{nT,w}$	59dB R_w
47dB $D_{nT,w}$	54dB R_w
42dB $D_{nT,w}$	49dB R_w
37dB $D_{nT,w}$	44dB R_w

Table 13 - Conversion of $D_{nT,w}$ values to R_w