NHS
Hawthorne Consulting Block
Stanley Grove
Manchester
M12 4NH

Acoustic Design Review

On behalf of

DarwinGroup

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Contents

1.0 Introduction **1**
2.0 Details of development proposals **1**
3.0 Sound insulation **1**
General note 3
Partition specifications 3
Doors and vision panels 4
4.0 Acoustic absorption **5**
5.0 Summary **6**

Appendices

Appendix A Acoustic terminology
Appendix B Sound insulation markups

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Darwin Group to provide an acoustic review of the designs for the proposed temporary NHS consulting block at Longsight, Manchester.

1.2. Internal sound insulation criteria and provision on acoustic absorption have been set out in accordance with HTM08-01 and BS 8233:2014.

1.3. A glossary of acoustic terminology is given in **Appendix A**. An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

2.1. The proposed consulting block will occupy the existing ASDA Superstore car park near the northwestern site boundary.

2.2. The facility is predominantly a diagnostic and treatment centre, with consulting rooms, treatment rooms, interview rooms and offices in a single floor.

2.3. The following specification encompasses the internal sound insulation requirements between spaces and provision of acoustic absorption. Guidance on external building envelope performance requirements is provided in a separate report.

3.0 Sound insulation

3.1. Guidance on airborne sound insulation of internal walls is provided in HTM08-01. The required sound insulation of partitions is based on the noise activity, noise sensitivity, and privacy requirements for each room and space. This is detailed in Table 3 and Table 4 of HTM08-01. The applicable rooms are shown in the Table 1 below.

Table 1 Sound insulation parameters of rooms

HTM08-01 Room Type	Privacy requirements for source room	Noise generation of the source room	Noise sensitivity of the receiving room	Applicable rooms
Consulting room, treatment room, interview room	Confidential	Typical	Medium	Consult rooms 1-7, treatment rooms 1-2, interview room
Single-person office	Private	Typical	Medium	Manager's office
Rest room	Moderate	High	Medium	Staff rest

HTM08-01 Room Type	Privacy requirements for source room	Noise generation of the source room	Noise sensitivity of the receiving room	Applicable rooms
Toilets (staff and public)	Moderate	Typical	Not sensitive	WC
Waiting (large >20 people)	Not private	High	Not sensitive	Waiting areas A & B
Dirty utility/sluice	Not private	High	Not sensitive	Sluice room
Multi-person office (2-4 people)	Moderate	Typical	Medium	Reception
Open plan office (≥5 people)	Not private	Typical	Medium	Office
Corridor	Not private	Typical	Not sensitive	Circulation 1-3 (inc. Resus equipment bay), draught lobby
Storeroom	Not private	Typical	Not sensitive	DB cupboard, IT hub, LV ln
Clean utility	Not private	Low	Not sensitive	Clean utility room, cleaners room

3.2. The required sound insulation is then determined by the following matrix (Table 4 in HTM08-01):

Figure 1 Sound insulation matrix from HTM08-01

Table 4 Sound-insulation ratings (dB $D_{nT,w}$) to be achieved on site

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.

General note

3.3. Laboratory-test data of partitions – walls and floors – are commonly given as their laboratory-tested sound insulation value, R_w, as distinct from their on-site performance, $D_{nT,w}$. The R_w is measured under stringently controlled conditions, whereas the $D_{nT,w}$ value is more variable and relies on good control of noise flanking, for example at the junction with external walls. The numerical difference between the R_w value of a wall or floor construction and the likely resulting $D_{nT,w}$ value can be calculated, taking into consideration the area of the separating element and the volume and design reverberation time/acoustic absorption in the receiving room and including a correction factor between the laboratory test performance and effective on-site performance. This last factor is typically around 7dB for lightweight partitions and around 4dB for concrete and masonry.

Partition specifications

3.4. The marked-up drawings in **Appendix B** show recommended minimum airborne sound insulation values for the internal walls. Performance values have been divided into three types, as follows:

- Type A (GREEN) – minimum laboratory test rating R_w 40dB. Typical constructions capable of providing this performance include lightweight partition with one layer of 12.5mm thick Gyproc WallBoard (or similar) each side of 70mm metal studs at 600mm centres, with 25mm thick APR1200 quilt in the cavity.

- Type B (BLUE) – minimum laboratory test rating R_w 48dB. Typical constructions capable of providing this performance include lightweight partition with one layer of 15mm thick Gyproc SoundBloc (or similar) each side of 70mm metal studs at 600mm centres, with 25mm thick APR1200 quilt in the cavity.

- Type C (YELLOW) – minimum laboratory test rating R_w 54dB. Typical constructions include lightweight partition with two layers 15mm thick Gyproc SoundBloc (or similar) each side of 70mm metal studs at 600mm centres, with 25mm thick APR1200 quilt in the cavity.

3.5. To enable the walls to provide the best possible acoustic performance it is important that noise flanking is well controlled. This includes:

- All walls must be built from structural floor to soffit; they must not be built off any raised access floor or similar and must pass through suspended ceilings to the underside of the floor/roof above.

- The junction of the floor with the external walls must be constructed to minimise flanking; the walls and floors should penetrate through the external drylining boards and not about them.

3.6. Final construction details must be developed in conjunction with the partition supplier's standard details.

Doors and vision panels

3.7. Where there is a door within the wall, the overall sound insulation will be limited by the acoustic performance of the door and in practice, there is no acoustic benefit for the partition to have a sound insulation rating more than 10dB higher than that of the door.

3.8. HTM08-01 states that solid-core door blanks (minimum 21kg/m^2) should be used for access from corridors, and these are capable of achieving an acoustic performance in the range R_w 30-35dB. If seals can be accommodated, the entire doorset is capable of achieving this level of sound insulation. If seals are not to be provided, the overall performance of the doorset will be in the range R_w 20-25dB.

3.9. Based on the above recommendations, all walls with doors are therefore shown as being Type A. For a partition to achieve R_w higher than 40-45dB, high performance doorsets or lobbied doors would be required.

3.10. All door specifications are to be confirmed with the infection control team to resolve potential conflicts such as opening force, infection control, patient safety and ventilation regimes.

3.11. Where doors have glazed vision panels, these should not reduce the sound insulation of the doorset. Any proposed vision panels on partitions and/or doors should be consulted with NSL.

Partition junctions

3.12. Junction details are to be developed. NSL will review proposed junction details when they are available.

4.0 Acoustic absorption

4.1. HTM08-01 notes that:

2.106 *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.*

...

2.110 *Acoustically-absorbent materials should have a minimum absorption area equivalent to a Class C absorber (as defined in BS EN ISO 11654:1997) covering at least 80% of the area of the floor, in addition to the absorption that may be provided by the building materials normally used. If a Class A or B absorbent material is used, less surface area is needed.*

4.2. It is understood that solid imperforate plasterboard ceiling systems are proposed for the consulting and treatment rooms. This ceiling system would require at least Class C acoustic performance.

4.3. For other rooms and areas, a similar ceiling system is recommended to meet the recommendations given in HTM08-01. Where ceiling systems are not proposed, other absorption solutions such as ceiling tiles or wall panels can be considered. It should be noted that this will likely to be more expensive than using a suitable absorbent grid ceiling.

5.0 Summary

5.1. Noise Solutions Ltd (NSL) has been commissioned by Darwin Group to provide an acoustic review of the designs for the proposed temporary NHS consulting block at Longsight, Manchester.

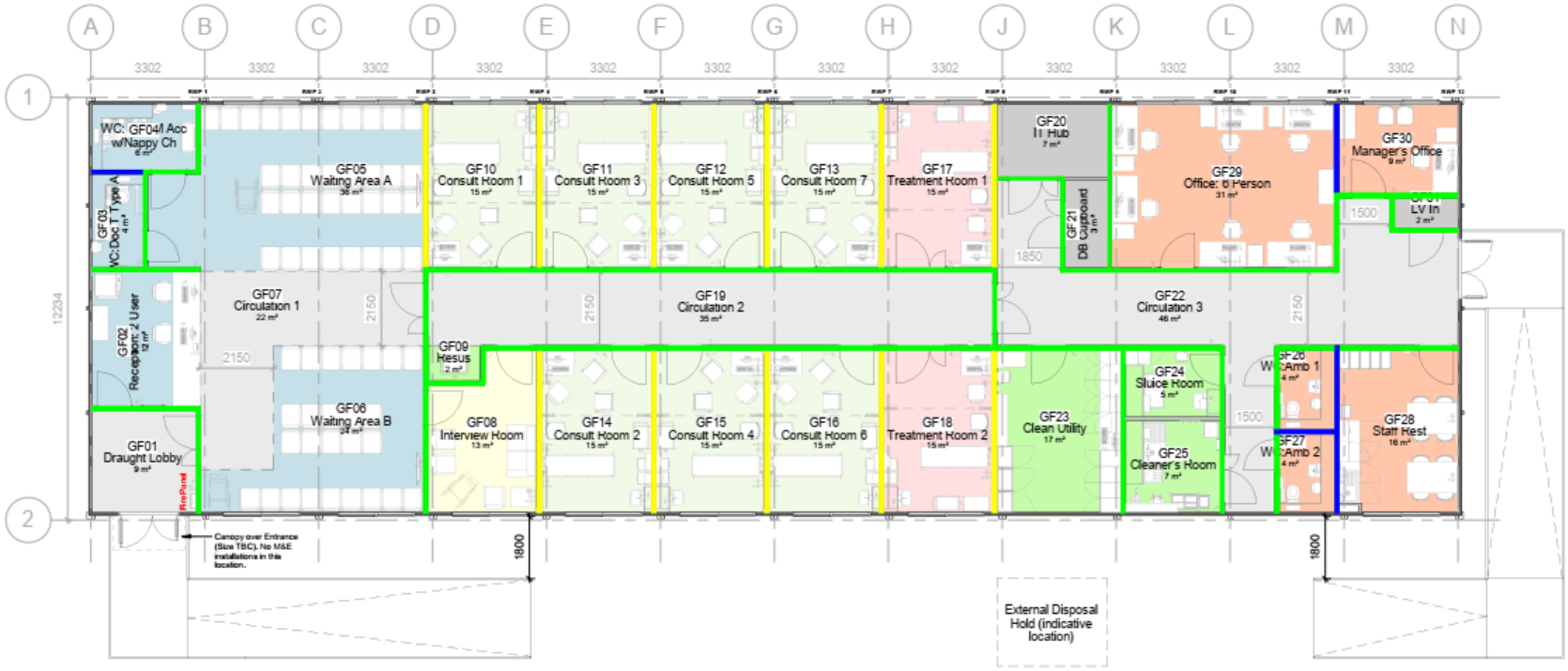
5.2. Internal sound insulation criteria and provision on acoustic absorption have been set out in accordance with HTM08-01 and BS 8233:2014.

5.1. Recommendations on suitable partitions and absorption provision have been specified.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Sound insulation markup



General Arrangement
1 : 100

KEY TO SOUND INSULATION SPECIFICATIONS

- Rw 40dB
- Rw 48dB
- Rw 54dB