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**Sound Insulation
Assessment Report**

On behalf of



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1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by Stace LLP to undertake an assessment of the sound insulation of the separating floor between the proposed ASDA Express store and residential flats above at the new Boorley Green development near Botley.
- 1.2. The airborne sound insulation has been estimated based on relevant information provided in regard to the composition of the separating floor.
- 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 store will occupy a ground floor commercial unit located within a mixed residential commercial development within the new Boorley Green development. Residential flats are proposed on upper floors.
- 2.2. The Asda store includes an internal plantroom housing cooling equipment. This plantroom will be located below a first floor residential unit.
- 2.3. The store sales floor and back of house areas will also be situated below residential flats at first floor level.

3.0 Assessment criteria

Building Regulations Approved Document E

- 3.1. Building Regulations Approved Document E *Resistance to the Passage of Sound* gives minimum standards for airborne and impact sound insulation between dwellings, and between dwellings and other occupancies, and are primarily aimed at controlling domestic noise transfer.
- 3.2. Under the requirements of Approved Document E, the airborne sound insulation provided by the separating wall or floor between a residential dwelling and any other part of the same building must be at least $45 \text{ dB } D_{nT,w} + C_{tr}$.
- 3.3. The Approved Document E requirements for impact sound insulation apply only when the dwelling is below the separating floor, and therefore need not be considered in this case.
- 3.4. Building Regulations do not give specific guidance on any enhancement to the sound insulation that may be required where, for example, noise levels in a commercial unit are higher than would be expected in a dwelling.

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

Airborne sound insulation

- 3.5. The minimum standards in the Building Regulations may not be sufficient to control noise, if the noise levels in the non-residential premises may be higher than would usually be expected for a dwelling. Guidance is therefore sought from BS 8233:2014 – ‘Guidance on sound insulation and noise reduction for buildings’.
- 3.6. Section 7.5 ‘Internal Sound Insulation’ of BS 8233, states the following:

“... sound from adjacent spaces can affect the intended use, depending on the noise activity, noise sensitivity and privacy requirement. A matrix may be used to determine the sound insulation requirement of separating partitions once the noise activity, noise sensitivity and privacy requirements for each room and space. An example matrix, which can be adapted according to the specific building use, is given in Table 3. Each room may be both a source and a receiving room. Where adjacent rooms have different uses, the worst case sound insulation should be specified.”

Table 3 Example on-site sound insulation matrix (dB $D_{nT,w}$)

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms		
		Low sensitivity	Medium sensitivity	Sensitive
Confidential	Very high	47	52	57 ^{A)}
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57 ^{A)}
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57 ^{A)}
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

NOTE Background noise can also influence privacy. See also 7.7.6.3.

^{A)} $D_{nT,w}$ 55 dB or greater is difficult to obtain on site and room adjacencies requiring these levels should be avoided wherever practical.

- 3.7. There is an element of professional judgement required with regard to the acoustic categorisation of each space.
- 3.8. As a worst case, the shop floor and BOH could be considered as a space which is not private and with a high activity noise level. The plantroom could be considered as a not private space with a very high activity noise level.
- 3.9. The residential properties adjoined can be considered as spaces with a high level of sensitivity.

- 3.10. Based on these considerations, the sound insulation of the partition separating the store from the residential space should not be lower than 47dB $D_{nT,w}$ based on the matrix table in BS 8233:2014. In practice, where the Building Regulations requirement described above is achieved, the minimum performance resulting from the BS 8233:2014 recommendations would normally be achieved "by default" for the floor above the sales floor and BOH areas.
- 3.11. The sound insulation of the partition separating the plantroom from the residential space should not be lower than 57dB $D_{nT,w}$.

Criterion for residential dwellings

- 3.12. BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* recommends desirable internal noise levels within different room spaces, including residential dwellings.
- 3.13. The applicable internal noise criteria for residential properties given in BS 8233:2014 are summarised in the following table:

Table 1 Summary of relevant guidance given BS 8233:2014 with regard to internal noise levels affecting residential premises

Period	Space	Recommended Noise Level (dB)
Daytime (07.00 – 23.00 hours)	Living rooms and Bedrooms	< 35 $L_{Aeq, T}$
Night-time (23.00 – 07.00 hours)	Bedrooms	< 30 $L_{Aeq, T}$

- 3.14. It should be noted that these criteria target levels are typically used to assess noise from general environmental noise break-in (i.e. road traffic) rather than intrusive sources of noise. Therefore, it is recommended to reduce the above limits in around 5dB, as the noise produced by the rolling of metal cages may be both tonal and intermittent. In addition, BS8233 also states that:

"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values"

- 3.15. As a consequence, it is also appropriate to use a limit in terms of $L_{Amax,F}$. WHO Guidelines for Community Noise 1999 stated that:

"If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise. If the noise is not continuous, sleep disturbance correlates best with L_{Amax} and effects have been observed at 45 dB or less. This is particularly true if the background level is low. Noise events exceeding 45 dBA should therefore be limited if possible. For sensitive people an even lower limit would be preferred."

Eastleigh Borough Council

- 3.16. Eastleigh Borough council have granted permission to the development with the following Condition 14:

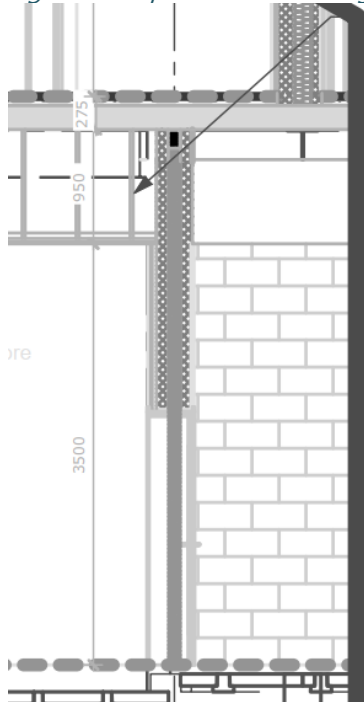
"Prior to the development above slab level of any building containing both commercial and residential uses, the constructional details shall be submitted to and approved in writing by the Local Planning Authority together with confirmation from a competent acoustic consultant, that any party wall or floor separating commercial use from residential use should have a sound insulation performance of 60dB D_{ntw} or better. The approved constructional details shall be implemented prior to the first occupation of any part of any building to which they relate.

Reason: In the interests of residential amenity."

4.0 Partitions

- 4.1. All partitions – walls and floors - are specified in terms of 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 7dB for lightweight partitions and 4dB for concrete and masonry.
- 4.2. The Carlton Design drawing "Retail Flat Block Plots 1-9 (HA Rented) Section D-D and E-E" reference B1008-CDP-VRFB00-XX-D2-A-AS-0305 Rev 010 describes the proposed build-up of the floor ceiling partition.
- 4.3. Figure 1 shows a detail from the Carlton Design drawing with the proposed floor/ceiling buildup. The full drawing is reproduced in [Appendix B:](#)

Figure 1 Proposed floor/ceiling build-up



Separating Floor Construction:

- 65mm min. sand:cement screed nominal 80kg/m²
- 6mm IsoRubber base with IsoEdge flanking strip
- 200mm Precast concrete plank min 300kg/m²

Primary Suspended Ceiling Construction:

- 200mm cavity filled with 200mm mineral wool quilt 0.032W/mK.
- Ceiling system to be GypCeiling MF by specialist
- Finished with 2 layers of 12.5mm BG Glasroc F Multiboard

Sacrificial Suspended Ceiling:

- 750mm void for services and retail fit out to be installed by tenant, GypCeiling MF (or equivalent)

- 4.4. Using Insul version 10.0.5 The estimated R_w for this build up is 75dB with a C_{tr} correction of -8. When likely noise flanking etc. has been taken into consideration this corresponds to an approximate $D_{nT,w}$ value of 62dB and a $D_{nT,w} + C_{tr}$ of 57dB. This will therefore comply with the Building Regulations requirement, the BS 8233:2014 guidance and the Local Authority planning condition for the sales floor and BOH areas.

5.0 Expected sound levels within the store Demise

- 5.1. NSL have previously undertaken internal reference noise measurements within a typical local convenience store during normal day-to-day operations. Within a back of house during normal operation it was typical to measure 57 dB $L_{Aeq,T}$ and on the shop floor it was typical to measure 61 dB $L_{Aeq,T}$.
- 5.2. Based on the plant equipment currently proposed, internal noise levels within the plantroom are expected to be around 78dB $L_{Aeq,T}$.

6.0 Sound transmission assessment

Separating floor between shop floor/BOH and first floor residential dwelling

- 6.1. As noted above the airborne sound insulation provided by the floor between the shop floor/BOH/Plant room and the first-floor flat is estimated as $D_{nT,w} + C_{tr}$ 57dB. This level of performance exceeds the minimum levels described in paragraphs 3.2 and 3.16.

- 6.2. Based on the above, and the expected sound levels referenced in section 5.0, the resulting sound levels in the residential dwelling directly above the store sales floor and back of house are shown in Table 2 below.

Table 2 Predicted activity sound levels within residential premises

Period	Space	Predicted Noise Level (dB)	Predicted NR level
Daytime (07.00 – 23.00 hours)	Living rooms and Bedrooms	3 $L_{Aeq,T}$	0

- 6.3. The predicted sound levels within the residential dwellings meet the limits as recommended by BS8233:2014, as stated in paragraph 3.13.

Separating floor between plantroom and first floor residential dwelling

- 6.4. The airborne sound insulation provided by the floor between the plantroom and the first-floor flat is estimated as $D_{nT,w} + C_{tr}$ minimum 57dB. This level of performance exceeds the required minimum levels described in paragraphs 3.2 and 3.16.
- 6.5. Based on the above, and the expected sound levels referenced in section 5.0, the resulting sound levels in the residential dwelling directly above the plantroom are shown in Table 3 below.

Table 3 Predicted plantroom sound levels within residential premises

Period	Space	Predicted Noise Level (dB)	Predicted NR level
Daytime (07.00 – 23.00 hours)	Living rooms and Bedrooms	30 $L_{Aeq,T}$	26
Night-time	Living rooms and Bedrooms	30 $L_{Aeq,T}$	26

- 6.6. The predicted sound levels within the residential dwellings meet the limits as recommended by BS8233:2014, as stated in paragraph 3.13.

7.0 Conclusions

- 7.1. The floor as specified will meet the requirements of Approved Document E and the additional requirements of Eastleigh Borough Council without further enhancement. No further treatment is considered necessary where the floor separates the residential flats from the sales floor, back of house areas or plant room.

8.0 Summary

- 8.1. Noise Solutions Ltd (NSL) has been commissioned by Stace LLP to undertake an assessment of the sound insulation of the separating floor between the proposed ASDA Express store and residential flats above at the new Boorley Green development near Botley.
- 8.2. The findings of the desktop study indicate that the airborne sound insulation provided by the proposed constructions meets and exceeds the requirements of Building Regulations Approved Document E and the requirements of Eastleigh Borough Council.

Appendix A Acoustic terminology

Parameter	Description
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10}(s_1/s_2)$. 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 $20\mu\text{Pa}$. 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
$L_{Aeq,T}$	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.
$D_{nT,w}$	Weighted standardized level difference. Single-number quantity that characterizes the airborne sound insulation between rooms.
C_{tr}	Spectrum adaption term applied to $D_{nT,w}$ (and similar) parameters to mimic the frequency content of traffic noise sources. Also used in England and Wales Building Regulations to control low frequency noise between dwellings.
R_w	A measure of the sound reduction of a building element. Like $D_{nT,w}$ it is a single-figure value derived from 1/3 octave band data; unlike that parameter, is measured under laboratory conditions, where noise flanking is controlled such that the performance relates to sound only passing through the element being considered.

[illegible]