

ASDA
Retail Unit T4
Circle Square
Oxford Road
Manchester

Noise Impact Assessment

On behalf of

ASDA

Project Reference: 91461 | Revision: - | Date: 18th September 2023

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Document Information

Project Name : ASDA, Retail Unit T4, Circle Square, Manchester
Project Reference : 91461
Report Title : Enhanced Noise Impact Assessment
Doc Reference : 91461/ENIA
Date : 18th September 2023

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Revision	Date	Description	Prepared	Reviewed/ Approved

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1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by ASDA Stores Ltd to provide acoustic consultancy services for the proposed new ASDA Express located within the new Circle Square development, Manchester.
- 1.2. The aim of this report is to discharge planning condition 24, related to the operation of the proposed ASDA store.
- 1.3. An enhanced sound insulation assessment and plant noise impact assessment has been produced to ensure the separating floor above the store, and plant serving the store meets the requirements of condition 24 and other associated relevant guidance.
- 1.4. 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 Site description

- 2.1. The proposed ASDA Express store will occupy a commercial unit on the ground floor, and mezzanine level within a mixed-use (commercial and residential) building located along Oxford Road, Manchester.
- 2.2. Residential dwellings will occupy the floors above, with the exception of levels 15 and 35 which are believed to contain ancillary and amenity spaces also.
- 2.3. The proposed plant comprises one heat pump unit to be located in a plantroom on the mezzanine level. The louvre serving the plantroom will discharge on to Charles Street at mezzanine floor level.
- 2.4. The heat pump may operate at any time to achieve the heating and cooling needs of the store but will typically run at reduced duty at night when the doors are likely to remain closed for longer periods.
- 2.5. All plant and associated pipework/ductwork should be fitted with suitable anti vibration mounts/hangers.
- 2.6. It is understood that the remainder of the ground and mezzanine floor is proposed to be used for commercial activities, as well as providing amenities to serve the residents of the apartment block.

3.0 Assessment criteria

Manchester City Council

- 3.1. The Planning and Noise Technical Guidance document for Manchester City Council¹ provides the following guidance with regards to noise and vibration from fixed plant/equipment.

The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'.

- 3.2. It has been assumed that this criterion would be applicable to noise from plant room louvres also.

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

- 3.1. BS 4142:2014 +A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014² includes "sound from fixed plant installations which comprise mechanical and electrical plant and equipment".
- 3.2. The procedure contained in BS 4142:2014 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.
- 3.3. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.
- 3.4. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

¹ Planning and Noise, Technical Guidance, Manchester City Council, October 2022

² For brevity, references to BS 4142 and BS 4142:2014 should be read as BS 4142:2014 + A1:2019

- 3.5. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes:
"Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."
- 3.6. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:
- *Typically, the greater this difference, the greater the magnitude of the impact.*
 - *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
 - *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*
 - *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. 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.*
- 3.7. The standard does state that *"adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*
- 3.8. The standard goes on to note that: *"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*
- 3.9. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:
- "An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*
- 3.10. BS 4142:2014 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

National Planning Policy Framework

- 3.11. A new edition of NPPF was published in July 2021 and came into effect immediately. The original National Planning Policy Framework (NPPF³) was published in March 2012, with revisions in July 2018 and February 2019 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2021 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the July 2021 edition.
- 3.12. Paragraph 174 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by (amongst others) *"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, water or noise pollution or land stability."*
- 3.13. The NPPF goes on to state in Paragraph 185:
- "planning policies and decisions should ...*
- a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development, - and avoid noise giving rise to significant adverse impacts on health and quality of life;*
 - b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason ...*
- 3.14. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE⁴).
- 3.15. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*
- 3.16. Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed"*.
- 3.17. Paragraph 119 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the*

³ National Planning Policy Framework, DCLG, March 2012

⁴ Noise Policy Statement for England, DEFRA, March 2010

environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land".

Deloitte Noise Impact Assessment

- 3.18. A noise impact assessment was prepared by Deloitte dated January 2016, in relation to the Circle Square development, providing limits for cumulative environmental noise for non-emergency services plant. The guidance was produced in line with the assessment methodology detailed in BS4142:2014 and is presented in Table 1 below.

Table 1 Cumulative environmental noise limits for non-emergency building services plant

Location	Noise Level, dB LAeq	
	Daytime (07:00hrs to 19:00hrs)	Night time (23:00hrs to 07:00hrs)
Residences, Montana House	47	38
Residences, Princess House	47	39
Residences, Oxford Place	50	45
Residences, Bracken House	50	45
Holiday Inn Express, Oxford Road	55	45
Residences, Former BBC site, Phase 1A (Planning permission reference 1100055/FO/2015/C1)	47	38
Residences, Former BBC site, Phase 1B	47	38

- 3.19. It should be noted that the above table does not provide recommendations for the period between 19.00 and 23.00.

Building Regulations Approved Document E

- 3.20. The 2003 Edition (incorporating 2004, 2010, 2013 and 2015 amendments) of the Building Regulations 2010 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.

- 3.21. Under the requirements of Approved Document E, the airborne sound insulation of a separating floor between a dwelling and another part of the same building must be at least 45dB $D_{nT,w} + C_{tr}$. Requirements for impact sound insulation apply only where a dwelling is located below a separating floor; there is therefore no impact sound requirement in this instance.
- 3.22. Approved Document E of the Building Regulations contains the following regarding non-domestic uses:

"0.8 The performance standards set out in Tables 1 a and 1 b are appropriate for walls, floors and stairs that separate spaces used for normal domestic purposes. A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal or non-domestic purposes. In these situations the appropriate level of sound insulation will depend on the noise generated in the communal or non-domestic space. Specialist advice may be needed to establish if a higher standard of sound insulation is required and, if so, to determine the appropriate level."

BS 8233:2014

- 3.23. 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'.
- 3.24. Section 7.5 'Internal Sound Insulation' of BS 8233: 2014, 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.

- 3.25. There is an element of professional judgement required with regard to the acoustic categorization of each space.
- 3.26. As a worst case, the back of house area, located on the mezzanine level could be considered as a space which is not private and with an activity noise level between the "high" and "very high" categories. The residential properties above can be considered as confidential spaces with a high level of sensitivity.
- 3.27. Based on these considerations, the sound insulation of the partition separating these spaces should not be lower than 47dB $D_{nT,w}$ based on the matrix table in BS 8233: 2014.
- 3.28. This requirement is in addition to the criterion in Building Regulations.

Fisher Acoustics Technical Advice Note

- 3.29. A technical advice note prepared by Fisher Acoustics dated 6th April 2016, in relation to the Circle Square development, provides recommendations in addition to the acoustic requirements of Approved Document E for party floors.
- 3.30. The technical advice note recommends that a floor separating a commercial unit and apartment, and plant room and apartment, should have a performance of at least 58 dB $D_{nT,w}$.

Manchester City Council Planning Condition 24

The Commercial Units shall be acoustically insulated in accordance with the Recommendations in Deloitte, Noise Impact, Phase 1B Circle Square dated January 2016 by Fisher Acoustics and the specifications in relation to structure borne noise as set out in Fisher Acoustics letter dated 6th April 2016 with the implementation of these approved works to be confirmed within a Verification Report to be submitted to and approved in

writing by the City Council as Local Planning Authority prior to occupation of any part of the development. The approved measures shall remain in situ whilst the use or development is in operation. For the avoidance of doubt any changes to the approved the structure are prohibited at any time without written approval of the planning authority.

Reason - In order to protect future residents from noise nuisance, pursuant to policies SP1, H1 and DM1 of the Core Strategy.

4.0 Plant noise impact assessment

- 4.1. NSL has produced a full noise impact assessment, Document Reference, 91461/NIA, Date 18th July 2023. The following is only intended to summarize the results of the Noise Impact Assessment and the original report should be referred to for a more complete understanding.
- 4.2. The cumulative plant noise level at the most affected noise sensitive receptor has been predicted based on manufacturer's noise data for the proposed equipment.
- 4.3. NSL was unaware of the Deloitte Noise Impact assessment when producing the Noise report and as such, although it produced different proposed criterion, it was based upon the same local authority guidance and assessment methodologies. However, the criteria proposed by NSL differ as they are based upon the results of a far more recent noise survey collected in April 2023, whereas the criteria within the Deloitte assessment are based upon survey data collected in 2015. As such, it is reasonable to expect that the noise climate may have changed significantly over the proceeding eight years.
- 4.4. Noise levels at the receptor have been predicted taking into account aperture size, directivity of sound propagation, screening, and distance attenuation. Predictions are inclusive of atmospheric-side attenuation fitted to the plant room as detailed in Table 2.

Table 2 Proposed atmospheric side attenuators to plant room

Attenuator	Insertion losses dB, at octave band centre frequencies (Hz)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Plantroom intakes	4	5	8	15	21	20	17	14
Plantroom VRV discharge	3	4	6	14	18	15	13	12

- 4.5. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. The proposed plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands placed upon the heat pump. However, a penalty of 3dB as described in BS 4142:2014 has been applied for the possible

presence of "...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment..."

- 4.6. Table 3 summarises the results of the assessment at the most affected properties. All other nearby receptors benefit from increased distance/screening to the plant such that resulting noise levels will be lower than at the receptors considered. The full set of calculations can be found in **Appendix F**.

Table 3 Assessment of predicted noise levels

Receptor	Period*	Plant sound pressure level at receptor, dB L _{Aeq}	Proposed criterion, dB L _{Aeq}	Excess, dBA
R1, Residential dwelling location above plant room louvre	Daytime (07.00 – 23.00 hours)	48	52	-4
	Night-time (23.00-07.00 hours)	48	48	0
R2, Residential, oxford place	Daytime (07.00 – 23.00 hours)	48	52	-4
	Night-time (23.00-07.00 hours)	48	48	0

- 4.7. The assessment shows that noise from the proposed plant will achieve the recommended criteria, when attenuated as described, at the most affected noise sensitive receptors and should therefore be acceptable to the local authority.

5.0 Roll cage testing and Sound Insulation Assessment

Measurement period

- 5.1. NSL attended the site between 11:00 hours and 14:00 hours on Tuesday 29th August 2023 to undertake sound insulation testing, inclusive of roll cage testing, within the proposed store and a residential dwelling located above the proposed stores back of house area. During this period, a service engineer was present such to enable the rolling of a cage over different floor surfaces, and the resulting noise levels observed and measured.

Table 4 Details of noise monitoring equipment

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977D / 99071	11/05/2023	Factory conformation certificate
Condenser microphone	ACO Pacific 7052E / 81197		

Description	Model / serial no.	Calibration date	Calibration certificate no.
Preamplifier	Svantek SV18A / 130661		
Calibrator	Svantek SV 33B / 83850	24/10/2022	1503647-1

- 5.2. On the day of testing the sound level meter in use was calibrated before and after testing using a Svantek Class 1L Acoustical Calibrator with a level of 114dB at 1000Hz applied to the measurement equipment. The readings were not found to have deviated by more than 0.1dB.

Survey methodology - Internal roll cage assessment

- 5.3. Testing was required to determine if an acoustic flooring was required throughout the proposed store.
- 5.4. As such, observations were made and internal roll cage testing undertaken within the living room of a residential dwelling located above the store, flat 109.
- 5.5. Noise levels were measured in the living room over very short periods to minimise the influence of extraneous sources (e.g. noise resulting from passing road traffic). Both broadband and one-third octave band frequency data were measured in order to obtain a more accurate description of noise generated by the roll cage, when rolled over the tested floor surfaces.
- 5.6. Measurements were taken of a typical ASDA roll cage, both laden and unladen, rolled across the Forbo Step Decibel vinyl flooring which is proposed to be installed upon the floor within the stores mezzanine level.

Roll cage assessment results

- 5.7. Measurements within the residential dwelling were taken both as broadband and one-third octave band noise levels. The results of the measurements are summarised in Table 5 below.

Table 5 Summary of measured noise levels within the living room of Flat 109

Location	Source	Range of recorded ambient sound pressure levels, LAeq	Subjective notes
Living room of Flat 109	Roll cage rolled across untreated floor	28-31	Roll cage audible
	Roll cage rolled across Vinyl	24-28	Significant improvement over untreated floor however still perceptible

- 5.8. Subjectively, roll cage noise was audible in each instance of testing however the introduction of the vinyl acoustic flooring solution did significantly reduce the degree to which roll cage noise attracted attention.

6.0 Airborne sound insulation assessment

Survey methodology – Airborne sound insulation assessment

- 6.1. Measurements of airborne sound insulation between rooms were undertaken in accordance with BS EN ISO 16283-1:2014 '*Acoustics: Field measurement of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation*', with the exception of the averaging procedure which follows the guidance advocated in Annex B (Paragraph B2.6) in Approved Document E of the Building Regulations 2000.
- 6.2. Pink noise was generated in the source room during testing using two loudspeakers. One-third octave band sound pressure levels were measured in the source room and in the receiver room using a moving microphone. The measurement time with each individual microphone position was at least 60 seconds. A measurement of background sound pressure levels lasting at least 60 seconds was undertaken in the receiver room using a moving microphone.
- 6.3. Reverberation times were measured in the receiving room, twice at each of three microphone positions using an interrupted noise source in the living room of flat 109.
- 6.4. The following separation distances were respected during the testing:
- 0.5 m between any microphone position and the room boundaries;
 - 1.0 m between any microphone position and the loudspeaker.

Sound insulation test results

- 6.5. Table 6 provides details of the partition tested, and the sound insulation test performed.

Table 6 Details of sound insulation testing

Partition type	Test type	Source room	Receive room	Composition
Floor	Airbourne	ASDA mezzanine level	Flat 109 Living room	200mm concrete slab

- 6.6. Table 7 provides the details of the noise generator and loudspeakers used in the sound insulation assessment.

Table 7 Details of sound insulation test equipment

Description	Model / serial no.	Calibration date	Calibration certificate no.
Noise Generator	NTI/ Minirator MR-PRO	N/A	-
Powered loudspeaker	Turbosound/ IX15	N/A	-
Powered loudspeaker	FBT/ ProMaxx12a	N/A	-

- 6.7. The results of the sound insulation test are provided in [Appendix C](#). Table 8 summarises the assessment of the test results against the design criteria detailed in Section 3.0.

Table 8 Summary of airborne sound insulation test results

Test	Source Room	Receiver Room	Measured Sound Insulation	Recommended Performance	Pass/Fail
	Description	Description			
A1.1	ASDA mezzanine level	Flat 109 Living room	57dB $D_{nT,w}$	(BS 8233:2014) 47dB $D_{nT,w}$	Pass
			57dB $D_{nT,w}$	(Fisher acoustics report) 58dB $D_{nT,w}$	Fail*
			49dB $D_{nT,w} + C_{tr}$	(Building Regulations) 45dB $D_{nT,w} + C_{tr}$	Pass

**Although the performance of the shell construction tested fell marginally short of the criterion of 58dB $D_{nT,w}$ set out in the Fisher Acoustics technical advice note was marginally exceeded, it should be noted that 58dB $D_{nT,w}$ is beyond even the most onerous criterion set out in Table 3 of BS 8233:2014 – ‘Guidance on sound insulation and noise reduction for buildings’. In practice a 1dB shortfall in sound insulation is marginal, is not perceptible, and is within the margin of precision for on-site tests of this type. It was noted that SVPs penetrating through the floor were not boxed-in at the time of testing.*

7.0 Discussion of results

Discussion of results – Roll cage assessment

- 7.1. With no resilient flooring installed noise from cage movements on the mezzanine level was clearly audible within the living room of flat 109. Subjectively, the vinyl solution provided a significant level of mitigation. It is important to note however even with the acoustic flooring solutions, noise from the roll cage was still audible, although unlikely to attract the level of attention that would result in a complaint. It should be stressed however, that prevailing residual noise levels likely influenced any subjective impression formed on site and it is possible that in quieter periods, such as the early morning and late evening, noise from the roll cages may be perceived to be more intrusive, and therefore more likely to attract the attention of the residents who live above the store, which may, although unlikely, result in complaints.
- 7.2. It should be noted that during testing, the noise of the cages rattling could also be heard indicating a weakness in the airborne sound insulation of the separating floor.

Discussion of results – Sound Insulation Assessment

- 7.3. The airborne sound insulation through the ceiling from the proposed back of house into the living room of flat 109, met the requirements of Building Regulations and the enhanced criteria of 47dB $D_{nT,w}$ with reference to BS 8233:2014. It did however fall marginally short of the $D_{nT,w}$ criterion of 58dB provided within the Fisher Acoustics report.

- 7.4. It is the opinion of NSL that the results of the sound insulation assessment are an indication that the airborne transmission path is likely to perform sufficiently against noise transfer between the store and its associated back of house area, and the residential dwellings located above.
- 7.5. NSL advises that an acoustic ceiling is required within the store's plant room.

8.0 Internal noise transfer mitigation plan

- 8.1. It is understood that ASDA will be undertaking the following works within the proposed store in order to provide adequate sound insulation between the store and the adjoining residential dwellings with consideration given to both structural and airborne transmission paths.

Airborne transmission

- 8.2. The result of the sound insulation test indicated that an acoustic ceiling would not be required within the store/ back of house, provided no plant is located within these areas. However, an acoustic ceiling is still to be installed within the plant room.
- 8.3. The proposed acoustic ceiling will comprise, 2No. 15mm SoundBloc layers supported from the soffit using resilient hangers to create a void at least 300mm deep. The void will be infilled to two-thirds depth with high density mineral wool. All joints between SoundBloc boards are to be staggered.
- 8.4. There should be no penetrations through the mass layer ceiling.
- 8.5. High standards of workmanship will be required to ensure that the separating floor provides the optimum performance. The perimeter of the separating partition must be isolated from the walls using appropriate perimeter isolation strips and ceiling fixings must not bridge the isolating elements.

Control of noise flanking

- 8.6. To control the potential for noise flanking transmission between the store/BoH and bathrooms and WCs in the flats above via soil vent pipes (SVP), any SVPs within the store demise are to be boxed in. The pipe enclosures are to be constructed from boards with a mass of at least 15kg/m² (e.g. two layers of 12.5mm thick plasterboard). The interior of the enclosures will be lined with 25mm thick mineral wool or glass wool.
- 8.7. Furthermore, to minimise noise flanking between the store and the flats, columns within the shop are to be independently lined with two layers of 15mm thick dense board (e.g. BG SoundBloc or similar), spaced at least 30mm from the structural wall and with glass/mineral wool in the cavity.

- 8.8. No sources of noise and/or vibration are to be rigidly connected to the building structure. This includes plant items such as ventilation fans, air conditioning cassette units, and loudspeakers.

Control of structure-borne transmission (roll cage movements)

- 8.9. The movement of roll cages through retail premises can be a significant source of structure-borne noise transmission. Vibrational energy from roll cage movements can transmit through the structure and reradiate as noise within adjoining premises. Structure-borne sound transmission from cage movements cannot be treated through the installation of acoustic ceilings; a resilient floor treatment is required to minimise transmission into the building structure.
- 8.10. It is understood that the tested acoustic vinyl solution be used upon the store's mezzanine level. It is the opinion of NSL, following testing, that the ASDA store is unlikely to receive complaints regarding structure borne noise resulting from roll cage movement. However, NSL reserves concern regarding the low levels of roll cage noise still audible within the tested period.
- 8.11. On the stores ground floor however, it is understood that a screed floating floor solution is to be installed. This will comprise screed cast onto a resilient layer. The resilient layer will either have a ΔL_w of not less than 30dB or have a natural frequency of not more than 24 Hz. The resilient layer will be at least 10mm thick and the floating floor will be isolated from the surrounding walls and columns to ensure flanking transmission does not occur. The floor finish will be smooth with no ridges or steps. There will be no rigid fixings through the screed finish into the resilient layer.

9.0 Summary

- 9.1. Noise Solutions Ltd (NSL) has been commissioned by ASDA Stores Ltd to provide acoustic consultancy services for the proposed new ASDA Express located within the new Circle Square development, Manchester.
- 9.2. A noise impact assessment and enhanced sound insulation testing has been undertaken to inform a scheme of mitigation measures that should prove an effective means of mitigating against noise from building services plant and structure/air borne noise resulting for the use of the commercial units as a convenience store.
- 9.3. Although the cumulative plant noise emission levels may in some instances exceed the criteria presented in the Deloitte report, the findings of a more recent assessment based upon the same methodologies and guidance found within the Deloitte report establishes that the cumulative plant noise emission levels for the proposed plant, when predicted at the most affected noise sensitive receptor locations are demonstrated to be in compliance with the typical requirements of Manchester City Council. Therefore, noise from the plantroom proposals should not be a reason for refusal of planning permission.

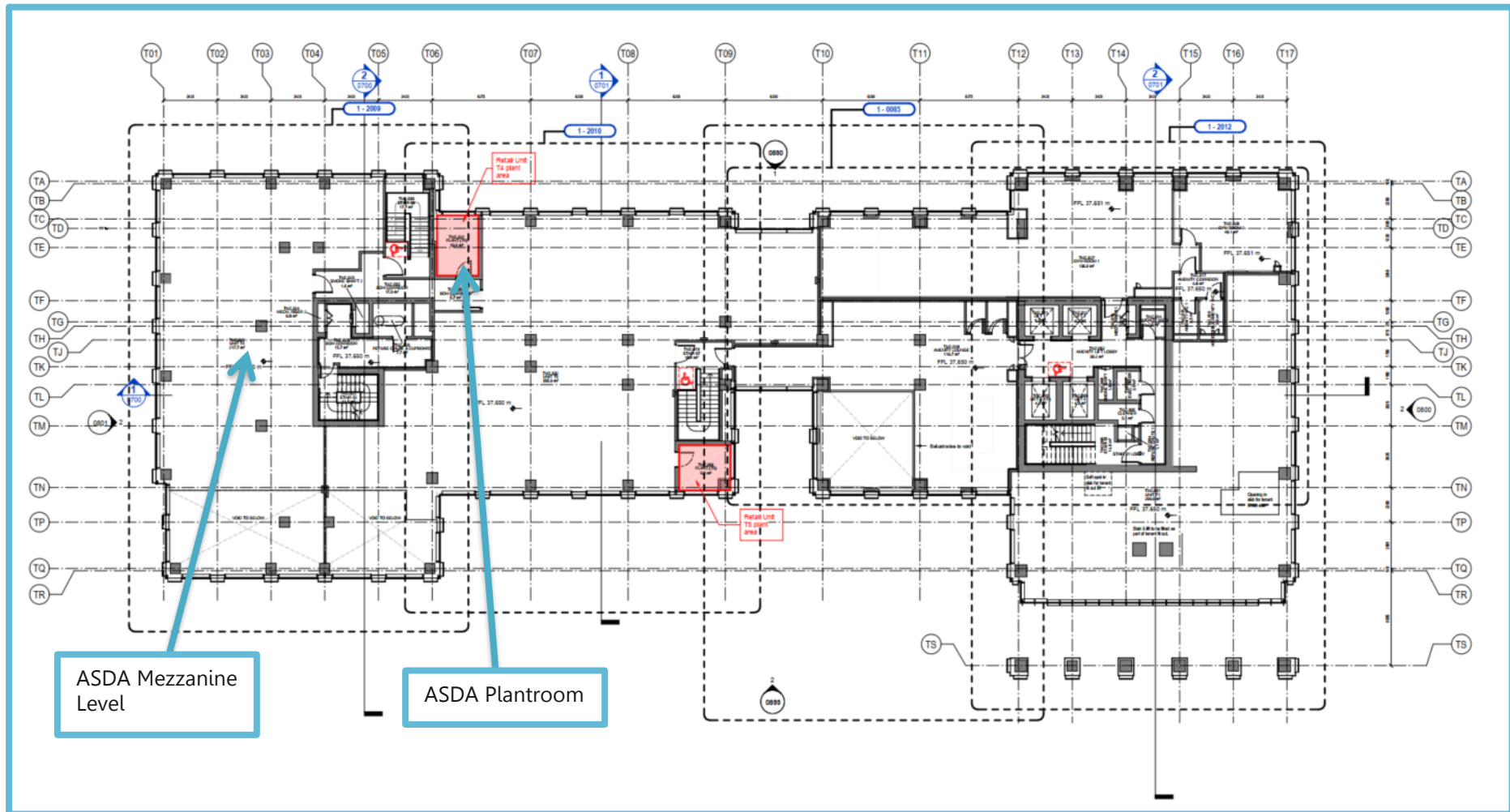
-
- 9.4. Predicted plant noise levels are inclusive of the following mitigation measures;
- Specified atmospheric-side attenuators to the proposed plantroom intake and VRV discharge.
 - All plant and associated pipework/ductwork should be fitted with suitable anti-vibration mounts/hangers.
- 9.5. NSL has attended site to undertake a sound insulation assessment within the living room of flat 109, located above the proposed store's mezzanine level, in order to determine compliance with guidance found in both Building Regulations Approved Document E, BS 8233:2014 and guidance provided by Fisher Acoustics.
- 9.6. The testing conducted shows that the airborne sound insulation of the shell separating floor between the store and living room above, achieves the criterion in the current Building Regulations and BS 8233:2014, however it fell marginally short of the criterion in the aforementioned Fisher Acoustics report. It should be noted, however, that a 1dB difference in performance is not perceptible and is within the limits of accuracy for site testing of this kind.
- 9.7. Furthermore, additional consideration has been given to the risk of structure borne noise and a resilient flooring is to be utilised upon both the ground, and mezzanine levels of the store.

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 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
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 L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	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 Drawings showing areas of interest

Mezzanine level

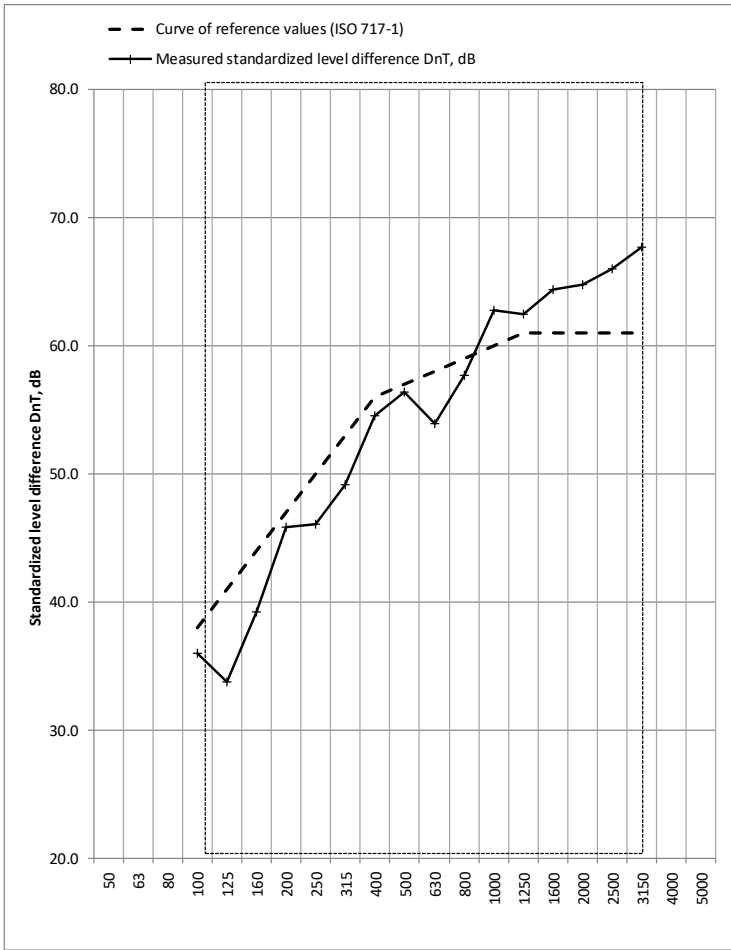


First Floor level



Appendix C

Results of sound insulation assessment

Standardized Level Difference According to ISO 140-4:1998 and Approved Document E Field Measurements of Airborne Sound Insulation Between Rooms																																															
Client:	ASDA Stores Ltd	Date of Test:	29/08/2023																																												
Address of Test:	Unit T4, Circle Square, Manchester																																														
Source Room:	Unit T4 Mezzanine Level																																														
Receiving Room:	Flat 109 Living Room																																														
Test Element:	Floor	No of test report:	A.1																																												
Description of Building Construction: Unknown existing construction																																															
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 2px;">Frequency f, Hz</th> <th style="padding: 2px;">D_{nT} (1/3 octave) dB</th> </tr> </thead> <tbody> <tr><td>50</td><td></td></tr> <tr><td>63</td><td></td></tr> <tr><td>80</td><td></td></tr> <tr><td>100</td><td>36.0</td></tr> <tr><td>125</td><td>33.8</td></tr> <tr><td>160</td><td>39.2</td></tr> <tr><td>200</td><td>45.8</td></tr> <tr><td>250</td><td>46.1</td></tr> <tr><td>315</td><td>49.2</td></tr> <tr><td>400</td><td>54.5</td></tr> <tr><td>500</td><td>56.4</td></tr> <tr><td>630</td><td>53.9</td></tr> <tr><td>800</td><td>57.7</td></tr> <tr><td>1000</td><td>62.7</td></tr> <tr><td>1250</td><td>62.4</td></tr> <tr><td>1600</td><td>64.4</td></tr> <tr><td>2000</td><td>64.7</td></tr> <tr><td>2500</td><td>66.0</td></tr> <tr><td>3150</td><td>67.7</td></tr> <tr><td>4000</td><td></td></tr> <tr><td>5000</td><td></td></tr> </tbody> </table>	Frequency f, Hz	D_{nT} (1/3 octave) dB	50		63		80		100	36.0	125	33.8	160	39.2	200	45.8	250	46.1	315	49.2	400	54.5	500	56.4	630	53.9	800	57.7	1000	62.7	1250	62.4	1600	64.4	2000	64.7	2500	66.0	3150	67.7	4000		5000				
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Rating in accordance with ISO 717-1 $D_{nT,w} (C;Ctr) = 57 (-3 ; -8) \text{ dB}$ Evaluation based on field measurement results obtained by an engineering method																																															
No of test report	A.1	Name of testing organisation:	Noise Solutions Ltd																																												
Date	29/08/2023	Signature:	Aiden Quinn																																												