



Withington Community Hospital: Community Diagnostics Centre

Noise Impact Assessment

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REVISION HISTORY

Revision	Date	Revision Details	Author	Checked
R01	10/05/2023	Initial issue	Susan Witterick BSc MIOA	Ben Tomlin BSc MIOA
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1 INTRODUCTION

- 1.1 dBx Acoustics Ltd has been appointed by the Manchester University NHS Foundation Trust (MFT) to carry out a noise survey and noise impact assessment for the proposed new-build Community Diagnostics Centre (CDC) in the grounds of Withington Community Hospital, Didsbury M20 2LR.
- 1.2 The Local Authority is Manchester City Council (MCC).
- 1.3 This report presents the results of an environmental noise survey carried out at the site and sets noise emission limits for externally mounted or discharging items of building services plant in order to meet the requirements of MCC.
- 1.4 A glossary of acoustic terminology has been supplied in Appendix A in order to assist the reader.

2 PROJECT DESCRIPTION

- 2.1 The project comprises the development of a two-storey building comprising a Community Diagnostics Centre (use class E(e)) with associated external landscaping, patient and delivery drop off area, and 6no. accessible parking spaces.
- 2.2 The location of the building within the existing site is indicated in Figure 1, below.

Figure 1: Building Location



- 2.3 The normal opening hours of the building are understood to be 08:00h-20:00h, Monday to Friday.
- 2.4 The building will be mechanically ventilated. An enclosed plant room is proposed at first floor level to the south west of the building (facing Burton Road). Air source heat pumps (ASHPs) and condensing units are proposed at roof level. It is anticipated that some operation of the ASHPs will be required overnight.

3 ACOUSTIC DESIGN CRITERIA

Manchester City Council

- 3.1 The Local Authority is Manchester City Council (MCC).
- 3.2 MCC's document *Planning and Noise*, last updated in October 2022, requires that BS412 should be used to assess the likely impact of noise from new items of plant. Specifically, it is required 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 (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'

- 3.3 BS 4142:2014 sets out a procedure for assessing noise impact whereby a Noise Rating Level is determined and compared with the existing local Background Sound Level.
- 3.4 The Rating Level ($dB_{L_{Ar,Tr}}$) is evaluated from the Specific Noise Level by including cumulative corrections to account for factors such as distinguishable tone, impulsivity, intermittency or other readily distinguishable sound characteristics.
- 3.5 The assessment of the impact depends upon the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level. An initial estimate of the impact of the specific sound is made by subtracting the Background Sound Level from the Rating Level, while considering the following points:
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
 - d) 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.

4 ENVIRONMENTAL NOISE SURVEY

- 4.1 An environmental noise survey was carried out on Friday 5th May 2023 between approximately 17:00h and 19:45h, typical of the lowest background noise levels for noise impact at the surrounding residential receptors during the anticipated operating hours of the building and associated plant.
- 4.2 As it is understood that some plant may be required to operate overnight, additional measurements were made during the nighttime period on Friday 15th September 2023.
- 4.3 Measurements were made at three locations, as indicated in Figure 2, below.

Figure 2: Noise Survey Locations



- 4.4 Location A was selected to be representative of the façade of the existing Hospital buildings, whilst Location B was representative of residential receptors on Fielden Road, and Location C was representative of residential receptors on Burton Road.
- 4.5 The noise climate at all locations was dominated by road traffic on Burton Road and the surrounding road network.
- 4.6 Measurements were undertaken in accordance with BS 7445-1:2003 *Description and Measurement of Environmental Noise*, with the microphone located approximately 1.5 metres above the local ground level and at least 3.5 metres away from reflective surfaces other than the ground; i.e in free field conditions.
- 4.7 All measurements were 15 minutes in duration.

Weather Conditions

- 4.8 Weather conditions during the measurement period were cool and dry.
- 4.9 Wind speeds were within suitable parameters for the measurement of environmental noise (i.e. generally under 5 ms⁻¹). The microphone was protected with a windshield for the duration of the survey.

Equipment

4.10 The equipment used during the environmental noise survey is detailed in Table 1, below.

Table 1: Equipment Used During Environmental Noise Survey

Kit Reference	Equipment	Manufacturer & Part No.	Serial Number	Calibration Date	Certificate Number
Kit 8 - Casella	Meter	Casella C633C	1716934	01/10/2021	04082/4
	Pre-Amp	CEL 495	001773		
	Microphone	CEL 251	000847		
	Calibrator	CEL 120/1	204515	18/01/2023	06083/4

4.11 The sound level meter was calibrated before and after measurements, with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrator, which had been calibrated not more than one year prior to the survey.

5 MEASURED NOISE LEVELS

- 5.1 The noise levels measured during the environmental noise survey are summarised in Table 2, below. Full measurement data are available on request.

Table 2: Measured Noise Levels

Location	Period	Ambient Noise Level, dBL _{Aeq,T}	Background Noise Level, dBL _{A90,T}
A – Hospital Façade	17:22h	48	46
	18:22h	50	42
B – Fielden Road	17:43h	52	43
	18:52h	48	41
	19:28h	51	43
	01:57	36	32
	02:32	36	32
C – Burton Road	18:02h	66	49
	19:09h	65	44
	02:15	52	39
	02:49	55	40

- 5.2 The lowest background noise level measured at each location during the survey has been used in the remainder of this assessment.

6 BUILDING SERVICES NOISE EMISSIONS

- 6.1 MCC requires that the rated plant noise level ($dB_{L_{Ar,Tr}}$), assessed in accordance with BS4142:2014 is controlled to 5dB below the background noise level $dB_{L_{A90,T}}$ at the nearest noise sensitive location during the periods in which the plant operates.
- 6.1 The nearest noise sensitive receptors are identified as the neighbouring residences on Fielden Road and Burton Road.
- 6.2 Consequently, when assessed at the nearest noise sensitive receptors, plant noise should not exceed the limits shown in Table 3, below, during the anticipated hours of operation (08:00h-20:00h).

Table 3: Building Services Noise Emission Limits

Receptor	Period	Lowest Measured Background Noise Level, $dB_{L_{A90,T}}$	BS4142 Rating Limit, $dB_{L_{Ar,Tr}}$
B – Fielden Road	Daytime 07:00h-23:00h	41	36
	Nighttime 23:00h-07:00h	32	27
C – Burton Road	Daytime 07:00h-23:00h	44	39
	Nighttime 23:00h-07:00h	39	34

- 6.3 It is anticipated that MCC will implement their standard planning condition with regard to control of noise from building services.
- 6.4 As the existing hospital building is within close proximity to the proposed development, it is proposed that the building services rating level should not exceed the existing background sound level at this location in order to minimise adverse noise impact. There are understood to be no windows to patient rooms which overlook the proposed development.

7 CONCLUSION

- 7.1 dBx Acoustics Ltd has been appointed by the Manchester University NHS Foundation Trust (MFT) to carry out a noise survey and noise impact assessment for the proposed new-build Community Diagnostic Centre (CDC) in the grounds of Withington Community Hospital, Didsbury M20 2LR.
- 7.2 This report presents the results of an environmental noise survey carried out at the site and surrounding noise sensitive receptors. Plant noise emission limits are set based on the lowest measured background noise levels during the survey, and in accordance with the requirements of Manchester City Council.
- 7.3 On this basis, noise should not be considered a limiting factor in granting planning permission for the proposed development.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is 2×10^{-5} N/m ² . The sound pressure level existing when microphone measured pressure is 2×10^{-5} N/m ² is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A-weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
L_{Fmax}	The instantaneous maximum sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
L_{AFmax}	The instantaneous maximum A weighted sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
$L_{Ar,Tr}$	The rating level: the equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Reverberation Time, T	The time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. The descriptor T, often includes other nomenclature to describe the type of reverberation time measurement or if the reverberation time is an average taken for specific frequencies. For example, a T_{mf} is the mid-frequency reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Acoustic Class, A - E	Classification of sound absorbers into Sound Absorption Classes A-E, according to BS EN ISO 11654, including frequencies 200-5000 Hz
NRC	A single-number rating system used to compare the sound-absorbing characteristics of building materials. A measurement of the acoustical absorption performance of a material, calculated by averaging its Sound Absorption Coefficients at 250, 500, 1000 and 2000 Hz
STI	Speech Transmission Index , Metric ranging between 0 and 1 representing the transmission quality of speech with respect to intelligibility by a speech transmission channel
R	Sound Reduction Index , the laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
R_w	Weighted Sound Reduction Index , a single number which represents the sound reduction of a material. It is derived by plotting the sound reduction index against a set of reference curves. The curves are shifted until a best-fit is established and the curve which best fits the sound reduction spectrum is used to represent the single figure value.
D_w	Weighted Level Difference , the weighted level difference between a pair of rooms, stated as a single figure.

D_{nT}	Standardised Level Difference, a frequency-dependent measurement of airborne sound insulation, calculated using the following formula: $D_{nT} = L_1 - L_2 + 10\log(T/T_0)$ dB Where: L_1 is the energy-averaged sound pressure level due to the pink noise source measured in the source room using a sweep technique. L_2 is the energy-averaged sound pressure level measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (= 0.5s for dwellings).
$D_{nT,w}$	Weighted Standardised Level Difference, a single-figure value of airborne sound insulation performance, derived according to procedures in BS EN ISO 717-1, based on the D_{nT} values at different frequencies (100-3150 Hz third octave bands).
$D_{n,F,w}$	Weighted, Normalised Flanking Level Difference, the normalised, weighted difference in sound level between a pair of rooms via a flanking element, such as mullion or ceiling detail. The level difference in octave bands is first normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
D_{ne}	Normalised Element Level Difference. The normalised difference in sound level between a pair of rooms via a small element such as a trickle ventilator. The level difference in octave bands is normalized to a reference amount of absorption.
$D_{n,e,w}$	Weighted, Normalised Element Level Difference. The normalised, weighted difference in sound level between a pair of rooms via a small element such as a trickle ventilator, stated as a single figure. The level difference in octave bands is normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
C_{tr}	Spectrum Adaptation Term, a correction term applied to the sound insulation single-number values (R_w, D_{wT}, and $D_{nT,w}$) in accordance with BS EN ISO 717-1. Applying the C_{tr} penalises a construction's performance if its low frequency performance is poor in relation its performance at higher frequencies.
Impact Sound	The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking or moving furniture on a floor structure.
L_{nT}	Standardised Impact Sound Pressure Level, a frequency dependent measurement of impact sound insulation, calculated using the following formula: $L_{nT} = L_1 + 10\log(T/T_0)$ dB Where: L_1 is the mean sound pressure level due to the tapping machine measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (0.5s for dwellings)
$L'_{nT,w}$	Weighted Standardised Impact Sound Pressure Level, a single-figure value (@ 500 Hz) of impact sound insulation, performance, derived according to BS EN ISO 717-2, based on the L_{nT} values at different frequencies (100Hz- 3150 Hz third octave bands).
Insertion Loss, IL	The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence.
NR	The Noise Rating level. This is a single figure value derived by plotting a noise spectrum against a set of curves. The curve under which the spectrum fits is the resulting NR level.

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