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Consultants in Acoustics, Noise & Vibration

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SEN NW Heywood

Environmental noise survey report – BB93

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Summary

Sandy Brown has been appointed by Mott MacDonald Limited to provide acoustic advice in relation to the proposed development at West Starkey Street in Heywood, Rochdale.

An environmental noise survey has been carried out with a view to determining the existing noise levels in the area, setting appropriate plant noise limits in line with the requirements of the Metropolitan Borough of Rochdale and determining the indicative sound insulation performance for the building envelope to achieve the requirements of BB93.

The noise survey was carried out on 4 December 2019.

The lowest background sound level measured during the survey was $L_{A90, 15\text{min}}$ 47 dB during the daytime.

Based on the requirements of BS 4142: 2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*' and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,16h}$ 47 dB during the daytime. These limits are set for daytime only, on the assumption that the school plant items will operate during school hours only.

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1 Introduction

Sandy Brown has been appointed by Mott MacDonald Limited to provide acoustic advice in relation to the proposed development at West Starkey Street in Heywood, Rochdale.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

Ambient noise level measurements allow assessment of the required sound insulation for the building envelope (eg facade, windows) to achieve the internal noise criteria set by Building Bulletin 93: *Acoustic Design of Schools: Performance Standards* version 17 dated 3 February 2015 (BB93).

This report presents the survey method, results of the environmental noise survey, a discussion of acceptable limits for noise emission from building services plant and the indicative sound insulation required for the different building facades.

2 Site description

2.1 The site and its surroundings

The proposed site location in relation to its surroundings is shown in Figure 1.

The land is bounded by West Starkey street to the south and is adjacent to the Heywood Sports Village.

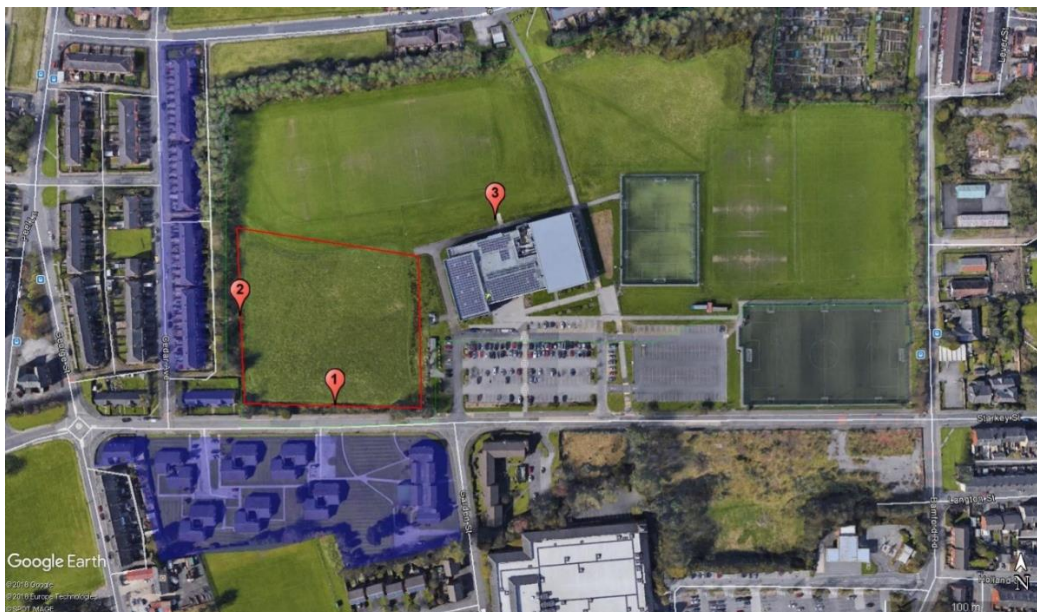


Figure 1 Image showing the site and its surroundings (courtesy of Google Earth)

2.2 Adjacent premises

The nearest noise-sensitive premises to the proposed site are shown in Figure 1 as follows:

- Retirement homes to the south of the site along West Starkey Street – highlighted in blue
- Residential premises to the west and south-west of the site – highlighted in blue.

3 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

3.1 Attended measurements

Attended sample measurements were performed by Elma Ooro at a number of locations around the proposed site. These are indicated in Figure 1 as positions 1 to 3. The attended measurements were carried out on 4 December 2019, over 15-minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area.

The noise levels measured at Position 2 are representative of the noise levels experienced by the nearest noise sensitive premises. The lowest background sound levels measured at this location will be used to set limits for plant noise egress. This assumes that all plant will operate during school hours only.

In each case the microphone was mounted on a tripod approximately 1.5 m above the ground level and at least 1 m from any other reflective surface.

4 Measurement results

4.1 Observations

The dominant noise sources observed at the site during the survey consisted of road traffic on West Starkey Street. Some noise from building work on a nearby house was also noted at position 2.

Less significant noise sources included dog-walkers and Heywood Sports Village plant items.

4.2 Attended measurement results

The sound pressure levels recorded during the survey are summarised in Table 1. The dominant noise sources noted during the measurements are also described. All the attended measurements were performed over 15-minute periods.

Table 1: Sound pressure levels from measurements

Position	Start time	Sound pressure level (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{A1,15min}$	$L_{A90,15min}$	
1	11:20	72	83	55	Road traffic along West Starkey Street
2	11:40	53	58	49	Building work on residential property nearby and road traffic on West Starkey Street
3	12:00	53	60	49	Sport centre plant items and people playing sports
1	12:20	72	82	57	Road traffic along West Starkey Street
2	12:40	53	60	48	Building work on residential property nearby and road traffic on West Starkey Street
3	13:00	52	56	47	Sport centre plant items

5 Assessment criteria

5.1 Noise egress criteria

5.1.1 Local Authority Criteria

It is understood that the Metropolitan Borough of Rochdale consider BS 4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' appropriate in the assessment of noise egress.

5.1.2 British Standard guidance

Guidance for noise emission from proposed new items of building services plant is given in BS 4142: 2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*' (BS 4142).

BS 4142 provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

5.2 Noise ingress criteria

5.2.1 Building Bulletin 93: Acoustic Design of Schools

The criteria for internal noise levels within a school are required by the Building Regulations to comply with levels recommended in Building Bulletin 93: *Acoustic Design of Schools* (BB93) as summarised in Table 2.

The noise levels given below do not include noise from teaching activities in the school, including noise from students, staff, and equipment within the building or in the playground.

Table 2: Maximum internal noise levels

Room or Area	Maximum internal noise level $L_{Aeq,30min}$ (dB) ¹
	New build
Recording studio, ensemble room	30
Teaching space intended specifically for students with special hearing and communication needs	30
Drama studio, assembly halls, multi-purpose halls	35
Nursery rooms, classrooms, teaching areas, small group rooms, seminar rooms, tutorial rooms, language laboratory, Lecture room	35
Open plan teaching area, breakout area, Libraries, Study room, Science laboratory	40

Design and technology, electronics, food, textiles, graphics, ICT room, art, design/resource area	40
Sports hall, dance studio, gymnasium/activity studio, dining room	40
Meeting room, interviewing/counselling room, video conference room	40
Office, medical room, staff room	40
Atrium, circulation not intended for teaching and learning	45
Corridor, stairwell, coats and locker area	45
Swimming pool	50
Kitchen, changing area, toilet	50

[1] BB93 also states that in order to protect students from regular discrete noise events, eg, aircraft or trains, indoor ambient noise levels should not exceed 60 dB $L_{A1,30min}$. This is typically achieved by default in spaces with maximum internal noise level up to 40 dB $L_{Aeq,30min}$ but requires assessment in spaces with higher maximum internal noise levels, eg, 45 and 50 dB.

A tolerance can be applied to the maximum internal noise levels given above in Table 2 for different types of ventilation systems. These tolerances are given below in Table 3.

Table 3 Maximum internal noise level tolerance for ventilation system types

Condition	Ventilation system	Noise level limit
Normal – ventilation for normal teaching and learning activities	Mechanical	Table 2 value
	Natural	Table 2 value + 5 dB ¹
	hybrid	Mechanical system noise: Table 2 value Total noise level: Table 2 value +5 dB
Summertime – ventilation under local control of teacher to prevent overheating – allowable during the hottest 200 hours of the year	Mechanical	Table 2 value + 5 dB ¹
	Natural or hybrid	≤55 dB
Intermittent boost ² – ventilation under local control of teacher for	Mechanical	Table 2 value + 5 dB ¹
	Natural	≤55 dB

dilution of fumes during practical activities as in practical spaces for science, art, food technology and design and technology

Process – Extract can be automatic ventilation for safety and/or under local control of teacher

Mechanical and/or natural

See IoA/ANC guide for operational noise levels

- [1] ¹ The + 5 dB does not apply to teaching and learning spaces where the Table 2 value maximum internal noise level is greater than or equal to 45 dB.
- [2] ² The noise level from locally controlled intermittent boost mechanical ventilation may exceed the maximum internal noise level by up to 5 dB.

6 Noise egress assessment

6.1 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed the limits set out in Table 4.

These limits are set for daytime only, on the assumption that the school plant items will operate during school hours only.

Table 4 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises ($L_{Aeq,15min}$ dB)
Daytime (07:00-23:00)	47

The limits set out in Table 4 do not include any attention catching features. The penalties for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed further in Section 6.2.

6.2 Attention catching features

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit below those set out above, based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible

For noise which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment is not appropriate, then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz)

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

6.3 Assessment

At this stage, no information is available in relation to the proposed installation of building services plant, and this will need to be assessed in detail as the design progresses. However, all plant items will be designed to achieve the plant noise limits set out above, including any corrections for attention catching features.

7 Conclusion

The lowest measured background sound level was $L_{A90,15min}$ 47 dB during the day. On the basis of the requirements of BS 4142, the relevant plant noise limits at the worst affected existing noise sensitive premises would be L_{Aeq} 47 dB during the day.

These limits are cumulative and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent than those set out above.

Appendix A

Survey details

Equipment

A B&K 2250 sound level meter was used to undertake the attended measurements. The calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Calibrator	4231/3019123	Brüel & Kjær	3 Sep 21	UCRT19/1969
Sound level meter	2250/3011964	Brüel & Kjær	4 Sep 21	UCRT19/1970, UTRC19/1976
Microphone	4189/3100176	Brüel & Kjær	4 Sep 21	UCRT19/1970, UTRC19/1976
Pre-amp	ZC0032/26376	Brüel & Kjær	4 Sep 21	UCRT19/1970, UTRC19/1976

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meter used in this survey are available upon request.

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{A1,T}$ The A-weighted maximum sound pressure exceeded for 1% of the measurement period. Indicative of the peak level.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

The L_{A90} is considered most representative of the background sound level for the purposes of complying with any local authority requirements.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

During the attended measurements carried out on 4 December 2019, the weather was generally clear and dry, and no rain occurred. Wind speeds varied between approximately 2 m/s and 4 m/s.

These weather conditions are considered suitable for obtaining representative measurements.