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Site Address : 5-7 Church Street, Wrexham, LL13 8LS
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Scope of Work: Baseline Noise Survey and Impact Assessment for proposed conversion of restaurant space to a flat.

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1. Introduction

- 1.1 REDFAN Solutions have been instructed to assess the background noise and impact on a refurbishment of 1st floor restaurant space into residential space at 5-7 Church Street, Wrexham, LL13 8LS.
- 1.2 An airborne sound insulation survey was also performed to ascertain the noise attenuation of the current floor between the new proposed new residential space and the existing restaurant area.
- 1.3 This report outlines the background noise levels at the site as well also provides any acoustic performance specifications that are required to enable the internal noise criteria to be achieved.
- 1.4 Monitoring of the prevailing background noise was undertaken over a 5-day period to cover both weekdays and weekends.

2. Criteria

BS8233:2014

- 2.1 Local Authorities usually stipulate internal noise criteria for residential buildings use levels based on British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'.
- 2.2 BS 8233:2014 provides references and guideline values for desirable indoor ambient noise levels for dwellings as shown in Table 2.8 below.

2.3 BS 8233:2014 Desirable Internal Ambient Noise Levels for Dwellings

Table 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.4 The table is noted to apply to external noise as it affects the internal acoustic environment from sources without a specific character.

2.5 The above internal ambient noise levels are therefore considered appropriate within this assessment.

2.6 BS 8233:2014 states that 'for traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed an upper guideline value of 55dB LAeq, which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances...in higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited'.

Changes in noise level

2.7 The Institute of Environmental Management and Assessment (IEMA) 'Guidelines for Environmental Noise Impact Assessment' provides guidance on the sensitivity of receptors to changes in noise levels. Changes in noise levels of less than 3dBA are not perceptible under normal conditions and changes of 10dB are equivalent to a doubling of loudness. This guidance has been accepted by Inspectors, at Inquiry, to encompass changes in noise levels in the index LAeq,T.

2.8 The following table summarises the response to changes in noise level (known as the Semantic Scale).

Table 2: Change in noise level – response and impact.

Change in noise level LAeqT dB	Response	Impact
<3	Imperceptible	None
3 - 5	Perceptible	Slight
6 - 10	Up to a doubling	Significant
11 – 15	More than a doubling	Substantial
> 15	-	Severe

2.9 BS 7445:2003 “Description and measurement of environmental noise”

Part 1 of BS 7445 establishes guidelines to quantities and procedures for environmental noise measurements. Guidance provided on instrumentation and calibration, measurement positions, meteorological effects, and information to be recorded.

- All equipment shall be calibrated and the configuration for calibration shall be in accordance with the manufacturer’s instructions.
- A comprehensive recalibration at certain time intervals may be prescribed by authorities responsible for the use of measurement results.
- A field check shall be made by the user at least before and after each series of measurements, preferably including an acoustic check of the microphone.
- “Outdoor measurements near buildings”: these measurements shall be carried out at places where the noise to which a receiver is exposed is of interest. If not otherwise specified, the preferred measurement positions are 1m to 2m from the façade and 1.2 to 1.5m above the ground.

2.10 BS 4142: 2014+A1:2019 “Method for rating and assessing industrial and commercial sound”

This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises;
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The significance of sound impact is to be determined according to the following summary process:

- Determine the background sound levels, in terms of the index LA90, at the receptor locations of interest.
- Determine the specific sound level of the source being assessed, in terms of its LAeqT level (T = 1 hour for day or 15 minutes for night), at the receptor location of interest.
- Apply a rating level acoustic feature correction if the source sound has tonal, impulsive, intermittent, or other characteristics which attract attention.
- Compare the rating sound level with the background sound level; the greater the difference between the two, the higher the likelihood of adverse impact.
- A difference (rating – background) of around +10 dB is an indication of significant adverse impact, depending on the context; a difference of +5 dB is an indication of an adverse impact, depending on the context. 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 upon context.

2.11 BS 4142 introduced the concept of 'context' to the process of identifying noise impact.

Section 11 of BS 4142: 2014+A1:2019 explains "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs" (our emphasis). 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" (our emphasis).

There are many context points to consider when undertaking an assessment of sound impact including:

- The absolute level of sound;
- The character and level of the specific sound in the context of the existing noise climate; for example, is the sound to occur in a location already characterised by similar activities as those proposed?
- The sensitivity of the receptors;
- The time and duration that the specific sound is to occur;
- The conclusions of assessments undertaken using alternative assessment methods, for example, WHO guidelines noise values or change in noise level;

2.12 It is therefore entirely possible that whilst the numerical outcome of a BS BS 4142:

2014+A1:2019 assessment is indicative of adverse or significant adverse impact, when the proposal is considered in context the significance of the impact is reduced to an acceptable level.

2.13 WHO Guidelines for Community Noise

2.13.1 The WHO Guidelines (1999) recommends indoor night-time guidelines in order to avoid sleep disturbance, the document states these to be 30 dB (LAeq) and 45 dB (LAfmax) for continuous and individual noise events respectively.

2.13.2 The document states that the number of noise events should also be considered and that individual noise events should not exceed 45 dB (LAfmax) more than 10 – 15 times per night.

2.14 The unattended survey was undertaken on 31/10/2023 between 12:00 and 23:00 on 05/11/23. This time period allows for measurements covering both weekends and weekdays. The monitoring equipment was placed at the 1st storey on church street. Measurements taken were (LAeq), (LA90), (LcfMax) and (LcfMax)

3. Site Description and Observations

3.1 The proposed construction area hereafter referred to as 'the site', is a proposed conversion of the upper story of a restaurant to residential space on the corner of Church Street and Temple Row. The site is situated near to the city centre of Wrexham. Church Street is a restricted vehicle, dead end road which accesses the Church, and Temple Row is a pedestrianised cut thorough along the backs of commercial shops and restaurants with very

little foot traffic. The site is approximately 35m from the main High Street, which is a low volume, slow-moving one-way road with a bus lane and shops to either side.

3.2 The noise survey was unmanned; therefore, a subjective assessment of background and ambient noise sources could not be undertaken for the whole monitoring duration. While onsite the dominant noise source was pedestrians using the local amenities as well as traffic from the High Street. Secondary noise will be from the restaurant below during service times and general background city noise.

3.3 Red lines outline approximate site and yellow dot shows positions tested.



4. Environmental Noise Survey

4.1 The unmanned Environmental Noise Survey was undertaken on 31/10/2023 between 12:00 and 23:00 on 05/11/23.

4.2 Ambient (L_{Aeq}), (L_{A90}), (L_{cfMax}) and (L_{cfMax}) level measurements were taken for a continuous 1-hour period in 5- and 15-minute increments.

4.3 The recordings were taken in 5 minute and 15-minute intervals to prevent any other single noises that would be seen as not representational from affecting the measurements. Prior knowledge of any out of the ordinary potential noise was limited and could have had an impact on the test.

4.4 The sound level meter was not positioned as for an outdoor free field measurement. And is less than 4m from the façade of any buildings and 1.2m to 1.5m above the ground. A 3dB reduction adjustment will be made to the recorded measurements. The position was chosen to best represent the ambient noise environment.

4.5 Equipment used for the survey.

Item	Make/Model	Serial no	Calibration Cert no
Calibrator	Norsonic 1255	125525488	U45621
Sound Level Meter	Norsonic 140	11404818	U39909
Microphone	Norsonic 1225	149539	39908

4.6 The Noise Survey and measurements were conducted as BS 7445:2003 establishes guidelines to quantities and procedures for environmental noise measurements.

4.7 Weather conditions throughout the unmanned survey were classed as overcast with light to heavy rain at times, temperature of between 4-13°C and wind had no set direction throughout the test and speeds did not exceed (<5m/s) and cloud cover varied throughout testing.

4.8 The noise monitoring equipment used was calibrated before and after both the noise survey periods. No significant drift was recorded for either. Equipment calibration certificates can be provided upon request.

5. Uncertainty

5.1 All measurements onsite were taken with a sound level meter manufacturer's margin of uncertainty at typically +/- 1.1dB. It is due to the tolerances associated with Class 1 sound level meters and calibrator equipment used to measure background noise.

6. Results

6.1 The test was not carried out in the free field position a 3dB reduction adjustment for reflective sound.

6.2 The table below gives the base line noise survey readings taken at site.

Date	Time Period	Sound pressure level dB (L_{Aeq})
31/10/23	Daytime (07:00-23:00hrs)	53dB
	Nighttime (23:00-07:00hrs)	46dB
01/11/23	Daytime (07:00-23:00hrs)	50dB
	Nighttime (23:00-07:00hrs)	44dB
02/11/23	Daytime (07:00-23:00hrs)	51dB
	Nighttime (23:00-07:00hrs)	42dB
03/11/23	Daytime (07:00-23:00hrs)	54dB
	Nighttime (23:00-07:00hrs)	45dB
04/10/23	Daytime (07:00-23:00hrs)	50dB
	Nighttime (23:00-07:00hrs)	45dB
05/11/23	Daytime (07:00-23:00hrs)	52dB
	Nighttime (23:00-07:00hrs)	N/A

6.3 The average-ambient (L_{Aeq}) noise levels at the measurement position during the survey has been based on an analysis of the monitored data.

6.3 The daytime (07.00-23.00hrs) loudest ambient noise level once the -3dB has been applied is 51dB (L_{Aeq}) 1hr with a nighttime (23.00-07.00hrs) loudest ambient noise level is 44dB (L_{Aeq}) 15min.

6.4 There were not more than 8 nighttime single incident noises that would be considered more than 45dB after the consideration of glazing attenuation.

7. Conclusions

7.1 Condensed results of testing performed.

Time Period	Average Sound pressure level dB (L_{Aeq})
Daytime (07:00-23:00hrs)	50dB
Nighttime (23:00-07:00hrs)	44dB

7.2 The assessment outlined national and local guidance, and considers this in relation to the likely operational activity and use of the building.

7.3 To comply with standards detailed in BS 8233:2014 a façade building fabric sound attenuation of 15dB is required.

7.4 The slate tile Mansard Roof with insulation and plaster/plasterboard to the first storey will attenuate more than 15dB.

7.5 Well maintained standard single 4mm glazed windows will have an R_w sound reduction of between 22-30dB.

7.6 Minimum glazed attenuation across the development should be approximately 15dB.

Sound Insulation of Typical Windows

Description	Weighted Sound Reduction Index, R_w
Any type of window in a facade when partially open	10 - 15
Single glazed windows (4mm glass)	22 - 30
Thermal insulating units (6-12-6)	33 - 35
Secondary glazed windows (6-100-6)	35 - 40
Secondary glazed windows (4-200-4)	40 - 45

7.7 Windows and any other proposed glazed areas or doors should be in a good state of repair and if required installed to manufacturers guidelines. With the provision of good workmanship and quality materials, there is no need for any further acoustic mitigation to comply with limit guideline noise values outlined in both BS 8233:2014 and the WHO Guidelines.

Appendices

1. These are the main noise indices in use in the UK.

- dB(A): The human ear does not hear all frequencies with the same intensity. It is most sensitive to sounds in the 500Hz-8kHz range. Above and below this range the ear becomes progressively less sensitive. To compensate for this, sound level meters incorporate electronic filtering to correspond with the varying sensitivity of the ear. This filtering is called A-weighting and Sound Pressure Levels obtained with this weighting are referred to as A-weighted and signified as dB(A).
- LA90: The sound level (in dBA) exceeded for 90% of the time. This unit gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the “background noise level” of an area.
- LAeq,T: The equivalent continuous sound pressure level over a period of time, T; (in dBA) This unit may be described as “the notional steady noise level that would provide, over a period, the same energy as the varying noise in question”. In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as road traffic, aircraft and trains.
- LA1: The sound pressure level (in dBA) exceeded for 1% of the time. This unit can give an indication of a regular maximum noise level from such activities as dance music.
- LAe: The sound exposure level, (previously denoted SEL) is the noise level of an event, such as a train or aircraft event, normally expressed in a 1 second time period.
- LAmin: The minimum sound pressure level (in dBA) measured over the time period.
- LAmax: The maximum level of sound (in dBA), i.e. the peak level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.
- LArT : sound rating level, the a-weighted, leq sound level of an industrial noise during a specified time period, adjusted for tonal character and impulsiveness

2. Leq (1hr) from test.

	L _{Aeq}						
		20:00	54	05:00	41	14:00	53
12:00	51	21:00	48	06:00	44	15:00	52
13:00	56	22:00	47	07:00	42	16:00	52
14:00	51	23:00	50	08:00	51	17:00	50
15:00	54	00:00	44	09:00	49	18:00	51
16:00	53	01:00	42	10:00	51	19:00	51
17:00	54	02:00	46	11:00	49	20:00	51
18:00	56	03:00	45	12:00	46	21:00	49
19:00	55	04:00	44	13:00	54	22:00	46
20:00	56	05:00	44	14:00	56	23:00	51
21:00	48	06:00	42	15:00	52	00:00	47
22:00	46	07:00	48	16:00	56	01:00	46
23:00	51	08:00	51	17:00	48	02:00	47
00:00	48	09:00	49	18:00	52	03:00	44
01:00	45	10:00	51	19:00	51	04:00	44
02:00	41	11:00	49	20:00	51	05:00	46
03:00	47	12:00	46	21:00	49	06:00	48
04:00	45	13:00	54	22:00	46	07:00	47
05:00	46	14:00	56	23:00	54	08:00	51
06:00	46	15:00	52	00:00	49	09:00	53
07:00	48	16:00	56	01:00	46	10:00	50
08:00	50	17:00	48	02:00	44	11:00	50
09:00	48	18:00	46	03:00	43	12:00	54
10:00	50	19:00	51	04:00	44	13:00	51
11:00	48	20:00	52	05:00	45	14:00	53
12:00	45	21:00	53	06:00	45	15:00	52
13:00	53	22:00	53	07:00	47	16:00	51
14:00	55	23:00	55	08:00	51	17:00	53
15:00	51	00:00	45	09:00	49	18:00	51
16:00	55	01:00	40	10:00	51	21:00	52
17:00	47	02:00	42	11:00	49	22:00	51
18:00	52	03:00	42	12:00	46	23:00	50
19:00	50	04:00	43	13:00	54		