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Building Services Engineering | Sustainability | Acoustics

Premier Inn London Hayes, Heathrow (North A4020)

Whitbread

Noise Impact Assessment

Revision 00

31/07/2024

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Project Particulars

Client Name: Whitbread

Project Name: Premier Inn London Hayes, Heathrow (North A4020)

Disclaimer

Revision History

Revision	Date	Prepared By	Checked By
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Contents

1 Introduction

1.1 Proposals are in place for a restaurant conversion at the existing Premier Inn London Hayes, Heathrow (North A4020) site, located at 362 Uxbridge Rd, Hayes UB4 0HF. The restaurant is in a separate building to existing hotel, towards the south-west of the site and will be converted to mixed hotel and restaurant use. This report presents an assessment of the noise emission from new building services plant associated with the redevelopment. Noise intrusion into the newly formed hotel bedrooms has also been assessed within this report.

1.2 Short-term and long-term external noise measurements have been conducted at the site, and the measurement data have been used to establish the prevailing ambient and background noise levels affecting the site and neighbouring noise-sensitive properties. This data has then been used to assess the noise impact in accordance with London Borough of Hillingdon's anticipated requirements.

1.3 Chapter 2 of this report presents the acoustic requirements, Chapters 3 and 4 describe external noise surveys, and the assessment of plant noise emission to neighbouring properties is presented in Chapter 5. External noise intrusion into hotel guestrooms is assessed in Chapter 6. Conclusions have been provided in Chapter 7.

1.4 The full measurement data are available on request. Definitions of some of the terminology used throughout the report have been included in Appendix A.

2 Acoustic requirements

2.1 Overview

2.1.1 When assessing the impact of noise emission from new building services plant associate with the proposed development, and noise intrusion into the proposed development, consideration has been given to local planning policy, available good practice guidance, and the hotel operator's brand standards. The key documents that have been included within this report are as follows:

Local Policy

- London Borough of Hillingdon Local Plan: Part 1 – Strategic Policies (Adopted November 2012)

Good Practice Guidance

- British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

Hotel Operator's Brand Standards

- Premier Inn Generic Specification for a Turnkey Development (January 2024 – Edition Rev. N)

2.1.2 Summaries of the guidance considered relevant to the proposals are presented within this Chapter.

2.2 London Borough of Hillingdon

2.2.1 While the Local Authority are not believed to have objective standards relating to noise ingress into or noise emission from development, noise is addressed in Strategic Objective SO10 and Policy EM8 of the Local Plan, with explanatory text.

2.2.2 The Local Plan identifies *"…the need to control, reduce and mitigate noise, especially around Heathrow and the major road network."* as a Main Challenge relating to open spaces.

2.2.3 Strategic Objective SO10 (Under *Land, Water Air, and Noise*) is as follows:

"Improve and Protect air and water quality, reduce adverse impacts from noise including the safeguarding of quiet areas and reduce the impacts of contaminated land."

2.2.4 Policy EM8 of the Local Plan is as follows:

> *"Noise*
>
> *"The Council will investigate Hillingdon's target areas identified in the Defra Noise Action Plans, promote the maximum possible reduction in noise levels and will minimise the number of people potentially affected.*
>
> *"The Council will seek to identify and protect Quiet Areas in accordance with Government Policy on sustainable development and other Local Plan policies.*
>
> *"The Council will seek to ensure that noise sensitive development and noise generating development are only permitted if noise impacts can be adequately controlled and mitigated."*

2.2.5 It is expected that the Local Authority will want to be reassured that the development will be in line with typical industry practice, with respect to noise.

2.3 British Standard 4142

2.3.1 British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*, presents a methodology for comparing the noise level of the new source (the *specific sound level*) with that of the existing background noise level in the area in the absence of the new source (the *background sound level*), and establishing the likely impact of the noise.

2.3.2 The methodology requires consideration to be given to all aspects of the assessment process, and accounts for unusual acoustic features such as tonal, impulsive, or intermittent characteristics of the noise by the addition of various corrections to the specific sound level. The corrected *specific sound level* is the *rating level*.

2.3.3 The *background sound level* is then arithmetically subtracted from the *rating level*. The greater the positive difference between the *rating level* and the *background sound level*, the greater the magnitude of the impact.

- A difference of around +10dB or more is likely to be an indication of a "significant adverse" impact, depending upon the context.
- A difference of around +5dB or more is likely to be an indication of an "adverse impact", depending upon the context.
- Where the *rating level* does not exceed the *background sound level*, this is an indication of a "low impact", depending upon the context.

2.3.4 It is proposed to target a BS 4142 *rating level* at or below the prevailing *background sound level* at all times the new plant is to be operating, in order to achieve a *low impact* at neighbouring noise-sensitive receivers.

2.4 Landlord requirements

2.4.1 All new Premier Inn developments and extensions are to be constructed so as to control noise intrusion in line with the requirements of the Premier Inn Generic Specification for a Turnkey Development, hereinafter referred to as the "PI Spec". Revision N (January 2024) of the PI Spec contains internal background noise limits for hotel bedrooms owing to external sources, as presented in Table 2-1, below:

Period	Noise level
Daytime (07:00-23:00 hrs)	$L_{Aeq,1hour} \leq 35$ dB
Night-time (23:00-07:00 hrs)	$L_{Aeq,1hour} \leq 30$ dB $L_{AFmax} \leq 42$ dB (*)

(*) The maximum criterion applies to all vehicles and railway train passbys and all aircraft flyovers. It also applies to the noise from all street activities including those associated with patrons attending and leaving adjacent, neighbouring or connected entertainment venues; noise associated with commercial and industrial neighbouring premises including delivery activities and process equipment; seagulls and church bells. Genuinely infrequent and unpredictable sources such as sirens or car alarms occurring no more than twice a night are excluded.

Table 2-1: Premier Inn internal background noise level requirements

2.4.2 The standards have been chosen to complement the Good Night Guarantee offered by Premier Inn, which refunds guests if they have been disturbed by noise while trying to sleep. These standards are more onerous than those recommended in British Standard 8233, the usual guidance adopted for controlling noise intrusion into residential accommodation. It is therefore intended to control noise intrusion into the hotel in line with the requirements of the PI Spec. Complying with these requirements can also be expected to satisfy any reasonable Planning requirements for noise intrusion into the hotel.

2.4.3 The PI Spec also requires that noise emission from all plant associated with the hotel be designed to be at least 5dB below the lowest measured background sound level at night with all plant operating simultaneously, when assessed at the boundary (assumed to be any normally occupied position) of the nearest noise sensitive property.

3 External unattended noise survey

3.1 Site description

3.1.1 The site is located in Hayes, on the junction of Coldharbour Lane/Yeading Lane and Uxbridge Road. As a result, road traffic from the main roads is the dominant noise source affecting the site. The existing restaurant (The Grapes) faces onto Uxbridge Road.

3.1.2 Residential properties bound the site to the north and east, and further away to the west across Yeading Lane. The site is shown in Figure 3-1 (overleaf).

3.1.3 Noise at the site from any existing building services was found to be imperceptible against the road traffic noise, although may become more audible during lulls in traffic flows.

3.1.4 Despite the site's proximity to Heathrow Airport (some 4.5km), no significant aircraft noise was noted during attendance on site. Flights serving Heathrow are oriented in the east-west direction, so the site is not under or close to any air traffic corridor.

3.2 Measurement methodology

3.2.1 Continuous, unattended noise level measurements were conducted at a single position, in the north area of the site. A secure location was selected that was representative of noise levels at nearby residential dwellings. The microphone is considered to have been placed in a reasonable approximation of free-field conditions; extended around 1.5m above ground.

3.2.2 The measurement position is shown on a satellite image in Figure 3-1 (overleaf).

3.2.3 The equipment used for the noise survey is listed below.

Table 3-1 Noise survey equipment list

Type	Manufacturer	Model	Serial number
Class 1 sound level meter	Norsonic	Nor131	2766
Microphone	Norsonic	Nor1207	12160
Preamplifier	Norsonic	Nor1227	170606
External weather enclosure	Norsonic	Nor1218	2517
Portable calibrator	Norsonic	Nor1251	34926

3.2.4 The calibration of the sound level meter was checked prior to and on completion of the measurement period in accordance with recommended practice. No significant drift in calibration occurred during the measurement period. The accuracy of the calibrator can be traced to National Physical Laboratory Standards.

3.2.5 Statistical and spectral data were recorded in 15-minute samples between 16:30 on Tuesday 4th and 11:00 on Friday 7th June 2024.

Figure 3-1 Satellite image of site showing the measurement position (source: Google Earth)

3.3 Weather

3.3.1 Weather conditions throughout the survey were observed to be generally calm and dry, and are understood to have included the occasional light spell of rain, based on local weather data. The measurement data are not believed to have been adversely affected by the weather in the context of this assessment.

3.4 Measurement results

3.4.1 Full measurement data are available in digital format upon request.

3.4.2 Figure 3-2 presents a graph showing the measurement noise level history.

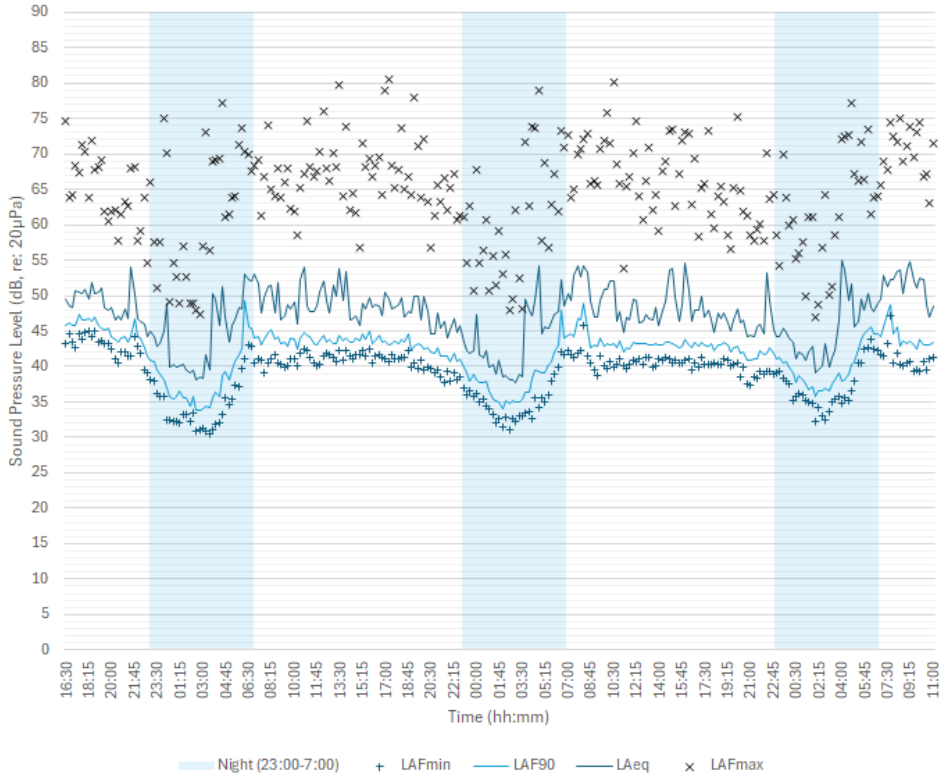

Figure 3-2: Measured noise level history

3.4.3 Minimum, background and average noise levels can be seen to be steady during the daytime and evening periods, with a drop-off late at night (presumably as traffic flows reduce). There is no obvious 'flattening out' of the background noise levels when ambient levels reduce, as may be expected from by constant underlying building services noise or similar.

3.4.4 The noise level history accords with the subjective impressions of the various sources of noise observed during the periods of attendance, being consistent road traffic noise.

3.4.5 Background noise levels typically reduce to about 34-37 dB $L_{A90,15mins}$ overnight. Noise levels start to increase from about 4am, presumably associated with the traffic flows starting to increase for the day.

4 Attended noise measurements

4.1 Overview

4.1.1 The long-term measurement position was chosen to measure background noise, and as such was shielded from both roads. Therefore, additional measurements were undertaken to gather noise data for road traffic on Yeading Lane/Uxbridge Road and the junction.

4.1.2 Short-term, attended noise measurements were undertaken of road traffic noise on Yeading Lane on 4th June 2024 between 16:10 and 16:20. Traffic was noted to be busy during this time, with frequent passbys from buses as well as regular vehicles. Two separate measurements lasting two minutes each were taken. The measurement location is shown in the following figures.

Figure 4-1 Street photograph showing attended measurement location on Yeading Lane. Courtesy of Google.

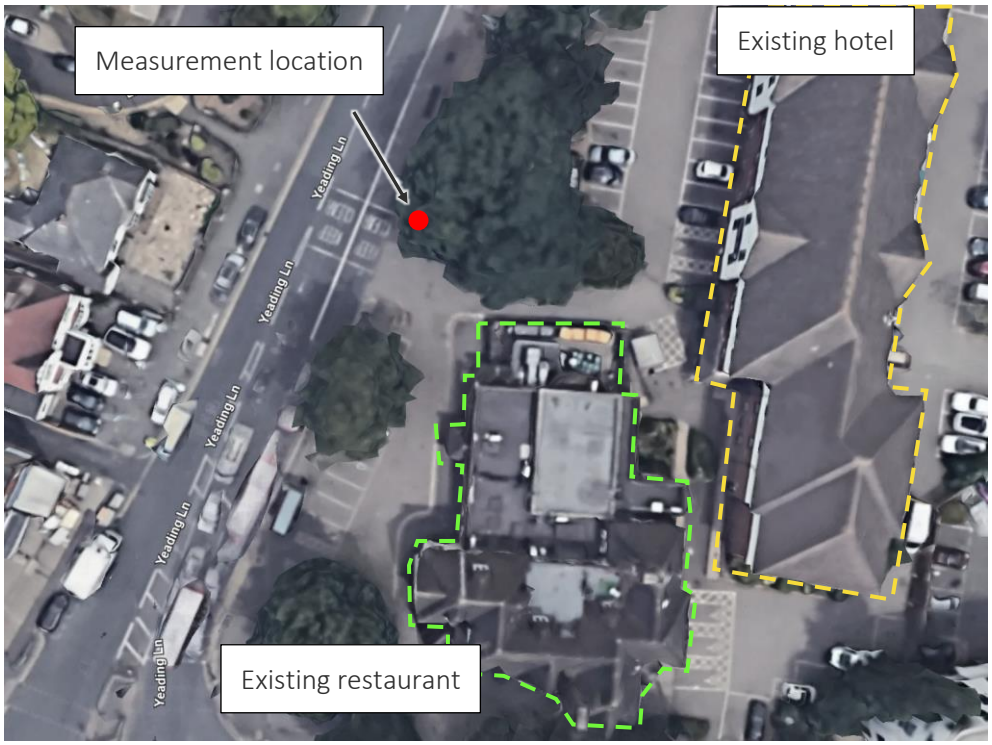

Figure 4-2 Aerial view of site showing attended measurement location. Courtesy of Google.

4.1.3 Results from the attended noise survey are presented below.

Start Time	Metric	Sound pressure level (dB) / Octave band (Hz)								
		63	125	250	500	1k	2k	4k	8k	dBA
16:12	L_{Fmax}	82	79	74	75	74	71	68	61	78
16:15	L_{Fmax}	80	80	73	73	75	73	89	63	90
16:12	$L_{eq,2mins}$	71	66	63	62	64	60	53	46	67
16:15	$L_{eq,2mins}$	70	66	63	62	65	60	61	45	69

Table 4-1 Attended noise survey results in octave-bands

5 Plant noise emission to neighbouring properties

5.1 Plant noise emission limits

5.1.1 In order to achieve a "low impact" according to a BS 4142 assessment, the rating level of the proposed building services plant needs to be no greater than the background sound level at the existing neighbouring properties. The background sound levels used should reflect the level that is typically expected to occur at different times during the day.

5.1.2 The noise level data at the measurement position are considered representative of the levels of background noise likely to be incident on facades of neighbouring noise-sensitive receivers. These levels are summarised below.

Time	Lowest measured background noise level
Day (07:00-23:00)	41 dB $L_{A90,15min}$
Night (23:00-07:00)	34 dB $L_{A90,15min}$

Table 5-1: Lowest measured background sound levels, taken as limits for noise emission at NNSRs

5.2 Plant proposals

5.2.1 To serve guestrooms, two outdoor condenser units (Mitsubishi PURY-EP200YNW-A2) are proposed to be installed at ground level in proximity to the new extension.

5.2.2 It is understood that all new external plant will be installed in an existing small timber plant enclosure to the north of the restaurant. This is shown in Figure 5-1, overleaf.

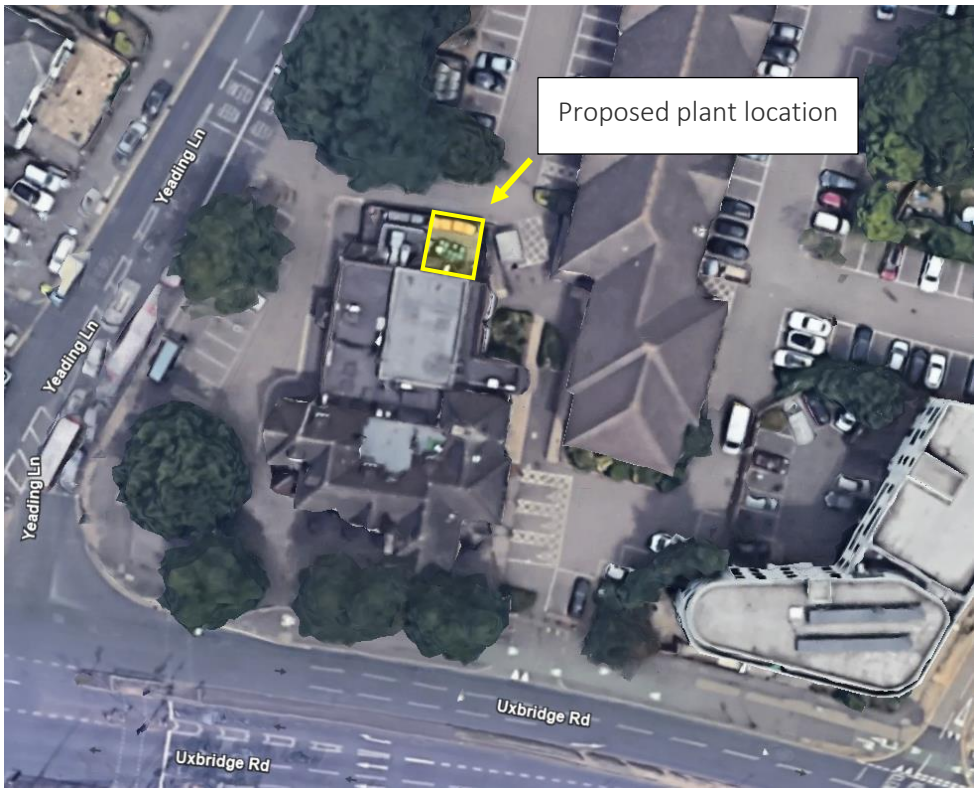

Figure 5-1 Aerial view of site with location of external plant indicated

5.2.3 The guestroom air-conditioning equipment (2 No. Mitsubishi PURY-EP200 units) are able to be controlled to 70% duty during the daytime (07:00 - 23:00) and to 50% duty overnight (23:00 - 07:00).

5.2.4 The sound power levels for the air-conditioning equipment at both 50% and 70% duty have been provided by the manufacturer and are presented in Table 5-2. The equipment is noisier when operating in heating mode, rather than other modes, so only the data for heating mode has been used in the assessment.

Unit	Highest noise levels in octave-band centre frequencies (Hz)								
	63	125	250	500	1k	2k	4k	8k	dBA
PURY-EP200 70% duty	79	74	69	67	65	62	64	60	72
PURY-EP200 50% duty	75	68	60	59	56	53	57	55	63

Table 5-2: Manufacturer-provided linear sound pressure levels dB ref:$2x10^{-5}$Pa (all measured at 1 metre)

5.3 Nearest noise-sensitive receivers

5.3.1 The assumed nearest noise-sensitive receivers (NNSRs) are presented in Figure 5-2 in relation to the hotel and existing restaurant. These are all residential properties, to the west, north, and east of the site.

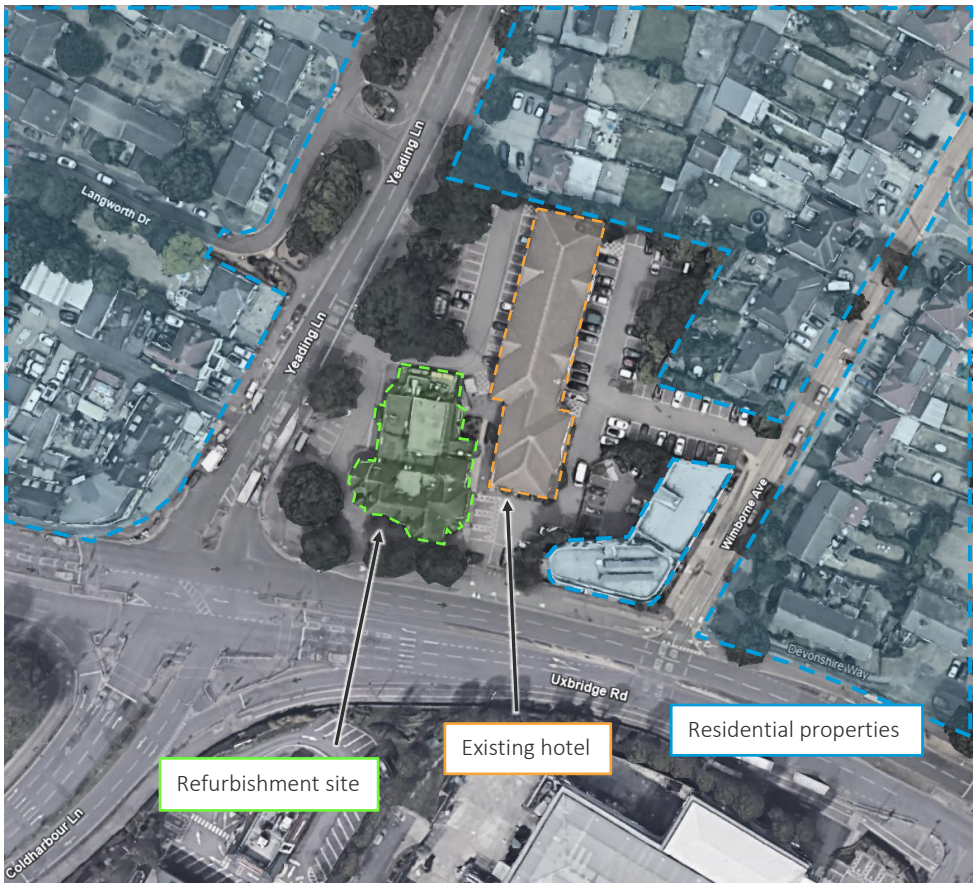

Figure 5-2: Satellite image of site showing the nearest noise-sensitive receivers (source: Google Earth)

5.3.2 The assumed assessment locations are taken as any normally occupied position within the site boundary of the most affected NNSRs, based on a theoretical free-field point.

5.3.3 The distance between the new external plant and the nearest residential boundary (residential properties across Yeading Lane) is 34m. Attenuation owing to point-source distance propagation will therefore be 31 dB.

5.3.4 No screening attenuation has been assumed from the timber fence.

5.3.5 Controlling noise emission to suitable levels at the assessment location can be expected to result in suitable levels at other NNSRs not discussed further in this report.

5.4 Specific sound level

5.4.1 The level of noise emission predicted from the new external equipment, when taking into account the respective amounts of propagation attenuation, and based on the manufacturer's data presented in Table 5-2, are presented overleaf.

- Nearest residential properties
  - Calculated daytime specific sound level 33 dB L_{Aeq}
  - Calculated night-time specific sound level 26 dB L_{Aeq}

5.5 Rating level

5.5.1 The guidance in BS 4142 requires that decibel corrections be added to the *specific sound level* if the noise contains unusual acoustic characteristics, as these have the potential to increase likelihood of adverse noise impact. The corrected sound level is known as the *rating level*. The following characteristics have been considered:

- Tonality – Noise from the proposed air-conditioning units will typically be airflow noise at maximum duty, which is broadband in character (i.e. distributed over a wide frequency range), and therefore not expected to contain tonal qualities. However, a precautionary +2 dB correction has been included to allow for a "just" perceptible tonality.
- Impulsivity – When properly maintained, noise from the proposed new equipment is not expected to exhibit impulsive characteristics, therefore this correction has not been applied.
- Intermittency – The duty of each individual air-conditioning unit will adjust depending on the cooling/heating duty requested by the occupants. The equipment is, however, expected to operate with gradual stop/starts, so it is unlikely that an intermittent characteristic would be experienced at the neighbouring properties. However, a precautionary +3 dB correction has been included.
- Other – The units are not expected to emit any other characteristics that would be readily distinctive against the existing acoustic environment, therefore no correction has been applied.

5.5.2 The BS 4142 rating level will therefore be 5 dB higher than the specific sound level at the nearest noise-sensitive receivers.

5.5.3 The calculated BS 4142 rating levels are as follows:

- Nearest residential properties
  - Calculated daytime rating level 38 dB L_{Aeq}
  - Calculated night-time rating level 31 dB L_{Aeq}

5.5.4 Comparing the above to the noise emission limits given in Table 5-1, it can be seen that the BS 4142 rating levels are 3 dB below the lowest background sound levels. This is an indication of a "low impact", according to BS 4142, depending on the context.

5.6 British Standard 4142 assessment

5.6.1 BS 4142 requires the context and uncertainty of the assessment to be considered. With regard to the context, the new noise source may be considered to have a differing character to the dominant noise source in the area. A +5 dB penalty has therefore been added to the assessment to account for any distinguishable character the noise emitted by the plant may have, when considered against the prevailing ambient noise climate. The corrections applied are considered precautionary, as any unusual acoustic features are unlikely to be perceptible at the assessment locations. So the inclusion of such corrections is considered to represent a worst-case scenario.

5.6.2 There is some uncertainty in using a simplified model to predict noise emission, due to the complexity of noise propagation. In addition, it is not certain that the noise measurements captured during the survey will reflect the typical noise levels experienced in the surrounding area throughout the year. To account for this, the lowest measured background sound levels have been used. This conservative approach to the assessment is therefore considered to sufficiently account for any inherent uncertainty.

5.6.3 It should be noted that the background sound levels used in the assessment are the lowest levels measured during the noise survey, and only occur for short periods during the quietest times of the night. At all other times, the background sound levels can be expected to be higher than assumed for the assessment, indicating a reduced impact.

5.6.4 Taking the above into account, no adjustment for context is considered to be necessary. It is therefore concluded that noise from the new plant will have a “low impact” on the neighbouring properties, based on the guidance presented in BS 4142.

6 Noise intrusion into new Premier Inn guestrooms

6.1 Introduction

6.1.1 Results from the attended noise survey have been used to calculate the level of noise ingress expected in new hotel bedrooms.

6.1.2 The level of noise intrusion into a space is a function of the volume and surface finishes of the space, and the sound insulation performance provided by the façade.

6.1.3 The following reasonable worst-case incident noise levels have been established, from the attended noise survey:

Metric	Sound pressure level (dB) / Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Maximum (L_{Fmax})	80	80	73	73	75	73	50
Average ($L_{eq,2min}$)	71	66	63	62	64	60	53

Table 6-1 Representative noise levels established from attended measurements, in octave bands

6.2 Recommended façade constructions

6.2.1 The recommended sound insulation performance of façade elements to achieve the criteria set out in Table 2-1 have been determined based on the ratio of glazing to solid façade and room sizes shown in the architectural drawings. The minimum recommended performance figures are set down in Table 6-2.

Façade element	Sound reduction index (dB *R*) Frequency (Hz)					
	125	250	500	1k	2k	4k
External walls	40	46	51	53	50	50
Bedroom windows	23	29	39	48	47	48

All values are sound reduction indices measured in accordance with BS EN ISO 10140-2

Table 6-2: Recommended acoustic specification for the proposed façade

6.2.2 The sound insulation performance for external walls is expected to be achieved by typical masonry constructions, supplemented with internal plasterboard linings and insulation in the cavity. Alternatively, lightweight façade wall systems are considered viable, but may need some form of cementitious board within the build-up.

6.2.3 A suitable glazing configuration for the bedroom windows would be a triple-glazed unit, such as Abbey Glass' "Urban" product, which comprises: 6mm outer pane, 14mm airgap, 8.8mm centre pane, 14mm airgap, 4mm inner pane.

6.2.4 Alternative constructions and glazing configurations may also be suitable, so long as they allow the criteria set out in Table 2-1 to be satisfied.

6.2.5 Noise ingress via the ventilation openings to bedrooms is expected to be adequately controlled using the standard Premier Inn detail, which incorporates a 1m length of acoustically-treated flexi-duct, located internally on the atmosphere-side terminations.

7 Conclusions

7.1 An external noise survey has been conducted at the site, and the measurement data have been used in conjunction with planning policies from Hillingdon London Borough Council and industry-standard guidance to establish noise emission limits at neighbouring residential properties.

7.2 A noise emission assessment has been undertaken of new building services plant associated with the proposed extension, based on the manufacturer's data and the findings of the noise survey.

7.3 The operating duties of the proposed air-conditioning equipment will be restricted to assist with satisfying the noise emission limits.

7.4 The noise emission assessment concludes that noise from the proposed plant is expected to have a "low impact" on neighbouring properties, according to British Standard 4142. This is expected to be in line with any condition that Hillingdon London Borough Council may wish to set, regarding noise emission to neighbours.

7.5 External noise intrusion into bedrooms of the proposed new hotel extension has been assessed. External wall and window specifications are recommended, which are expected to result in satisfying the Premier Inn Specification for hotel bedrooms. Note that the hotel operator's requirements are more onerous than those within British Standard 8233, which is the standard usually adopted for residential properties.

8 Appendix – Terminology

A-weighting **L_A or L_{pA}, L_{WA},**	Within its operating limits a precision measurement microphone measures all frequencies the same so the output it produces does not reflect what we would actually hear. The A-weighting is an electronic filter that matches the response of a sound level meter to that of the human ear. When A-weighted the Sound Pressure Level L_p becomes L_{pA} (or L_A) and the Sound Power Level L_W becomes L_{WA}.
L_p	*The instantaneous sound pressure level* (L_p)
L_{pA} (or L_A)	*The A-weighted instantaneous sound pressure level* (L_{pA} or L_A). This is the root mean square size of the pressure fluctuations in the air. This level can fluctuate wildly even for seemingly steady sounds. To make sound level meters easier to read the values on the display are smoothed or damped out. This is effectively done by taking a rolling average of the previous 0.125s (FAST time constant) or the previous 1s (SLOW time constant).
L_{AF}, L_{AS}	The letters F or S are added to the subscripts in the notation to indicate when the FAST or SLOW time constant has been used. These are often omitted but it is good practice to include them.
L_{max}	*The maximum instantaneous sound pressure level* (L_{max}),
L_{Amax}	*The A-weighted maximum instantaneous sound pressure level* (L_{Amax})
L_{AFmax}	*The A-weighted maximum instantaneous sound pressure level with a FAST time constant* (L_{AFmax}).
$L_{N,T}$	*The percentage exceedance sound pressure level* ($L_{N,T}$),
$L_{AN,T}$ $L_{AFN,T}$ **$_N$ = %age value, 0-100** **$_T$ = measurement time** **eg. L_{A90}, L_{A10}, $L_{AF90,\ 5\ min}$**	*The A-weighted percentage exceedance sound pressure level* ($L_{AN,T}$), *the A-weighted percentage exceedance sound pressure level with a FAST time constant* ($L_{AFN,T}$). This is the sound pressure level exceeded for *N*% of time period *T*. e.g. If an A-weighted level of x dB is exceeded for a total of 6 minutes within one hour, the level will have been above x dB for 10% of the measurement period. This is written as $L_{A10,1hr}$ = x dB. L_{A0} (the level exceeded for 0 % of the time) is equivalent to the L_{Amax} and L_{A100} (the level exceeded for 100 % of the time) is equivalent to the L_{Amin}. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
$L_{eq,T}$	The *equivalent continuous sound pressure level over period T* ($L_{eq,T}$),
$L_{Aeq,T}$ **$_T$ = measurement time** **eg. $L_{Aeq,5min}$**	*The A-weighted equivalent continuous sound pressure level over period T* ($L_{Aeq,T}$). This is effectively the average sound pressure level over a given period. As the decibel is a logarithmic quantity the L_{eq} is not a simple arithmetic mean value. The L_{eq} is calculated from the raw sound pressure data. It is not appropriate to include a reference to the FAST and SLOW time constants in the notation.

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