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Building Services Engineering | Sustainability | Acoustics

Premier Inn Welwyn Garden City, Extension

Whitbread plc

Condition 4: Pre-completion testing

Revision 00

18/02/2020

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Project Particulars

Client Name: Whitbread plc

Project Name: Premier Inn Welwyn Garden City, Extension

Disclaimer

Revision History

Revision	Date	Prepared By	Checked By
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1 Introduction

1.1 Permission has been granted for the construction of a three-storey extension to the Premier Inn Welwyn Garden City hotel (Application Number: 6/2018/1922/FULL).

1.2 The development is subject to a series of planning conditions, two of which pertain to the control of plant noise at the nearest residential properties. These conditions are presented below:

> *2. Prior to commencement the applicant must submit to, for approval in writing by the Local Planning Authority, details relating to noise from plant and equipment to be installed at the premises with evidence in the form of an acoustic report showing that noise emissions from plant and equipment will be 5dB (LAeq) below the background noise level (LA90) at the nearest residential properties (10dB below the background noise level if the noise produced is tonal). The approved details must then be implemented in full on site prior to the first occupation of the extension, and then permanently maintained.*
>
> *4. Prior to the first occupation of the three storey extension, pre-completion testing must take place which shows compliance with the plant installed for the extension meets the 10dB below the background at the nearest sensitive receptor. If non-compliance is shown, additional mitigation measures will be required.*

1.3 An external noise survey has previously been carried out at the development site to determine the prevailing noise climate and a Noise Emission Assessment was submitted to Welwyn Hatfield Borough Council to discharge Condition 2.

1.4 This report presents the results of pre-completion testing of the installed plant now that the extension has been completed and serves to discharge Condition 4.

1.5 The cumulative level of plant noise at the nearest sensitive receptor has been calculated by extrapolating the results of noise level measurements recorded at a distance of 1 metre from each plant item. This is because when a noise source is at least 10dB below the prevailing background noise level there should be a negligible measurable change (<0.5dB). As such, it would be very difficult to clearly demonstrate compliance with the Condition with measurements at the nearest sensitive receptor.

1.6 Noise level calculations and a glossary of some of the terminology used in this report are presented in the appendices A and B.

2 Plant noise assessment

2.1 Site description

2.1.1 Plant associated with the extension comprises 24 Nº MVHR units serving individual guestrooms, a gas boiler with a flue extending from a ground floor plant room located to the south of the extension and a water booster set located within the plant room itself.

2.1.2 The ground floor plant room is located in the south eastern corner of the new extension, overlooking the adjacent railway line, and placed well away from any residential neighbours.

2.1.3 Photographs of the MVHR vents, boiler flue and the water booster set are presented in Figure 2-1, Figure 2-2 and Figure 2-3.

Figure 2-1 MVHR vents in south-east facade

Figure 2-2 Boiler flue

Figure 2-3 Water booster set

2.2 Plant noise

2.2.1 Spot check measurements were taken approximately 1 metre from the external boiler flue and the water booster set on Tuesday 12th February 2020. Each plant item was measured in isolation and it is understood that the equipment had been fully commissioned before testing.

2.2.2 The measured noise levels are reported below in Table 2-1.

	Frequency (Hz)								
Plant item	63	125	250	500	1000	2000	4000	8000	dBA
Boiler	65	61	63	67	54	46	38	34	65
Booster set	51	52	64	65	63	63	54	59	69

All values are sound pressure levels in dB (ref: $2x10^{-5}$Pa) at a distance of 1 metre
Table 2-1 Plant noise levels

2.2.3 It was not possible to measure noise from the guestroom MVHR units as their noise output was so far below the prevailing ambient noise level. The manufacturer's data for the units, which was provided in the original Noise Emission Assessment, quotes a noise level of 22dB L_{pA} to 38dB L_{pA} at 1 metre from the external vent depending if the units are operating in trickle or boost mode. It should be noted that the units have been installed with flexible duct silencers and external noise levels can therefore be expected to be even lower.

2.2.4 Noise from the MVHR units is not expected to have any significant impact upon the cumulative noise level at the nearest sensitive receptor and has therefore not been considered further within this report.

2.2.5 Details of the equipment used to undertake the noise level measurements are provided below.

Equipment	Type	Serial No.
Class 1 sound level meter	Norsonic 131	1313650
Portable sound calibrator	Norsonic 1251	34926

Table 2-2 Survey equipment

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

2.3 Nearest noise sensitive receptor

2.3.1 The nearest noise sensitive receptor to the extension has been identified as a residential property on Stanborough Mews; some 17-metres from the north-east façade of the hotel extension and 40-metres from the boiler room.

2.3.2 The location of the residential property in relation to the new extension is shown in Figure 2-4.

Figure 2-4 Site map demarking plant locations and nearest sensitive receptor

2.3.3 It should be appreciated that the noise sensitive receptor has a windowless gable end and does not have a direct line of sight to the plant room nor the boiler flue which are tucked away behind the extension.

Figure 2-5 Photograph of nearest sensitive receptor

2.4 Background sound levels

2.4.1 Prevailing background noise levels at the noise sensitive receptors have been taken from the original external noise survey data undertaken between the 4th and 5th of April 2019. With the exception of the construction of the hotel extension, there have been no significant changes to the local area and so the data is still deemed relevant.

2.4.2 Full details of the survey can be found in Scotch Partners' original *Noise Emission Assessment* dated 11th April 2019.

2.4.3 The lowest measured background noise levels during the daytime, evening, and night are presented below.

Time	Lowest measured background noise level
Daytime (07:00-19:00)	46dB $L_{A90,15min}$
Evening (19:00-23:00)	38dB $L_{A90.15min}$
Night (23:00-07:00)	30dB $L_{A90,15min}$

Table 2-3 Lowest measured background noise levels

2.5 Noise level at receptors

2.5.1 The cumulative level of plant noise at the receptor has been calculated based on the measured plant noise reported in Section 2.2 and with attenuation owing to distance propagation and acoustic screening offered by the extension itself.

2.5.2 Plant noise at the nearest sensitive receptor is predicted to be 20dB L_{Aeq} when the boiler and booster set are operating simultaneously. A breakdown of the calculation has been provided in Appendix A.

2.6 Conclusions

2.6.1 Pre completion testing of plant associated with the new hotel extension has been undertaken pursuant to Condition 4.

2.6.2 Noise level measurements of plant items have been taken at source and the data has been used to calculate the cumulative noise level at the nearest sensitive receptor.

2.6.3 Plant noise at the nearest residential properties is predicted to be 20dB L_{Aeq} which is 10dB below the lowest background noise level measured throughout the day and night.

2.6.4 It can therefore be concluded that the plant proposals satisfy the requirements of Condition 4 and the Condition can be discharged.

Appendix A – Plant noise calculation

Item	Note	Frequency (Hz)								
		63	125	250	500	1000	2000	4000	8000	dBA
Boiler flue	L_p at 1 metre	65	61	63	67	54	46	38	34	65
Geometric divergence	40m	-32	-32	-32	-32	-32	-32	-32	-32	-
Acoustic Screening	Provided by the extension itself	-9	-11	-13	-16	-19	-20	-20	-20	-
Ground effect	N/A	Omitted as these effects are expected to be negligible over such a short distance								
Atmospheric absorption	N/A									
L_p at receptor		24	18	17	19	3	0	0	0	17
Booster set	L_p at 1 metre	51	52	64	65	63	63	54	59	69
Geometric divergence	40m	-32	-32	-32	-32	-32	-32	-32	-32	-
Acoustic Screening	Provided by the extension itself	-15	-18	-20	-20	-20	-20	-20	-20	-
Ground effect	N/A	Omitted as these effects are expected to be negligible over such a short distance								
Atmospheric absorption	N/A									
L_p at receptor		4	2	12	13	11	11	2	7	17
Cumulative L_p at receptor		**24**	**18**	**19**	**20**	**12**	**11**	**2**	**7**	**20**

Appendix B – Glossary

This appendix provides an explanation of some of the terms used in this report.

A-weighting **L_A or L_{pA}, L_{WA},**	The human ear does not sense all frequencies of sound equally. Our sensitivity is at a maximum at around 2 kHz and steadily decreases above and below. Below 20 Hz and above about 20 kHz we can't hear at all. 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 0.125 s (FAST time constant) or the previous 1 s (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_{min} , L_{Fmin}	The opposite of the L_{max} is the *minimum instantaneous sound pressure level* or L_{min} etc. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.

$L_{N,T}$	*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*. eg. 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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