Sandy Brown associates LLP

1 Coleridge Gardens
London NW6 3QH

tel: (020) 7644 6500
fax: (020) 7644 6510
email: post@sandybrown.com

07123/DR REV 4
02 October 2007

Chichester House, WC1

Plant noise assessment

Summary

An environmental noise assessment has been conducted for Chichester House to assess the potential noise impact on the surrounding residential properties from the proposed plant items to be installed on the roof of the redevelopment.

The nearest affected noise sensitive premises have been identified to be the flats behind the existing Penderel's Oak pub on the south of High Holborn just to the east of the site.

Noise measuring equipment was installed on the south east side of the fifth floor roof of Chichester House. This position was considered to be representative of the noise levels at the nearest affected residential window.

Octave band measurements were recorded for the duration of the survey. The lowest night time background noise level recorded was $L_{A90,\ 15min}$ 50 dB at 01:54 on Tuesday 13 June 2006. The lowest daytime background noise level was recorded at 21:39 on Sunday 11 June 2006.

Based upon London Borough of Camden's requirements, limiting spectral noise levels to be applied to the prospective plant have been determined.

With the rooftop layout as shown in Figure 3 and an acoustic louvre as prescribed in Table 2, the noise requirements of the London Borough of Camden should be met.

Introduction

Sandy Brown Associates have been commissioned to undertake an environmental noise assessment at Chichester House, High Holborn, London, WC1.

The purpose of the survey was to establish the background noise climate in the area surrounding the site and the nearest residential properties in order to assess the potential noise impact from the plant associated with the existing premises.

This report presents the survey method and results and discusses appropriate limits for noise emission from the proposed plant location.

The site and its surroundings

The site is situated on the south side of High Holborn in London. This road is a busy two lane two way road in the centre of London. Whetstone Park and Lincolns Inn Fields are other roads just south of the site but are comparatively quieter than High Holborn. To the East is a public footpath called Great Turnstile; directly to the West and attached to Chichester House is Princeton House (271-277 High Holburn).

The surrounding buildings house both commercial and residential space. Residences lie to directly east of the site on the opposite side of Great Turnstile behind Penderel's Oak pub. The nearest residential window is estimated to be 15 m from the measurement position on Chichester House.

Other nearby residences include those above the Red Lion pub on the corner of High Holborn and John Street. This residence is estimated to be around 30 m from Chichester House.

There are also residences nestled at the south side of the proposed Chichester House development itself. Because of their location and elevation, they are less susceptible to roof level plant noise than the residences across Great Turnstile.

The measurement location is shown in Figure 1 at the end of this report.

Survey

Local authority's requirements

The site is located in London Borough of Camden. The local authority for Camden requires the following criteria:

- *Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (L_{A90}), expressed in dB(A) when all plant/equipment are in operation.*

  Where it is anticipated that any plant/equipment will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps) special attention should be given to reducing the noise levels from that piece of plant/equipment at any sensitive façade to at least 10dB(A) below the L_{A90}, expressed in dB(A).

- *For each of the octave band of centre frequencies 63Hz-8KHz inclusive, noise levels from all plant/equipment (measured in L_{Aeq}) when in operation shall at all times add not more than 1 decibel to the existing background noise level L_{A90}, expressed in dB(A), in the same octave band as measured 1 metre external to sensitive facades.*

Location and period

A five day continuous unmanned noise survey was undertaken from the 08 to 14 June 2006. Noise measuring equipment was installed to measure octave band sound pressure levels over consecutive periods of fifteen minutes throughout the survey.

The equipment was installed on the south east side of the fifth floor roof of Chichester House. This position is deemed representative of the noise levels expected at the nearest residential buildings across Great Turnstile due to their similar proximity and shielding from the main noise source of High Holburn.

Weather conditions

The weather was mainly dry during the survey with only light showers on the last two days. Temperatures ranged from 10°C to 30°C during the survey.

Noise sources

During the installation of the meter, the dominant noise source was existing plant on Chichester house. The plant could not be switched off. However, it is understood that the plant only operated between 07:00 – 18:00 hrs every day. Therefore the background noise levels recorded at night are understood to be without the presence of plant noise from Chichester house.

Noise indices

Noise indices recorded included the following:

$L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.

$L_{Amax,T}$ The A-weighted maximum sound pressure level that occurred during a given period. Measured using the fast time weighting in accordance with the requirements of BS 8233 : 1999.

$L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period, indicative of the background noise level.

$L_{A10,T}$ The A-weighted sound pressure level exceeded for 10% of the measurement period, indicative of the reasonable highest noise level.

The $L_{A90,\ T}$ is the measurement quantity requested for the purposes of complying with the local authority's requirements.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', e.g. $L_{A90,T}$) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 1991 ISO 1996-1: 1982 *'Description and measurement of environmental noise, Part 1. Guide to quantities and procedures'*.

Results

The results of the noise logging survey conducted on the roof of Chichester House are shown graphically in Figure 2 at the end of this report. The graph shows that the lowest recorded background noise level for the duration of the survey was $L_{A90,\ 15min}$ 50 dB. This was recorded at 01:54 hours on Tuesday 13 June 2006. The lowest daytime background noise level was recorded at 21:39 hours on Sunday 11 June 2006.

The lowest octave band $L_{90,\ 15min}$ daytime (07:00-23:00) and night time (23:00-07:00) background noise levels recorded were as follows:

Table 1 - Minimum daytime and night time measured sound pressure level L90, dB

L_{90}, dB	Octave band centre frequency, Hz								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
Daytime (07:00-23:00)	59	56	54	50	47	43	35	24	52
Night time (23:00-07:00)	61	54	52	47	45	41	34	25	50

These levels are considered representative of the noise levels outside the nearest affected residences across Great Turnstile.

External plant noise assessment

Proposed plant

The proposed rooftop plant layout has been as reported by Faber Maunsell and shown in Figure 3 at the end of this report. The proposed items of plant are as follows.

- Two 600kW dry air coolers (for general cooling)
- One air handling unit
- Two generators (one landlord and one future)
- Space for future tenant plant
- Two office smoke extract fans located in the enclosed plant room and ducted
- One toilet extract fan located in the enclosed plant room and ducted

Two air handling units, pumps, boilers, generators and CHP plant are located in the Basement. Noise from these will be attenuated at source and will not be significant at roof level.

Calculation method

The procedure for predicting the contributing noise levels from the plant compounds at nearby residential properties is based on accepted calculation methods involving calculation of both distance and barrier attenuation as discussed below.

Distance attenuation

Noise data for the generators and chillers are sound pressure levels at 1 m. The attenuation with distance is calculated, bearing in mind the dimensions of the plant items. Where receptors are nearby the attenuation is based upon a planar source or line source propagation.

Barrier attenuation

Attenuation due to intervening structures (buildings, acoustic barriers) between plant items and the nearest residential premises is calculated using Maekawa's method. This estimates the reduction in each octave band based on the difference in length between sound passing around the barrier and that propagating on a notional uninterrupted path. The amount of attenuation in any one octave band is limited to a practical level of 24 dB.

Acoustic louvre

The drawings refer to an acoustic louvre. This louvre shall have the minimum performance stated in Table 2.

Table 2 - Octave band transmission loss for acoustic louvre used in calculations

	Octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Transmission loss (dB)	6	6	8	10	14	18	16	15

This can typically be achieved using an IAC Slimshield SL-120 acoustic louvre.

Noise limits

Dry Air Coolers

On the basis of the measured results (Table 1) and the local authority's guidelines, the noise level limit for the dry air coolers has been calculated at a distance of 1 m from any unit. This is shown in Table 3. The calculation takes into account that there are multiple units in the space.

The dry air coolers are located on the upper deck of the double decked plant space. They are completely surrounded by an acoustic louvre. This calculation considers the attenuation provided by an acoustic louvre with minimum performance are prescribed in Table 2 and also minor barrier attenuation provided by the edge of the building. This assessment also assumes that the equipment in this area is operated 24/7.

Table 3 - Maximum allowable dry air cooler noise levels at 1 m

	Octave band centre frequency, Hz								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
L_{eq} (dB)	80	73	73	71	72	72	63	53	77

These noise limits apply collectively for any equipment that would be located in this area.

Proposed dry air cooler selection

Preliminary selections for these units are from Ciat UK Ltd with reported sound pressure levels as follows.

Table 4 - Sound pressure levels at 1m for Ciat UK Ltd dry air coolers (600 kW dry air cooler)

	Octave band centre frequency (Hz)								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
L_{eq} (dB)	49	63	68	71	70	68	63	52	76

The proposed 600 kW dry air coolers meet the maximum allowable noise levels as stated in Table 3 and should meet the regulatory criterion.

Air handling unit

On the basis of the measured results (Table 1) and the local authority's guidelines, the noise level limit for the AHU has been calculated at a distance of 1 m from the unit. This is shown in Table 5.

The AHU is located on the roof of the building to the North. It is partially surrounded by an acoustic screen. This calculation considers the attenuation provided by an acoustic louvre with minimum performance are prescribed in Table 2 and also minor barrier attenuation provided by the edge of the building. This assessment also assumes that the equipment in this area is operated 24/7.

Table 5 - Maximum allowable AHU noise levels at 1 m

	Octave band centre frequency, Hz								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
L_{eq} (dB)	81	74	72	68	67	64	60	53	72

These noise limits apply collectively for any equipment that would be located in this area.

Proposed AHU selection

A preliminary selection for this unit is from Dalair. The predicted sound pressure levels are as follows.

Table 6 – Predicted sound pressure levels at 1m for the AHU

	Octave band centre frequency (Hz)								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
L_{eq} (dB)	80	77	65	63	46	42	48	60	66

The proposed AHU meets the maximum allowable noise levels as stated in Table 5and should meet the regulatory criterion.

Generator (landlord)

On the basis of the measured results (Table 1) and the local authority's guidelines, the noise level limit for the landlord generator has been calculated at a distance of 1 m from the unit. This is shown in Table 7.

The landlord generator is located on the roof of the building. This calculation considers the attenuation provided by an acoustic louvre with minimum performance as prescribed in Table 2 and also minor barrier attenuation provided by the edge of the building. This assessment also assumes that the equipment in this area is operated 24/7.

Table 7 - Maximum allowable landlord generator noise levels at 1 m

	Octave band centre frequency, Hz								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
L_{eq} (dB)	79	72	72	69	71	71	62	52	76

These noise limits apply collectively for any equipment that would be located in this area.

Proposed landlord generator selection

A preliminary selection for this unit has been made. The predicted sound pressure level spectrum is as follows.

Table 8 – Predicted sound pressure levels at 1m for the landlord generator

	Octave band centre frequency (Hz)								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
L_{eq} (dB)	83	86	82	67	63	60	54	48	76

The proposed landlord generator meets the maximum allowable overall noise level as stated in Table 7 and first portion of the regulatory criterion. At low frequencies, the noise is somewhat higher than background, while higher frequencies are lower. As this equipment is for interim emergency use only, and testing will only occur during the daytime on weekdays, this is expected to be minor in our professional opinion.

Generator (future)

The future generator does not form part of this planning application and limits are set here simply for completeness.

On the basis of the measured results (Table 1) and the local authority's guidelines, the noise level limit for the future generator has been calculated at a distance of 1 m from the unit. This is shown in Table 9.

The area designated for the future generator is on the roof of the building, towards the East. This areas is partially surrounded by and acoustic louvre. This calculation considers the attenuation provided by an acoustic louvre with minimum performance as prescribed in Table 2 and also minor barrier attenuation provided by the edge of the building. This assessment also assumes that the equipment in this area is operated 24/7.

Table 9 - Maximum allowable future generator noise levels at 1 m

	Octave band centre frequency, Hz								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
L_{eq} (dB)	77	70	68	64	63	60	55	49	68

These noise limits apply collectively for any equipment that would be located in this area.

Tennant plant (future)

The future tenant plant area does not form part of this planning application and limits are set here simply for completeness.

On the basis of the measured results (Table 1) and the local authority's guidelines, the noise level limit for the future tenant plant area has been calculated at a distance of 1 m from any unit. This is shown in Table 10.

The area designated for the future tenant plant is on the roof of the building, towards the East. This area is partially surrounded by an acoustic louvre. This calculation considers the attenuation provided by an acoustic louvre with minimum performance as prescribed in Table 2 and also minor barrier attenuation provided by the edge of the building. This assessment also assumes that the equipment in this area is operated 24/7.

Table 10 - Maximum allowable future generator noise levels at 1 m

	Octave band centre frequency, Hz								A-weighted Broadband
	63	125	250	500	1k	2k	4k	8k	
L_{eq} (dB)	75	68	66	62	61	58	54	47	66

These noise limits apply collectively for any equipment that would be located in this area.

Other plant

Toilet extract fan

This fan is small, located in the enclosed mechanical penthouse, and ducted to the outdoors. Its noise will be attenuated to a sound pressure level at least 10dB lower than the limits set in Table 3, and will thus not affect the overall noise levels from roof plant.

Smoke extract fans

The smoke extract fans are located in the enclosed mechanical penthouse and ducted to the outdoors. They would only be used if there was a fire in the building. Since they would not operate under normal conditions they have not been included in this assessment. If the fans require testing it is recommended that this takes place during the day when ambient noise levels are higher and the noise from the smoke extract fans is less likely to disturb surrounding areas.

Conclusion

With the rooftop layout as shown in Figure 3 at the end of this report, and an acoustic louvre as prescribed in Table 2, the noise requirements of the London Borough of Camden should be met.

Figure 1 - Acoustic logging position and nearest residence

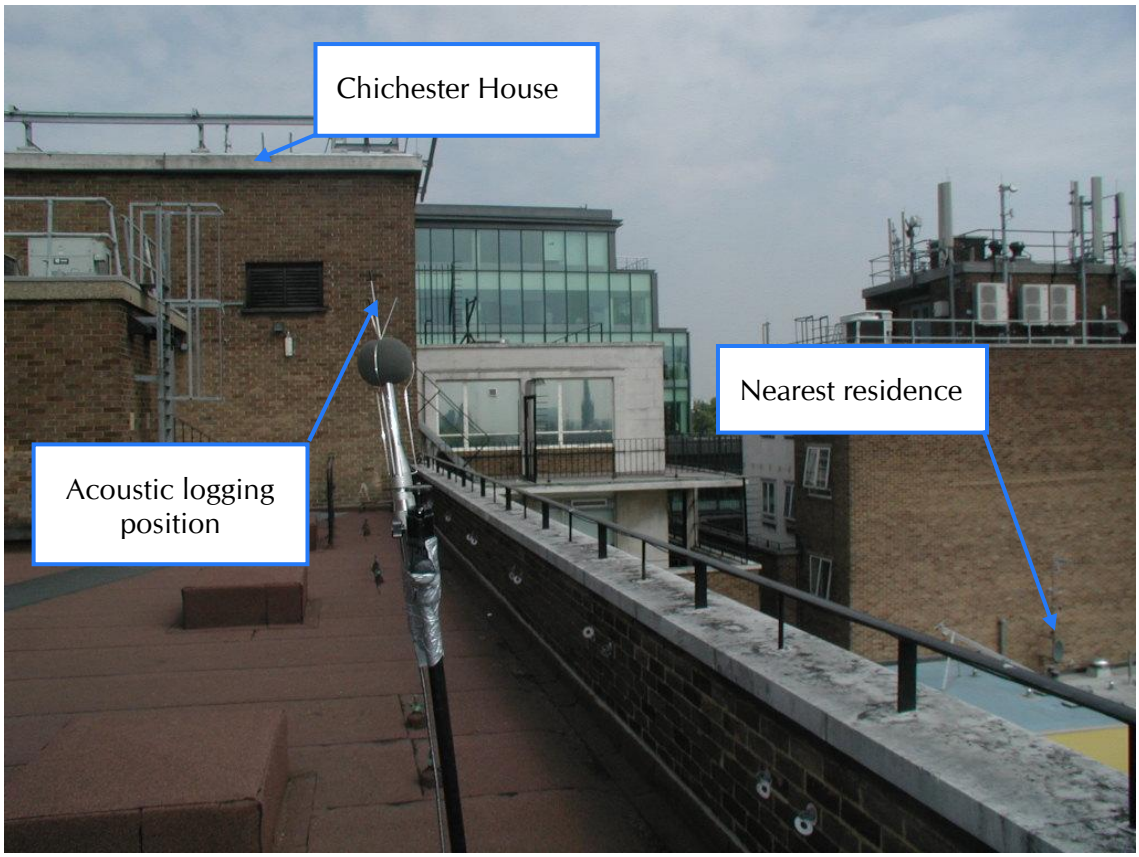

Figure 2 - Results of the unmanned logging survey

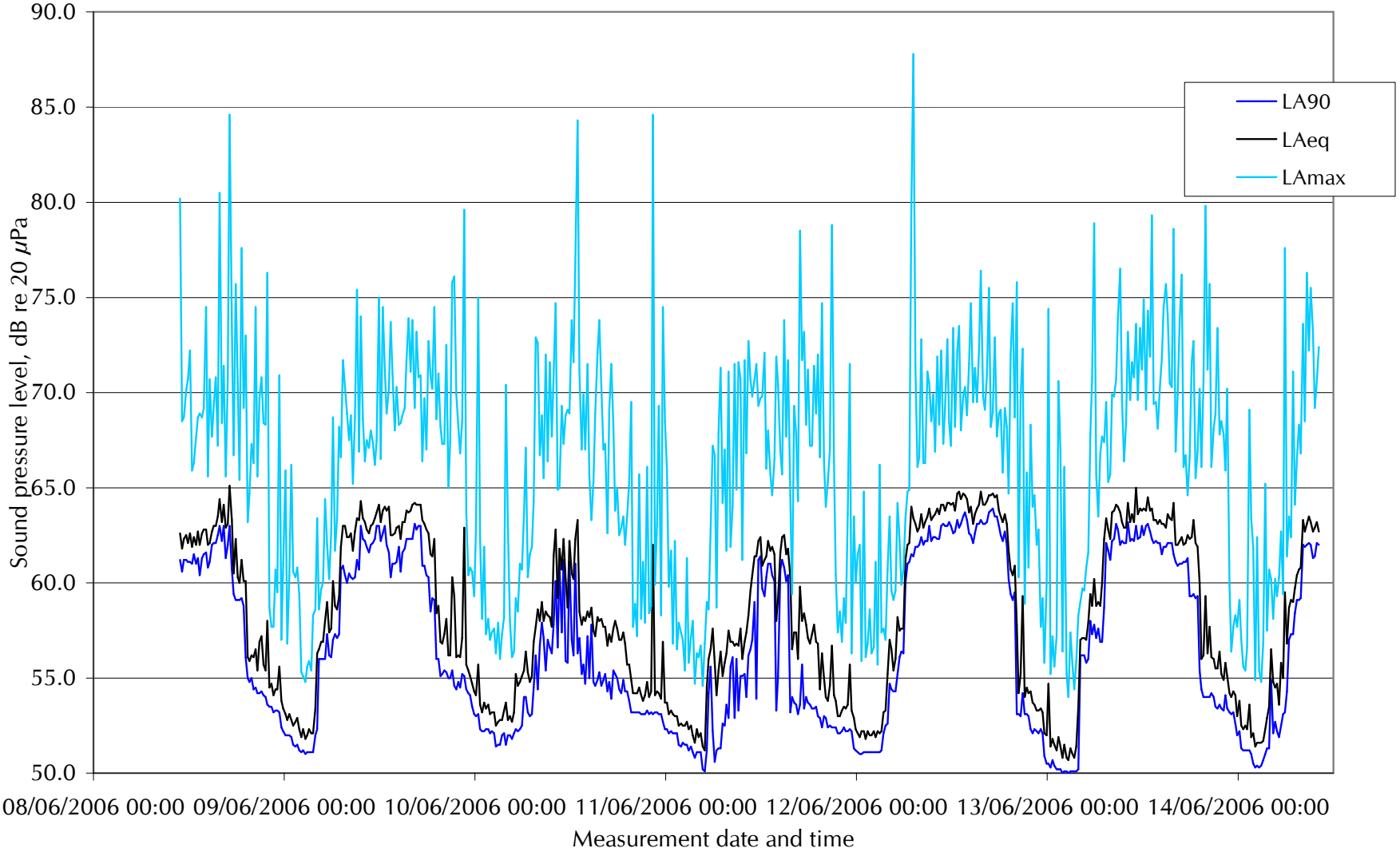

Figure 3 - Plan of rooftop equipment