Acoustic Design Services Ltd

CONSULTANTS IN ACOUSTICS NOISE AND VIBRATION

2 SECOND AVENUE DENVILLES HAVANT HANTS PO9 2QP

Acoustic Report of air conditioning plant at Commonwealth House 1-19 New Oxford Street WC1A 1NV Tel: 023 9249 8822 Fax: 023 9249 8822 www.acousticdesignservices.co.uk

### Supplementary Report

### **1.0 Introduction**

1.1 Acoustic Design Services Ltd have prepared an Acoustic Report ( $1^{st}$  February 2009 aka ADS 1/2/09) in respect of air conditioning units on the roof of 1-19 New Oxford Street, WC1.

1.2 ADS 1-2 -2009 deals with the existing daytime noise environment over a three hour period.

1.3 A new tenant is expected for the eighth floor and part of the seventh floor of Commonwealth House. This tenant wishes to install an additional air conditioning unit to service a "comms room" on the seventh floor and this room will be in operation 24hours a day.

1.4 This external unit, (Mitsubishi MUZ-GB50VA), will be mounted on the north west stairwell of 1-19 New Oxford Street in a similar location to 5 other similar units (Figure 1, Location B, ADS 1/2/09 refers ).

1.5 This report will deal with the units at the other Locations in similar groupings to ADS 1/2/09.

1.6 This report will deal also with the likely sound emissions at night. It is assumed that the external split air conditioning units are switched off at night. Group C units are in an acoustic compound and comprise heat pump units. These units are either switched off or can be operated in "Night Mode" with a lower sound emission than in standard mode.

1.7 To avoid conflict of similar titles to Tables in this report and in ADS 1/2/09, the relevant tables will be prefaced by "S" to allow direct comparison where required.

### 2.0 Sound level Measurements

2.1 The ambient sound levels were measured on the roof of Commonwealth House at two locations P and Q, on the north side of the building (New Oxford Street and the south side of the building (High Holborn). ADS 1/2/09 Tables 1 and 2, Charts 1 and 2 refer.

2.2 It is considered that the relevant L90 values for measurement locations P and Q are 56-57dBA and 58-59dBA respectively. The differences are marginal and reflect the different traffic flow on New Oxford Street and High Holborn.

### 3.0 Air conditioning Units

3.1 Drawings by ITD Consultants of Portsmouth (ITD drawings 1636/7HL and 1636/Roof) show the internal units on the 7<sup>th</sup> floor offices and in particular the distribution of the individual units groups at roof level. We retain the grouping of the units as shown in Figure 1 of ADS 1/2/09

3.2 We summarise the units and the combined sound emission levels in Table S3 as follows :-

Plant Group	Units	wall mounted / free standing +3dB / 0dB	Unit SPL @1m	Total SPL @1m
A	5 x PUHZ-RP35VHA3	+3 <b>d</b> B	46dBA	55dBA
В	5 x PUHZ-RP35VHA3 1 x MUZ-GB50VA	+3dB +3dB	46dBA 48dBA	57dBA
С	2 x PUHY-P350YHM-A plus 4 x PUHY-P400YHM	0dB 0dB	60dBA 61dBA	68dBA
D	1 x PUHZ-RP35VHA3	+3dB	46dBA	49dBA
E	1 x PUHZ-RP35VHA3	+3dB	46dBA	49dBA

Table	S3A	Summary of	<b>Roof Level</b>	Air	Conditioning	Plant (	( Daytime )	)
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3.3 The majority of the units above are switched off at night except the additional MUZ-GB50VA unit for the "Comms Room".

3.4 It is likely that the Group C units are switched off or set in "Night Mode. The night mode setting for these units is 8-10dBA lower than the standard day time setting. Accordingly we have revised Table S3 as follows:-

Plant Group	Units	wall mounted / free standing +3dB / 0dB		Total SPL @1m
A	5 x PUHZ-RP35VHA3	+3dB	Off	
В	5 x PUHZ-RP35VHA3 1 x MUZ-GB50VA	+3dB +3dB	Off 48dBA	48dBA
С	2 x PUHY-P350YHM-A plus 4 x PUHY-P400YHM	0dB 0dB	52dBA 53dBA	60dBA
D	1 x PUHZ-RP35VHA3	+3dB	Off	
E	1 x PUHZ-RP35VHA3	+3dB	Off	

Table S3B Summary of Roof Level Air Conditioning Plant ( Night time )

# 4.0 Assessment of Acoustic Impact

4.1 The usual acoustic assessment of fixed pant is consideration according to BS 4142 :1997 "A method of Rating industrial noise affecting mixed residential and industrial areas".

4.2 The noise emission from the plant is determined as an LAeq(t) where t is a reference time. This measured or calculated level is corrected by 0dBA or +5dBA according to whether or not it is considered that the noise will have distinguishable characteristics (whistles, whines hisses or bumps) or is intermittent. The corrected sound level is termed the Rating Level

4.3 The method of assessment is based on a measurement of the LA90 background sound level. and comparing the excess of the measured or calculated Rating Level of the process above that of the L90 level to give the Assessment level.

4.4 An Assessment Level of about 5dBA is considered of marginal significance. An Assessment Level in excess of 10dBA is regarded as a likelihood that complaints may occur. A Rating Level of 10dBA or more *below* the L90 may be taken as positive indication that complaints are unlikely.

4.5 This report considers both the likely effects by day and by night. The only difference in the methodology is that by day it is usual to consider a reference time t as 1 hour whilst at night the reference time is reduced to 5 minutes.

#### 5.0 Sound levels Calculations

5.1 Acoustic Design Services have been asked to consider the acoustic impact of the roof mounted plant at Commonwealth House on potential residential units. The roof mounted plant items are in the same groups as described in ADS 1/2/09 together with the additional unit in Group B.

5.2 We have calculated the sound emission levels derived from the plant groups for four receiver points at a nominal distance of 20m north, east, south and west of Commonwealth House both by day and by night and summarise the these in Table S4 as follows :-

<b>Receiver Location</b>	Total SPL Day time	Total SPL Night time
North ( New Oxford Street)	37.6dBA	30.0dBA
East	34.1dBA	25.7dBA
South ( High Holborn)	41.7dBA	33.5dBA
West	36.1dBA	20.1dBA

Table S	54
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5.3 It will be seen that comparison of Table S4 with Table 4 of ADS 1/2/09 shows very little change in level at any of the receptor points for day time sound level emissions as result of the additional air conditioning unit.

5.4 The night time sound emission levels are reduced also with less units in operation and group C units set to night mode.

5.5 We summarise the calculation methodology and detailed results in Annexes S1 and S2.

# 6.0 Acoustic Assessment (BS4142 :1997)

6.1 Section 2 of ADS 1/2/09 above indicates that reasonable assessments for the day time L90 sound levels are represented by 56-57dBA for Location P overlooking to New Oxford Street and 58-59dBA at Location Q overlooking High Holborn.

6.2 Acoustic Design Services have conducted many 24 hour ambient noise surveys. We consider that the daytime L90 sound levels decrease by approximately 8-10dBA at night and hence our night time L90 levels are taken as 46dBA and 48dBA at Locations P and Q respectively.

6.3 We have calculated the total sound emission levels at 20m from the Commonwealth House Facades at 4 locations around the building. These are shown in Table S4.

6.4 It will be seen that the calculated sound level from the air conditioning plant at all four receptor locations is greater than *10dBA less* than the relevant L90 level both by day and by night.

6.5 The greatest sound level by day is represented on High Holborn at 41.7dBA compared to the relevant L90 level of 58-59dBA derived from the road traffic noise.

6.6 If this is considered formally under the methodology of BS4142:1997 the day time analysis is as follows :-

	Level LAeq(1hr)	BS 4142:1997 clause
Maximum Specific Level	41.7dBA	
•		Para 3.1
Tonal Correction	0dBA	Para 6.0
Rating Level	41.7dBA	Para 8.0
L90 Background level	58dBA	Para 7.0
Assessment level	-16.3dBA	Para 9.0

### BS4142 :1997 Assessment for High Holborn Daytime

# Comment:- Positive indication of complaints is unlikely

6.7 The greatest sound level emission is represented on High Holborn receptor location by day at 41.7dBA and by night at 33.5dBA. The relevant daytime L90 level of 58-59dBA would decrease at night would decrease 10dBA to 48dBA.

6.8 In the BS 4142 analysis the tonal / intermittency corrections are taken as zero. The reasoning is that in the presence of a number of different sources, an individual source, at sound levels well below a broad band background, are unlikely to be detected or operate simultaneously.

6.9 If this is considered formally under the methodology of BS4142 :1997 this is as follows :-

	Level LAeq(1hr)	BS 4142:1997 clause
Maximum Specific Level	33.5dBA	Para 3.1
Tonal Correction	0dBA	Para 6.0
Rating Level	33.5dBA	Para 8.0
L90 Background level	46dBA	Para 7.0
Assessment level	-12.5dBA	Para 9.0

# BS4142 :1997 Assessment for High Holborn Night time

# Comment:- Positive indication of complaints is unlikely

#### 7.0 Conclusions

7.1 Acoustic Design Services Ltd have visited Commonwealth House and have determined the ambient noise level over a 3hour period at roof level.

7.2 We could ascertain no residential units in the immediate neighbourhood nor are there any in Commonwealth House itself.

7.3 We have calculated the likely sound emissions from the listed equipment at four locations at a distance of 20m from the façade of Commonwealth House. The calculated sound level from the air conditioning plant is at least 10dBA lower than the L90 background sound level derived from the traffic noise both by day and by night.

7.4 We have analysed the calculated sound levels according to the methodology of BS4142:1997; we find that with calculated sound levels greater than 10dBA *below* the L90 background sound level, there would be a positive indication that a noise complaints are unlikely.

Ramon Shack MSc, PhD, CPhys, MInstP, FIOA

18th February 2009 Lunch Share



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#### Supplementary Report

#### **ANNEX S1**

SA1.1 In the case of a number of identical plant items, each with a sound emission of LdB at a given distance, then the combined sound emission is

 $L + 10log_{10} N$  where N is the number of units

SA1.2 Where the units( or groups ) have different sound emission levels (L1, L2 L3, etc) the total sound pressure level is given by

L total = 
$$10\log_{10} [ 10^{(L1/10)} + 10^{(L2/10)} + 10^{(L3/10)} ....]$$

SA1.3 It is necessary that the sound pressure level (SPL) are specified with respect to a distance. At distances which are large by comparison to source dimensions, the SPL generally decreases with increasing distance according to

 $L_2 = L_1 + 10 \log_{10} [d_1^2 / d_2^2]$ 

where  $d_1$  and  $d_2$  are the respective distances

SA1.4 We have checked the manufacturers data and find that the SPL for the units are quoted at a distance of 1m on a hard reflecting ground plane for free standing units. Where the units are attached to a hard surface such as a wall, an additional 3dB has been assumed.

SA1.5 In the case of the units at group Location C effectively in a plant compound, no reflection has been assumed but neither has any screening factor.

SA1.6 At certain reception locations, some of the wall mounted units will be self screened by the building elements. In these cases a modest screening factor has been assumed.

1.

Group Sources	Group SPL @1m Day/ Night)	Distance in m	Distance correction	Screening	Nett SPL Day/(Night)
Δ	55(0)dBA	20	-26.2dBA	0	28.8(0)dBA
<u>A</u>	57/(51)dB	40	-32.0dBA	-5dBA	20.0(16.0)dBA
<u>u</u>	68(60)dBA	21	-26.6dBA	0	41.4(33.4)dBA
 D	49(0)dBA	30	-29.6dBA	0	19.4(0)dBA
E	49(0)dBA	35	-30.9dBA	0	18.1(0)dBA

Table S5C -20m from south Façade (High Holborn)

Total 41.7(33.5)dBA

Group	Group SPL	Distance	Distance	Screening	Nett SPL
Sources	@1m Day/ Night)	in m	correction		Day/(Night)
Δ	55(0)dBA	34	-30.7dBA	-10dBA	14.3(0)dBA
R R	57/(51)dBA	34	-30.6dBA	-10dBA	16.4(12.4)dBA
	68(60)dBA	40	-32.0dBA	0	36.0(28.0)dBA
	40(0)dBA	69	-36 7dBA	-10dBA	2.3(0)dBA
E E	49(0)dBA	80	-38.0dBA	-10dBA	1.0(0)dBA

## Table S5D -20m from west Facade

Total 36.1(28.1)dBA