SANDY BROWN

Consultants in Acoustics, Noise & Vibration

14027-R03-A

14 September 2016

1 New Oxford Street

Plant noise discharge report

55 Charterhouse Street, London EC1M 6HA
68 Sackville Street, Manchester, M1 3NJ
2 Walker Street, Edinburgh EH3 7LA
35 St Paul's Square, Birmingham B3 1QX

T: +44 (0)20 7549 3500
T: +44 (0)161 771 2020
T: +44 (0)131 235 2020
T: +44 (0)121 227 5020

post@sandybrown.com
www.sandybrown.com

Sandy Brown Associates LLP
Registered in England & Wales No. OC 307504

Registered Office: 55 Charterhouse Street, London EC1M 6HA

Version	Date	Comments	Author	Reviewer
A	14 Sep 16	First issue	Ben Southgate	Richard Muir

Summary

Sandy Brown (SB) has been appointed to provide acoustic consultancy advice in relation to the redevelopment of 1 New Oxford Street, London, WC1A 1NU.

An environmental noise survey has been carried out to determine the existing background sound levels in the area and setting appropriate plant noise limits in line with the requirements of the London Borough of Camden (LBC).

The noise survey was performed between 13 February 2014 and 17 February 2014.

The lowest background noise levels measured during the survey were $L_{A90,15min}$ 51 dB during the daytime and $L_{A90,15min}$ 48 dB at night.

As the adjacent buildings around 1 New Oxford Street are all commercial buildings, a design limit for the rooftop plant of L_{Aeq} 50 dB at 1 m from the nearest receivers is considered appropriate for daytime weekday operation.

An assessment has been carried out of rooftop plant items to the nearest noise sensitive receivers. A discharge attenuator is required to toilet extract fans TEF 02 and TEF 03 in order to achieve these limits.

Providing that this attenuation is implemented, the noise egress due to roof level plant items is predicted to meet the noise limits at the nearest noise sensitive receivers.

Contents

1 Introduction

Sandy Brown (SB) has been appointed to provide acoustic consultancy advice in relation to the redevelopment of 1 New Oxford Street, London, WC1A 1NU.

This report summarises the environmental noise measurements undertaken, discusses acceptable limits for noise emission from building services plant and provides an assessment of plant noise to the nearest noise sensitive receivers.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1.

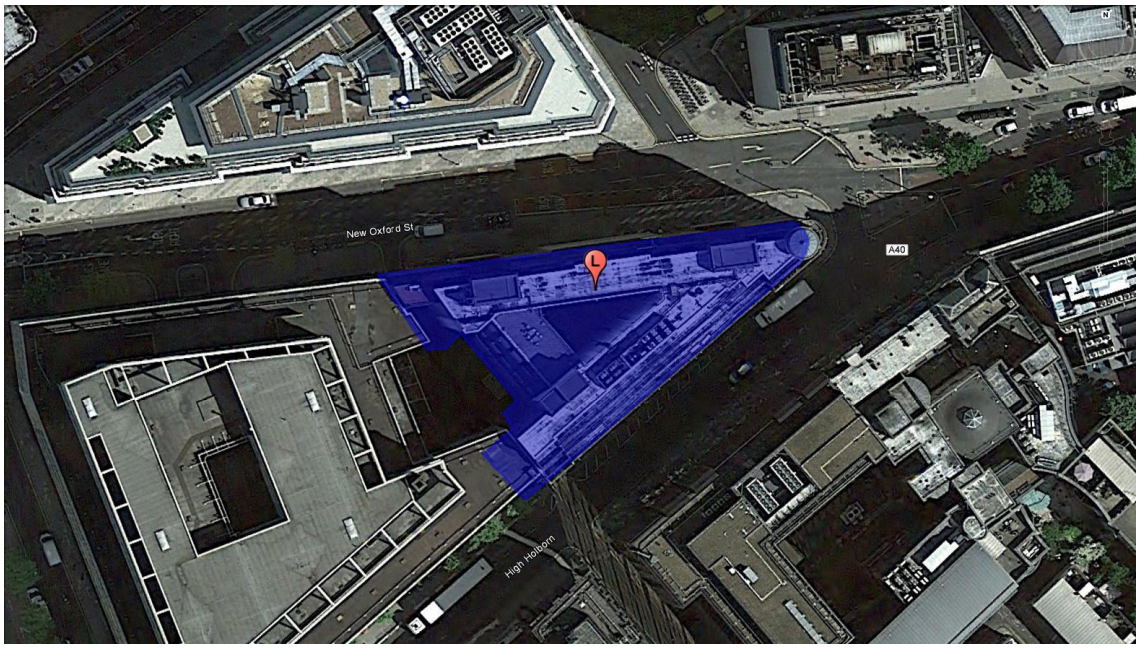


Figure 1 1 New Oxford Street and the surrounding area (Courtesy of Google Earth)

1 New Oxford Street is located at the junction of New Oxford Street and High Holborn. The site is highlighted in blue in Figure 1 with the logger location indicated by the letter 'L'.

2.2 Adjacent premises

High Holborn and New Oxford Street consist primarily of ground level retail units with offices above. Holborn Town Hall is located adjacent to the east of 1 New Oxford Street. The nearest noise sensitive receivers are considered to be the offices located to the north, south and west of the site.

3 Environmental noise survey

3.1 Survey details

The unattended environmental noise survey was performed over 5 days between 13 February 2014 and 17 February 2014. Full details of the survey and the survey method can be found in SB report *14027 R01-C Commonwealth House environmental noise & vibration report*. The key results from the survey are summarised in the following sections.

3.2 Measurement results

3.2.1 Observations

The dominant noise sources observed at the site during the survey consisted of road traffic noise and pedestrians.

Less significant noise sources included construction noise on New Oxford Street and police sirens in distance.

3.2.2 Measurement results

The results of the unattended noise measurements performed at the site are summarised in the following tables. A graph showing the results of the unattended measurements is provided in Appendix B of this report.

The day and night time ambient noise levels measured during the unattended survey are presented in Table 1.

Table 1 Ambient noise levels measured during the survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Thursday 13 February 2014	58*	55
Friday 14 February 2014	61	62
Saturday 15 February 2014	59	56
Sunday 16 February 2014	56	54
Monday 17 February 2014	60*	-
Average	59	58

* Measurement not made over full period due to monitoring start and end time; not included in the average

The minimum background noise levels measured during the unattended survey are given in Table 2.

Table 2 Minimum background noise levels measured during the survey

Date	Daytime (07:00 – 23:00) $L_{A90,15min}$ (dB)	Night (23:00 – 07:00) $L_{A90,15min}$ (dB)
Thursday 13 February 2014	53*	50
Friday 14 February 2014	55	52
Saturday 15 February 2014	52	50
Sunday 16 February 2014	51	48
Monday 17 February 2014	54*	-

* Measurement not made over full period due to monitoring start and end time

The lowest background noise levels measured during the survey were $L_{A90,15min}$ 51 dB during the daytime and $L_{A90,15min}$ 48 dB at night.

4 Assessment criteria

4.1 Standard guidance

Standard guidance for noise emission from proposed new items of building services plant is given in BS4142: 2014 '*Method for rating industrial noise affecting mixed residential and industrial areas*'.

BS4142 provides a method for assessing noise from items such as building services plant against the existing background noise levels at the nearest noise sensitive receptors to assess the risk of complaints occurring.

BS4142 suggests that if the rating noise level is 10 dB or more higher than the existing background noise level, complaints are likely. If the rating level is 5 dB above the existing background noise level, it is considered of marginal significance. If the rating level is 10 dB or more below the existing background noise level, this is considered a positive indication that complaints are unlikely.

If the noise contains 'attention catching features' such as tones, bangs etc, these limits should be reduced by a further 5 dB.

4.2 Local authority guidance

The requirements of Camden Borough Council are set out in Table 3.

Table 3 Requirements of LBC

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	5 dBA < L_{A90}
Noise that has a distinguishable note (whine, hiss, screech, hum) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10 dBA < L_{A90}
Noise that has a distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10 dBA < L_{A90}

On this basis, all external plant installed at the site must be designed such that the cumulative noise level at the nearest noise sensitive receiver is not less than 5 dB below the lowest measured background noise level ($L_{A90,15min}$), unless it contains tones or impulsive sound.

4.3 Plant noise limits

Based on the criteria set out above and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the most affected windows of the nearest noise sensitive premises should not exceed the limits set out in Table 4.

Table 4 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises (dB)
Daytime (07:00-23:00)	46
Night-time (23:00-07:00)	43

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit 5 dB below those set out above.

The adjacent buildings around 1 New Oxford Street are all commercial buildings and therefore a design limit for the rooftop plant of L_{Aeq} 50 dB is considered appropriate for daytime weekday operation. The nearest noise sensitive facade is the adjacent office building to the west of 1 New Oxford Street or either of the office buildings directly opposite on New Oxford Street and High Holborn.

5 Assessment

An assessment of plant noise egress to the nearest noise sensitive receivers (to the north, south and west) has been undertaken. This is based on the layout and noise levels of plant, as presented in Figure 2 and Table 5 respectively.

The assessment was also based on distance attenuation, and any duct losses indicated in the drawings provided.

There also believed to be AHUs located on lower floors that will have atmospheric terminations, but attenuation requirements have already been included for these and hence they have not been included in the assessment.

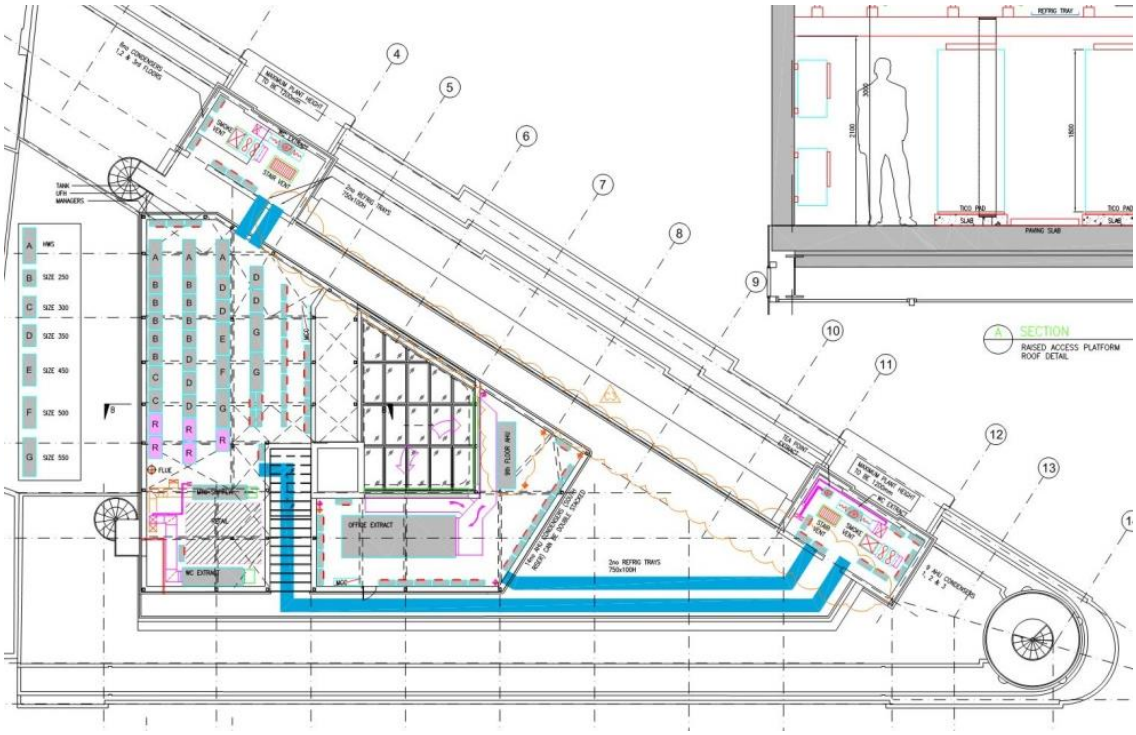


Figure 2 Plant layout used as basis for assessment

Table 5 Sound power levels used as basis for assessment

Unit	Source	Octave-band centre frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	A
TEF 01	Outlet	74	77	77	69	63	56	47	38	72
	Breakout	69	79	72	66	59	52	50	46	69
TEF 02	Breakout	76	95	88	86	81	76	76	71	88
TEF 03	Breakout	74	91	83	81	76	72	69	65	83
EF 01/ EF 02	Outlet	47	62	59	60	62	62	58	52	67
AHU 02/AHU 03	Intake	58	65	63	63	59	59	57	50	66
	Exhaust	60	69	67	67	69	65	62	54	72
AHU 05[1]	Breakout	64	64	59	57	54	50	45	37	59
Condensers (small)	Breakout	58	51	45	44	40	37	32	31	46
Condensers (250)[2]	Breakout[3]	76	66	63	59	52	46	42	34	60
Condensers (300)[2]	Breakout[3]	74	69	65	62	56	48	41	37	63
Condensers (350)[2]	Breakout[3]	74	69	65	62	56	48	43	38	62
Condensers (450)[2]	Breakout[3]	73	70	65	61	56	51	47	41	62
Condensers (500)[2]	Breakout[3]	73	70	66	62	56	52	47	40	63
Condensers (550)[2]	Breakout[3]	78	71	67	63	57	51	45	39	64

[1] This level is based on the unit operating during heating mode, which is the worst case
[2] The numbers shown represent the unit size
[3] This data is sound pressure level data measured at 1 m from the unit

In order to achieve the noise limits (set out in Section 4) at each of the nearest noise sensitive receivers, the attenuation set out in Table 6 is required.

Table 6 Attenuation requirements to achieve noise limits

Unit	Octave-band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
TEF 02	0	7	7	10	9	5	6	0
TEF 03	0	6	6	10	8	6	2	0

Based on the information in the datasheets provided, the units requiring attenuation are TEF 02/03. Breakout noise from these units will need to be controlled (as detailed in Table 6) in order to meet the noise limit at the nearest receivers. This level of attenuation can be provided by a silencer located at the discharge duct of the fan.

Based on the calculations (shown in Appendix C) and the attenuation requirements detailed above, the noise levels predicted at each of the nearest noise sensitive receivers due to each item of plant are given in Table 7.

Table 7 Calculated levels due to plant noise egress at nearest receivers

Unit	Calculated noise level at receiver, L_{Aeq} (dB)		
	North	South	West
TEF 01	38	31	41
TEF 02[1]	43	44	36
TEF 03[1]	35	41	40
EF 01	30	32	34
EF 02	33	33	26
AHU 02	35	37	34
AHU 03	35	37	34
AHU 05	33	35	37
Condensers - small (cumulative)	39	42	41
Condensers - large (cumulative)	47	46	47
Total	**50**	**50**	**50**

[1] These levels are based on the attenuation set out in Table 6. If a barrier is used to achieve this, then the levels are predicted to be very similar

Based on the results given in Table 7, the noise egress due to roof level plant items is expected to meet the noise limits set out in Section 4, should the attenuation measures be implemented as detailed.

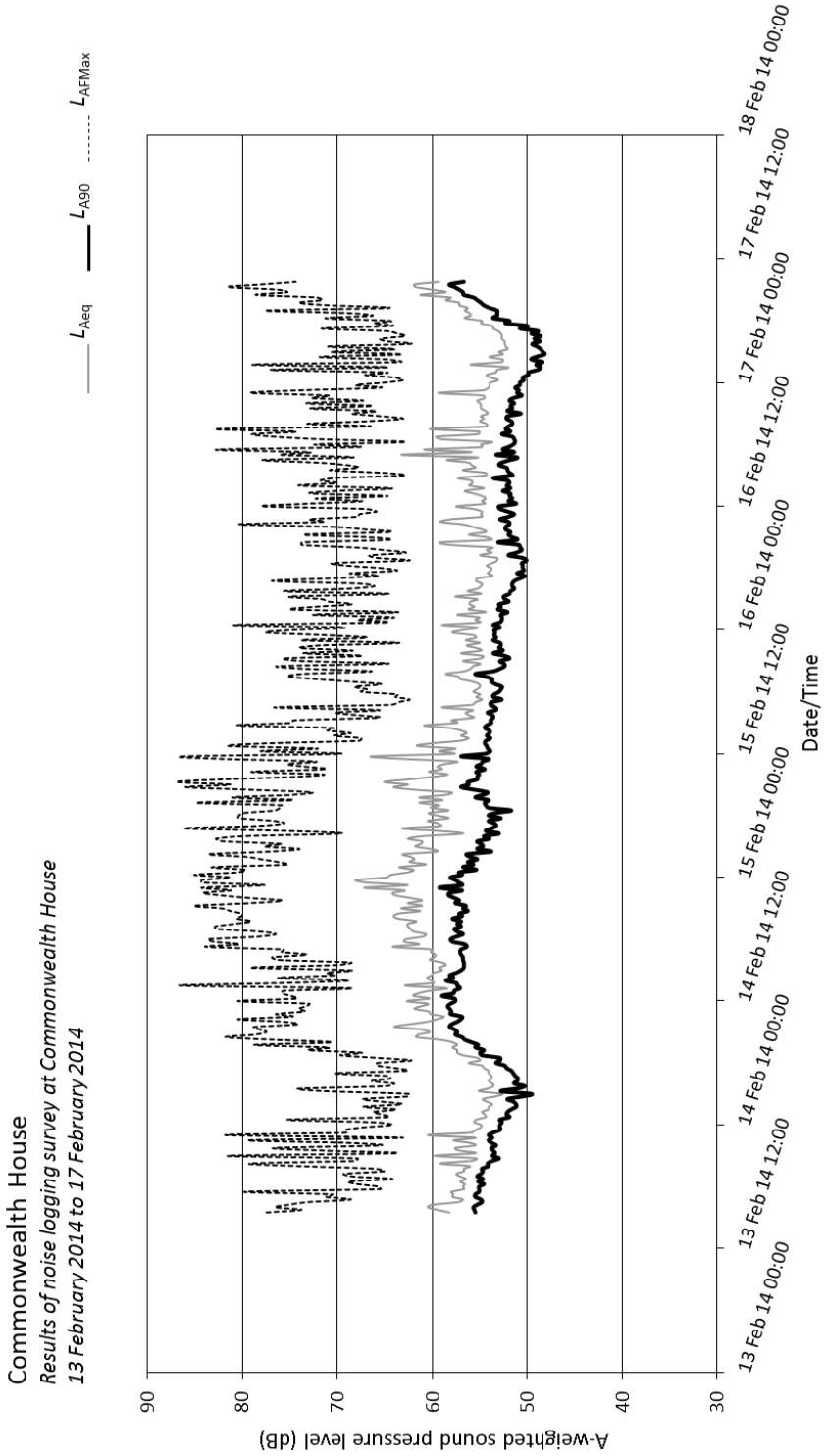
Appendix A – Equipment calibration information

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00320633	Rion	12 Apr 14	1204155
Microphone	UC-59/03382	Rion	12 Apr 14	1204155
Pre-amplifier	NH-25/ 10641	Rion	12 Apr 14	1204155
Calibrator	N7-74/34125430	Rion	12 Apr 14	1204151

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meters used in this survey are available upon request.

Appendix B – Results of unattended measurements


Commonwealth House
Results of noise logging survey at Commonwealth House
13 February 2014 to 17 February 2014
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
90
80
70
60
50
40
30
Date/Time
13 Feb 14 00:00
13 Feb 14 12:00
14 Feb 14 00:00
14 Feb 14 12:00
15 Feb 14 00:00
15 Feb 14 12:00
16 Feb 14 00:00
16 Feb 14 12:00
17 Feb 14 00:00
17 Feb 14 12:00
18 Feb 14 00:00

Appendix C – Calculations

	Comments	Octave band centre frequency (Hz)								Rating 1		Rating 2	
		63	125	250	500	1k	2k	4k	8k				
	14027 - Commonwealth House	*Plant noise discharge calcs*											
	BS - 08/09/2016												
	SWL data												
	TEF 01												
	Outlet	74	77	77	69	63	56	47	38	L=	81	L_A=	72
	Breakout	69	79	72	66	59	52	50	46	L=	80	L_A=	69
	TEF 02												
	Outlet	76	80	73	71	66	61	61	56	L=	83	L_A=	73
	Breakout	76	95	88	86	81	76	76	71	L=	96	L_A=	88
	TEF 03												
	Outlet	74	76	68	66	61	57	54	50	L=	79	L_A=	68
	Breakout	74	91	83	81	76	72	69	65	L=	92	L_A=	83
	EF 01												
	Outlet	47	62	59	60	62	62	58	52	L=	69	L_A=	67
	EF 02												
	Outlet	47	62	59	60	62	62	58	52	L=	69	L_A=	67
	AHU 4/5 (meeting)												
	PUHZ-RP250YKA heating	64	64	59	57	54	50	45	37	L_A=	59		
	PUHZ-RP250YKA cooling	61	63	59	55	53	49	44	35	L_A=	58		
	AHU 2/3												
	Supply inlet	58	65	63	63	59	59	57	50	L_A=	66		
	Supply outlet	61	69	67	68	70	65	62	55	L_A=	73		
	Extract inlet	57	65	63	62	59	58	56	49	L_A=	65		
	Extract outlet	60	69	67	67	69	65	62	54	L_A=	72		
	Condensers for AHUs (small units)												
	PUHZ-ZRP35VKA and PUHZ-ZRP50VKA	58	51	45	44	40	37	32	31	L_A=	46		
	Large condensers for FCUs etc (A-G)												
	SPL at 1m												
	Size 250	76	66	63	59	52	46	42	34	L_A=	60		
	Size 300	74	69	65	62	56	48	41	37	L_A=	63		
	Size 350	74	69	65	62	56	48	43	38	L_A=	62		
	Size 450	73	70	65	61	56	51	47	41	L_A=	62		
	Size 500	73	70	66	62	56	52	47	40	L_A=	63		
	Size 550	78	71	67	63	57	51	45	39	L_A=	64		
	Calculations												
	A-weighting curve	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1				
	TEF01												
	Outlet	74	77	77	69	63	56	47	38	L_A=	72		
	Breakout	69	79	72	66	59	52	50	46	L_A=	69		
	End Ref.Loss 0.14m2 (d=0.42)	-10.2	-5.6	-2.3	-0.8	-0.2	-0.1	0	0				
	Silencer - outlet	0	0	0	0	0	0	0	0				
	Breakout attenuation	0	0	0	0	0	0	0	0				
	Attenuated outlet	63.8	71.4	74.7	68.2	62.8	55.9	47.0	38.0	L_A=	70		
	Attenuated breakout	69.0	79.0	72.0	66.0	59.0	52.0	50.0	46.0	L_A=	69		
	SWL out	70.1	79.7	76.6	70.2	64.3	57.4	51.8	46.6	L_A=	72		
20	Lp to north	36.1	45.7	42.6	36.2	30.3	23.4	17.8	12.6	L_A=	38		
46	Lp to south	28.9	38.5	35.3	29.0	23.1	16.1	10.5	5.4	L_A=	31		
15	Lp to west	38.6	48.2	45.1	38.7	32.8	25.9	20.3	15.1	L_A=	41		
	TEF02												
	Breakout	76	95	88	86	81	76	76	71	L_A=	88		
	End Ref.Loss 0.2m2 (d=0.50)	-8.9	-4.6	-1.8	-0.6	-0.2	0	0	0				
	Breakout attenuation	0	7	7	10	9	5	6	0				
	Attenuated breakout	76.0	88.0	81.0	76.0	72.0	71.0	70.0	71.0	L_A=	80		

28	Lp to north	39.1	51.1	44.1	39.1	35.1	34.1	33.1	34.1	L_A=	43
27	Lp to south	39.4	51.4	44.4	39.4	35.4	34.4	33.4	34.4	L_A=	44
66	Lp to west	31.6	43.6	36.6	31.6	27.6	26.6	25.6	26.6	L_A=	36
	TEF03										
	Breakout	74	91	83	81	76	72	69	65	L_A=	83
	End Ref.Loss 0.6m2 (d=0.87)	-5.3	-2.2	-0.7	-0.2	-0.1	0	0	0		
	Breakout attenuation	0	6	6	10	8	6	2	0		
	Attenuated breakout	74.0	85.0	77.0	71.0	68.0	66.0	67.0	65.0	L_A=	76
46	Lp to north	32.8	43.8	35.8	29.8	26.8	24.8	25.8	23.8	L_A=	35
23	Lp to south	38.8	49.8	41.8	35.8	32.8	30.8	31.8	29.8	L_A=	41
27	Lp to west	37.4	48.4	40.4	34.4	31.4	29.4	30.4	28.4	L_A=	40
	EF01										
	Outlet	74	77	77	69	63	56	47	38	L_A=	72
	End Ref.Loss 0.14m2 (d=0.42)	-10.2	-5.6	-2.3	-0.8	-0.2	-0.1	0	0		
	Silencer - outlet	0	0	0	0	0	0	0	0		
	Attenuated outlet	63.8	71.4	74.7	68.2	62.8	55.9	47.0	38.0	L_A=	70
42	Lp to north	23.4	31.0	34.3	27.8	22.4	15.5	6.6	-2.4	L_A=	30
31	Lp to south	26.0	33.6	36.9	30.4	25.0	18.1	9.2	0.2	L_A=	32
26	Lp to west	27.5	35.1	38.4	31.9	26.5	19.6	10.7	1.7	L_A=	34
	EF02										
	Outlet	74	77	77	69	63	56	47	38	L_A=	72
	End Ref.Loss 0.14m2 (d=0.42)	-10.2	-5.6	-2.3	-0.8	-0.2	-0.1	0	0		
	Silencer - outlet	0	0	0	0	0	0	0	0		
	Attenuated outlet	63.8	71.4	74.7	68.2	62.8	55.9	47.0	38.0	L_A=	70
28	Lp to north	26.9	34.5	37.8	31.3	25.9	19.0	10.1	1.1	L_A=	33
27	Lp to south	27.2	34.8	38.1	31.6	26.2	19.3	10.4	1.4	L_A=	33
66	Lp to west	19.4	27.0	30.3	23.8	18.4	11.5	2.6	-6.4	L_A=	26
	AHU 2 and AHU 3										
	Supply inlet	58	65	63	63	59	59	57	50	L_A=	66
	Extract outlet	60	69	67	67	69	65	62	54	L_A=	72
	End Ref.Loss 1.8m2 (d=1.51)	-2.7	-0.9	-0.3	-0.1	0	0	0	0		
	380x1140mm Rec UL Duct	-0.9	-0.6	-0.4	-0.1	-0.1	-0.1	-0.1	-0.1		
	Silencer - inlet	0	0	0	0	0	0	0	0		
	Silencer - outlet	0	0	0	0	0	0	0	0		
	Attenuated inlet	54.4	63.5	62.3	62.8	58.9	58.9	56.9	49.9	L_A=	66
	Attenuated outlet	57.3	68.1	66.7	66.9	69.0	65.0	62.0	54.0	L_A=	72
	Combined SWL	59.1	69.4	68.0	68.3	69.4	66.0	63.2	55.4	L_A=	73
31	Lp to north - both units	24.3	34.6	33.2	33.5	34.6	31.2	28.4	20.6	L_A=	38
27	Lp to south - both units	25.5	35.8	34.4	34.7	35.8	32.4	29.6	21.8	L_A=	40
36	Lp to west - both units	23.0	33.3	31.9	32.2	33.3	29.9	27.1	19.3	L_A=	37
	AHU 5										
	Supply inlet	58	65	63	63	59	59	57	50	L_A=	66
	Extract outlet	60	69	67	67	69	65	62	54	L_A=	72
	End Ref.Loss 0.3m2 (d=0.62)	-7.5	-3.6	-1.3	-0.4	-0.1	0	0	0		
	Silencer - inlet	0	0	0	0	0	0	0	0		
	Silencer - outlet	0	0	0	0	0	0	0	0		
	Attenuated inlet	50.5	61.4	61.7	62.6	58.9	59.0	57.0	50.0	L_A=	66
	Attenuated outlet	52.5	65.4	65.7	66.6	68.9	65.0	62.0	54.0	L_A=	72
	Combined SWL	54.6	66.9	67.2	68.1	69.3	66.0	63.2	55.5	L_A=	73
42	Lp to north	14.2	26.4	26.7	27.6	28.9	25.5	22.7	15.0	L_A=	33
31	Lp to south	16.8	29.0	29.3	30.2	31.5	28.2	25.4	17.6	L_A=	35
26	Lp to west	18.3	30.6	30.9	31.8	33.0	29.7	26.9	19.2	L_A=	37
	Small condensers										

	PUHZ-RP250YKA heating	64	64	59	57	54	50	45	37	L_A=	59
31	Lp to north - all units	43.6	43.6	38.6	36.6	33.6	29.6	24.6	16.6	L_A=	39
21	Lp to south - all units	47.0	47.0	42.0	40.0	37.0	33.0	28.0	20.0	L_A=	42
25	Lp to west - all units	45.5	45.5	40.5	38.5	35.5	31.5	26.5	18.5	L_A=	41
	Large condensers										
	Size 250	76	66	63	59	52	46	42	34	L_A=	60.0
	Size 300	74	69	65	62	56	48	41	37	L_A=	62.5
	Size 350	74	69	65	62	56	48	43	38	L_A=	62.5
	Size 450	73	70	65	61	56	51	47	41	L_A=	62.5
	Size 500	73	70	66	62	56	52	47	40	L_A=	63.5
	Size 550	78	71	67	63	57	51	45	39	L_A=	64.5
9	x Size 250	86	76	72	68	62	56	51	44	L_A=	69.6
2	x Size 300	77	72	68	65	59	51	44	40	L_A=	65.6
7	x Size 350	82	77	73	70	64	56	51	46	L_A=	70.9
1	x Size 450	73	70	65	61	56	51	47	41	L_A=	62.5
5	x Size 500	79	76	73	69	63	58	53	46	L_A=	70.4
3	x Size 550	83	76	72	68	62	55	49	44	L_A=	69.2
	Total SWL	89	83	79	75	69	63	58	52	L_A=	77
n	20log(r1/r2), r1=1, r2=30	-30	-30	-30	-30	-30	-30	-30	-30		
s	20log(r1/r2), r1=1, r2=34	-31	-31	-31	-31	-31	-31	-31	-31		
w	20log(r1/r2), r1=1, r2=30	-30	-30	-30	-30	-30	-30	-30	-30		
	Lp to north	60	53	49	46	40	34	29	22	L_A=	47
	Lp to south	59	52	48	45	39	33	27	21	L_A=	46
	Lp to west	60	53	49	46	40	34	29	22	L_A=	47
	Total at receivers										
	Lp to north	60.0	56.3	51.9	47.8	43.2	39.1	36.4	35.0	**L_A=**	**50**
	Lp to south	59.1	56.7	51.6	47.7	43.8	40.1	37.9	36.2	**L_A=**	**50**
	Lp to west	60.0	56.2	52.0	47.9	43.3	38.7	35.7	32.0	**L_A=**	**50**