Optima Building Environmental Solutions

41 – 42 Chester Terrace – Acoustic Report with Calculations

CONTENTS

1. SUMMARY

An initial report was carried out in the early design stages of the project by Hanns Tucker that is provided in Section 2 of this updated acoustic report with calculations. What follows in this report is a reference drawing for principal comfort cooling plant in external plant rooms, the calculations and manufacture's literature showing noise levels used for calculation.

The supplementary information and calculations provided replaces the information in sub-clause 9.1 of Section 9 - DISCUSSION OF PLANT NOISE IMPACT in the Hanns Tucker Report. For other sub-clauses we would note:

9.2 Air ventilation – we agree with the report the attenuation has been provided and atmospheric noise impact will be negligible.

9.3 Attenuation of boiler flues was deemed not to be required as noise negligible and the discharge is at roof level.

9.4 Where specialist plant have been provided acoustic attenuation has been provided where deemed necessary. The Spa air handling unit uses highly efficient fans.

The calculation demonstrate the plant noise emissions have been designed in order to comply with the plant noise emission criteria.

2. Environmental Noise Survey report 18996/ES81 by Hanns Tucker – 13 Sheets

41-42 Chester Terrace
London

ENVIRONMENTAL NOISE SURVEY
REPORT18996/ENS1

For:

Shalimar Investors Ltd
41-42 Chester Terrace
London
NW1 4ND

7 March 2013

HANN TUCKER ASSOCIATES
Consultants in Acoustics
Noise and Vibration

Head Office
Duke House
1-2 Duke Street
WOKING
Surrey GU21 5BA

Tel : 01483 770595
Fax : 01483 729565

Northern Office
First Floor
346 Deansgate
MANCHESTER
M3 4LY

Tel : 0161 832 7041
Fax : 0161 832 8075

E-mail : Enquiries@hanntucker.co.uk
www.hanntucker.co.uk

ENVIRONMENTAL NOISE SURVEY
REPORT 18996/ENS1

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1.0 INTRODUCTION

A redevelopment is proposed at 41 and 42 Chester Terrace in London. The current proposals allow for the semi-detached houses at 41 and 42 Chester Terrace to be merged in order to create a large single family detached property.

As part of the redevelopment proposals, new mechanical installations are proposed. The noise emissions from the new plant are subject to the requirements of the Local Authority in terms of noise impact at neighbouring residential premises.

Hann Tucker Associates has therefore been appointed to carry out an environmental noise survey and propose suitable plant noise emission criteria based on the typical requirements of the Local Authority.

The building services design is at the early stages and therefore a final plant noise impact assessment cannot be undertaken at this stage. This report presents the methodology and results of the noise survey, the suitable plant noise emission criteria and provides a discussion for the various items of plant.

2.0 OBJECTIVES

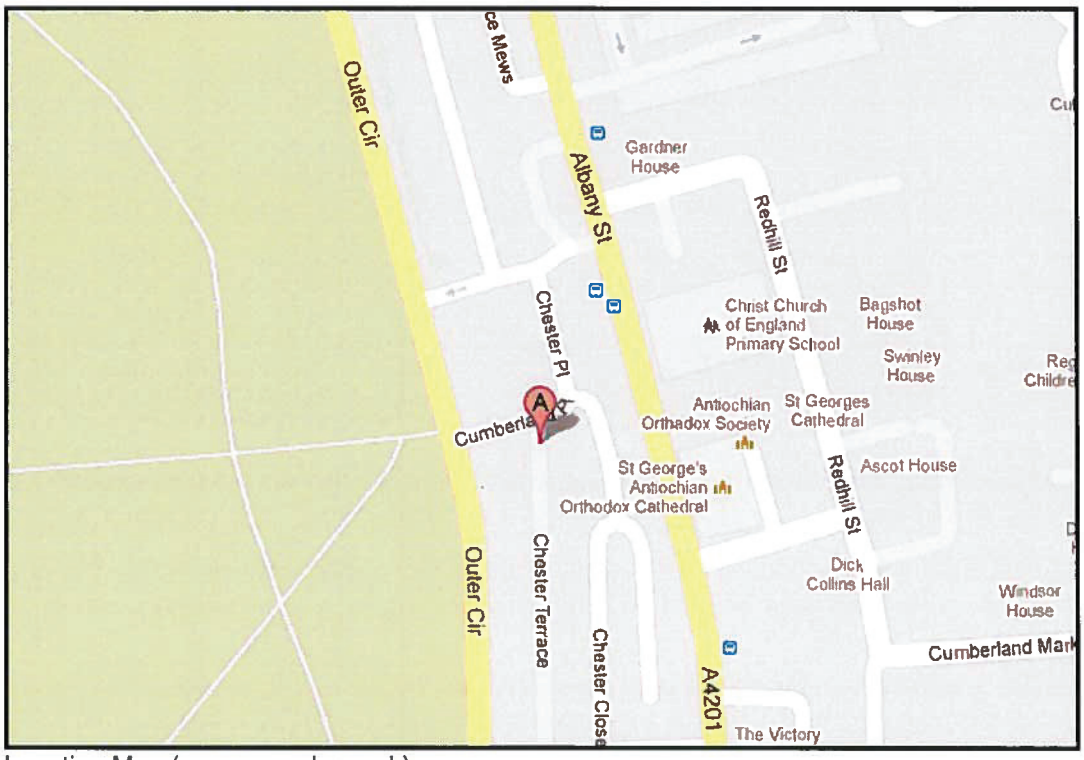
To establish, by means of detailed daytime and night-time fully automated environmental noise survey spanning a weekend, the existing A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} environmental noise levels at a selected accessible street level position at the site, thought to be representative of the noise climate at the nearest affected residential property.

Based on the results of the noise survey, and in conjunction with the typical requirement of the Local Authority, to recommend suitable plant noise emission criteria.

3.0 SITE DESCRIPTION

3.1 Location

The site is located at Chester Terrace overlooking Regent's Park in London and falls within Camden Council's jurisdiction. See Location Map below.



Location Map (maps.google.co.uk)

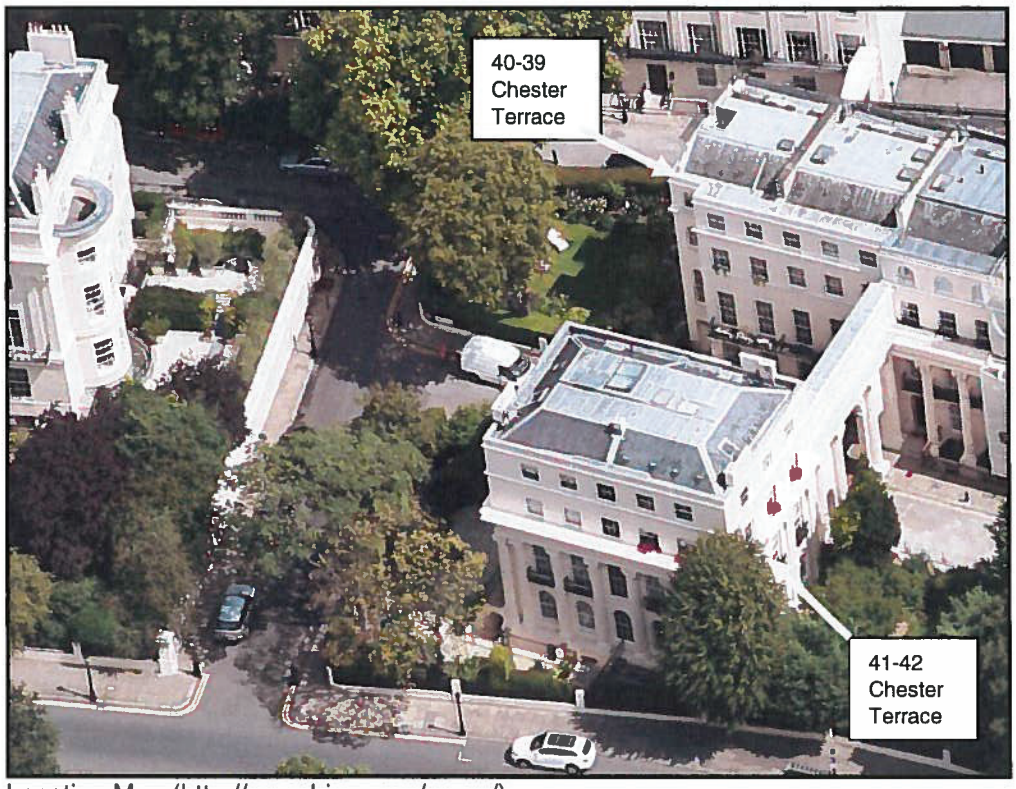
3.2 Description

The site comprises two semidetached houses (Nos 41 and 42) located on the northern end of Chester terrace. The properties are connected with the Chester terrace properties via an arch. The proposals allow for the redevelopment of the two houses into one detached (albeit for the arch connection) property with a garden.

The nearest premises are residential and are located to the east (Nos 40 and 39 Chester Terrace). Neighbouring residential premises are also located to the north-east along Chester Place.

The Outer Circle is located to the West. It is a road which circles Regent's Park.

The photograph below (view from the west) shows the location of the development in relation to the nearest residential premises.



Location Map (http://www.bing.com/maps/)

4.0 ACOUSTIC TERMINOLOGY

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 METHODOLOGY

5.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 13:00 hours on Friday 1 March 2013 to 12:00 hours on Monday 4 March 2013.

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period. However at the beginning and end of the survey period the wind conditions were calm from approximately a Westerly direction. The sky was generally overcast. We understand that generally throughout the survey period the weather conditions were similar to this. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} sound pressure levels over full hourly periods.

5.2 Measurement Position

The noise level measurements were undertaken at a single position at the development site. The microphone was located at the garden approximately 3m to the north of the north elevation of No 41 and approximately 3m from ground level.

The position was selected in order to assess the lowest noise levels at the development site for subsequent use in setting plant noise emission criteria.

The photograph below shows the location of the microphone.

Photograph courtesy of Hann Tucker Associates

5.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Latest Verification
Type 1 Data Logging Sound Level Meter	Larson Davis	824	3542	LD calibration on 24/02/2012
Type 1 ½" Condenser Microphone	PCB	377B02	104675	LD calibration on 24/02/2012
Type 1 Calibrator	Larson Davis	CAL200	3082	LD calibration on 02/03/2012

The sound level meter, including the extension cable, was calibrated prior to and on completion of the survey. No significant changes were found to have occurred (no more than 0.1dB).

The sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. The microphone was fitted with a Larson Davis windshield.

6.0 RESULTS

The results have been plotted on Time History Graphs 18996/TH1 to 18996/TH2 enclosed, presenting the hourly A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} levels at the measurement position throughout the duration of the survey.

7.0 DISCUSSION OF NOISE CLIMATE

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise source was noted to be vehicular movement on the Outer Circle road.

8.0 PLANT NOISE EMISSION CRITERIA

Camden's council typical requirements in relation to plant noise emissions are the following:

"It is the Council's duty to ensure that no process shall be carried on or equipment/machinery installed which is not such as could be carried on or installed in any residential area without detriment to the amenity of that area because of noise, vibration, smell, fumes, smoke, soot, ash, dust, or grit. Thus, for noise and vibration, an Acoustic Consultant's report is required detailing works to be carried out in order that the Council's requirements are met, taking into consideration the following:

The following standard applies to all air-cooled, heating, ventilation, extraction and conditioning systems and ancillary plant, ducting and equipment, which would have an impact on the ***external*** *environment. In order to protect existing levels and prevent "creep" (a rise in background noise levels), the Council seeks to ensure that noise level output from all such systems does not increase existing* ***background*** *noise levels.*

Thus, for new developments involving noisy plant/equipment or other uses, design measures should be taken to ensure that:

1a. ***(CG08)***

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).

And,

1b. (CG09)

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.

1c.

All related measurements shall be carried out over a period of 60 minutes (that is, hourly recorded measurements shall be presented over a 24 hour period).

Based on the results of our environmental noise survey and the above requirements we would propose that the cumulative plant noise emissions levels at 1m from the nearest residential window do not exceed **28dBA**. Since the development is residential we have opted to provide one criterion to allow for continuous operation of the plant.

The table below presents the predicted background noise level at 1m from the nearest noise sensitive façade which should be of assistance when determining compliance with requirement 1b. (CG09).

Lowest measured LA90 sound pressure levels (Hz) at Octave Band Centre Frequencies (Hz)							
63Hz	**125Hz**	**250Hz**	**500Hz**	**1KHz**	**2KHz**	**4KHz**	**8KHz**
47	41	39	37	33	27	21	19

9.0 DISCUSSION ON PLANT NOISE IMPACT

The M&E proposals for the development are not in the detailed design phase. As such there is limited information available to complete a plant noise impact assessment. This will be undertaken at a later phase when the M&E design has been finalized and all equipment have been selected and certified noise data (in octave band centre frequency data) are made available.

The proposed plant noise emission criteria are low, reflecting the location of the development which overlooks a large park and is relatively set back from major road traffic.

However, due to the location of the nearby residential premises and the luxurious nature of the development, compliance with the criteria should not be overly challenging.

A short discussion of the various sources of mechanical noise is presented below:

9.1 External Condensers

A number of external condensers are currently proposed. These are proposed to be located to the west of the building at lower ground floor level.

Due to the luxurious nature of the development we would recommend that these condensers are enclosed within propriety acoustic enclosures in order to reduce the noise impact at the amenity space (garden, garden terrace) of the premises. Propriety enclosures from a company like Environ (www.environ.co.uk) can provide up to 25dB of noise reduction. The inclusion of the acoustic enclosures and the favourable location of these condensers (screened from neighbouring premises at Chester terrace and Chester place) should ensure that the noise emissions from these units do not contribute to the noise climate at the neighbouring residential windows.

9.2 Air Ventilation

Mechanical air ventilation is currently proposed in most habitable rooms of the redeveloped single family premises.

One option for ventilation would include various façade openings to provide fresh air and extract. Depending on the plant selection and location of the penetrations atmospheric attenuators may be required to be placed in the ductwork.

Alternatively, fresh air and extract could be accommodated using ductwork/riser arrangements in order to obtain fresh air and exhaust at roof level. If required a single large atmospheric attenuator may be placed before the roof openings. The termination grille could also be oriented in such a way that it faces away from the neighbouring premises (i.e. facing west).

Based on our experience in similar luxurious developments, the stringent internal noise criteria for M&E services often dictates the selection of very low noise level fans (most often these fans are large in diameter and rotate at a low speed in order to ensure low noise levels) and as a result, atmospheric noise impact at neighbouring premises is most often negligible.

9.3 Boiler Flues

A number of new boilers are proposed which will probably be located in the basement. The boiler flues will most probably be located at roof level. If required atmospheric attenuators can be installed to reduce the noise output at roof level.

9.4 Specialist Areas

The current proposals allow for new Spa/Sauna area, catering area, a wine cellar etc. These areas have not been considered in any detail (other than space allocation) at this stage. If the building services design for these areas will be detailed at a stage which supersedes the final design stage for the main building, it is important for allowances to be made in order to

accommodate the atmospheric noise emissions from these sources since the proposed plant noise emission criterion should be achieved cumulatively from all new noise sources.

10.0 CONCLUSIONS

A detailed daytime and night-time fully automated environmental noise survey spanning a weekend has been undertaken in order to establish the currently prevailing street level environmental noise climate around the site.

Plant noise emission criteria have been recommended based on the results of the noise survey and in conjunction with the typical requirements of the Local Authority.

A short discussion in relation to possible mitigation proposals for the various building services is also included. The development proposals are at an early stage and final design solutions for the building services design are not available.

Due to the location of the nearby residential premises and the luxurious nature of the development, compliance with the plant noise emissions criterion should not be overly challenging.

Prepared by
Teli Chinelis
Associate
HANN TUCKER ASSOCIATES

Appendix A

The acoustic terms used in this report are as follows:

dB : Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.

dBA : The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dBA level.

Because of being a logarithmic scale noise levels in dBA do not have a linear relationship to each other. For similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

L_{10} & L_{90}: If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq} : The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 1 hour).

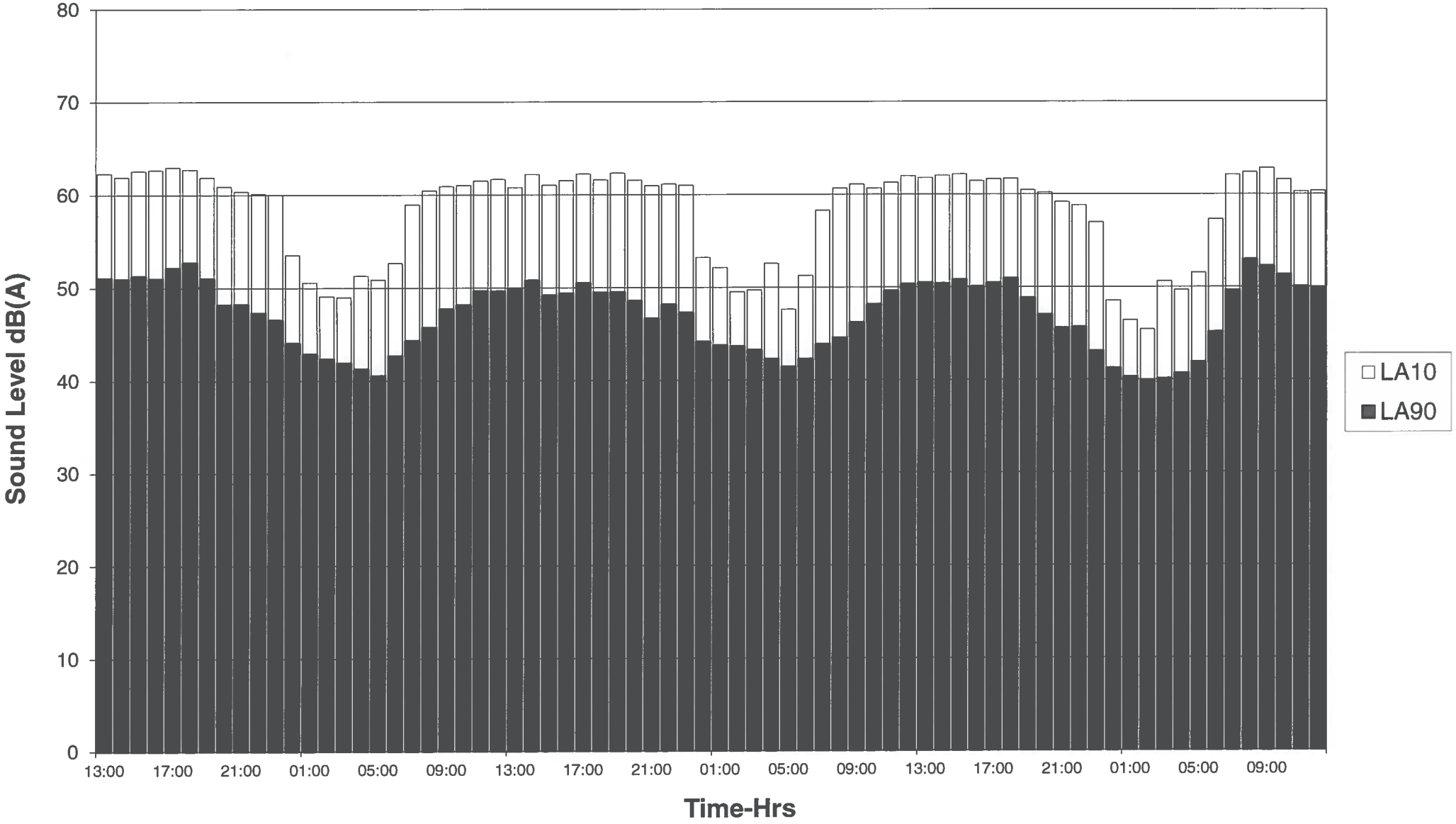
The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

L_{max} : L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

41-42 Chester Terrace, London

L_{A10} and L_{A90} Noise Levels

Friday 1/03/2013 - Monday 4/03/2013

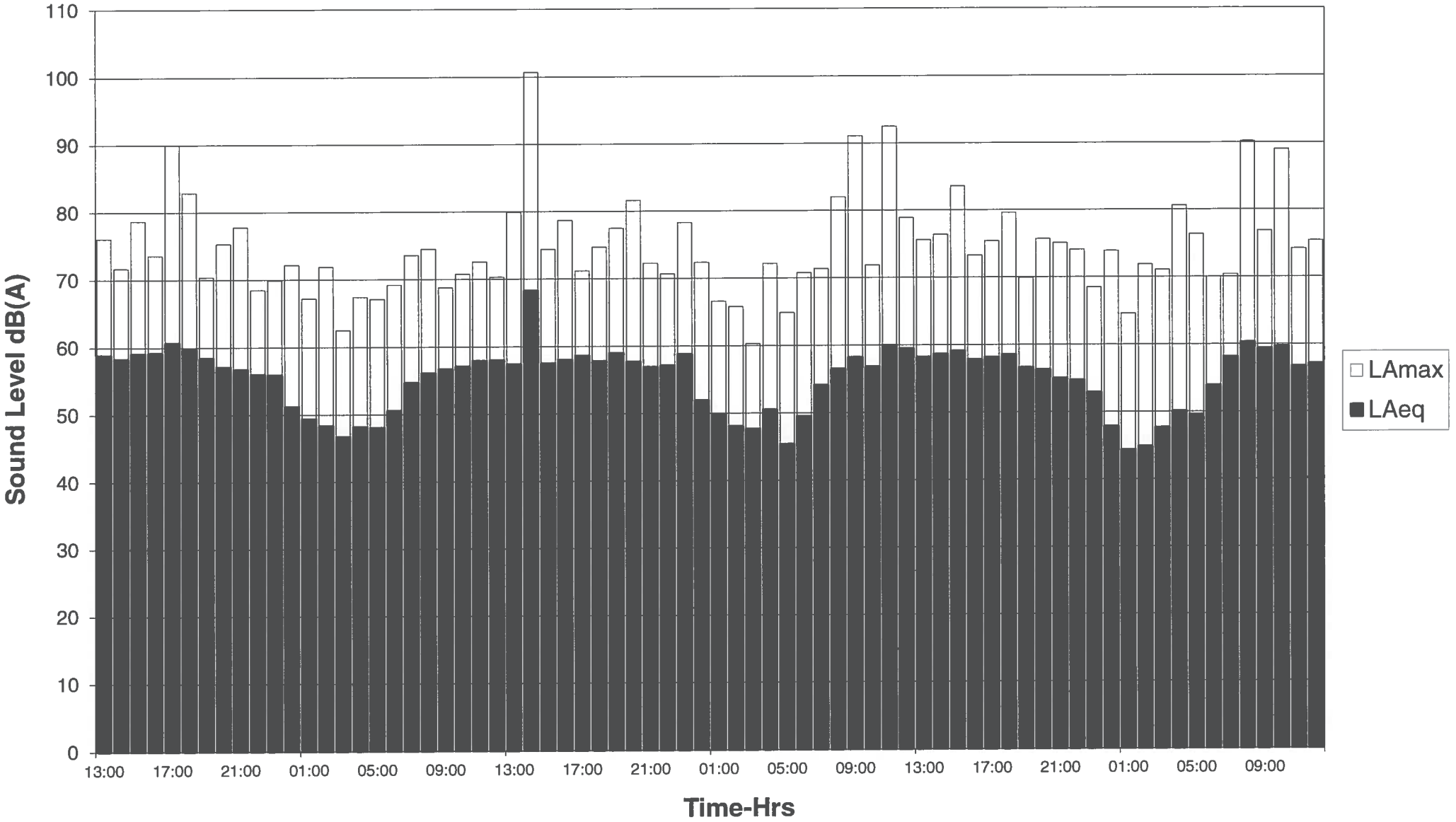


Time History Graph 18996/TH1

41-42 Chester Terrace, London

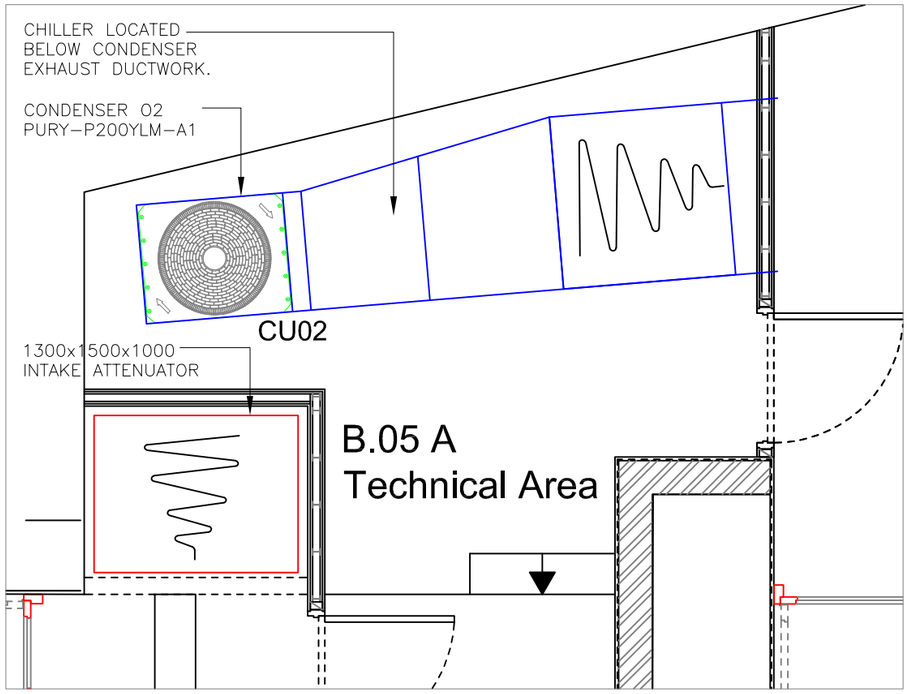
L_{Aeq} and L_{Amax} Noise Levels

Friday 1/03/2013 - Monday 4/03/2013

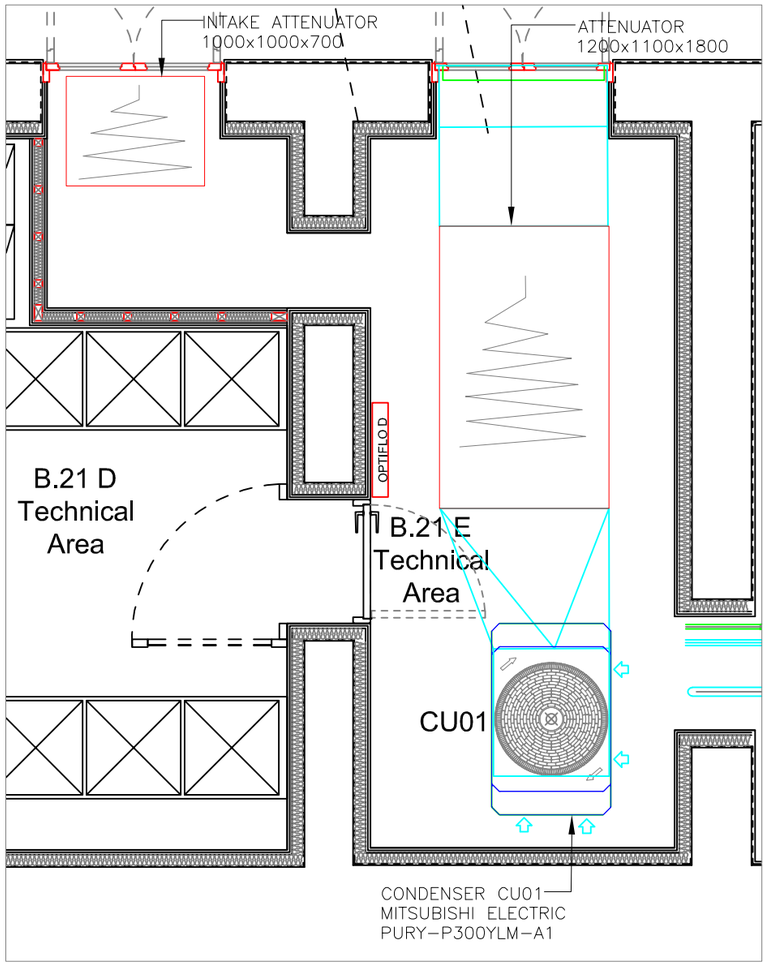


Time History Graph 18996/TH2

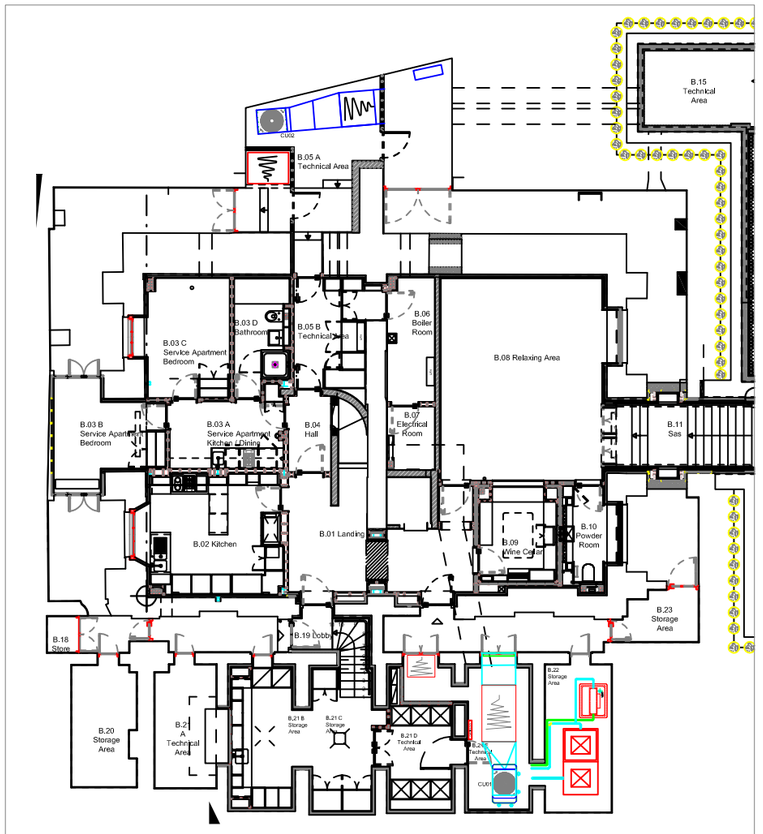
3. Technical Areas Layout Reference Drawing



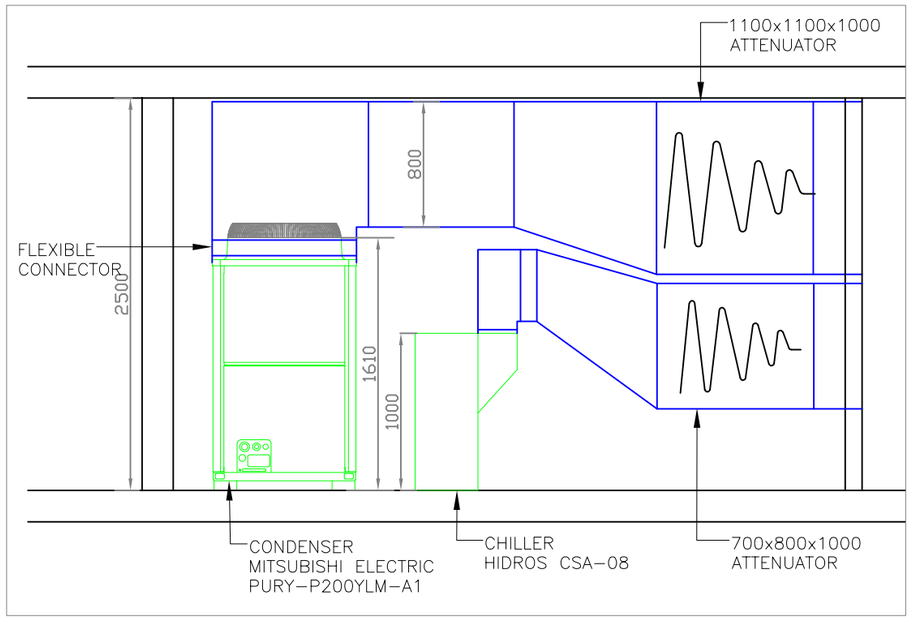
TECHNICAL AREA B.05 A
SCALE 1:20



TECHNICAL AREA B.21 E
SCALE 1:20



BASEMENT LAYOUT
SCALE 1:100



ELEVATION OF TECHNICAL AREA B.05 A
SCALE 1:20

FOR INFORMATION	I	04/07/16	GH
Purpose of Issue	Rev	Date	Authorised

QUENTRALL SERVICES ltd.
Unit 9 abbots Business Park, Primrose Hill, King's Langley, Hertfordshire, WD4 8FR
TEL: 020 8445 0751 EMAIL: enquiries@quentrall.co.uk

Client:
SHALIMAR INVESTMENTS LTD

Project:
41-42 CHESTER TERRACE
LONDON, NW1 4ND

Title:
MECHANICAL SERVICES
TECHNICAL AREAS LAYOUT

Scale:	Drawn:	Checked:	Authorised:	Drwg Size:
1:20@A1	ET	GH	GH	A1
	Date: JUL2016	Date:	Date:	

Drawing Number: MSK504 Rev I

4. Noise calculations from EEC – 5 Sheets

Noise control calculations 41-42 Chester Terrace

FRONT VAULT, ASSESSED TO 40, CHESTER TERRACE

Front Vault (Condenser 1) Fresh Air Inlet

Front Vault Condenser 1								
Frequency	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Cumulative Plant Sound Power Level*								
	76	72	68	61	58	53	50	47
Reverberant Sound Pressure Level †								
	71	68	64	58	55	51	47	45
Facade Sound Insulation								
AS50/06 lined plenum chamber	2	2	7	10	11	9	8	7
Distance between Source and Facade							4	m
Distance between Facade and Receiver Location							9	m
						w	h	
Facade/Enclosure Dimensions (facing facade)						1.2	1.1	m
Directivity (Q) of Surroundings ‡							2	
Calculations:								
Reverberant to Direct Noise								
Reverberant Level	71	68	64	58	55	51	47	45
AS50/06 lined plenum chamber	2	2	7	10	11	9	8	7
-6	-6	-6	-6	-6	-6	-6	-6	-6
Distance = Rathes (w x h correct for facing facade)	-28	-28	-28	-28	-28	-28	-28	-28
Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	39	36	26	17	13	11	8	7
Direct to Direct Noise								
Sound Power Level	76	72	68	61	58	53	50	47
Total Distance Correction	22	22	22	22	22	22	22	22
-11	-11	-11	-11	-11	-11	-11	-11	-11
AS50/06 lined plenum chamber	2	2	7	10	11	9	8	7
Resultant @ Receiver	41	37	28	18	14	11	9	7
Cumulative Sound Pressure Level @ Receiver Location								
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
	43	39	30	20	17	14	11	10
dBA Spectrum	17	23	21	17	17	15	12	9
							27	**dB(A)**
No line of sight screening	5	5	5	5	5	5	5	5
SPL screened	38	34	25	15	12	9	6	5
dBA	12	18	16	12	12	10	7	4
Notes:								
							22	**dB(A)**

Front Vault (Condenser 1) Exhaust Air

Attenuator Calculation Sheet												
EC13636-011	**41 - 42 Chester Terrace**											
Quentrall Services Ltd												
ATT01: Condenser 1 (PURY-P300-YJM-A) Exhaust												
29/06/16				**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
SWL				81	79	77	72	69	64	61	58
outlet dims	W or (dia)	H									
	1200	1100									
area	1.32										
surfaces 0-3	1										
System Losses			gth/no. off								
Duct	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
Bend m/r/mtv/lb											
mtv	1000		1	0	0	1	2	3	3	3	3
0	0		0	0	0	0	0	0	0	0	0
0	0		0	0	0	0	0	0	0	0	0
0	0		0	0	0	0	0	0	0	0	0
Split	% to outle										
	100	%		0	0	0	0	0	0	0	0
Additional attenu	+ screening		ES 40/18	13	21	30	40	42	39	28	19
Other: filter-bag/			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
End Reflection				3	1	0	0	0	0	0	0
Total System atte				-16	-22	-31	-42	-45	-42	-31	-22
SWL at outlet				65	57	46	30	24	22	30	36
Direct Contributio											
dist. to ear	9	m		-30	-30	-30	-30	-30	-30	-30	-30
directivity	0	degrees		5	7	8	8	9	9	9	9
SPLdir				40	34	24	8	3	1	9	15
Criteria	28	dBA		49	37	28	21	17	14	11	10
Required DIL				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**
		22	**dBA**	14	18	15	5	3	2	10	14

TECHNICAL AREA, ASSESSED TO 2, CUMBERLAND PLACE

Technical Area (Condenser 2 & Chiller unit) Fresh Air Inlet

Tech Area FAI								
Frequency	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Cumulative Plant Sound Power Level*								
	82	75	71	65	63	58	54	48
Reverberant Sound Pressure Level †								
	79	73	70	67	66	61	56	50
Facade Sound Insulation								
AS40/10	4	7	13	19	23	23	16	13
Distance between Source and Facade							**2**	**m**
Distance between Facade and Receiver Location							**35**	**m**
						w	**h**	
Facade/Enclosure Dimensions (facing facade)						**1.3**	**1.8**	**m**
Directivity (Q) of Surroundings ‡							**2**	
Calculations:								
Reverberant to Direct Noise								
Reverberant Level	79	73	70	67	66	61	56	50
Enclosure SRI	4	7	13	19	23	23	16	13
-6	-6	-6	-6	-6	-6	-6	-6	-6
Distance = Rathes (w x h correct for facing facade)	-37	-37	-37	-37	-37	-37	-37	-37
Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	35	26	17	8	3	-2	0	-3
Direct to Direct Noise								
Sound Power Level	82	75	71	65	63	58	54	48
Total Distance Correction	31	31	31	31	31	31	31	31
-11	-11	-11	-11	-11	-11	-11	-11	-11
Enclosure SRI	4	7	13	19	23	23	16	13
Resultant @ Receiver	36	26	16	4	-2	-7	-5	-8
Cumulative Sound Pressure Level @ Receiver Location								
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
	38	29	19	9	4	-1	1	-2
dBA Spectrum	12	13	10	6	4	0	2	-3
							18	**dB(A)**
Screening/ directivity	5	5	5	5	5	5	5	5
SPL screened	33	24	14	4	-1	-6	-4	-7
dBA	7	8	5	1	-1	-5	-3	-8
Notes:								
resultant SPL at our windows at 3m	37	dBA					**13**	**dB(A)**
Min L90 mH tucker	*38*	dBA						

Technical Area (Condenser 2) Exhaust Air

Attenuator Calculation Sheet												
EC13636-011	**41 - 42 Chester Terrace**											
Quentrall Services Ltd												
ATT03: Condenser 2 (PURY-P200-YJM-A) Exhaust												
29/06/16				**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
SWL				79	77	75	69	66	61	55	52
outlet dims	W or (dia)	H									
	1300	1300									
area	1.69										
surfaces 0-3	1										
System Losses			length/no. off								
Duct	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
Bend m/r/mtv/lb											
mtv	800		1	0	0	0	1	2	3	3	3
0	0		0	0	0	0	0	0	0	0	0
0	0		0	0	0	0	0	0	0	0	0
0	0		0	0	0	0	0	0	0	0	0
Split	% to outlet										
	100	%		0	0	0	0	0	0	0	0
Additional attenu	+ screening	AS 40/10		9	12	18	24	28	28	21	18
Other: filter-bag/			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
End Reflection				2	0	0	0	0	0	0	0
Total System atte				-11	-12	-18	-25	-30	-31	-24	-21
SWL at outlet				68	65	57	44	36	30	31	31
Direct Contributio											
dist. to ear	35	m		-42	-42	-42	-42	-42	-42	-42	-42
directivity	0	degrees		5	7	8	8	9	9	9	9
SPLdir				31	30	23	10	3	-2	-2	-2
Criteria	28	dBA		49	37	28	21	17	14	11	10
Required DIL				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		18	**dBA**	5	14	14	7	3	-1	-1	-3

Technical Area (Chiller unit) Exhaust Air

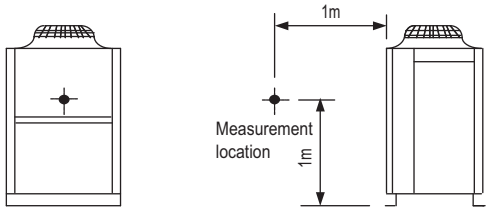
Attenuator Calculation Sheet											
EC13636-011	**41 - 42 Chester Terrace**										
Quentrall Services Ltd											
ATT04: Chiller unit Exhaust											
29/06/16				**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
SWL				84	75	69	68	67	61	58	49
outlet dims	W or (dia)	H									
	1000	1000									
area	1										
surfaces 0-3	2										
System Losses			length/no. off								
Duct	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
	0		0	0	0	0	0	0	0	0	0
Bend m/r/mtv/lb											
r	500		1	0	0	0	1	2	3	3	3
0	0		0	0	0	0	0	0	0	0	0
0	0		0	0	0	0	0	0	0	0	0
0	0		0	0	0	0	0	0	0	0	0
Split	% to outlet										
	100	%		0	0	0	0	0	0	0	0
ldditional attenuati	+ screenin	ES 33/10		11	15	20	27	31	29	24	19
Other: filter-bag/			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
End Reflection				4	1	0	0	0	0	0	0
Total System atte				-15	-16	-20	-28	-33	-32	-27	-22
SWL at outlet				69	59	49	40	34	29	31	27
Direct Contributic											
dist. to ear	35	m		-42	-42	-42	-42	-42	-42	-42	-42
directivity	0	degrees		7	8	8	9	9	9	9	9
SPLdir				34	25	15	7	1	-4	-2	-6
Criteria	28	dBA		49	37	28	21	17	14	11	10
Required DIL				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		14	**dBA**	8	9	6	4	1	-3	-1	-7

5. Manufacturers Noise Data

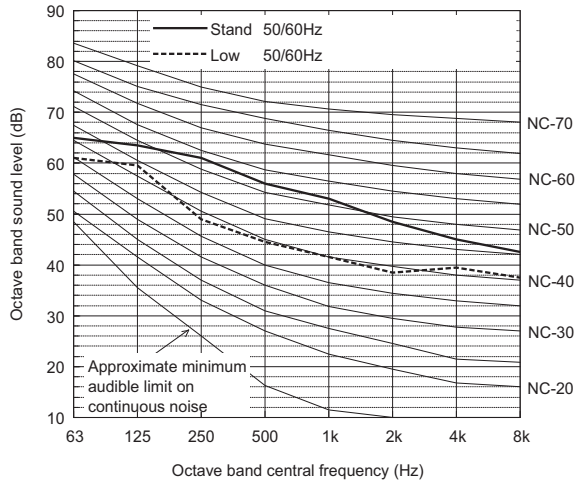
5.1 Mitsubishi City Multi Databook

5.2 CSA 08 Chiller noise data

Measurement condition
PURY-P200,250,300YJM-A(-BS)



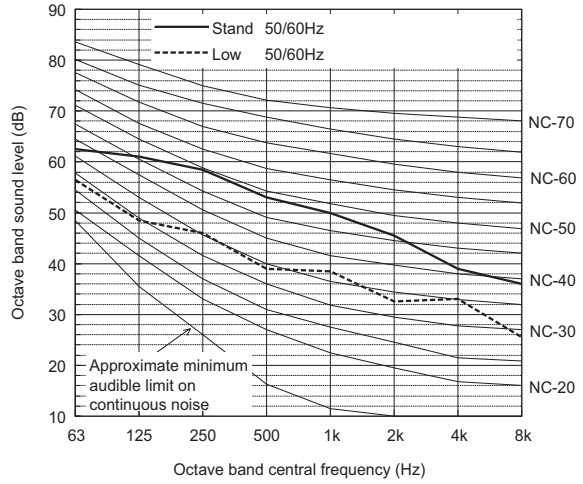
Sound level of PURY-P300YJM-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	65.0	63.5	61.0	56.0	53.0	48.5	45.0	42.5	59.0
Low noise mode	50/60Hz	61.0	59.5	49.0	44.5	41.5	38.5	39.5	37.5	50.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

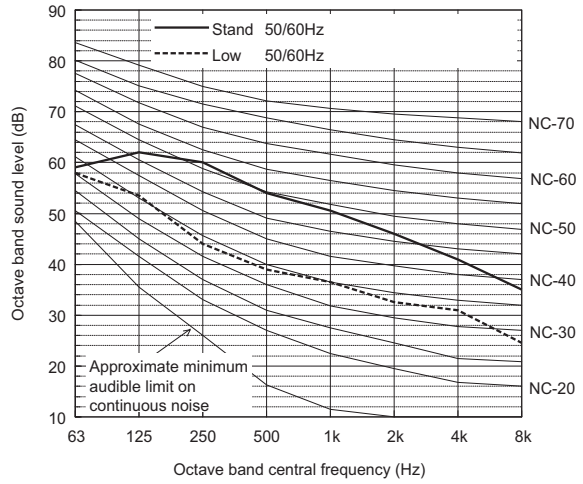
Sound level of PURY-P200YJM-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	62.5	61.0	58.5	53.0	50.0	45.5	39.0	36.0	56.0
Low noise mode	50/60Hz	56.5	48.5	46.0	39.0	38.5	32.5	33.0	25.5	44.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

Sound level of PURY-P250YJM-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	59.0	62.0	60.0	54.0	50.5	46.0	41.0	35.0	57.0
Low noise mode	50/60Hz	58.0	53.5	44.0	39.0	36.5	32.5	31.0	24.5	44.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

R2

3.7 Sound data

LOW NOISE VERSION (LS)											
	Octave bands (Hz)								Lw		Lp
Modd.	63	125	250	500	1K	2K	4K	8K	dB	dB(A)	dB(A)
	dB	dB	dB	dB	dB	dB	dB	dB			
06	84,1	75,3	69,2	67,7	66,6	61,2	57,8	48,7	84,9	71	43
08	84,1	75,3	69,2	67,7	66,6	61,2	57,8	48,7	84,9	71	43
10	84,1	75,3	69,2	67,7	66,6	61,2	57,8	48,7	84,9	71	43
14	86,1	77,3	71,2	69,7	68,6	63,2	59,8	50,7	86,9	73	45
16	86,1	77,3	71,2	69,7	68,6	63,2	59,8	50,7	86,9	73	45
21	90,1	81,3	75,2	73,7	72,6	67,2	63,8	54,7	90,9	77	49
26	90,1	81,3	75,2	73,7	72,6	67,2	63,8	54,7	90,9	77	49
31	95,1	86,3	80,2	78,7	77,6	72,2	68,8	59,7	95,9	82	54
36	95,1	86,3	80,2	78,7	77,6	72,2	68,8	59,7	95,9	82	54
41	95,1	86,3	80,2	78,7	77,6	72,2	68,8	59,7	95,9	82	54

Lw: Sound power level according to ISO 9614.
Lp: Sound pressure level measured at 10 mt from the unit in free field conditions direction factor Q=2 according to ISO 9614.

The sound pressure level of the STANDARD VERSIONS without compressor jackets and compressor vane insulation is approx. 1,5 dB(A) higher than the equivalent low noise versions LS.

4. INSTALLATION

4.1 General safety guidelines and and use of symbols

Before undertaking any task the operator must be fully trained in the operation of the machines to be used and their controls. They must also have read and be fully conversant with all operating instructions.

All maintenance must be performed by TRAINED personnel and be in accordance with all national and local regulations.

The installation and maintenance of the unit must comply with the local regulations in force at the time of the installation.

Avoid contact and do not insert any objects into moving parts.