

Proposed Commercial Development
3-5 King Street, Reading, Berkshire, RG1
2HB



Noise Impact Assessment

TECHNICAL REPORT

32308 R1

Proposed Commercial Development

Noise Impact Assessment

Prepared for: Sunnyday Trading, 10 Carlos Place, Mayfair, London WK1 3AT, c/o DWP Associates

Site location: 3-5 King Street, Reading, Berkshire, RG1 2HB

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1 INTRODUCTION

- 1.1 The site under consideration is located at 3-5 King Street, Reading, Berkshire, RG1 2HB (hereinafter, “The Site”).
- 1.2 The Site has applied for planning permission to Reading Borough Council (reference 190267), to develop and extend 1st – 3rd floor areas into offices spaces with associated plant area.
- 1.3 The granted planning permission is subject to Condition 5, relevant to this assessment.
- 1.4 It has been confirmed from Reading Borough Council that a noise impact assessment in accordance with BS 4142:2014 is required to satisfy Condition 5 of the approved development:

In relation to Condition 5 – noise arising from development, the noise assessment needs to follow BS 4142:2014 methodology and needs to establish the predicted noise rating level at the nearest noise sensitive receptor taking account any characteristic factors like tonality or impulsiveness of the noise. The rating level should be compared with the background noise level.

- 1.5 Sound Solution Consultants have been commissioned to undertake a noise impact assessment to determine the level of impact from proposed building services plant on nearby noise sensitive receptors.
- 1.6 The proposed plant area will be located at the rear courtyard above the proposed extension at 3rd floor level and adjacent to the existing plant room; scheme design is shown in Appendix C.
- 1.7 The nearest noise sensitive receptor is identified as the nearest window on 3rd floor level internal courtyard, assumed associated with Chancellors estate agents. All the windows of the internal courtyard are associated with commercial use with no access / amenity within. Appendix C Figure C5 shows the relative position of the condenser units within the roof area, nearest receptor windows will be at least partially shielded by the extended roof profile.
- 1.8 Appendix D shows photographs illustrating views of the site and measurement location during times of site assessment.
- 1.9 A Glossary of Acoustic Terms can be found in Appendix A that may assist with the terminology used within this report.



2 NOISE CRITERIA

BS4142:2014 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

- 2.1 The British Standard BS4142: 2014 “Methods for Rating and Assessing Industrial and Commercial Sound” describes methods for rating and assessing sound of an industrial or commercial nature. The scope of the standard includes relevant topics for commercial development, such as sound from fixed installations (mechanical and electrical plant and equipment). The standard is applicable to the determination of rating levels for sources of sound as well as ambient, background and residual levels.
- 2.2 Certain acoustic features can increase the significance of impact that might be expected from a comparison of the specific sound level to the background sound level. Where such features are present at the assessment location, a character correction to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.
- + Tonality: A correction of 0dB to +6dB for sound ranging from not tonal to prominently tonal; using the Joint Nordic Method or subjectively.
 - + Impulsivity: A correction of up to +9dB can be applied for sound that is impulsive.
 - + Other characteristics: A correction of 3dB can be applied where the sound is neither tonal nor impulsive, but distinctive in the residual acoustic environment.
- 2.3 The rating sound level is equal to the specific sound level if there are no acoustic features present or expected to be present.
- 2.4 The significance of sound depends upon both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. An initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level. The context of the development is important in assessing the impact.
- Typically, the greater this difference, the greater the magnitude of the impact.
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.
 - The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact... Where the rating level does exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- 2.5 The scope of the Standard recognises that human response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.



3 ENVIRONMENTAL NOISE SURVEY

- 3.1 An environmental survey was undertaken from Monday 18th to Tuesday 19th March 2019 to quantify sound levels at the development site in accordance with BS 7445-2:1991.
- 3.2 The equipment used during the survey consisted of precision monitoring equipment and accessories which conform to BS EN 61672-1:2003 (Class 1) for sound level meters and BS EN 60942 (Class 1) for sound calibrators. All equipment listed has traceable calibration history valid during the relevant times of the site assessment; no greater than two years for sound level meters and one year for sound calibrators. Calibration records are available on request.
- 3.3 The calibration of the sound level meter was checked using the handheld calibrator CAL200 at its verified reference level and frequency, 114 dB at 1kHz, before any measurements were taken. Validation checks at the end of the survey demonstrated acceptable drift across all parts of the study, of ≤ 0.10 dB.
- 3.4 The weather conditions at the start and end of the noise survey were recorded as dry and calm with average measured wind speed <3 m/s. Reasonable measurement conditions were reported throughout the noise survey, such that the weather is not expected to have significantly or adversely influenced the levels measured.
- 3.5 Measurements were taken at one location highlighted in Appendix B. Position 1 was located at rooftop level within the internal courtyard, in free-field conditions. The noise climate was dominated by mechanical noise from existing building services plant associated with the adjoining buildings, including intermittent extract louvres, ventilation plant and various condenser plant.
- 3.6 Interval noise data was recorded the measurement locations at 15-minute and 1-minute periods, time synchronised to GMT. The meter was configured to record average equivalent (L_{Aeq}), maximum (L_{Amax}), minimum (L_{Amin}) and statistical (L_n) parameters in octave bands. Measurements were primarily taken to evaluate the representative background sound levels (L_{A90}) during the daytime (07:00 to 23:00) and night time (23:00 to 07:00) periods.

BACKGROUND SOUND LEVELS

- 3.7 The 'typical' background sound levels for assessment in accordance with BS 4142 have been established from histograms of the recorded $L_{A90,15min}$ data at Position 1. These are shown in Appendix E.
- 3.8 In line with Section 8.1.4 of BS 4142:2014, the monitoring duration should reflect the range of background noise levels for the period assessed. In practice, there is no single level for background sound as this is a fluctuating parameter, although a representative value of the period should be used. Note this is not either the lowest or mean average value of $L_{A90,15min}$.

From the commentary of BS 4142:2014, it is recognised that in using the background sound level in the method for rating and assessing industrial and commercial sound, the objective is not simply

to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods. A representative level should account for the range of background sound levels and not automatically assumed to be the lowest value.

3.9 The following summary of $L_{A90,T}$ sound levels is presented from the measured data at Position 1 of the environmental assessment. This has been established in accordance with the assessment methodology of BS 4142:2014.

Measurement Data		Free Field Sound Pressure Level dB $L_{A90,T}$ re. 20 μ Pa	
Date	Time HH:MM	Position 1	
		Range	Representative
18 th – 19 th March 2019	07:00 – 23:00	49-58	51
	23:00 – 07:00	47-51	48

Table 1 – Background $L_{A90,T}$ sound pressure levels at Position 1.



4 NOISE IMPACT FROM MECHANICAL PLANT

4.1 It is noted from Reading Borough Council planning requirements that BS 4142:2014 should be used to assess impacts from mechanical sources instated by the development. The following assessment is therefore presented in accordance with BS 4142:2014 methodology.

4.2 The following plant selection relevant for acoustic assessment are detailed in Appendix F and described as follows:

- External condenser plant - PURYP300YNWA (x3)
 - Located external roof top plant area, as indicated in Appendix C scheme design.
- Heat Recovery Units (HRU's) – LGH-100RVX-E
 - One unit internally on each level, with associated inlet/outlet ducts terminating on the internal courtyard façade.

4.3 The HRU's published sound data indicates a sound pressure level of 37 dB L_{pA} ; with duct losses the level at the facade terminations will be lower. The noise impact is deemed to be negligible where the courtyard area is dominated by existing mechanical plant sources and where the daytime background sound levels range 49-58 dB $L_{A90,15 \text{ min}}$. It is therefore deemed unnecessary to include a detailed assessment of noise impact from the HRU's and the following BS 4142 assessment will consider the impact of the external condenser plant.

BS4142:2014 ASSESSMENT OF MECHANICAL PLANT

4.4 The proposed development and associated plant will typically operate during the daytime period. All windows within the courtyard area are identified as associated with commercial premises which will typically operate during the daytime period. For any noise sensitive receptors beyond the internal courtyard area, all proposed plant will be fully screened by the building footprint.

4.5 The following numerical BS 4142 assessment is therefore based on a daytime period of assessment at the nearest identified noise sensitive receptor (the nearest commercial window on third floor level assumed associated with the adjoining Chancellors estate agents).

4.6 Calculations are based on manufacturers' noise levels for the highest operating mode for all three condensers running simultaneously.

4.7 Calculation details for the specific sound level are summarised in Appendix G, based on a nominal 5 m distance to the noise sensitive receptor and accounting for a nominal 5 dB attenuation for screening from the extended roof profile and parapet (the roof level plant will be one storey higher than the nearest adjacent commercial window within the courtyard, with condensers located away from the outer edge as shown in Appendix C Figure C5). This calculation can be considered conservative, and therefore representative of a 'worst-case'.



BS4142:2014 Assessment - Condensers, daytime		
Result		Commentary
Residual Sound Level, $L_{Aeq, T}$	55	Taken from measurements at Position 1.
Background Sound Level, dB $L_{A90, T}$	51	Representative background level taken from Table 1.
Reference time interval	1-hour	Assessment for daytime period.
Specific Sound Level, dB $L_{Aeq, T}$	45	Calculated level based on manufacturer's sound data and calculation details in Appendix G.
Rating penalty dB	0	No character associated with source.
Rating level dB $L_{Ar, Tr}$	45	The rating level is equal to the specific sound level plus acoustic feature corrections.
Excess of rating level over background sound level	-6	The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
Assessment indicates likely indication of: *depending on context	Low impact*	
Uncertainty of the assessment	Insignificant	Where the excess of the background sound level over the rating level is high, the uncertainty of the measurement does not have any significance on the outcome of the assessment.

Table 2 – Assessment of proposed condenser plant on noise sensitive receptors, in accordance with BS 4142:2014.

4.8 Table 2 highlights that proposed mechanical plant will have a low impact, beyond any reasonable uncertainty in the assessment. This is indicated where the rating sound level is predicted to lie at least 6 dB below the representative daytime background sound level.

4.9 The concept of “context” is important within BS 4142:2014 and when considering impacts assessed using the standard. Section 11 of the Standard stipulates:

“...that an effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context”.

The assessment of existing mechanical plant in Table 2 must be considered in context to the development. For example:



- The character and level of the residual sound compared to the character and level of the specific sound. The pre-existing noise climate is dominated by existing mechanical plant noise sources.
 - No account has been made to assess the absolute internal and external sound levels, or relative levels compared to residual sound at the assessment site.
- 4.10 When context is considered relevant to predicted sound levels, negligible impact is expected from the proposed mechanical plant incident on the nearest noise sensitive receptors.
- 4.11 **Based on the numerical assessment and considering the context of the site using BS 4142:2014 methodology, planning condition 5 is deemed to be satisfied where the proposed plant has been shown to have low or negligible impact.**

STATEMENT OF UNCERTAINTY

- 4.12 Uncertainty inevitably limits the accuracy associated with all steps of any noise assessment, including measurement, calculation or prediction. Factors include, but are not limited to:
- The inherent accuracy limitation of methodology in Standards and guidance.
 - Variability in meteorological conditions.
 - The accuracy of sound source input data of a calculation or noise model.
- 4.13 It is imperative to minimise the uncertainty to a level commensurate with the intention of the assessment objective. Measures taken in this assessment to minimise uncertainty are:
- Baseline sound levels have been measured over an appropriately long time frame therefore provide a good indication of representative background and residual sound levels with and without the existing plant in operation.
 - Sound level measurements were undertaken in accordance with recognised Standards, using a tall environmental windshield and were undertaken during reasonable weather conditions e.g. acceptably low wind speeds and precipitation.
 - Field calibration checks were undertaken before and after measurements to record very low levels of equipment drift.
 - The sound source data has been provided from site measurements and evaluated in third octave bands.
 - The calculations are conservative as not to under-predict the resulting impacts.
- 4.14 The aforementioned measures reduce uncertainty to a level considered not to have any significance to the outcome of the assessment.



5 CONCLUSIONS

- 5.1 A noise survey has been carried out at The Site and a noise impact assessment for the proposed building services plant has been carried out using the methodology given in British Standard *BS 4142:2014 Methods for rating and assessing industrial and commercial sound*.
- 5.2 Based on the proposed plant selection and manufacturers' sound data provided, the proposed plant has been assessed using BS 4142 methodology and has been shown to have low or negligible impact at the nearest noise sensitive receptor locations.
- 5.3 The proposed plant selection has therefore been shown to meet Reading Borough Council condition 5 requirements.



Appendix A: Glossary of Acoustic Terms

'A' weighting dB(A): Correction applied to the frequency range of a noise in order to approximate the response of the human ear. Noise measurements are often A-weighted using an electronic filter in the sound level meter.

Attenuation: Sound reduction, measured in decibels (dB).

Ambient Sound: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far. Note: The ambient sound comprises the residual sound and the specific sound when present.

Background sound level: A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

Calibration: A check of the function of a sound level meter by comparing the meter reading with a known sound pressure level.

Decibel (dB): The unit of sound level and noise exposure measurement. The range of audible sound pressures is approximately 0 dB to 140 dB.

Frequency (Hz): The pitch of the sound, measured in Hertz.

L_{Aeq,T}: The A-weighted equivalent continuous sound pressure level during a period. It is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period, T.

Octave-bands: A division of the frequency range into recognised bands.

Rating level, L_{Ar,Tr}: The specific sound level plus any adjustment for the character of the sound.

Residual sound: Ambient sound remaining in the absence of the specific sound or that it is suppressed as not to contribute to the ambient sound level.

Residual sound level, L_r or L_{eq,T}: The equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given reference time interval, T.

Sound pressure level (SPL): The basic measure of sound, expressed in decibels, usually measured with an appropriate frequency weighting (e.g. the A-weighted SPL in dB(A)).

Sound power level (L_w): The sound energy radiated per unit time by a sound source measured in watts (W). Sound power can be weighted (e.g. A-weighted) and is not influenced by environmental or physical factors such as weather or distance.

Specific sound: Sound source being assessed.

Specific sound level, L_s or L_{eq,T}: The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval, T.



Appendix B: Sound Measurement Locations

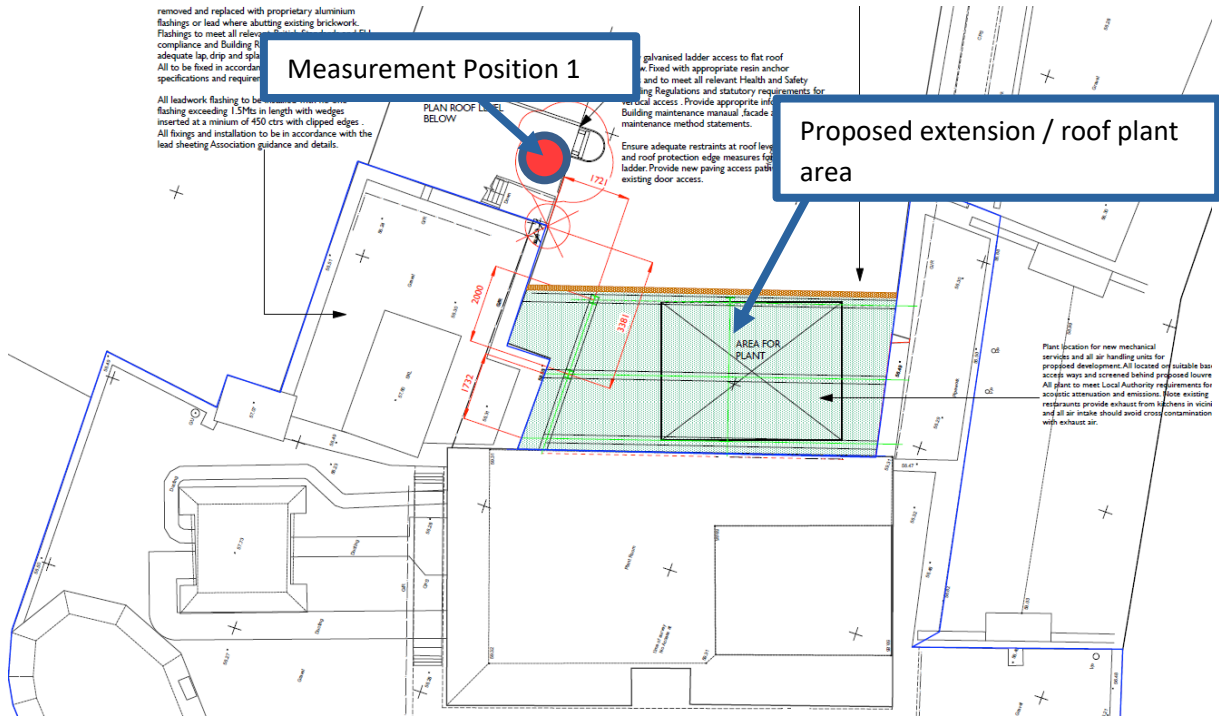


Figure B1 – Roof layout plan showing approximate measurement position 1.

Appendix C: Scheme Design

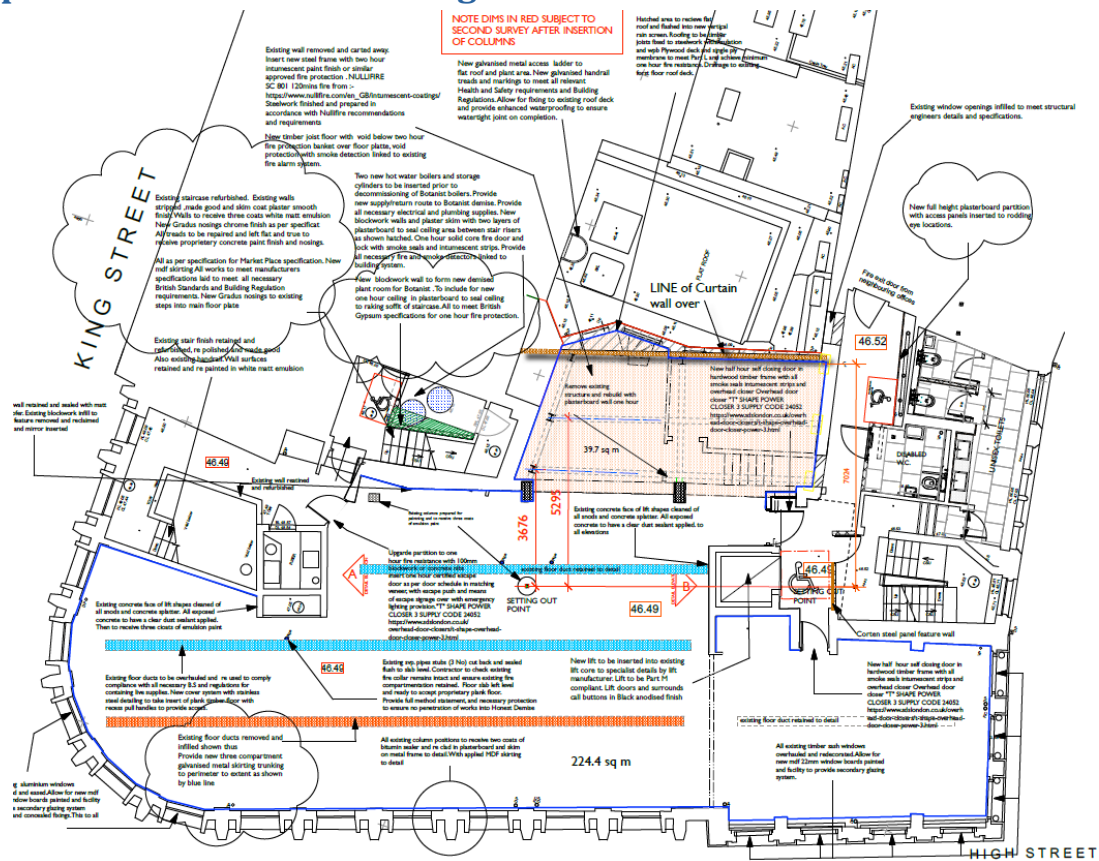


Figure C1 – Proposed first floor plan.

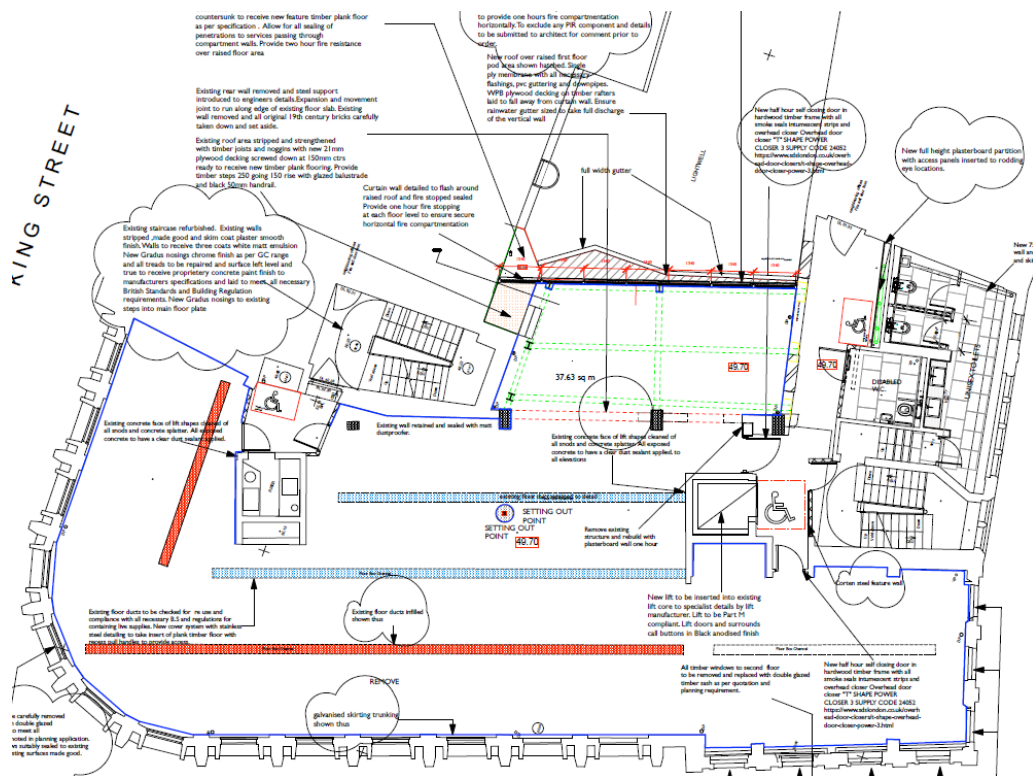


Figure C2 – Proposed second floor plan.

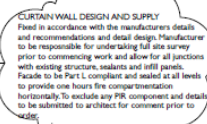


Figure C3 – Proposed third floor plan.

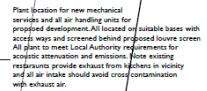


Figure C4 – Proposed roof plan.

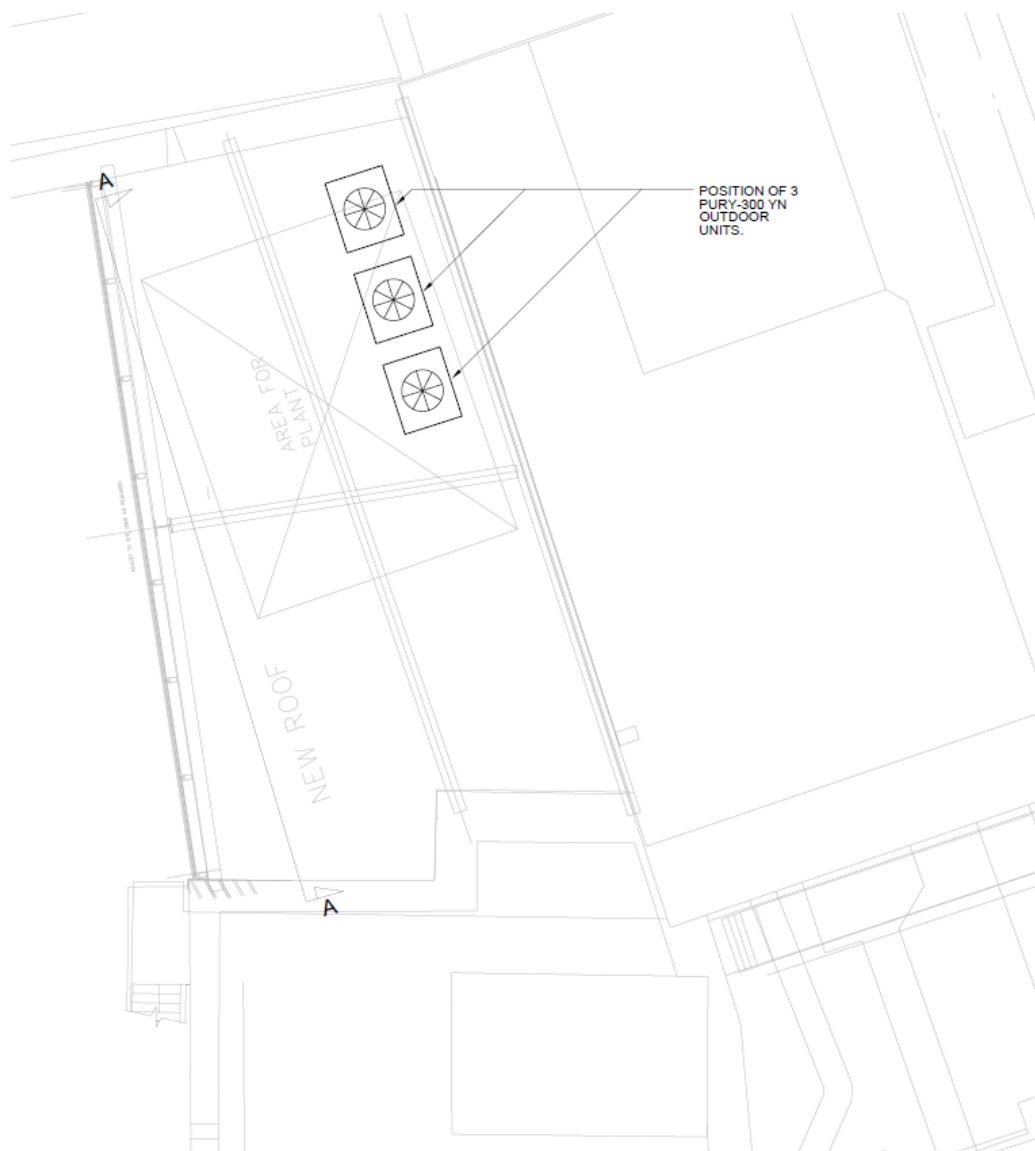
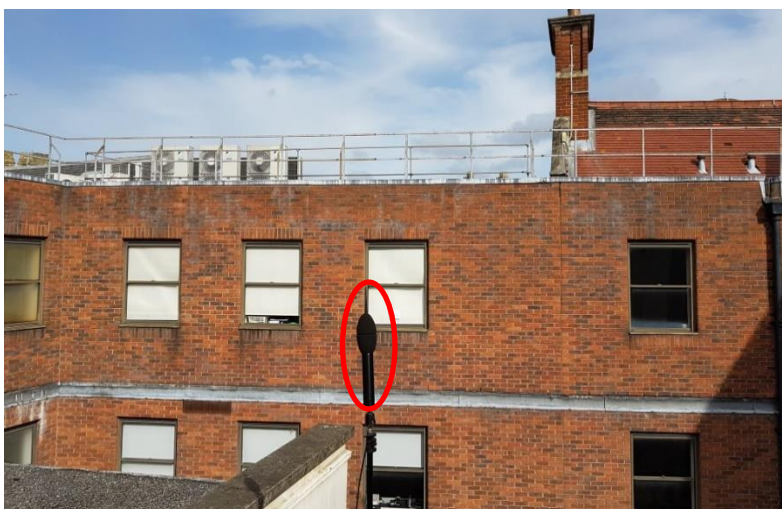


Figure C5 – Proposed plant location.

Appendix D: Site Photographs



Figures D1 to D3 – Photographs showing measurement Position 1.

Appendix E: Sound Survey Data

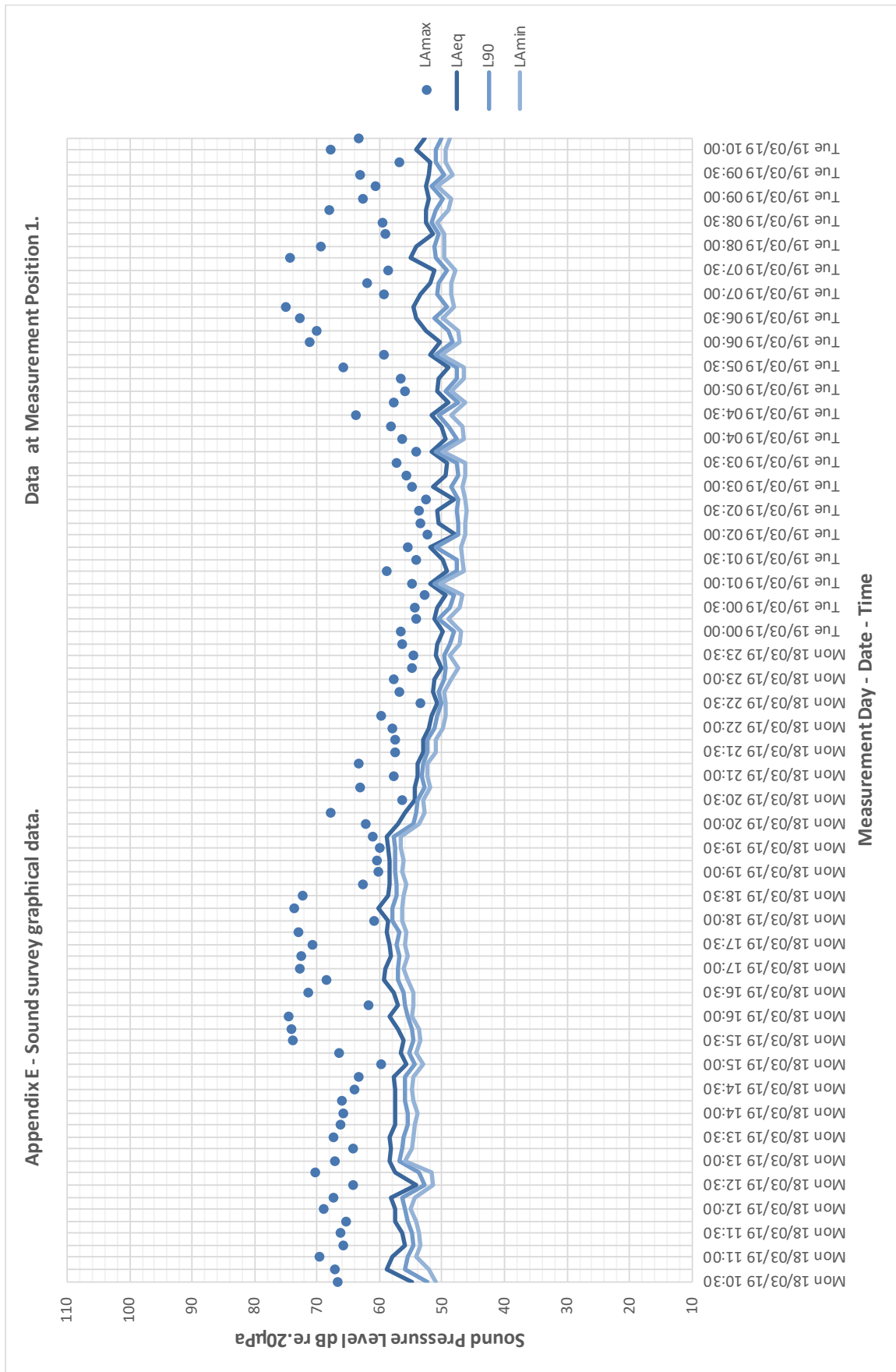


Figure E1 – Time-history of sound survey data at Position P1.

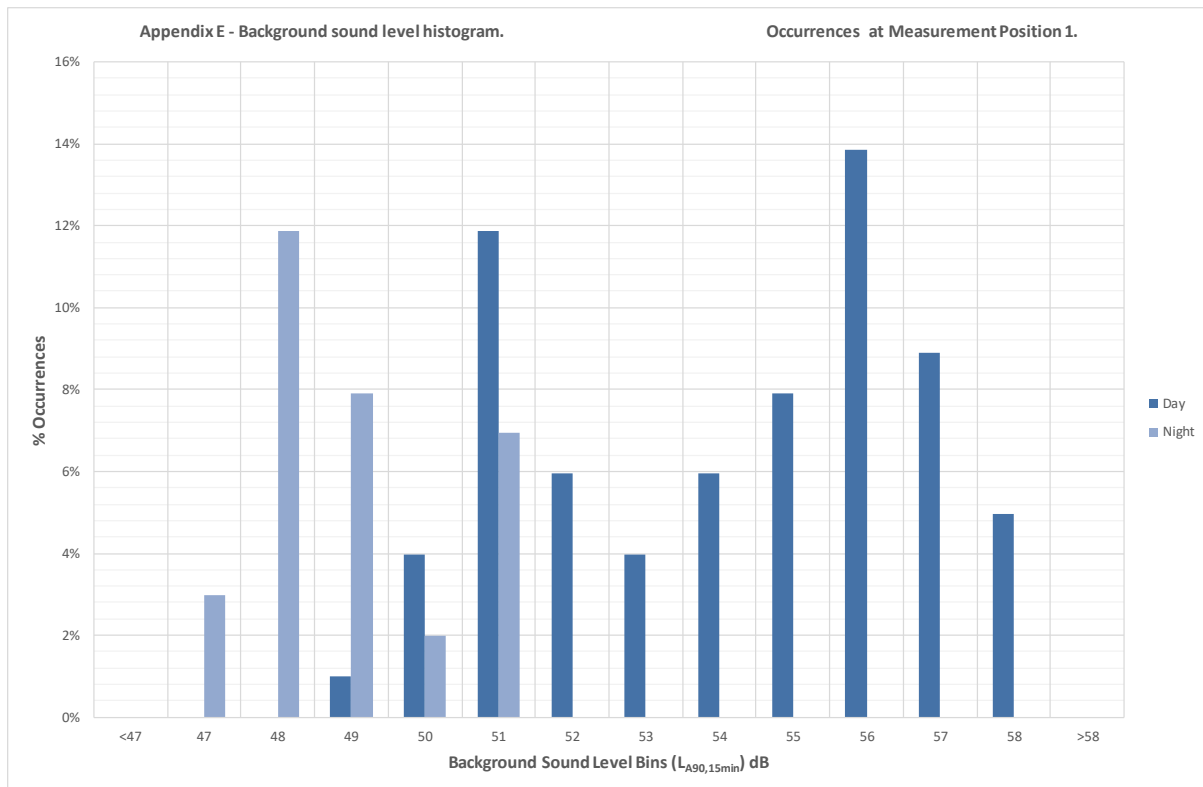


Figure E2 – Histogram showing background sound levels at Position P1.

Appendix F: Mechanical Plant Specifications

5. SOUND LEVELS

Outdoor units

5-2. Sound levels in heating mode

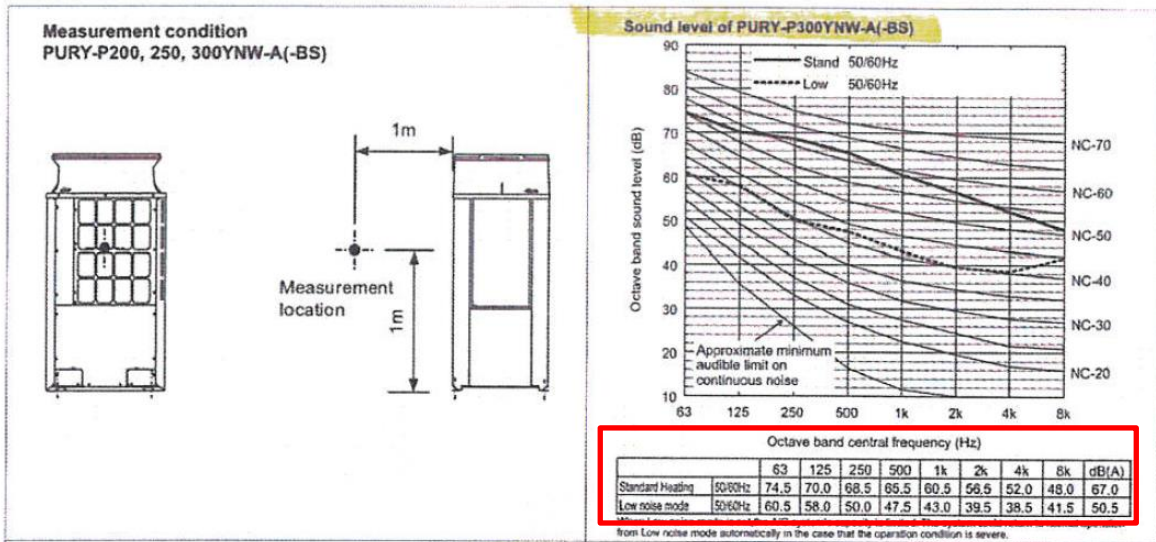
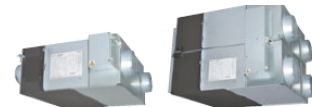


Figure F1 – PURY condenser plant sound data.

LGH-RVX-E Commercial Series



COMMERCIAL MODELS		LGH15RVX-E	LGH25RVX-E	LGH35RVX-E	LGH50RVX-E	LGH65RVX-E	LGH80RVX-E	LGH100RVX-E	LGH160RVX-E	LGH200RVX-E
ELECTRICAL POWER SUPPLY		220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz
RUNNING CURRENT (A)	SP1	0.10	0.10	0.12	0.13	0.15	0.15	0.17	0.29	0.33
	SP2	0.15	0.16	0.26	0.26	0.39	0.36	0.50	0.70	0.88
	SP3	0.24	0.28	0.54	0.59	0.90	0.83	1.20	1.75	2.20
	SP4	0.40	0.48	0.98	1.15	1.65	1.82	2.50	3.71	4.88
INPUT POWER (W)	SP1	7	8	11	12	15	18	21	38	42
	SP2	14	16	31	32	49	60	75	123	153
	SP3	28	33	70	78	131	151	200	311	400
	SP4	49	62	140	165	252	335	420	670	850
AIRFLOW (m³/h) ^{1/2}	SP1	38	63	88	125	163	200	250	375	500
	SP2	75	125	175	250	325	400	500	750	1000
	SP3	113	188	263	375	488	600	750	1125	1500
	SP4	150	250	350	500	650	800	1000	1500	2000
AIRFLOW (l/s) ^{1/2}	SP1	10	17	24	35	45	56	69	104	139
	SP2	21	35	49	69	90	111	139	208	278
	SP3	31	52	73	104	135	167	208	313	417
	SP4	42	69	97	139	181	222	278	417	556
SPECIFIC FAN POWER (W/(l/s))	SP1	0.70	0.47	0.46	0.34	0.33	0.32	0.30	0.37	0.30
	SP2	0.67	0.46	0.63	0.46	0.54	0.54	0.54	0.59	0.55
	SP3	0.90	0.63	0.96	0.75	0.97	0.90	0.96	0.99	0.96
	SP4	1.17	0.90	1.44	1.19	1.39	1.51	1.51	1.61	1.53
EXTERNAL STATIC PRESSURE (Pa)	SP1	6	5	10	8	8	10	11	11	10
	SP2	24	21	40	30	30	38	43	44	38
	SP3	54	48	90	68	68	85	96	98	84
	SP4	95	85	160	120	120	150	170	175	150
SOUND PRESSURE LEVEL (dBA)	SP1	17	17	17	18	18	18	18	18	18
	SP2	19	20	20	19	22	23	23	24	28
	SP3	24	22	28	28	29	30	31	32	36
	SP4	28	27	32	34	34.5	34.5	37	39	40

Figure F2 – proposed HRU plant data.

Appendix G: Calculations

Unit		63	125	250	500	1k	2k	4k	8k
PURYP300YNWA OUTDOOR UNIT (Heating mode)		74.5	70	68.5	65.5	60.5	56.5	52	48
PURYP300YNWA OUTDOOR UNIT (Heating mode)		74.5	70	68.5	65.5	60.5	56.5	52	48
PURYP300YNWA OUTDOOR UNIT (Heating mode)		74.5	70	68.5	65.5	60.5	56.5	52	48
Total Sound Power Level		79	75	73	70	65	61	57	53
A-weighting		-26	-16	-9	-3	0	1	1	-1
LwA		53	59	65	67	65	62	58	52
LwA to LpA (hemi, Q=2), nominal 5 m distance	5	31	37	43	45	43	40	36	30
Screening, nominal 5 dB		-5	-5	-5	-5	-5	-5	-5	-5
Resultant LpA at receptor		26	32	38	40	38	35	31	25
Total SPL at receiver, single figure dBA	45								

Table G1 – Specific sound level calculation at nearest commercial window.



Appendix H: Acousticians Qualifications and Status

James Blakeley BSc. (Hons) MIOA

Position Held: Acoustic Consultant.

Qualifications: BSc. (Hons) Audio Technology.

Affiliations: Corporate Member of the Institute of Acoustics.

Acoustics Experience: 7 years.

Core Competences: Environmental acoustics, building acoustics.

Steve Skingle BSc. (Hons) MAES MIOA

Position Held: Principal Acoustic Consultant.

Qualifications: BSc. (Hons) Acoustics.
Institute of Acoustics Diploma in Acoustics and Noise Control.

Affiliations: Corporate Member of the Institute of Acoustics.
Corporate Member of the Audio Engineering Society.

Acoustics Experience: 16 years.

Core Competences: Building acoustics, environmental acoustics, electro acoustics.

