CST Environmental & Acoustic Consultants

Updated Proposals for Installation of fixed a/c plant Planning Noise Assessment

38 Russell Square
London
WC1B 5DA

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January 2020

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Version 1.1.

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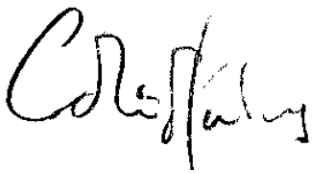


Report Prepared by:.....

Checked by:.....LDS

Date:.....24th January 2020

1.0 Executive Summary

1.1 This report has been prepared for Frankham Consultancy Group Ltd. in support of a Town Planning application for the installation of external plant as part of a renovation and upgrade scheme for existing offices for the British Museum.

1.2 It responds to concerns recently raised by L.B Camden to previous proposals to locate a single external VRF unit on the flat roof area of 38 Russell Square. We understand the concerns were in respect of visual amenity.

1.3 A new location for the proposed plant has been identified within the rear basement area. This is shown as Option A on a plan extract at appendix 1. As before the proposals seek to locate 1No. Mitsubishi PURY EP 350YNW-A external air conditioning unit. Permission is sought to operate the plant 24/7.

1.4 The proposed location is not immediately adjacent to residential or other potentially noise sensitive buildings. There will be no direct line of sight to the pavement and hence this location will provide a significant degree of acoustic shielding to a pavement receptor.

1.5 An initial opinion of the suitability of this proposed location has been sought from the local planning authority.

1.6 The revised proposals have been assessed against local guidance issued by the local planning authority in respect of fixed external mechanical plant (CPG 2018 - Amenity). A summary of the local policy requirements is set in section 4. Calculations that demonstrate a route for compliance with the LBC local criteria are to be found at section 5. By reference to LBC's local noise standards it is predicted that the proposals will fall within the "green" category. No adverse implications for the local sound environment are indicated and no noise attenuating acoustic enclosure is deemed necessary.

1.7 The results of the 2017 baseline survey showed that the local sound environment is materially influenced by road traffic during the day and this is reflected in recorded levels.

1.8 For town planning purposes the baseline sound levels recorded are set out in table 1 below:

Table 1 - Sound Environment (Summary)

Time	Measured Ambient L_{Aeq} 16/8 hr	Measured Background L_{A90} 16/8 hr
07:00 – 23:00 hrs	54	48
23:00 – 07:00 hrs	49	44

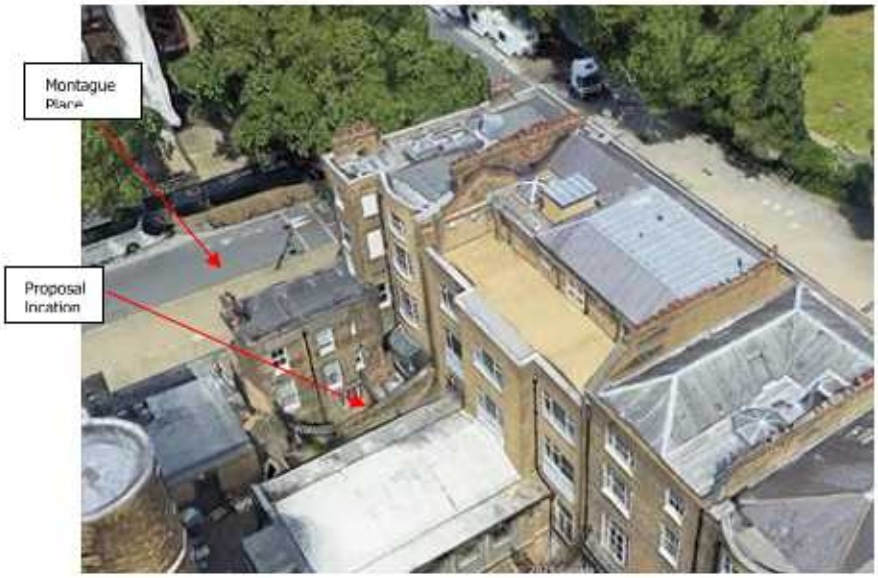
Table 1

1.9 A number of technical terms are referred to both in this summary and in the main report. A glossary of acoustic terms is to be found at appendix 3.

2.0 Description of Site

2 .1 The site is to be found at approximate grid reference 530052(E): 181862(N). It is further identified by an extract of the location plan below:

2.2 An aerial photograph below shows the subject location in relation to its surroundings. The nearest potentially sensitive receptors are pedestrians using the Montague Place footpath adjacent to the north west elevation of the subject building.



3.0 Objectives of Report

3.1 The objective of this report is:

- To test the proposed location (option2) against the current L.B Camden local noise standards as set out in the authority's local plan (July 2017) together with its supplementary planning document Camden Planning Guidance on Amenity. Baseline data obtained in 2017 from a noise survey has been used as the results are still considered to be within calibration. For ease of reference details of the baseline survey are included as appendix 2.

4.0 Noise Impact - Assessment Framework

4.1 UK Noise policy is set within a framework of national guidance provided by the National Planning Policy Framework (NPPF). At the heart of the NPPF there is now a presumption in favour of sustainable development. However National Planning Guidance also advises that to prevent unacceptable risks from pollution, new development must be appropriate for its location and the effects of pollution on amenity mitigated to an acceptable level.

4.2 The local guidance on noise and vibration specifically draws on advice contained in government guidance contained in the Noise Policy Statement for England (NPSE).

4.3 The NPSE embraces three key concepts borrowed from the field of toxicology:

(i) No Observed Effect Level (NOEL) - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise.

(ii) Lowest Observed Adverse Effect Level (LOAEL) - This is the level above which adverse effects on health and quality of life can be detected.

(iii) Significant Observed Adverse Effect Level (SOAEL) - This is the level above which significant adverse effects on health and quality of life occur.

4.4 The Government's Planning Practice Guidance on noise (PPG) provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking them to the NOEL and, as exposure increases, the LOAEL and SOAEL.

4.5 As exposure increases above the LOAEL, noise begins to have an adverse effect and consideration should be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

4.6 The LOAEL is described in the PPG as the level above which noise starts to cause small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. The PPG acknowledges that above the LAOEL there is potential for to affects the acoustic character of the area such that there is a perceived change in the quality of life". This can also include reported sleep disturbance

4.7 The PPG identifies “SOAEL” as the level above which "noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. SOAEL is also the level of noise that can see quality of life diminished due to change in the acoustic character of an area. There is also potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep.

4.8 L.B Camden - Noise Policy

4.9 L.B Camden has published a number of local noise polices which are contained within the local plan for the borough. The Council's decisions on planning applications should be taken in line with its development plan unless there are significant matters (material considerations) that indicate otherwise.

4.10 Local Plan - Policy A4 Noise & Vibration: sets out the Council's overall policy in relation to planning and noise.

4.11 For ease of Reference policy A4 (Noise and Vibration) is reproduced below:

> ***The Council will seek to ensure that noise and vibration is controlled and managed.***
>
> ***Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3).***
>
> ***We will not grant planning permission for:***
>
> ***a. Developments likely to generate unacceptable noise and vibration impacts; or***
>
> ***b. Developments sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation can be provided and will not harm the continued operation of existing uses.***
>
> ***We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity.***
>
> ***We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development***

4.12 In respect of Commercial Noise Sources, the local plan has specific requirements. These are set out at Appendix 3 of the plan. The stated requirements are:

" *A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion.*

4.13 The table below[1] sets out the local planning authority requirements for noise from fixed plant:

[1] Source: appendix 3 Camden Local Plan 2017

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dB L_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dB L_{Amax}

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

Table 2 – LB Camden Local Noise Standards (Fixed Plant)

4.14 By reference to the above local requirements, BS 4142:2014 is considered to be an appropriate reference standard for this project. It will be necessary to demonstrate that:

- The proposed plant (rating level) will not exceed the measured background level by 10dB(A).

4.15 Having already established a representative baseline background sound environment it is possible to calculate the noise impact at specified distances from the proposed installation and compare these levels with the baseline L_{A90}. This process is set out in the following table (Table 2).

4.16 Standard acoustic prediction techniques and formulae for a sound attenuation of a point sound source and barrier calculations[2] have been used in the calculations which are set out in theh following section.

[2] due to the very good acoustic shielding provided by the building envelope, crtn barrier methodology has been adopted.

5.0 Calculation Framework - BS 4142:2014 Assessment

5.1 BS 4142:2014 describes a method for rating and assessing:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

5.2 If appropriate, the specific sound level of the source (LAeq,T) is corrected by the application of one or more corrections for acoustic features such as tonal qualities and/or distinct impulses to give a 'rating' level (LAr,Tr). The Standard effectively compares and rates the difference between the rating level of the specific sound and the typical background sound level (LA90,T) in the absence of the specific sound.

5.3 The BS advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) the source in question operates or is proposed to operate in the future.

5.4 Comparing the rating level with the background sound level, BS 4142 states:

- Typically, the greater this difference, the greater the magnitude of impact.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- A difference of around +10 dB or more is likely to be an indication of a significant 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 or a 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.

5.5 Table 1 (section 1) summarises the survey data in respect of the night and daytime periods required by Appendix 3 of the LBC Local Plan.

5.6 Table 2 below sets out the receptor locations (pedestrians walking along south side of Montague Place), their distance from the proposed plant and the calculated impact for each option.

5.7 Manufacturers' data have been consulted for the proposed plant and enclosures. Extracts of the relevant sound test data including spectral analysis of the sound emission data are appended at appendix 2. These data give confidence that in service the units are capable of operating without generating perceptible tonality. On this basis a design criteria of "Rating Level" 10dB below background has been adopted with reference to the calculation procedure set out in BS4142: 2014.

Table 2 - Calculations

Option A – Basement (Rear)	Design Criteria & Calculations – Daytime Operation
Receptor: Pedestrians - 11.5 m from source Notes Manufacturer's data quotes Sound Pressure level of 64dB(A) @1m. * Attenuation for a point source given by formula Attn = 20*log d1/d2 ** Facade value (+3dBA for reflection)	Day Time Background Level = 48.0dB$L_{A90(16hr)}$ Design Target for plant noise emission = 38dBLAeq(T) Proposed Plant (From Manufacturers' data) 1 No. Mitsubishi PURY EP350 YNW A- Source Sound Pressure Level (Lp) = 64dB(A) Distance to Receptor = 11.5 metres. Attenuation due to distance = 29.5dB(A)* Receptor Sound Pressure Level = 53.5dB Less shielding effect of building envelope = 26.4dB(A)** Resulting Sound Pressure Level at pavement receptor = 30.1dB(A)** **BS 4142:2014 Assessment - Daytime** Background Noise Level (Table 1) = 48dBLA90 Measured Ambient (Table 1) = 54 dB(A) Residual Sound (Measured) = 54 dB(A) Acoustic feature correction = 0dB(A) Rating Level = 30.1 dBL_{AeqTr} Excess of Rating over Background = **minus 17.9dB** **Result** – The proposals are capable of compliance with LBC noise standards. **BS 4142:2014 Assessment - Night** Background Noise Level (Table 1) = 44dBLA90 Measured Ambient (Table 1) = 49 dB(A) Residual Sound (Measured) = 49 dB(A) Acoustic feature correction = 0dB(A) Rating Level = 30.1 dBL_{AeqTr} Excess of Rating over Background = **minus 13.9dB** **Result** The proposals are capable of compliance with LBC noise standards.

6.0 Conclusions

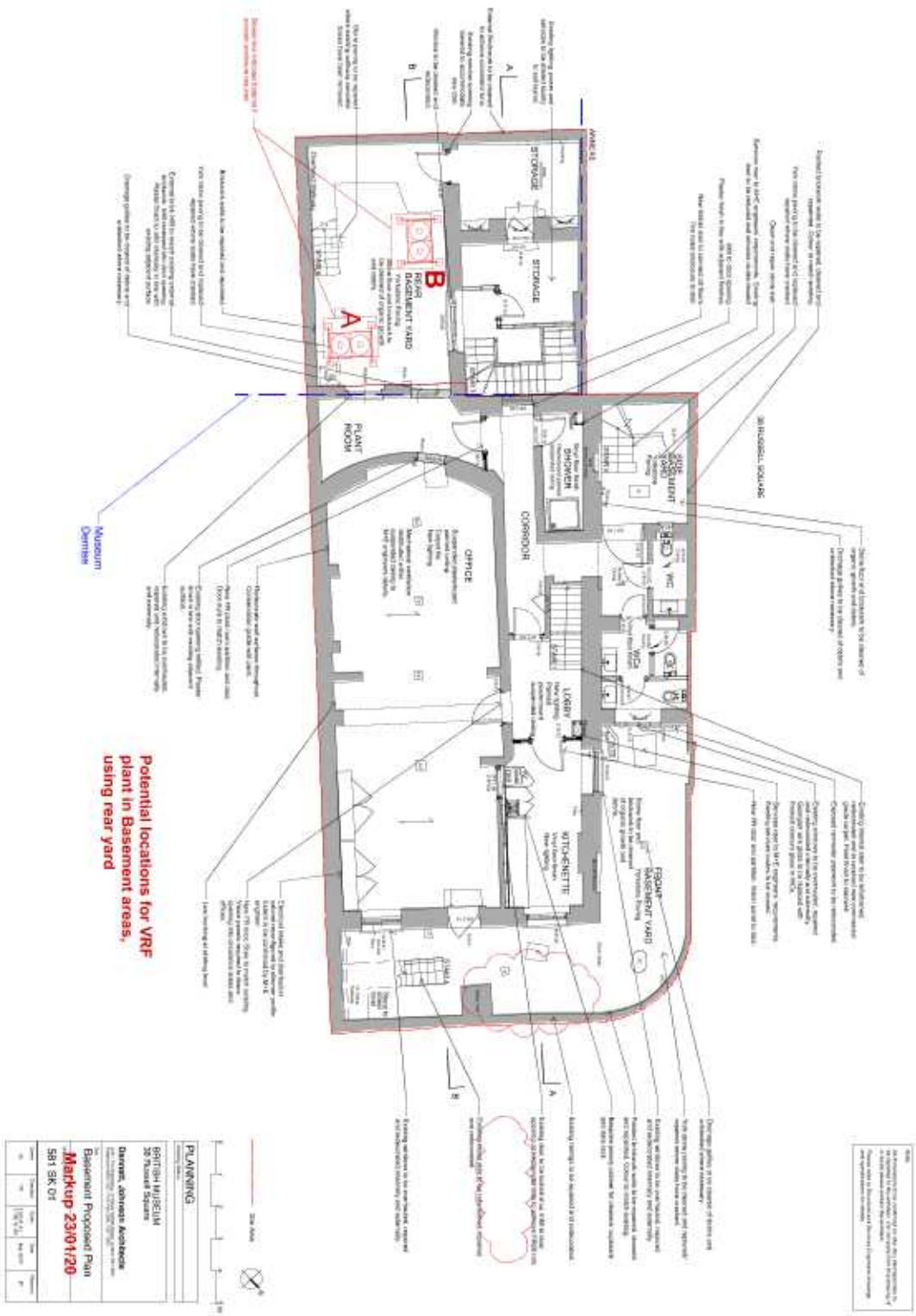
6.1 A baseline assessment of the local sound environment has been carried out.

6.2 The local sound environment is in common with much of central London materially impacted by road traffic noise.

6.3 The proposed location for the new plant is not immediately adjacent to residential accommodation. The nearest sensitive location was identified as being pedestrians using the footpath along Montague Place adjacent to the northwest elevation of the subject building.

6.4 By reference to manufacturers' published data the proposed plant is predicted to meet the LPA requirements contained in the LB Camden Local Plan (July 2017).

7.0 Appendix 1 – Proposed Location Plan Extracts



8.0 Appendix 2 - Baseline Survey

8.1 A single survey position was established at roof level on the subject building. The survey equipment and location can be seen in the photograph below:

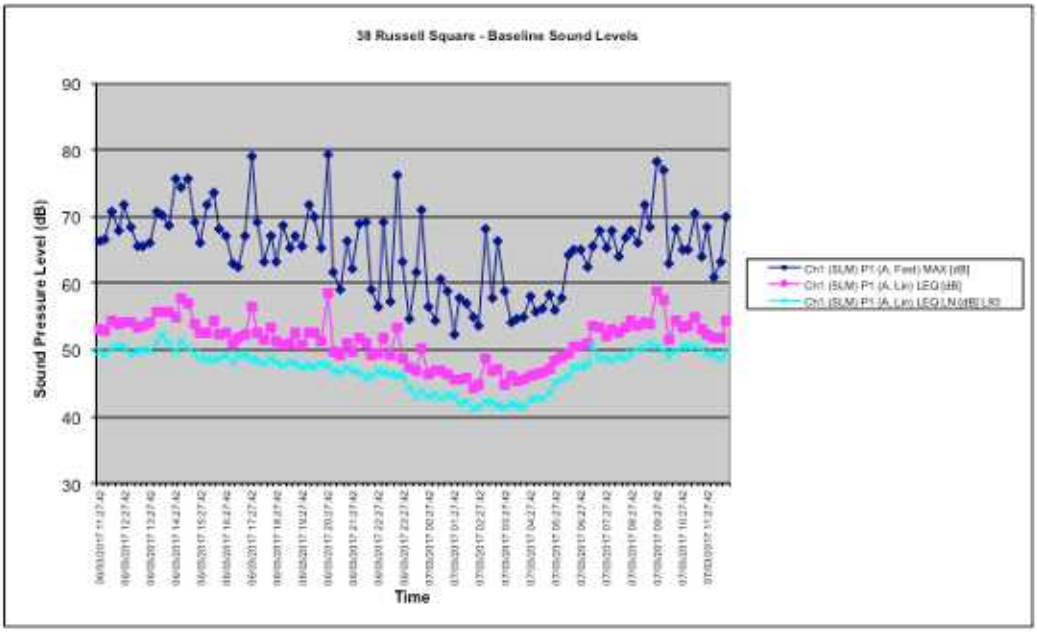
View of Survey Position (Looking south west)

8.2 A Svantek 959 precision grade sound level meter was used to objectively measure the local sound environment from around 11:30 hrs on 6th March 2017 to 12:30hrs on 7th March 2017. The meter was mounted on a tripod at a height approximately 1.5m above the roof deck.

8.3 The memory features of the meter were used to automatically capture and store sound energy data every 15 minutes. The meter (Serial number 11229) was calibrated on site prior to the commencement of the survey to 104dB using a Castle Associates acoustic calibrator (serial number 0500301). A calibration check was also performed at the end of the survey period. No drift in calibration was observed.

View from Survey Point along Montague Place

8.4 The following graph, compiled from the raw survey data shows the time / sound level history recorded at the survey point.



8.5 Weather Conditions:

8.6 The weather was fine and dry throughout the survey with a light south westerly breeze (less than 5m/s)

8.7 Discussion of the Survey Results

8.8 The local sound environment is in common with much of central London materially impacted by road traffic during the day. During the core part of the night ambient levels drop markedly and this will need to be considered in the event that full 24/7 operation of the plant is required.

9.0 Appendix 3 - Glossary of Acoustic Terms

Sound is measured in decibels (dB). To establish a reference framework it is useful to consider two noise levels which are at the extreme ends of the range to be considered. At the low end, 35 to 40 dB (A) is the normal noise level in a quiet living room, 35 dB (A) is the noise level given as a target for suburban bedrooms by the Wilson Report; a government report on noise published in 1963. At the high end is the noise level experienced at the pavement edge of a busy city centre street, a level of 75 to 80 dB (A).

The sensitivity of the human ear varies with pitch or frequency. The designation "A" used in this assessment simply means that the noise level was measured using a meter which is able electronically to respond very closely to the performance of the human ear.

Decibels are measured using a logarithmic scale, and therefore two numerically equal values cannot be added together arithmetically. Two equal noise levels occurring together form a new level which is 3 dB (A) higher than either alone. Thus two identical vehicles each producing 65 dB (A) outside someone's window will produce, not 130 dB (A), but 68 dB (A) if both engines are running together at the same distance from the microphone.

If one sound source is 10 dB (A) below an adjacent louder source, then the combined effect will be virtually no different to the louder one alone.

Experiments have shown that most people will indicate that a sound has become twice as loud, when on a measuring meter it has risen by about 10 dB (A). Also it is generally accepted that a difference in 3 dB (doubling in energy terms) is the smallest incremental step that can be distinguished by the average human ear.

Some additional acoustic terms are also referred to in this report. These are:

LA10: is the noise level just exceeded for 10% of the measurement period, and calculated by statistical analysis.

L_A90. This is the sound level exceeded for 90% of a time interval T. L_A90 and it is termed background sound or noise level. It is effectively a measure of the minimum noise level which is experienced in the absence of specific noisy events such as brake squeal or engine backfire.

$L_{A\ eq(T)}$ is the equivalent continuous sound level over a time T, which can be described as the "energy - average" noise level.

L_A max is the highest noise level recorded by the measuring meter during a single event e.g. overlying aircraft. In this assessment the meter was set to "fast" response.

Ambient Sound - This is the all encompassing sound at a given location at a within a specified time frame and comprises the sound from all near and distant sources.

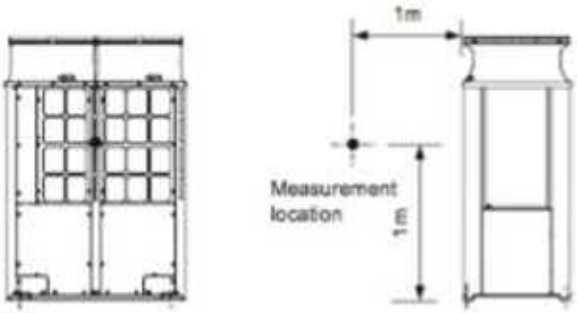
Noise - Noise was defined in the Wilson Report on 1964 as "unwanted sound'. Noise excluded vibration, except where indicated otherwise.

10.0 Appendix 4 - Manufacturer's Sound Data

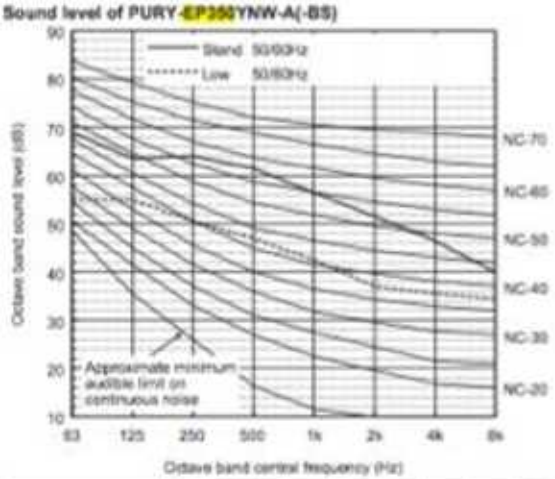
PURY-EP350YNW-A(-BS)
PURY-EP400YNW-A(-BS)
PURY-EP450YNW-A(-BS)

14, 16, 18HP

Measurement condition
PURY-EP350, 400, 450YNW-A(-BS)



Sound level of PURY-EP350YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard Cooling	50/60Hz	69.0	63.5	64.0	61.0	56.5	51.5	46.0	40.0	62.5
Low noise mode	50/60Hz	56.0	55.0	50.5	47.0	42.5	37.0	35.5	34.5	49.0

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.

OUTDOOR UNIT
R2 Series

PURY-P YNW-A(-BS)

Specifications

Model				PURY-P200YNW-A (-BS)	PURY-P250YNW-A (-BS)	PURY-P300YNW-A (-BS)	PURY-P350YNW-A (-BS)
Power source				3-phase 4-wire 380-400-415 V 50/60 Hz	3-phase 4-wire 380-400-415 V 50/60 Hz	3-phase 4-wire 380-400-415 V 50/60 Hz	3-phase 4-wire 380-400-415 V 50/60 Hz
Cooling capacity (Nominal)		*1	kW	22.4	28.0	33.5	40.0
			BTU/h	76,400	95,500	114,300	136,500
	Power input		kW	4.43	6.07	7.54	10.04
	Current input		A	7.4-7.1-6.8	10.0-9.5-9.2	12.7-12.0-11.6	16.9-16.1-15.5
	EER		kW/kW	5.05	4.69	4.44	3.98
Temp. range of cooling	Indoor		W.B.	15.0~24.0 °C (59~75 °F)	15.0~24.0 °C (59~75 °F)	15.0~24.0 °C (59~75 °F)	15.0~24.0 °C (59~75 °F)
	Outdoor		D.B.	-5.0~52.0 °C (23~126 °F)	-5.0~52.0 °C (23~126 °F)	-5.0~52.0 °C (23~126 °F)	-5.0~52.0 °C (23~126 °F)
Heating capacity (Max)		*2	kW	35.0	31.5	37.5	45.0
			BTU/h	85,300	107,500	128,000	153,500
	Power input		kW	4.71	6.06	8.38	10.68
	Current input		A	7.9-7.5-7.2	10.2-9.7-9.3	14.1-13.4-12.9	18.0-17.1-16.5
	COP		kW/kW	5.30	5.19	4.47	4.21
(Nominal)		*3	kW	22.4	28.0	33.5	40.0
			BTU/h	76,400	95,500	114,300	136,500
	Power input		kW	4.14	5.27	6.8	8.84
	Current input		A	6.9-6.6-6.3	8.8-8.4-8.1	11.4-10.9-10.5	14.9-14.1-13.6
	COP		kW/kW	5.41	5.31	4.92	4.52
Temp. range of heating	Indoor		D.B.	15.0~27.0 °C (59~81 °F)	15.0~27.0 °C (59~81 °F)	15.0~27.0 °C (59~81 °F)	15.0~27.0 °C (59~81 °F)
	Outdoor		W.B.	-20.0~15.5 °C (-4~60 °F)	-20.0~15.5 °C (-4~60 °F)	-20.0~15.5 °C (-4~60 °F)	-20.0~15.5 °C (-4~60 °F)
Indoor unit connectable	Total capacity			50~150%	50~150%	50~150%	50~150%
	Model / Quantity			P15~P250/1~20	P15~P250/1~25	P15~P250/1~30	P15~P250/1~35
Sound pressure level (measured in anechoic room)		*4	dB <A>	59.0 / 59.0	60.5 / 61.0	61.0 / 67.0	62.5 / 64.0
Sound power level (measured in anechoic room)		*4	dB <A>	76.0 / 76.0	78.5 / 80.0	80.0 / 86.5	81.0 / 83.0