ACLAND BURGHLEY SCHOOL - 93 BURGHLEY ROAD, LONDON

BS4142 PLANT NOISE ASSESSMENT

13 June 2018

Frankham Consultancy Group

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ARAN ACOUSTICS

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1.0 INTRODUCTION

Aran Acoustics has been appointed to carry out a noise impact assessment for the proposed replacement of external plant at Acland Burghley School, London.

A noise survey and assessment has been requested to ensure that noise levels from replacement plant does not cause undue disturbance to nearby noise sensitive locations.

The purpose of this assessment is to determine the existing noise levels of plant and establish the maximum permissible noise levels from proposed units.

Such to establish suitable plant noise levels an assessment has been carried out to BS 4142: 2014 '*Method for rating and assessing industrial and commercial sound*'. This assessment has been benchmarked against an environmental noise survey carried out on 04 June 2018.

This report therefore describes the noise survey and its results. Figure 4.1 contains a graphical representation of the background noise measurements taken on site. Section 5.0 provides the maximum permissible noise levels for the proposed plant. Section 6.0 provides an assessment of plant noise levels.

2.0 SITE DESCRIPTION

Acland Burghley School is located at 93 Burghley Road in the London Borough of Camden. Proposals are to replace the existing air condenser units located at ground floor level on the north elevation of the main school building as indicated in Figure 2.1 below.

The nearest noise sensitive receptor to the location of plant are residential houses to the north of the site on Churchill Road.

A subjective noise assessment on site determined that the main noise sources in the area to impact the site and nearest noise sensitive receptor is background noise levels from road traffic on surrounding roads.

Figure 2.1 below shows a location map and aerial photo of the site and surrounding area including the location of plant as indicated by the red balloon (1).

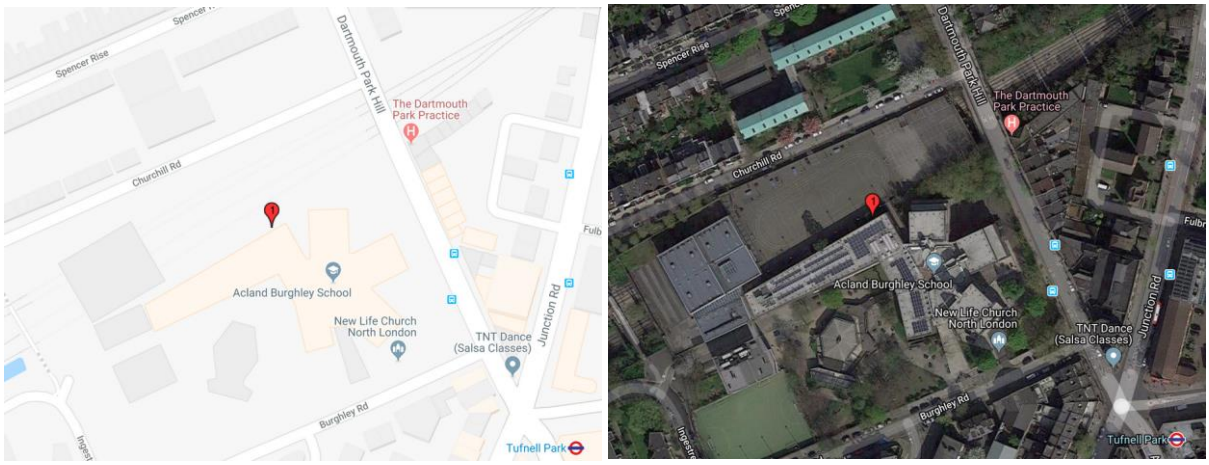


Figure 2.1 – Location map and aerial photo of the site

3.0 NOISE SURVEY

A noise survey was carried out on Monday 04 June 2018. Measurements of the existing units of plant in operation were carried out on-site along with measurements of background noise levels at nearby residential housing on Churchill Road.

Background measurements were carried on the footpath opposite residential housing on Churchill Road using a single noise monitor. Noise levels measured at this location are considered representative of existing noise levels to impact the adjacent houses. Site photos of measurements positions are provided in Appendix A.

3.1 Measurement Equipment

The following measurement equipment was used, which complies with the performance specifications for a Class 1 device in accordance with BS EN 61672-1, BS EN 61260 and BS EN 60942.

Name	Serial Number	Last Calibrated	Calibration Due
Norsonic Precision Sound Analyser Type 140	1403701	Oct 2016	Oct 2018
Norsonic Type 1209 Pre-amplifier	13278	Oct 2016	Oct 2018
Norsonic Type 1225 Microphone	106867	Oct 2016	Oct 2018
Norsonic Sound Calibrator Type 1251	32994	Sept 2017	Sept 2018

Table 3.1 – Measurement equipment used on site

The meter was calibrated before and after testing - no deviations were found.

3.2 Weather Conditions

The weather was fine and dry for the duration of the survey. Wind speed remained below 5 m/s. The temperature was approximately 22 ^{o}C.

The weather conditions were seen as suitable for environmental noise surveying in accordance with BS 7445-1:2003 '*Description and measurement of environmental noise'*.

4.0 SURVEY RESULTS

Background noise levels measured during survey period are shown in Figure 4.1 below. The full set of acoustic data measured on site is available upon request.

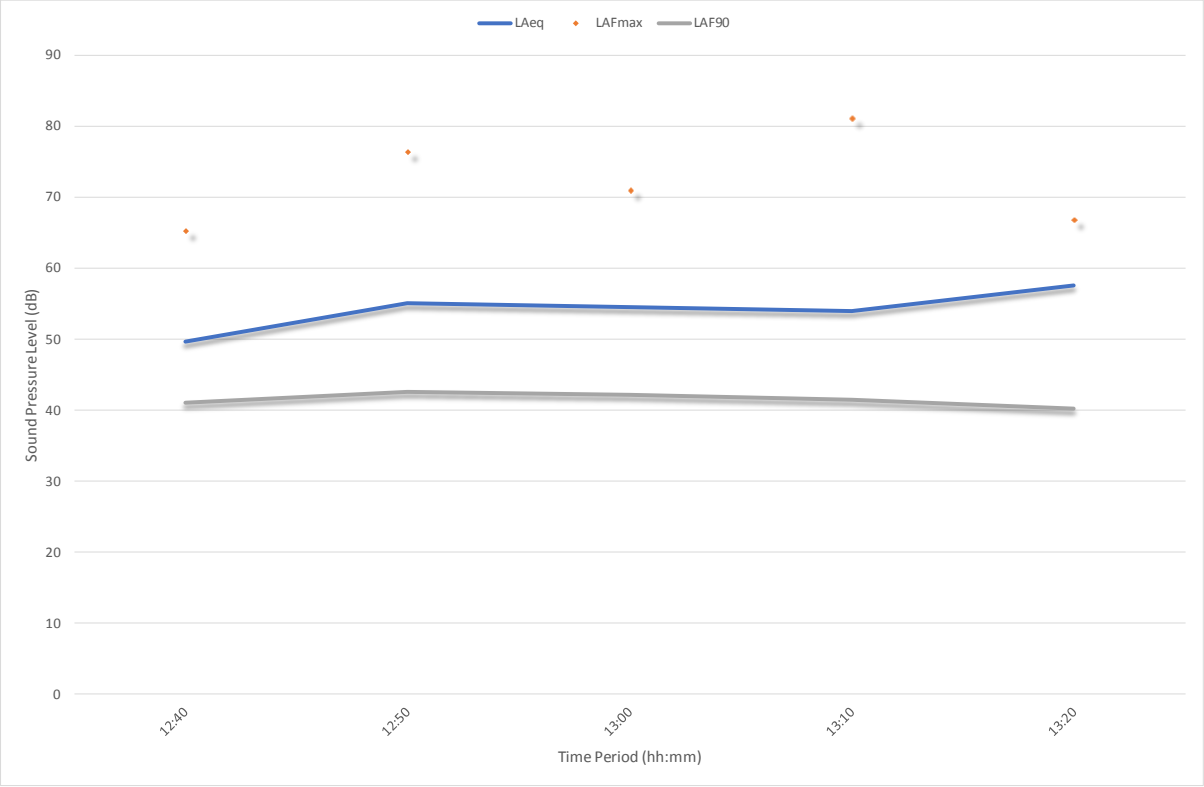


Figure 4.1 - Noise levels measured on site

The table below provides a summary of the noise levels measured on site at the nearest noise sensitive receptor during the survey period including the representative background; L_{A90}.

Noise Descriptor	Average Noise Level L_{Aeq}, dB	Representative Background L_{A90}, dB
Daytime (07:00 – 23:00)	55	42

Table 4.1 - Summary of measured noise levels

Note that noise levels have been rounded to the nearest whole number for assessment purposes in accordance with BS4142:2014.

5.0 GUIDANCE DOCUMENTS

5.1 British Standard 4142

BS 4142:2014 describes a method of determining the level of noise of an industrial nature, together with the procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. As such, an assessment to BS 4142 is typically called for within planning conditions.

The likelihood of complaints in response to a specific noise depends on various factors. BS 4142 assesses the likelihood of complaints by considering the margin by which the noise in question exceeds the background noise level. BS 4142 states that:

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

This standard also allows for an appropriate correction for the acoustic features present in the noise using a number of methods. A correction should be applied if one or more of the following features (see the list below), are present within the noise sources in question.

- The noise is of a tonal nature, i.e. it contains a distinguishable, discreet, continuous note such as whine, hiss, screech, hum;
- The noise is impulsive, i.e. it contains distinct impulses such as bangs, clicks, clatters, or thumps;
- The noise contains other characteristics that are neither tonal nor impulsive but is irregular enough to attract attention.

5.2 Summary of Guidance Documentation

It can be concluded from the BS4142 guidance document that noise levels from new plant should not increase the existing background noise level to such an extent to cause adverse or significant noise impact.

5.3 Target Plant Noise Levels

It is understood that the plant will operate intermittently during school time, i.e. Monday – Friday between 08:00 – 16:30 hours. Based on BS4142 guidance and given the location of the site, Aran Acoustics propose that noise levels from new plant should not exceed 0 dB below the existing background noise level. This target has been imposed upon similar developments and is seen as a suitable design target where the new plant will have low impact.

It is considered that external condenser units associated with air conditioning systems produce a broadband noise with no tonal features. The units are also inverter driven, meaning that they will gradually increase or decrease operating capacity depending on the level of duty required. This gives a positive indication that the noise produced is not immediate or distinguishable therefore no correction need be applied to the results.

Based on the lowest measured background noise level during the proposed operating period and the suggested design targets including any tolerance or correction factors, the following table shows the maximum permissible noise level from the plant when measured at the window of the nearest residential receptor.

Representative Background, L_{A90}	Tolerance Factor	Correction Factor	Max Noise Level at Residential
42 dBA	-0 dB	-0 dB	**42 dBA**

Table 5.1 - Plant Noise Level Target

Based upon the measurement results in Section 4.0 and noise level criteria provided within this section, it can be seen that noise levels from plant should not exceed 42 dBA when measured at 1m from the nearest noise sensitive receptor.

6.0 PLANT NOISE LEVEL ASSESSMENT

There is currently a total of 8 no. air condenser units installed on site consisting of 7 no. Fujitsu AOY54RBF3L condensers and 1 no. Fujitsu AOYA30LFTL condenser. These units are considered part of the existing noise level environment.

Measurements of each unit type was carried out at a distance of 1m from the front of the unit while in operation. The following table provides the average noise level for each unit type along with the calculated noise level for all units running simultaneously.

	Octave Band Centre Frequency, dB						
	125 Hz	250 Hz	500 Hz	1.0 K Hz	2.0 K Hz	4.0 K Hz	dBA
Fujitsu - AOY54RBF3L	69.2	65.3	59.4	61.1	57	49.3	65
Fujitsi - AOYA30LFTL	62.8	58.7	57.3	54.6	51.9	46.6	60
Combined (8 units)	78.6	74.7	70.0	70.5	66.7	59.7	**75**

Table 6.1 – Existing Plant Noise Levels

Calculations show that the noise level from all existing units of plant running simultaneously is approximately 75 dBA when referenced to a distance of 1 metre.

Proposal are to replace the existing units of plant with 7 no. Fujitsu AOYG54LATT external condenser units. The following table provides the manufacturers noise level data for the proposed units along with the calculated noise level with all units running simultaneously referenced to a distance of 1 metre. Manufacturers data sheets are provided in Appendix A.

	Octave Band Centre Frequency, dB						
	125 Hz	250 Hz	500 Hz	1.0 K Hz	2.0 K Hz	4.0 K Hz	dBA
Fujitsu - AOYG54LATT	56	55	54.5	53.5	46	42	57
Combined (7 units)	64.5	63.5	63.0	62.0	54.5	50.5	**65**

Table 6.2 – Proposed Plant Noise Levels

Based on the existing plant noise levels within Table 6.1 and proposed plant noise levels within Table 6.2, it is seen that noise levels from the proposed new units of plant are significantly below the existing plant noise levels which is a positive indication of low noise impact on the surrounding environment.

Further calculations were carried out to determine the noise level from the new units of plant at the nearest noise sensitive receptor. The units or plant are located within a fenced area at a distance of approximately 56m to the nearest noise sensitive windows. Based on the

location, noise levels from plant can be considered a point source and sound will decay at a rate of 6 dB per doubling of distance.

The fencing prevents a direct line of sight between the plant and noise sensitive receptors therefore a barrier correction has been included within our calculations. A barrier attenuation of 10 dB is expected when the noise source is not visible from the receiver position.

Distance attenuation can be added to the attenuation provided by any barrier to give the overall attenuation. The following table provides the calculated noise levels from each unit of plant along with the combined noise level for units of plant running simultaneously when measured at 1m from the nearest residential receptor.

Plant Location	Combined Plant Noise Levels	Distance Attenuation	Barrier Attenuation	Noise Level at Residential
Fujitsu - AOYG54LATT	57	-34.8	-10	12
Combined (7 units)	65	-34.8	-10	**20**

Figure 6.1 – Calculated Plant Noise Levels at 1m

Calculations show that worst case noise levels from all units of plant running simultaneously will be approximately **20 dBA** when measured at the nearest noise sensitive window. This is below the target plant noise level of **42 dBA** established in Section 5.0 above which is considered a positive indication of low impact and that complaints are unlikely therefore no further mitigation is proposed.

7.0 SUMMARY AND CONCLUSION

A noise survey was carried out at the proposed location for replacement units of plant to be installed at Acland Burghley School, London on 04 June 2018.

From this survey the minimum representative background noise level at the nearest sensitive property was found to be 42 dB L_{A90} during the proposed operational hours.

Using guidance in BS 4142, noise levels from the new units of plant should not exceed 0 dBA below the background noise level at the window of the nearest noise sensitive receptor.

Based on manufacturers noise level data for the new units of plant along with measurements of existing plant it is seen that noise levels from the new plant will be significantly below the existing plant noise levels which is a positive indication of low noise impact.

Based on the proposed location of plant, calculations show that the combined noise from all new units will be 20 dBA when measured at 1m from the nearest noise sensitive receptor. This does not exceed the maximum permissible noise level target of 42 dBA which is a positive indication of low impact in accordance with BS8233 therefore complains are deemed unlikely.

APPENDIX A – SITE PHOTOS

Churchill Road

Existing Plant

APPENDIX B – MANUFACTURERS DATA SHEETS

Feature explanation

Economy mode
Thermostat setting automatically changes according to the temperature to avoid unnecessary cooling and heating.

Auto-changeover
The unit automatically switches between heating and cooling modes based on your temperature setting and the room temperature.

Up/down swing flaps
The up/down flaps automatically swing up and down.

Automatic fan speed
The micro-computer automatically adjusts the airflow effectively to follow the changes of room temperature.

Auto restart
In the event of a temporary power failure, the air conditioner will automatically restart in the same operating mode as before, once power supply is restored.

Connectable fresh air duct
Outside air can be introduced by attaching Locally purchased duct to fresh air knockout and optional part.

Connectable distributing duct
Systems are capable of attaching Locally purchased branch ducts distributing the airflow.

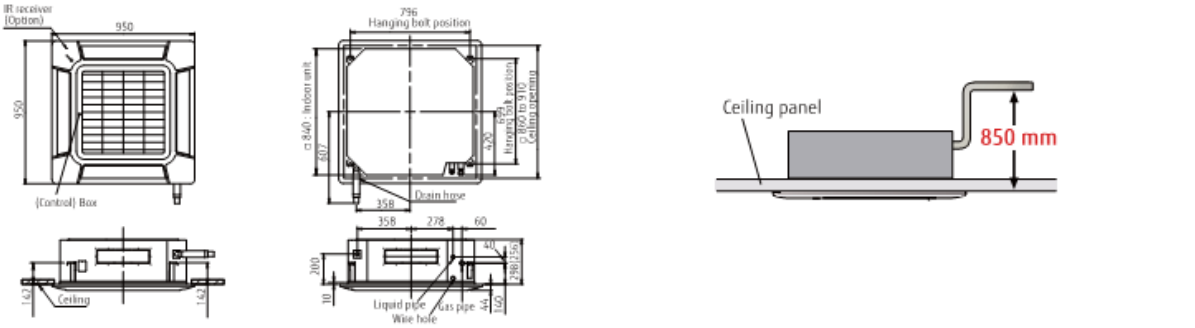
Weekly + setback timer
Weekly + Setback timer can set temperature for two times spans and for each day of the week.

Filter sign
Indicates the filter cleaning period by lamp.

Blue fin

Dimensions

(Unit : mm)



Specifications

(TENTATIVE)

	Indoor	AUYG30LRLE	AUYG36LRLE	AUYG45LRLA	AUYG54LRLA	3-Phase Units AUYG36LRLA	AUYG45LRLA	AUYG54LRLA
	Outdoor	AOYG30LETL	AOYG36LETL	AOYG45LETL	AOYG54LETL	AOYG36LATT	AOYG45LATT	AOYG54LATT
Nominal Capacity (kW)	Cooling	8.50 (2.80-10.00)	10.00 (2.80-11.20)	12.50 (4.00-14.00)	13.30 (4.50-14.50)	10.00 (4.70-11.40)	12.50 (5.00-14.00)	14.00 (5.40-16.00)
	Heating	10.00 (2.70-11.20)	11.20 (2.70-12.70)	14.00 (4.20-16.20)	16.00 (4.70-16.50)	11.20 (5.00-14.00)	14.00 (5.40-16.20)	16.00 (5.80-18.00)
UK Total / Sensible Cooling *		8.63 / 6.22	10.53 / 7.58	11.66 / 8.63	12.28 / 9.01	9.27 / 6.42	11.63 / 7.64	12.87 / 8.51
Power Consumption (kW)	Cooling	2.65	3.12	3.88	4.42	2.44	3.54	4.36
	Heating	2.77	3.02	3.77	4.69	2.56	3.58	4.43
EER / COP (Nominal Conditions)		3.21 / 3.61	3.21 / 3.71	3.22 / 3.71	3.01 / 3.41	4.10 / 4.38	3.53 / 3.91	3.21 / 3.61
Pdesign (kW) @ -10°C	Cooling	8.50	10.00	-	-	10.00	-	-
	Heating	8.00	8.70	-	-	10.00	-	-
SEER	Cooling	6.50	6.30	-	-	6.50	-	-
SCOP	Heating (Average)	4.30	4.20	-	-	4.30	-	-
Energy Efficiency Class	Cooling	A++	A++	-	-	A++	-	-
	Heating (Average)	A+	A+	-	-	A+	-	-
Annual Energy Consumption (kWh/a)	Cooling	458	555	-	-	573	-	-
	Heating	2604	2897	-	-	3253	-	-
Moisture Removal	l/h	2.50	3.50	4.50	5.00	3.00	4.50	5.00
Dimensions (HxWxD) mm	Inner (Ex. Grille)*	288x840x840	288x840x840	288x840x840	288x840x840	288x840x840	288x840x840	288x840x840
	Outer	830x900x330	830x900x330	1290x900x330	1290x900x330	1290x900x330	1290x900x330	1290x900x330
Net Weight (kg)	Inner (Ex. Grille)*	26	26	26	26	26	26	26
	Outer	61	61	86	86	104	104	104
Room Air Circulation (high) m3/h	Inner	1600	1800	1900	2000	1800	1900	2000
	Outer	3600	3800	6750	6750	6200	6900	6900
Power Supply	V-PH-Hz	230 / 1 / 50	230 / 1 / 50	230 / 1 / 50	230 / 1 / 50	400 / 3 / 50	400 / 3 / 50	400 / 3 / 50
Power Supply To		Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
Running Current (A)	Cooling	11.60	13.70	17.00	19.30	3.70	5.30	6.50
	Heating	12.20	13.30	16.50	20.50	3.90	5.30	6.60
Starting Current	A	12.20	13.70	22.50	23.50	10.00	10.00	10.00
Suggested MCB/Fuse	A	20	20	25	25	16	16	16
Interconnecting Cable		3 + E	3 + E	3 + E	3 + E	3 + E	3 + E	3 + E
Remote Control Type		Wired	Wired	Wired	Wired	Wired	Wired	Wired
Sound Pressure (dB(A) Cooling)	Indoor O/L/M/H	32 / 36 / 38 / 40	32 / 36 / 38 / 43	36 / 40 / 42 / 46	37 / 41 / 43 / 47	33 / 36 / 39 / 44	36 / 40 / 42 / 46	37 / 41 / 43 / 47
	Outdoor H	53	54	55	55	51	54	55
Sound Power (dB(A) Cooling)	Indoor H	54	57	-	-	58	-	-
	Outdoor H	68	69	-	-	67	-	-
Max Pipe Length	m	50	50	50	50	75	75	75
Max Height Difference	m	30	30	30	30	30	30	30
Refrigerant Charge	m	20	20	20	20	30	30	30
Additional Refrigerant Charge	g/m	40	40	40	40	50	50	50
Pipe Size (inches)	Gas	5/8	5/8	5/8	5/8	5/8	5/8	5/8
	Liquid	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Operating Range (OC)	Cooling	-15 ~ 46	-15 ~ 46	-15 ~ 46	-15 ~ 46	-15 ~ 46	-15 ~ 46	-15 ~ 46
	Heating	-15 ~ 24	-15 ~ 24	-15 ~ 24	-15 ~ 24	-15 ~ 24	-15 ~ 24	-15 ~ 24
Refrigerant		R410A	R410A	R410A	R410A	R410A	R410A	R410A
Grille (to be ordered separately)		UTGUGYAW	UTGUGYAW	UTGUGYAW	UTGUGYAW	UTGUGYAW	UTGUGYAW	UTGUGYAW

*Excludes Grille. Grille dimensions = 50x950X950, Grille weight = 6.5kg

Note
- Cooling/heating capacities are based on the following conditions.

Cooling	Indoor temperature 23°CDB / 16°CWB Outdoor temperature 30°C

- Performance test is in accordance with EN14511
- Seasonal efficiency test is on accordance with EN14825
- Sound power test is in accordance with EN12102

- Specifications and design are subject to change without notice for further improvement.
- Actual products' colours may be different from the colours shown in this printed material.

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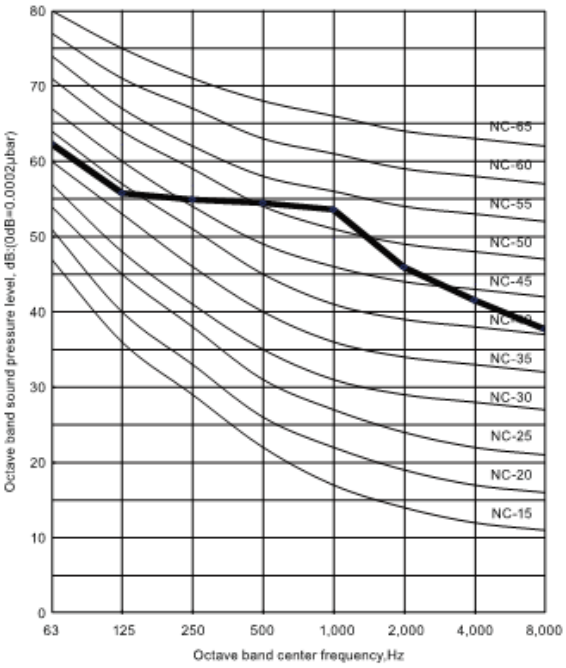
■MODEL: AO*G54LA

●Cooling



●Heating