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ACOUSTIC
CONSULTANTS

1 CONWAY STREET, LONDON

PLANT NOISE IMPACT ASSESSMENT

architectural

environmental

occupational

industrial

noise control at source

project management

planning

legal services

expert witness

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Contents

1.0 SUMMARY

At the request of JAB Design, Philip Dunbavin Acoustics has conducted an assessment of the noise egress from newly installed plant at 1 Conway Street, London.

A 24 hour ambient noise survey was carried out in the vicinity of the nearest noise sensitive residences. Noise egress from a new air source heat pump outdoor unit and a new air-handling unit was calculated at the nearby noise sensitive residences.

The calculated noise levels due to the plant were compared with the criterion of the Local Authority. The minimum L_{A90} background noise level measured over a 24 hour period in 5 minute measurement intervals was 47 dB. The calculated noise levels due to the plant at 1m from the nearest noise sensitive residence window was 42 dB which meets the Local Authority criterion of 5dB below the pre-existing background noise level. Note that we understand that the proposed units are only to operate during daytime office hours in which case the minimum L_{A90} background noise level increases to 50 dB and the noise from the proposed plant is 8 dB below the pre-existing background level.

2.0 INTRODUCTION

PDA Ltd. was engaged to carry out the following;

A) We will travel to the site in Camden and undertake a noise survey to establish the ambient noise climate in the vicinity of the noise sensitive properties. Measurements will be made for a full 24 hours. The inverters will need to be switched off for the duration of the measurement. We will need close access to the immediate surroundings close to nearby noise sensitive properties.

All measurements shall be made in accordance with the provisions of BS 7445 "Description and Measurement of Environmental Noise". The measurements will include dB(A) and octave bands in terms of L_{eq}, L_{max} and L_N values

B) Using manufacturers noise data for the plant and the ambient noise levels measured in Part A), we will calculate the noise impact of the air conditioning units on nearby noise-sensitive properties. The impact will be calculated using the methods of BS4142 "Method for rating industrial noise affecting mixed residential and industrial areas". The results of the assessment will be compared with the criterion of the Local Planning Authority. Where plant noise levels exceed the selected criterion we will propose suitable remedial measures such that the criteria may be achieved (For existing units remedial measures are likely to be limited to the use of barriers or replacement with quieter units).

C) We will produce a full technical report detailing all measurements, calculation results, assessments and remedial measures suitable for submission to the Local Planning Authority.

3.0 SITE DESCRIPTION

The site consists of Georgian terraced town houses built along Conway Street with a yard behind accessed from Bromley Place which runs between 5 Conway Street and 7 Conway Street. To the south-east of Bromley Place numbers 1-5 Conway Street have been converted to office use, whilst to the north-west of Bromley Place the houses on Conway Street are in residential occupation. There are also infill buildings in the yard to the rear of the properties on Conway Street and these buildings are used as offices.

A new external air-source heat pump inverter and a new mechanical ventilation heat recovery air handling unit have been fitted within the yard to service the offices. The air source heat pump is at ground floor level on the façade of the infill buildings in the yard above the light-well behind 3 Conway Street. The air handling unit is at 3rd floor level on the plant deck above the 2nd floor infill building behind 1 Conway Street (see Figure 2 for site layout and plant locations.)

This report assesses the noise impact of the two new items of plant.

4.0 ASSESSMENT CRITERIA

4.1 National Planning Policy Framework

National Planning Policy is guided by the National Planning Policy Framework. With regard to Noise the Framework states the following;

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*

- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

The terms 'significant adverse impact' and 'other adverse impacts' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE) which states;

> *There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:*
>
> *NOEL – No Observed Effect Level*
>
> *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 the noise.*
>
> *LOAEL – Lowest Observed Adverse Effect Level*
>
> *This is the level above which adverse effects on health and quality of life can be detected.2.21*
>
> *Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*
>
> *SOAEL – Significant Observed Adverse Effect Level*
>
> *This is the level above which significant adverse effects on health and quality of life occur.*

The notes also offer an explanation of the term 'other adverse impacts' as follows;

> *… refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.*

It should be noted that no specific noise limits for LOAEL and SOAEL have yet been defined, however, guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

4.2 BS 4142:1997

The effect of industrial noise on nearby noise sensitive residences is generally assessed in accordance with BS4142:1997 – 'Method for rating industrial noise affecting mixed residential and industrial areas'. This includes noise break-out from the industrial and commercial units and noise from external plant.

The standard describes a method of determining the level of a noise of an industrial nature, together with procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity.

Briefly the standard may be thought of as a procedure for comparing the noise from industrial sources with background noise levels in the absence of the industrial noise and determining the likelihood of complaints.

In accordance with BS 4142 the background noise level is the A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific noise level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the noise source over a given time interval.

Certain acoustic features can increase the likelihood of complaint over that expected from a simple comparison between the specific noise level and the background level. Where such features are present, these are taken into account by adding 5 dB to the specific noise level. This is called the rating level.

This 5 dB correction should be applied if one or more of the following features occur, or are expected to be present.

- The noise contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.).
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps).
- The noise is irregular enough to attract attention.

From the above the rating level is established, this being the value that is compared with the background noise.

According to BS 4142 a rating level of:

- 10 dB(A) or more above the background is an indication that complaints, attributable to the operation of the noise source, are likely.
- 5 dB(A) above the background is of marginal significance.
- 10 dB(A) below the background is a positive indication that complaints attributable to the operation of the noise source are unlikely.

BS4142 indicates that the noise source should be evaluated over the appropriate time interval which is as follows:

- 1h during the day
- 5 min during the night

It should be noted however BS4142 does not give specific time periods that constitute day or night-time. Instead it states that the night period should cover the times when the general adult population are preparing for sleep or are actually sleeping.

It is generally accepted that the night-time period runs from 23:00 to 07:00 and the daytime period runs from 07:00 to 23:00.

4.3 Local Authority Requirements

4.3.1 London Borough of Camden Development Policy DP28

Policy DP28 covers the Local Planning Authorities policies with regard to noise and vibration affecting new developments and developments including new sources of noise and vibration.

With respect to new noise sources from mechanical services the criterion for assessment of noise is given in Table E of DP28 which is reproduced below;

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB$_{LAeq}$

4.3.2 Noise, vibration and ventilation assessments guidance

The Camden council website contains a short guide on assessing noise and vibration from new ventilation plant. The guide details the requirements for establishing background noise levels by stating that a noise, vibration and ventilation assessment should include;

- *Existing background noise levels measured over a 24-hour period (including the cumulative noise levels of all existing units)*
- *Proposed background noise levels (including the cumulative noise levels of all proposed units)*
- *Any proposed measures to reduce noise, fume emissions and vibration*
- *The system manufacturers specification of the proposed equipment to be installed, altered or replaced*
- *Details of the method used to compile the report and examples of the calculations and assumptions made*

5.0 SURVEY DETAILS

A 24 hour ambient noise survey was carried out on the 18th – 19th December 2013. Noise measurements were taken from an unattended sound level meter which was installed with the microphone extended on a boom from the window of one of the office buildings in the yard. The selected window was a similar distance from the existing plant as the nearest noise sensitive residential windows to give noise levels representative of the nearest residential façade.

As this is a retrospective noise assessment the new items of plant were both switched off for the duration of the survey.

5.1 Survey times and personnel

The ambient noise survey measurements were made between 13:45 on 18th December 2013 and 13:40 on 19th December 2013. Measurements were made using a single unattended environmental monitoring sound level meter. The equipment was installed by Mr Wesley Charlton BSc(Hons) of PDA Ltd.

5.1.1 Measurement Locations

Measurements were taken for the full 24 hours 1m from the 2nd floor window in the location shown in Figure 2.
A photograph of the microphone position is shown in Figure 1 below.

Figure 1 – Ambient noise survey microphone location

5.1.2 Measurement Equipment

The noise survey was conducted using the following sound level meter.

Table 1 - Sound level meter used

Manufacturer	Model	Serial number
Rion	NL-52	00810317

The Rion NL-52 sound level meter is a Class 1 sound level meter in accordance with IEC 61672-1:2002.

The meter was set to measure 'A' weighted sound pressure levels and the time weighting was set to fast response. The microphone was of the 'free field' type. In additional a range of statistical indicators was also measured. The meter was field calibrated before and after the survey, during which time no significant calibration drift was observed. Calibration details for the meter are shown in the Appendix.

5.2 Description of Existing Noise Sources

The noise climate was dominated by road traffic on local and more distant roads with some mechanical services noise from the existing plant audible during quieter periods.

5.3 Noise Survey Results

The noise survey results are summarised in Table 2 below:

Table 2 – Summary noise measurements

Daytime (07:00 – 23:00)		Night-time (23:00 – 07:00)	
$L_{Aeq, 16h}$ [dB]	L_{A90} range (5 minute periods) [dB]	$L_{Aeq, 8h}$ [dB]	L_{A90} range (5 minute periods) [dB]
61	50 – 60	54	47 – 55

Full measurement results are included in the appendix to this report.

6.0 SITE NOISE PROPAGATION

6.1 Method of calculation

Noise propagation around the site has been calculated as follows;

The site layout has been modelled using 'Soundplan' 3D environmental noise propagation software. The model has included the heights of the buildings surrounding the yard, the locations of the plant and the location of the noise sensitive residential windows. The 'Soundplan' software calculates noise propagation in accordance with ISO-9613:2 "Acoustics – Attenuation of sound during propagation outdoors – general method of calculation" and takes into account attenuation due to geometric spreading, air attenuation, ground effects and shielding by buildings, barriers and landform. The software also takes into account the effects of reflections in the ground plane and in buildings. Noise data for the proposed plant were obtained from manufacturers noise data. For the Daikin air-source heat pump unit noise data was available as an A-weighted sound power level and an octave band spectrum. For the Sabiana air handling unit A-weighted noise levels at 1m from the fan outlets was given. For this unit the likely octave band spectrum of the noise was derived using a fan spectrum prediction model for a forward curved centrifugal fan of the same flow rate and pressure as the proposed unit.

6.2 Proposed New Noise sources

6.2.1 Daikin RXS35K air-source heat pump

The manufacturer's literature shows a sound power level (high setting) of 63 dB L_{WA}. In addition a typical octave band sound pressure spectrum is given (see appendix).

Although we do not have narrowband spectral data for this specific unit, previous measurements of similar Daikin inverter units have shown that these units are not tonal. In addition as the unit is inverter controlled the output is modulated by continuous variation in the fan speed rather than switching so the unit will operate continuously rather than intermittently.

6.2.2 Sabiana ENY 6 air handling unit

The manufacturer's literature shows a sound pressure level of 64 dB(A) at 1m from the fan outlet in free-field conditions with the unit operating at the highest setting. Assuming that the outlets radiate into half-space we have calculated the sound power of the unit as 72 dB L_{WA}.

The unit is a mechanical heat recovery ventilation unit which is designed to operate continuously during the daytime. Although we do not have narrowband spectral data for this unit the design of the fan is a forward curved centrifugal fan which generally exhibit a low-noise broadband spectrum. For this reason we have assumed that the noise due to this unit is neither tonal nor intermittent.

6.3 Calculation results

Calculated noise levels at the nearby noise sensitive residences are shown in Table 3 below;

Table 3 – Calculated noise levels at nearby residences

Receiver	L_{Aeq}
Nearest rear window of 7 Conway Street	42

7.0 NOISE IMPACT ASSESSMENT

The criterion of the Local Planning Authority states that noise due to the plant should be 5dB below the pre-existing background. The lowest measured background L_{A90} during the 24 hour survey was 47dB, therefore the maximum acceptable noise level to meet the Local Authority criterion is 42dB.

The results of the Soundplan model indicate that the proposed air-source heat pump and air handling unit just meet the criterion of the Local Authority and hence are acceptable. We would also note that it is proposed that the units will only operate during normal daytime office hours, and in this case, the minimum daytime L_{A90} background increases to 50 dB, resulting in an acceptable criterion of 45dB due to the sources at the nearby noise sensitive residences.

8.0 VIBRATION

We would not expect either of the new units to be significant sources of vibration. The Daikin air-source heat pump is not expected to be a significant source of vibration and is mounted on the masonry façade of an office use building which is not a noise sensitive use. The Sabiana air-handling unit is mounted on the plant deck again above an office use space and is also mounted on proprietary anti-vibration mounts as detailed in the appendix.

9.0 CONCLUSION

At the request of JAB Design, Philip Dunbavin Acoustics has conducted an assessment of the noise egress from newly installed plant at 1 Conway Street, London.

A 24 hour ambient noise survey was carried out in the vicinity of the nearest noise sensitive residences. Noise egress from a new air source heat pump outdoor unit and a new air-handling unit was calculated at the nearby noise sensitive residences.

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Appendix

EQUIPMENT LIST

Manuf.	Type	Model	Serial Number	Date of Expiration of Calibration	Calibration Certificate Number
Rion	Sound Level Meter	NL-52	00810317	28/11/2015	TCRT13 1372
Rion	Calibrator	NC 74	34683835	06/02/2015	06955

Noise Survey Measurements

Position 1 Ambient Noise Survey Results

Date	Start Time	L_{A90}	$L_{Aeq,5mins}$
Daytime			
19/12/2013	07:00:00	50	56.8
19/12/2013	07:05:00	51	56
19/12/2013	07:10:00	50	54.2
19/12/2013	07:15:00	51	54.6
19/12/2013	07:20:00	51	54.2
19/12/2013	07:25:00	51	54.2
19/12/2013	07:30:00	52	54.8
19/12/2013	07:35:00	51	54.6
19/12/2013	07:40:00	52	56.6
19/12/2013	07:45:00	53	55.5
19/12/2013	07:50:00	53	56
19/12/2013	07:55:00	52	55.9
19/12/2013	08:00:00	52	55.4
19/12/2013	08:05:00	52	61.4
19/12/2013	08:10:00	52	59.6
19/12/2013	08:15:00	53	56
19/12/2013	08:20:00	53	57.4
19/12/2013	08:25:00	54	57.9
19/12/2013	08:30:00	56	62.3
19/12/2013	08:35:00	55	59.5
19/12/2013	08:40:00	53	56.9
19/12/2013	08:45:00	56	65.8
19/12/2013	08:50:00	53	60.4
19/12/2013	08:55:00	54	58.1
19/12/2013	09:00:00	54	57.2
19/12/2013	09:05:00	54	57.7
19/12/2013	09:10:00	53	56.7
19/12/2013	09:15:00	53	55.9
19/12/2013	09:20:00	53	57.1
19/12/2013	09:25:00	54	57
19/12/2013	09:30:00	54	57.2
19/12/2013	09:35:00	54	57.7
19/12/2013	09:40:00	53	58.4
19/12/2013	09:45:00	54	56.1
19/12/2013	09:50:00	54	58.7
19/12/2013	09:55:00	53	56.7
19/12/2013	10:00:00	53	59.5
19/12/2013	10:05:00	53	57.9
19/12/2013	10:10:00	54	57.7
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19/12/2013	10:20:00	52	56.1
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19/12/2013	11:30:00	53	57.5
19/12/2013	11:35:00	52	55.9
19/12/2013	11:40:00	57	59.4
19/12/2013	11:45:00	54	63.7
19/12/2013	11:50:00	53	57.7
19/12/2013	11:55:00	54	57.7
19/12/2013	12:00:00	56	57.4
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19/12/2013	13:35:00	53	73.3
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18/12/2013	13:50:00	57	62.9
18/12/2013	13:55:00	55	60.7
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18/12/2013	21:30:00	55	58.6
18/12/2013	21:35:00	56	59.8
18/12/2013	21:40:00	56	59.8
18/12/2013	21:45:00	55	58.3
18/12/2013	21:50:00	56	58.2
18/12/2013	21:55:00	56	62.3
18/12/2013	22:00:00	57	60.3
18/12/2013	22:05:00	56	59.6
18/12/2013	22:10:00	56	57.8
18/12/2013	22:15:00	57	59.9
18/12/2013	22:20:00	55	58.8
18/12/2013	22:25:00	56	57.7
18/12/2013	22:30:00	56	58.8
18/12/2013	22:35:00	55	58.6
18/12/2013	22:40:00	54	59.1
18/12/2013	22:45:00	55	58.6
18/12/2013	22:50:00	54	57.2
18/12/2013	22:55:00	55	58.3
Minimum		**50**	
Overall			**61**

Night-time			
18/12/2013	23:00:00	55	58.5
18/12/2013	23:05:00	53	57.1
18/12/2013	23:10:00	52	56.9
18/12/2013	23:15:00	52	55.6
18/12/2013	23:20:00	51	55.7
18/12/2013	23:25:00	52	59.4
18/12/2013	23:30:00	52	56.7
18/12/2013	23:35:00	51	53.6
18/12/2013	23:40:00	51	56.1
18/12/2013	23:45:00	51	55.8
18/12/2013	23:50:00	50	52.6
18/12/2013	23:55:00	50	53.2
19/12/2013	00:00:00	50	57.6
19/12/2013	00:05:00	49	53.3
19/12/2013	00:10:00	49	54.1
19/12/2013	00:15:00	49	56
19/12/2013	00:20:00	50	53.9
19/12/2013	00:25:00	49	52.5
19/12/2013	00:30:00	48	52.4
19/12/2013	00:35:00	49	52.1
19/12/2013	00:40:00	49	50.7
19/12/2013	00:45:00	49	51.4
19/12/2013	00:50:00	50	53.1
19/12/2013	00:55:00	49	51.5
19/12/2013	01:00:00	49	52.3
19/12/2013	01:05:00	50	55.9
19/12/2013	01:10:00	49	51.8
19/12/2013	01:15:00	48	52
19/12/2013	01:20:00	49	52.2
19/12/2013	01:25:00	49	51.9
19/12/2013	01:30:00	50	52.5
19/12/2013	01:35:00	49	52
19/12/2013	01:40:00	49	50.9
19/12/2013	01:45:00	49	53.5
19/12/2013	01:50:00	50	52.8
19/12/2013	01:55:00	50	52.8
19/12/2013	02:00:00	50	53.3
19/12/2013	02:05:00	51	59.4
19/12/2013	02:10:00	50	51.9
19/12/2013	02:15:00	49	55.5
19/12/2013	02:20:00	49	51.8
19/12/2013	02:25:00	49	51.2
19/12/2013	02:30:00	48	50.9
19/12/2013	02:35:00	48	50.9
19/12/2013	02:40:00	48	51.3
19/12/2013	02:45:00	48	50.7
19/12/2013	02:50:00	49	51.6
19/12/2013	02:55:00	48	52.9
19/12/2013	03:00:00	48	53
19/12/2013	03:05:00	49	51.2
19/12/2013	03:10:00	48	50.9
19/12/2013	03:15:00	48	50.9
19/12/2013	03:20:00	48	52.5
19/12/2013	03:25:00	48	50.6
19/12/2013	03:30:00	47	49.6
19/12/2013	03:35:00	47	50.4
19/12/2013	03:40:00	47	51.8
19/12/2013	03:45:00	48	52.9
19/12/2013	03:50:00	48	50.8
19/12/2013	03:55:00	48	50.8
19/12/2013	04:00:00	48	50
19/12/2013	04:05:00	48	52.4
19/12/2013	04:10:00	49	51.7
19/12/2013	04:15:00	48	51
19/12/2013	04:20:00	49	51.1
19/12/2013	04:25:00	48	50.4
19/12/2013	04:30:00	48	50.5
19/12/2013	04:35:00	48	51.2
19/12/2013	04:40:00	48	50.3
19/12/2013	04:45:00	48	50.7
19/12/2013	04:50:00	49	51.7
19/12/2013	04:55:00	49	50.5
19/12/2013	05:00:00	48	50.9
19/12/2013	05:05:00	49	58.8
19/12/2013	05:10:00	48	52.2
19/12/2013	05:15:00	48	51.7
19/12/2013	05:20:00	48	51.1
19/12/2013	05:25:00	48	51.3
19/12/2013	05:30:00	48	51
19/12/2013	05:35:00	49	51.3
19/12/2013	05:40:00	48	51.7
19/12/2013	05:45:00	51	53.7
19/12/2013	05:50:00	50	52
19/12/2013	05:55:00	49	51.2
19/12/2013	06:00:00	49	51.7
19/12/2013	06:05:00	49	53.4
19/12/2013	06:10:00	50	52.9
19/12/2013	06:15:00	50	52.8
19/12/2013	06:20:00	50	53.4
19/12/2013	06:25:00	51	54.2
19/12/2013	06:30:00	51	53.5
19/12/2013	06:35:00	50	53.1
19/12/2013	06:40:00	50	56.7
19/12/2013	06:45:00	51	56.9
19/12/2013	06:50:00	50	53
19/12/2013	06:55:00	50	54.9
Minimum		**47**	
Overall			**54**

Manufacturers’ data sheets

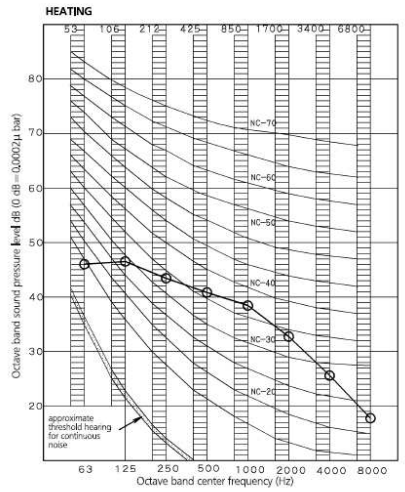
2 Specifications

2-9 Technical Specifications					RXS20K	RXS25K	RXS35K	RXS42K	RXS50K
Capacity control	Method				Inverter controlled				
Casing	Colour				Ivory white				
Dimensions	Unit	Height		mm	550				735
		Width		mm	765				825
		Depth		mm	285				300
	Packed unit	Height		mm	612				797
		Width		mm	906				992
		Depth		mm	364				390
Weight	Unit			kg	34			39	47
	Packed unit			kg	38			45	52
Heat exchanger	Length			mm	805			810	845
	Rows	Quantity			2				
	Fin pitch			mm	1.4			1.5	1.8
	Stages	Quantity			24				32
	Tube type				ø7 Hi-XA			ø8 Hi-XA	
	Fin	Type			Waffle louvered fin		WF fin	Precoat Fin	
Compressor	Model				1YC23AEXD		1YC23AEXDC	2YC36BXD#C	
	Type				Hermetically sealed swing compressor				
	Output			W	600			1,100	
Fan	Type				Propeller fan				
	Air flow rate	Cooling	High	m³/min	33.5		36.0	37.3	50.9
				cfm	1,183		1,271	1,317	1,797
			Nom.	m³/min	33.5		36.0	37.3	50.9
				cfm	1,183		1,271	1,317	1,797
			Low	m³/min	30.1		-		
				cfm	1,063		-		
			Super low	m³/min	-		30.1	30.6	48.9
				cfm	-		1,063	1,080	1,727
		Heating	High	m³/min	28.3			31.3	45.0
				cfm	999			1,105	1,589
			Low	m³/min	25.6		-		
				cfm	904		-		
			Super low	m³/min	-		25.6	27.2	43.1
				cfm	-		904	960	1,522
Fan motor	Model				D23H-28			D50R-28	KFD-380-50-8D
	Output			W	23			50	53
	Speed	Cooling	High	rpm	860		920	890	780
			Super low	rpm	780			790	670
		Heating	High	rpm	860			890	720
			Super low	rpm	740			780	670
Sound power level	Cooling	Nom.		dBA	61	62	-		
		High		dBA	-		63		
Sound pressure level	Cooling	High		dBA	46		48		
		Silent operation		dBA	43		44		
	Heating	High		dBA	47		48		
		Silent operation		dBA	44		45		
Operation range	Cooling	Ambient	Min.	°CDB	-10				
			Max.	°CDB	46				
	Heating	Ambient	Min.	°CWB	-15				
			Max.	°CWB	18				
Refrigerant	Type				R-410A				
	Charge			kg	1.0		1.2	1.3	1.7
	GWP				1,975				
Refrigerant oil	Type				FVC50K				
	Charged volume			l	0.375			0.650	

9 Sound data

9 - 2 Sound Pressure Spectrum - Heating

RXS20-25K



NOTES

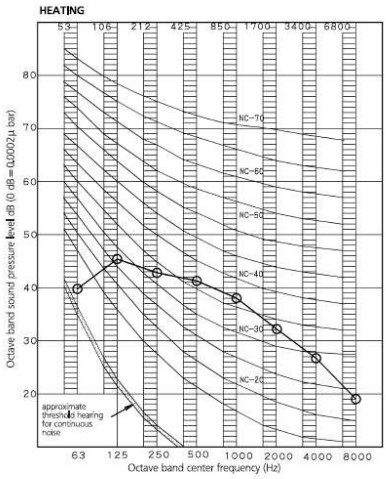
1 Overall (dB)

Scale	50Hz 220–240V (V)
A	47

(B,G,N is already rectified)
2 Measuring place: Measure in anechoic room
3 Operation noise differs with operation and ambient conditions.
4 Operating conditions: Power source 220–240V 50Hz
O—O
Heating
5 Location of microphone
JISC9612
The operation noise measuring method is in accordance with JISC9612

3D059599G

RXS35K



NOTES

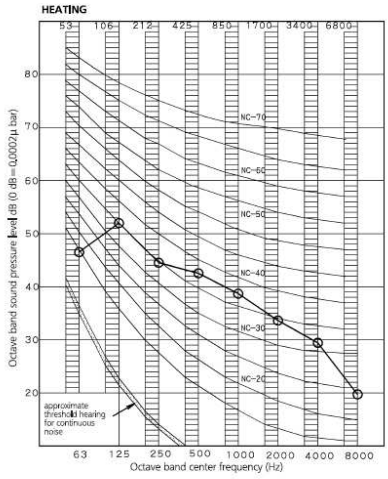
1 Overall (dB)

Scale	50Hz 220–240V (V)
A	48

(B,G,N is already rectified)
2 Measuring place: Measure in anechoic room
3 Operation noise differs with operation and ambient conditions.
4 Operating conditions: Power source 220–240V 50Hz
O—O
Heating
5 Location of microphone
JISC9612
The operation noise measuring method is in accordance with JISC9612

3D059593G

RXS42K



NOTES

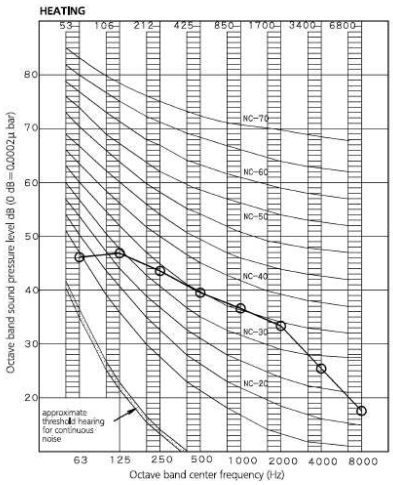
1 Overall (dB)

Scale	50Hz 220–240V (V)
A	48

(B,G,N is already rectified)
2 Measuring place: Measure in anechoic room
3 Operation noise differs with operation and ambient conditions.
4 Operating conditions: Power source 220–240V 50Hz
O—O
Heating
5 Location of microphone
JISC9612
The operation noise measuring method is in accordance with JISC9612

3D059597D

RXS50K



NOTES

1 Overall (dB)

Scale	50Hz 220–240V (V)
A	48

(B,G,N is already rectified)
2 Measuring place: Measure in anechoic room
3 Operation noise differs with operation and ambient conditions.
4 Operating conditions: Power source 220–240V 50Hz
O—O
Heating
5 Location of microphone
JISC9612
The operation noise measuring method is in accordance with JISC9612

3D059740F

Main technical specifications without post-heating coil

Working static pressure = 50 Pa

MODEL			ENY 1	ENY 2	ENY 3	ENY 4	ENY 5	ENY 6
High speed	Air flow	m³/h	620	1200	1450	2150	2500	3800
	Sound pressure (*)	dB(A)	54	56	58	62	60	64
Medium speed	Air flow	m³/h	535	940	1080	1690	1630	2800
	Sound pressure (*)	dB(A)	52	52	53	58	58	60
Low speed	Air flow	m³/h	365	780	840	1040	1270	2230
	Sound pressure (*)	dB(A)	49	49	48	51	48	56

(*) Sound pressure measured in an open field at a distance of 1 metre from the fan outlet.

HEAT RECOVERY			ENY 1	ENY 2	ENY 3	ENY 4	ENY 5	ENY 6
High speed	Efficiency (-5°C / 20°C)	%	54,6	54,2	54,5	51,9	58,2	51,1
	Leaving air temperature	°C	8,6	8,5	8,6	7,9	9,5	7,8
Medium speed	Efficiency (-5°C / 20°C)	%	55,3	55,6	56,4	53,5	60,8	53,5
	Leaving air temperature	°C	8,8	8,9	9,1	8,4	10,2	8,4
Low speed	Efficiency (-5°C / 20°C)	%	57,1	56,6	58,0	56,6	62,3	55,3
	Leaving air temperature	°C	9,3	9,2	9,5	9,2	10,6	8,8

Main technical specifications with post-heating coil

Operation at high speed
Working static pressure = 50 Pa

MODEL		ENY 1	ENY 2	ENY 3	ENY 4	ENY 5	ENY 6
Air flow	m³/h	580	1080	1370	2020	2400	3600

HEAT RECOVERY		ENY 1	ENY 2	ENY 3	ENY 4	ENY 5	ENY 6
Efficiency (-5°C / 20°C)	%	54,9	54,8	54,9	52,4	58,4	51,5
Leaving air temperature	°C	8,7	8,7	8,7	8,1	9,6	7,9

POST-HEATING WATER COIL		ENY 1	ENY 2	ENY 3	ENY 4	ENY 5	ENY 6
Rows	No.	3	3	3	3	3	3
Emission (air 8°C - water 70/60°C)	kW	5,92	11,7	15,9	20,4	25,5	34,9
Leaving air temperature	°C	37,1	38,8	41,2	36,8	38,2	35,6
Air side pressure drop (coil)	Pa	45	36	28	53	42	64.7
Water side pressure drop	kPa	6	7	14	22	19	35.5
Diameter of threaded male connections		1"	1"	1"	1"	1"	1"

Main technical specifications of the electric fans

ELECTRIC FANS		ENY 1	ENY 2	ENY 3	ENY 4	ENY 5	ENY 6
No. of motor poles	No.	2	4	4	4	4	4
Power supply		230 V - 50 Hz					
Power delivered to shaft	Watt	2 x 60	2 x 147	2 x 184	2 x 350	2 x 350	2 x 550
Max. current input	A	1,4	3	3,04	6,2	6	11,4
Speed no.	No.	3	3	3	3	3	3

Operating limits

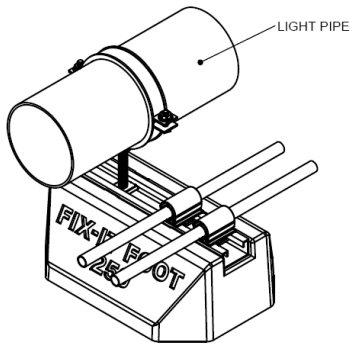
Water circuit	Maximum water pressure	10 bar
	Maximum water temperature	+95 °C
Outside air	Minimum temperature	-15 °C
Power supply	Rated single-phase voltage	230V-50Hz

FIX-IT FOOT & MULTIFOOT SPECIFICATION SHEET

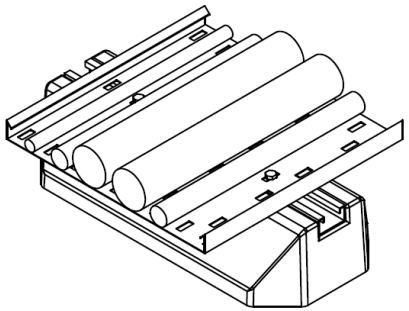
FIX-IT FOOT & MULTI FOOT DETAILS & PERFORMANCE RECOMMENDATIONS										
PART NUMBER		**B6735**	**B6736**	**B6737**	**B9037**	**B9043**	**B9045**	**B9368**	**B6357**	**B6359**
DESCRIPTION		FIX-IT FOOT 250	FIX-IT FOOT 400	FIX-IT FOOT 600	FIX-IT FOOT 1000	FIX-IT FOOT LOW 250	FIX-IT FOOT LOW 400	FIX-IT FOOT LOW 500	MULTI FOOT 400	MULTI FOOT 600
LENGTH	mm	250	400	600	1000	250	400	500	400	600
	inches	10	15 3/4	24	39 1/2	10	16	19 3/4	16	24
WIDTH	mm	180	180	180	180	130	130	130	180	220
	inches	7	7	7	7	5	5	5	7	8 3/4
HEIGHT	mm	95	95	95	95	50	50	50	80	80
	inches	3 3/4	3 3/4	3 3/4	3 3/4	2.0	2.0	2.0	3	3
WEIGHT	kg	2.4	3.6	7.5	9.3	1.2	2.5	4.6	1.7	2.5
	lbs	5.3	7.9	16.5	20.5	2.6	5.5	10.1	3.7	5.5
DESIGN LOAD	kg	82	128	224	295	82	128	134	259	474
	lbs	181	282	494	650	181	282	295	571	1045

DESIGN LOAD BASED ON PUBLISHED GUIDLINES FROM BRITISH RIGID URETHANE MANUFACTURERS ASSOCIATION (BRUFMA) OF AN ACCEPTABLE LOAD OF 35KN/M2 (5.1 PSI). PROJECT SPECIFIC DESIGN PARAMETERS WILL BE SUBJECT TO ROOF MAKE-UP, DETAILED BY STRUCTURAL ENGINEER.

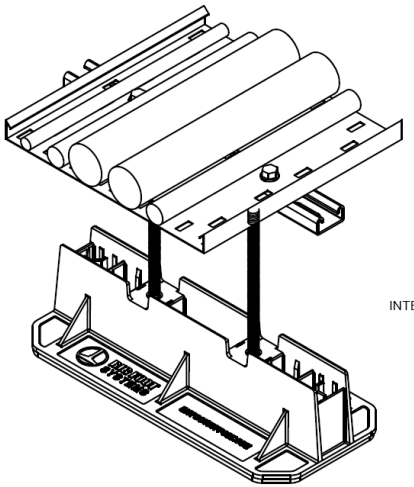
MATERIAL SPECIFICATION										
DESCRIPTION	MATERIAL	REGULATION CONFORMANCE	DENSITY		FLEXURAL STRENGTH (@ BREAK, 2mm/min)		YIELD STRENGTH		COMPRESSIVE STRENGTH (@ 20%)	
			kg/m3	lbs/ft3	MPa	psi	MPa	psi	MPa	psi
FIX-IT FOOT	RECYCLED RUBBER CRUMB	BS7188:1989	650-1020	41-64	-	-	-	-	1.20	174
MULTI FOOT	POLYAMIDE 6		1140	71	210	30458	250	36259	-	-
FIX-IT FOOT CHANNEL	ALUMINIUM 6063-T5		2700	169	-	-	145	21030	-	-



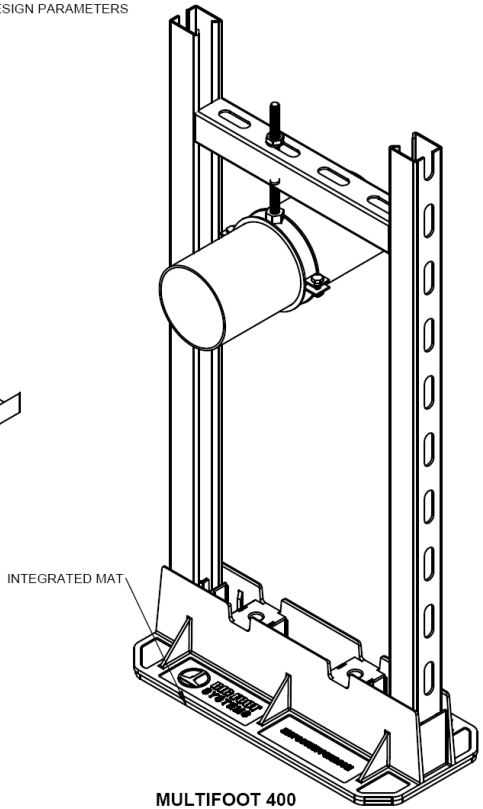
FIX-IT FOOT 250



FIX-IT FOOT 400



MULTIFOOT 400



MULTIFOOT 400

BIG FOOT NBS SPECIFICATION CLAUSE

B6735 - Big Foot Fix-it Foot, model 250
B6736 - Big Foot Fix-it Foot, model 400
B6737 - Big Foot Fix-it Foot, model 600
.
B9096 - Big Foot Fix-it Foot, model 1000
B9043 - Big Foot Fix-it Foot, model 250L
B9045 - Big Foot Fix-it Foot, model 400L
B6357 - Big Foot Multi Foot, small

FOR BESPOKE DESIGNS PLEASE CONTACT THE BIG FOOT TECHNICAL OFFICE

+44(0)1323 844 355
TECHNICAL@BIGFOOTSUPPORT.COM
WWW.BIGFOOTSUPPORT.COM

TITLE: FIX-IT / MULTI FOOT SPECIFICATION SHEET

DWG NO. FM1005-01-01

BIG FOOT SYSTEMS

Site layout and Soundplan calculated noise levels

Figure 2 – Site layout and Soundplan noise model result