Philip Acoustics Ltd.

Consultants in Noise & Vibration
Building Regulations Certification Sound Insulation Testing

REPORT TITLE: ACOUSTIC REPORT FOR A PROPOSED VRV AIR SOURCE HEAT PUMP (ASHP) UNIT AT FLAT 1, 69 GREENCROFT GARDENS, LONDON NW6 3LJ

REPORT REF: 21051-002

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SUMMARY

- Philip Acoustics has been commissioned to provide an acoustic (noise & vibration) assessment report for a new VRV Air Source Heat Pump (ASHP) unit, proposed to be installed to serve an existing residential property Flat 1 at 69 Greencroft Gardens, London NW6 3LJ.

- The unit is proposed to be located externally at low level behind a patio retaining wall within the rear garden area of the property, within an acoustic enclosure.

- The assessment is in accordance with London Borough of Camden's planning consent acoustic requirements for mechanical services equipment (including items such as ASHP units) as contained in Policy A4: *Noise & Vibration* of Section 6: *Protecting Amenity* of Camden Local Plan (adopted June 2017).

- As part of the assessment a background noise survey has been carried out over a six-day period including sample weekdays and a full weekend to establish existing noise levels during the entire range of operational times of the VRV ASHP unit. The noise survey was at a location representative of outside nearest noise sensitive properties, which are neighbouring residential dwellings.

- Based on results of the background noise survey and noise model calculations using the proposed VRV ASHP unit manufacturer's noise data, the overall noise level from the unit (with noise reduction treatment fitted) is calculated to comply with London Borough of Camden's planning consent acoustic requirements for mechanical services equipment.

- The noise reduction treatment comprises an acoustic enclosure to the VRV ASHP unit. Specification details for the acoustic enclosure are included in Section 6.1 of the report.

- Proposed location of the VRV ASHP unit is at distance from, and not structurally linked to, neighbouring residential dwellings. Therefore, there will be no potential for any structure-borne vibration from the unit to transfer to neighbouring properties. Notwithstanding this, then as good practice it is advised the VRV ASHP unit be installed on conventional proprietary vibration isolators. Specification details for suitable vibration isolators are provided in Section 6.2 of the report.

1. INTRODUCTION

A new Daikin VRV Air Source Heat Pump (ASHP) unit is proposed to be installed to serve a residential property Flat 1, 69 Greencroft Gardens, London NW6 3LJ.

The unit is proposed to be located externally at low level behind a patio retaining wall within the rear garden area of the property and positioned within an acoustic enclosure.

As part of the planning process associated with the proposed VRV ASHP unit, the Local Planning Authority (London Borough of Camden) as validation to the planning application requires information in the form of an acoustic report in order to seek to protect the amenity of neighbouring residents in the vicinity with regard to possible noise and vibration from the unit.

Philip Acoustics has therefore been commissioned to provide an acoustic (noise & vibration assessment) report for the proposed VRV ASHP unit, the assessment to be in accordance with the relevant requirements of London Borough of Camden as contained within Policy A4: *Noise & Vibration* of Section 6: *Protecting Amenity* of the Camden Local Plan (adopted June 2017).

This report presents results of the assessment and includes:

- Noise Criteria - London Borough of Camden planning consent acoustic requirements;
- Measurement survey of existing background noise levels;
- Manufacturer noise data for the VRV ASHP unit and calculation of unit noise levels;
- Consideration of vibration from the VRV ASHP unit;
- Specification for noise reduction treatments and/or vibration isolation as necessary to ensure compliance with London Borough of Camden's planning consent acoustic requirements.

2. NOISE CRITERIA *(London Borough Of Camden Acoustic Requirements)*

Policy A4: *Noise & Vibration* from Section 6 – *Protecting Amenity* of the Camden Local Plan (adopted June 2017) covers in detail noise issues relating to a wide range of planning and noise pollution scenarios, including of proposed new mechanical services plant / equipment such as domestic use VRV ASHP units.

Policy A4: *Noise & Vibration* is reproduced below:

Policy A4 Noise and vibration

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. development likely to generate unacceptable noise and vibration impacts; or
b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures 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.

"Camden's Noise & Vibration Thresholds" referenced in Policy A4 as applicable for proposed new plant / equipment such as VRV ASHP units are advised in Table C from Section: *Industrial & Commercial Noise Sources* of Appendix 3 to the Camden Local Plan document as reproduced below:

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 57dBL_{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 88dBL_{Amax}

Supporting notes to Table C and as relevant for the proposed VRV ASHP unit in this instance include:

- A Rating Level ($L_{Ar,Tr}$ dB) of 10dB below the background noise (15dB if tonal components are present) should be considered the design criterion, the Rating Level established as per the provisions of BS4142:2014;
- The periods in Table C correspond to 7am to 11pm for the day & 11pm to 7am for the night;
- For smaller equipment such as air source heat pumps where achievement of the Rating Level may not afford protection, the Council will generally also require NR35 or below. To be achieved (in terms of $L_{eq,5mins}$ dB octave band levels) 1m externally from the façade of premises located in a quiet background area.

Full title of the current edition of the referenced British Standard is BS4142:2014+A1:2019 "*Methods for rating and assessing industrial and commercial sound"*. All reference within this report to BS4142:2014 relates to this current edition of the standard.

Note that as an aid to clarity and consistent with wording / guidance of *"Camden's Noise & Vibration Thresholds"* referenced in Policy A4, this report retains use of the more familiar term *"noise"* throughout as opposed to the replacement term *"sound"* of BS4142:2014.

It is the author's experience of undertaking many surveys and assessments of noise from air source heat pumps and similar equipment items in similar scenarios and contexts to that as Flat 1, 69 Greencroft Gardens, that compliance with London Borough of Camden's policy requirements would mean noise from the proposed new VRV ASHP unit is not generally audible / disturbing or otherwise of impact to neighbouring residential occupiers.

Additional clarification points relevant to the assessment and noise criteria are provided below:

VRV ASHP Unit Operating Mode

The noise criteria are cautiously/robustly applied for the VRV ASHP unit operating at standard duty (i.e. full normal 100% capacity), potentially over a complete 24-hour period (i.e. including during the middle of the night). In practice it is expected the VRV ASHP unit would operate at a reduced capacity (and thus with reduced noise output over standard duty) for much of the time including during the late evening and night period. Manufacturer noise data for the VRV ASHP unit is provided in Section 4 of this report.

Rating Noise Level

The noise criteria are applied in terms of a noise Rating Level $L_{Ar,Tr}$ dB and thus with any correction for tonal characteristics noise applied as necessary to the VRV ASHP unit noise at the assessment position as per the BS4142:2014 assessment methodology.

Assessment Positions

As per Camden's policy requirements, day and night period (as relevant) noise criteria for the VRV ASHP unit are applied for separate assessment positions; to directly outside nearest windows, also to within nearest external amenity space of neighbouring residential properties to location of the unit.

Background Noise Level

The noise criteria are applied as "worse case", cautiously/robustly based on the representative lowest existing background noise level for the times over 24 hours as relevant for the assessment position, based on results of a six-day background noise survey including sample weekdays and a full weekend (see Section 3 of the report).

Table A from Section *Vibration* of Appendix 3 to the Camden Local Plan document provides vibration level thresholds. The thresholds are applicable for a wide range of vibration sources such as railways, roads, leisure & entertainment premises as well as plant/machinery (so including such as VRV ASHP units), as affecting (i.e. occurring inside) various types of property including residential dwellings. The vibration level thresholds are in terms of Vibration Dose Values (VDVs) and for dwellings with separate level thresholds applicable for the day and night period.

Location for the VRV ASHP unit within the rear garden area of the property is at distance from, and not structurally linked/connected to, neighbouring residential properties. Thus, there is no potential for structure-borne vibration from the unit to transfer to the neighbouring properties and by default Camden's vibration level thresholds will be complied with.

3. NOISE SURVEY

To assess noise from the VRV ASHP unit against London Borough Of Camden's planning consent noise requirements it is necessary to establish background noise levels representative of at the assessment positions. Details of the background noise survey carried out are provided in Sections 3.1 to 3.3.

3.1 Survey Instrumentation

Details of the noise survey instrumentation used are provided in Appendix A. The sound level meter was calibration verified before and after the survey measurements using the UKAS certified calibrator.

3.2 Survey Details & Procedure

It is noted the noise survey was unavoidably conducted during the Government's imposed restrictions as associated with the Covid-19 Pandemic. Consideration of this is included in Section 3.3 of the report.

Although the VRV ASHP unit would likely only tend to operate during the daytime and evening periods, as it is to serve a residential property then it will potentially operate at any time over 24 hours. Therefore, the survey was conducted over at least a full 24-hour period to obtain representative samples of the existing noise climate during the entire range of possible times of unit operation.

The survey was carried out over a six-day period from Thursday 29 April 2021 through to Tuesday 04 May 2021, to include sample weekdays and also a full weekend.

The weather included dry and calm / light wind (i.e. suitable survey conditions) during majority of the day and night periods of the survey with exception from the afternoon of Monday 03 May 2021 through Tuesday 04 May 2021 when some rain and stronger winds occurred. This is indicated on the survey results graph in Appendix C, the background noise survey results are disregarded from the assessment during this time.

Measurements of background noise were recorded continually in terms of consecutive 15-minute samples of overall equivalent free-field $L_{A90,T}$ dB values (T= 15 minutes) over the entire survey duration.

The nearest windows of neighbouring properties to proposed location of the VRV ASHP unit are rear elevation windows of upper floor level other flats within 69 Greencroft Gardens itself and rear elevation windows of the adjacent property at 67 Greencroft Gardens. The nearest of these windows are circa 10m distance from the unit. Nearest external amenity space includes rear elevation balcony/terrace areas of upper floor level other flats within 69 Greencroft Gardens itself and rear garden area of the adjacent property 67 Greencroft Gardens.

The background noise survey position was externally from within the rear garden area of 69 Greencroft Gardens, with the instrumentation microphone nominally 1.5m above ground level and in equivalent free-field conditions as per the procedural guidance of BS4142:2014. The survey position was selected as best practicable and representative of outside nearest windows and external amenity space of neighbouring properties.

A site location block plan, proposed layout drawing, and photograph are provided in Appendix C, annotated to indicate the proposed location for the VRV ASHP unit at low level behind a patio retaining wall within the rear garden area of the property, neighbouring properties and the noise survey measurement position.

3.3 Survey Results, Observations & VRV ASHP Unit Noise Limits

Full raw data results of the six-day noise survey are provided in graphical format in Appendix C.

The survey was unavoidably conducted during the Government's imposed restrictions as associated with the Covid-19 Pandemic, and therefore with a potential consequence of slightly lower than normal conditions background noise levels. Consideration of the noise survey results in respect to this is provided below:

- For date of the survey 29th April - 4th May 2021 the Government's Department for Transport statistics show daily overall traffic volume nationally for Great Britain at circa 97% (average all days excluding bank holiday Monday 3rd May) of normal conditions based on traffic volumes in the first week of February 2020. The figures specifically for goods vehicles are higher and above normal; i.e. > 100% for LGVs & HGVs;
- Broadly applied, overall traffic volume at circa 97% would equate to a theoretical reduction in underlying noise from traffic generally of less than 0.5dB as compared with normal conditions, and therefore not of materially significant difference;
- The site is in a residential area, not in the immediate vicinity of licensed premises (restaurants, pubs, bars or nightclubs etc.) and thus not noise affected by such. The Government's currently imposed restrictions on the hospitality sector does not directly affect noise levels at the site;
- Based on site observation and also noise measurement surveys conducted in similar residential locations in north London, undertaken previously by the author prior to the Covid-19 Pandemic, the survey results obtained are as broadly typical in magnitude and profile to as would be expected under normal conditions.

As per the above consideration, results of the noise survey as measured (i.e. not altered or otherwise corrected), are used for assessment of the proposed VRV ASHP unit at Flat 1, 69 Greencroft Gardens.

Existing background noise levels externally to the rear of the property plus outside neighbouring dwellings are low and predominantly due to underlying noise from distant traffic generally on surrounding roads and streets. Greencroft Gardens is "one-way" and has only occasional passing vehicles.

Noise levels fluctuate during the day and then gradually reduce during the evening and night, being lowest during the middle of the night / early morning between circa 1am to 4am before then increasing again in the morning. This diurnal environmental noise profile is normal for this location where there is traffic on surrounding roads and streets plus the wider area during the day followed by a reduction in traffic during the evening and night.

Summary of the representative lowest measured $L_{A90,T}$ background noise levels and associated VRV ASHP unit noise limits based on London Borough of Camden's noise requirements (as detailed in Section 2 of this report) are shown in Table 1. The background levels and limits are split into two separate time period values such that noise from the VRV ASHP unit to outside windows and to external amenity space of neighbouring residential properties is assessed using the representative lowest background noise during times as relevant.

VRV ASHP Unit Operating Mode	**Assessment Position & Relevant Times**	**Representative Lowest Background Noise Level $L_{A90,15min}$**	**VRV ASHP Unit Noise Limit *(Rating Level)***
Unit operating full 100% duty; cooling or heating mode	External amenity space of neighbouring properties *Assessment range: 7am to 11pm*	34dB	$L_{Ar,Tr}$ ≤24dBA *(10dB below background)* $L_{Ar,Tr}$ ≤19dBA *(15dB below background, applicable if unit noise has tonal components)*
	Outside windows of neighbouring properties *Assessment range: Over 24 hours*	31dB *(occurs during middle of the night circa 2am to 4am)*	$L_{Ar,Tr}$ ≤21dBA *(10dB below background)* $L_{Ar,Tr}$ ≤16dBA *(15dB below background, applicable if unit noise has tonal components)*

Table 1: Measured representative lowest background noise and associated noise limits

4. NOISE FROM VRV ASHP UNIT

The proposed VRV ASHP unit is a Daikin model RXYSCQ5TV1. Manufacturer's noise data for the unit is provided in Appendix D.

The manufacturer data is for the VRV ASHP unit operating at full normal 100% duty for cooling or heating mode. The noise data is in terms of free-field overall dBA and linear octave band dB sound pressure levels at 1m distance in front of the unit.

Summary of noise output from the VRV ASHP unit including octave band values operating full normal 100% duty is shown in Table 2.

Description	Overall dBA	Octave Band Centre Frequency (Hz) (Linear dB)							
		63	125	250	500	1k	2k	4k	8k
Daikin model RXYSCQ5TV1 *(full normal 100% duty cooling or heating mode)*	52	51.0	53.0	51.5	52.5	46.5	40.5	34.0	26.5

Table 2: VRV ASHP unit noise data; free-field sound pressure levels at 1m

Manufacturer noise data for the Daikin model RXYSCQ5TV1 indicates the unit generates a typically broadband type noise without very strong or clearly perceptible tonal elements. This correlates with experience of the author in measuring noise levels from as-installed domestic use same make and same or similar type/size model units.

Notwithstanding this, with the acoustic enclosure noise reduction treatment (see Section 6.1 of the report), any residual tonal components will tend to be supressed and noise from the VRV ASHP unit to neighbouring properties will be substantially below the lowest background noise. Therefore, the noise criterion 10dB below background of London Borough of Camden's planning consent noise requirement is applied.

To calculate the noise contribution from the VRV ASHP unit to the assessment positions outside nearest windows and to external amenity space of neighbouring properties a spreadsheet-based noise model has been used. The model takes account of the distance between the VRV ASHP unit and the assessment positions, acoustic directivity, acoustic reflections and any natural line of sight acoustic screening.

The noise model calculation also takes account of the acoustic enclosure (noise reduction treatment) applied to the VRV ASHP unit as specified in Section 6.1 of this report.

Noise model calculation details are provided in Appendix E.

The overall calculated noise Rating Level from the proposed VRV ASHP unit to outside nearest windows and to external amenity space of neighbouring residential properties compared with London Borough of Camden's noise requirement is shown in Table 3 on the following page .

Noise from the VRV ASHP unit to outside other windows of neighbouring properties and/or other external amenity spaces that are more distant from, or more significantly screened from, location of the unit will be lower.

VRV ASHP Unit Operating Mode	Assessment Position & Relevant Times	VRV ASHP Unit Overall Noise Level *(Rating Level)*	Noise Limit	Comment
Unit operating full 100% duty; cooling or heating mode	External amenity space of neighbouring properties *Assessment time range: 7am to 11pm*	≤21dB	$L_{Ar,Tr}$ ≤24dBA	Complies
	Outside windows of neighbouring properties *Assessment time range: Over 24 hours*	≤19dB	$L_{Ar,Tr}$ ≤21dBA	Complies

Table 3: Noise from proposed VRV ASHP unit to assessment positions

Table 3 shows that noise from the proposed VRV ASHP unit with the specified acoustic louvre enclosure noise reduction treatment (see Section 6.1), complies with the noise limit criteria as per London Borough of Camden's requirements.

At this level, noise from the VRV ASHP unit will be significantly below existing lowest background noise levels and be subjectively very low such that it would not be expected to give rise to any noise impact or disturbance affecting the amenity of residential neighbours.

Additionally, it is important to note the noise model calculation and associated assessment is cautious and in practice noise from the proposed VRV ASHP unit is expected to be lower than the calculated values in Table 3 and thus further below the background noise and noise limit requirement for the following reasons:

- The calculation is for the VRV ASHP unit operating at full 100% duty (cooling or heating mode); at all times over 24 hours including throughout the entire late evening and night period, this is extremely unlikely to occur for majority of the time;
- For the late evening and night period it is more likely the unit would operate at reduced (set-back) capacity and consequently under night quiet (lower noise) mode. Manufacturer's data for the Daikin model RXYSCQ5TV1 indicates three "set-back" night quiet modes for the unit, at respectively -5dBA, -8dBA and -11dBA as compared with full normal 100% duty as per the noise assessment in this report. Thus, during the late evening and night it is expected actual noise from the unit will be further and substantially below the background noise and noise limit requirement;
- The calculation allows no acoustic directivity benefit; even though the unit's orientation means it does not face directly towards the nearest neighbouring residential properties;
- The noise limit used for the windows assessment position is very cautiously based on the representative lowest measured background noise level over 24 hours (i.e. including middle of the night), over several days. Background noise for the majority of the time, including during parts of the night on some days is higher than the lowest value used for the assessment, and correspondingly for these times noise from the unit would be further below the background noise and associated noise limits applicable to these times based on the background noise occurring during these times.

In addition to the assessment as detailed on the previous page and in Table 3, noise from the VRV ASHP unit to outside nearest windows of the neighbouring properties is also assessed against London Borough of Camden's NR value noise limit requirement (NR35) as detailed in Table 4:

Description	NR Value	Octave Band Centre Frequency (Hz) ($L_{eq,5mins}$ dB)							
		63	125	250	500	1k	2k	4k	8k
London Borough of Camden NR value limit	≤NR35	≤63	≤52	≤45	≤39	≤35	≤32	≤30	≤29
Noise from VRV ASHP unit Daikin RXYSCQ5TV1 operating full 100% duty to outside nearest windows of neighbouring properties	NR16	26	25	22	20	10	3	-	-
Excess of unit noise on NR limit *(no excess)*	-	-	-	-	-	-	-	-	-

Table 4: Noise from proposed VRV ASHP unit; NR value assessment

Table 4 shows that noise from the VRV ASHP unit within the specified acoustic enclosure (noise reduction treatment - see Section 6.1), readily complies with the NR35 noise limit criterion as per London Borough of Camden's requirements.

This additional NR value limit assessment confirms noise from the proposed VRV ASHP unit will be significantly / subjectively very low and not expected to give rise to any noise impact or disturbance affecting the amenity of residential neighbours.

5. VIBRATION FROM VRV ASHP UNIT

Proposed location of the VRV ASHP unit is at distance from, and not structurally linked to, neighbouring residential dwellings. Therefore, there will be no potential for any structure-borne vibration from the unit to transfer to neighbouring properties.

Notwithstanding this, then as good practice it is advised the VRV ASHP unit be installed on conventional proprietary vibration isolators. Specification details for suitable vibration isolators are provided in Section 6.2 of the report

6. SPECIFICATIONS FOR NOISE & VIBRATION TREATMENTS

Note that whilst this report is based on the specific make and model of VRV ASHP unit as detailed in Section 4 (Daikin model RXYSCQ5TV1), if as part of any future equipment replacement, an alternative unit make and/or model is selected then it is important that noise levels for the alternative unit be checked/verified by Philip Acoustics or another Acoustic Consultant to ensure the noise reduction and vibration isolation treatments specified below remain valid and noise emissions from the alternative replacement unit remain compliant with London Borough Of Camden's noise requirements.

6.1 Noise

To ensure compliance with London Borough of Camden's noise requirements it is proposed the VRV ASHP unit be located within an acoustic louvre enclosure as indicated on the layout plan drawing in Appendix F.

Note that Philip Acoustics can only advise on acoustic (noise and vibration) issues and therefore professional advice from others may need to be sought to confirm aspects of the acoustic louvre enclosure with regard to non-acoustic issues such as visual appearance, structural loading, maintenance access and airflow ventilation.

Use of an acoustic louvre enclosure is a normal / standard method of noise reduction treatment for singular or small quantity and domestic type external ASHP units or similar equipment in this scenario, and in non-technical terms essentially forms a "soundproof" box over and around the unit. The acoustic louvre enclosure is required to reduce noise levels of the VRV ASHP unit in overall terms by at least 9dBA.

Although outside of the scope for this acoustic (noise assessment) report, the use of an acoustic louvre enclosure will also have the benefit of visually screening the VRV ASHP unit.

A typical acoustic enclosure would have acoustic louvres to the front (and sides and/or top) to permit airflow to/from the unit and with the remaining non-acoustic louvre parts of the enclosure's outer structure (if not formed by adjacent walls), being formed by normal/standard type proprietary 25mm to 50mm thick acoustic panels, being solid one side (minimum 20swg sheet steel) and perforated the other (typically perforated 22swg sheet steel) with 25mm to 50mm thick acoustic grade mineral wool absorptive lining. The perforated (absorptive) side of the enclosure panels need to face inwards towards the unit.

Proprietary 25mm to 50mm thick acoustic panels as the specification details above are available as standard from most acoustic hardware suppliers.

The acoustic panel parts of the enclosure can be painted or over-clad externally to whatever specification / material as required for visual reasons.

The recommended minimum performance requirement for the enclosure acoustic louvres is shown in Table 5. As normal for noise reduction treatments, the performance specification is for different amounts in different frequency bands, but with requirement to achieve an overall noise reduction of at least 9dBA.

Description	Octave Band Centre Frequency (Hz)								Comments
	63	125	250	500	1k	2k	4k	8k	
Acoustic Louvre Insertion Loss dB	3	6	8	11	15	16	13	12	Overall noise reduction ≥ -9dBA suitable acoustic louvres would be typically 300mm depth type

Table 5: Acoustic louvre performance specification *(typical for nominal 300mm depth acoustic louvres)*

The Table 5 acoustic louvre specification is based on using a proprietary nominal 300mm depth type acoustic louvre as available from most acoustic hardware suppliers.

Technical data sheets for three example suitable 300mm depth acoustic louvres (suppliers Allaway Acoustics, Kingfisher and McKenzie Martin) are provided in Appendix F.

Note that different acoustic suppliers have slightly differing performance data for their 300mm depth acoustic louvres. Therefore, some supplier data may indicate slight variation in performance as compared with the octave band specification data in Table 5, however this is recommended acceptable providing the acoustic louvres are 300mm depth type.

It is anticipated the acoustic louvres forming the enclosure will need to be demountable to enable maintenance access to the unit. This would be achieved typically by using easy release acoustic louvered access panels (as opposed to acoustic louvre doors which are more costly and unnecessary for this relatively small size enclosure). All cable and pipe entry points into and out of the enclosure should be sealed airtight.

6.2 Vibration

As detailed in Section 5, it is advised as good practice that the VRV ASHP unit be installed using conventional proprietary vibration isolator mountings.

Appropriate proprietary vibration isolators for the VRV ASHP unit are rubber or neoprene turret type mountings. The vibration isolators should each have a static deflection nominally ≥3mm under the weight / loading of the unit. Normally four isolators are required for a unit; one to each mounting corner position of the unit.

Details of three example suppliers and their typically suitable vibration isolators are provided below. The stated gross weight (kg) for the Daikin unit model RXYSCQ5TV1 is for the unit itself plus refrigerant charge.

The suppliers are not listed in any order of preference, a copy of each of the supplier's data sheets for the suitable isolators is provided in Appendix G. Other suppliers will also be able to offer suitable / equivalent vibration isolators.

Example Supplier 1:

EMTEC: www.emtecproducts.co.uk Isolator type: Neoprene Mountings Series R/RD

Daikin model RXYSCQ5TV1 (gross weight 98kg) = Isolator R-1 Red (max load per mount 31.7kg)

Example Supplier 2:

Christie & Grey: www.christiegrey.co.uk Isolator type: Rubber Turret Mountings RM

Daikin model RXYSCQ5TV1 (gross weight 98kg) = Isolator RM 19.100.Y.F Yellow (max load per mount 28kg)

Example Supplier 3:

Vibracoustics: www.vibracoustics.com Isolator type: Vi-Turret Mountings

Daikin model RXYSCQ5TV1 (gross weight 98kg) = Isolator VS42000 Yellow (max load per mount 35kg)

APPENDIX A

Noise Survey Instrumentation

Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

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Date: May 2021

NOISE SURVEY INSTRUMENTATION

Six-day Noise Survey Thursday 29 April 2021 - Tuesday 04 May 2021:

- Rion sound level meter type NL-31 Class 1 serial number 00773045 (in locked & tamperproof environmental case) plus Rion preamplifier type NH-21 serial number 25056 with Rion microphone type UC-53A serial number 313002 and Rion microphone extension cable type EC-04A, Rion outdoor microphone windshield type WS-10 and tripod / extension boom arrangement;
- Bruel & Kjaer calibrator type 4231 serial number 2326801 (UKAS certified);
- Speedtech Instruments Skymaster model SM-28 serial number 19370 (for sample weather conditions data during attended parts of survey).

APPENDIX B

Site Location Block Plan, Proposed Layout Drawing & Photograph

Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

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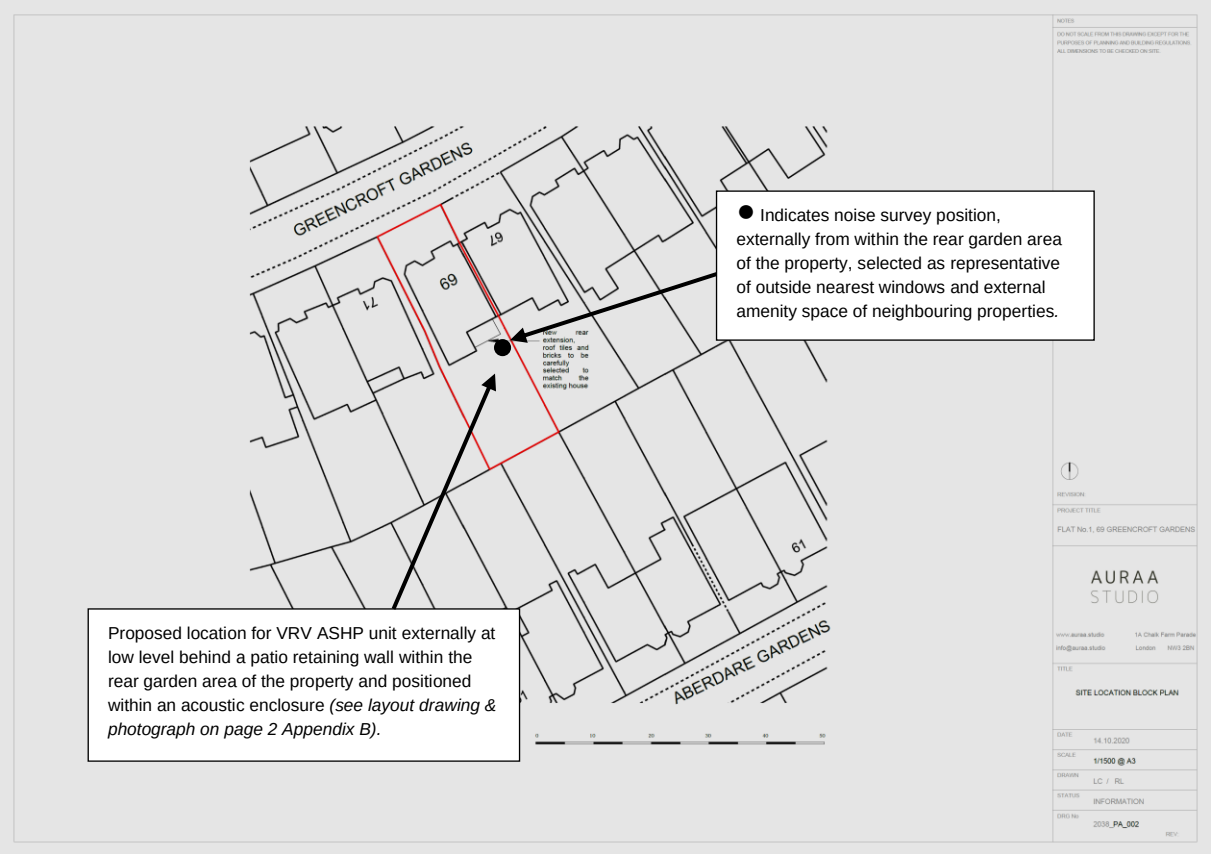
Date: May 2021

SITE LOCATION BLOCK PLAN



Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

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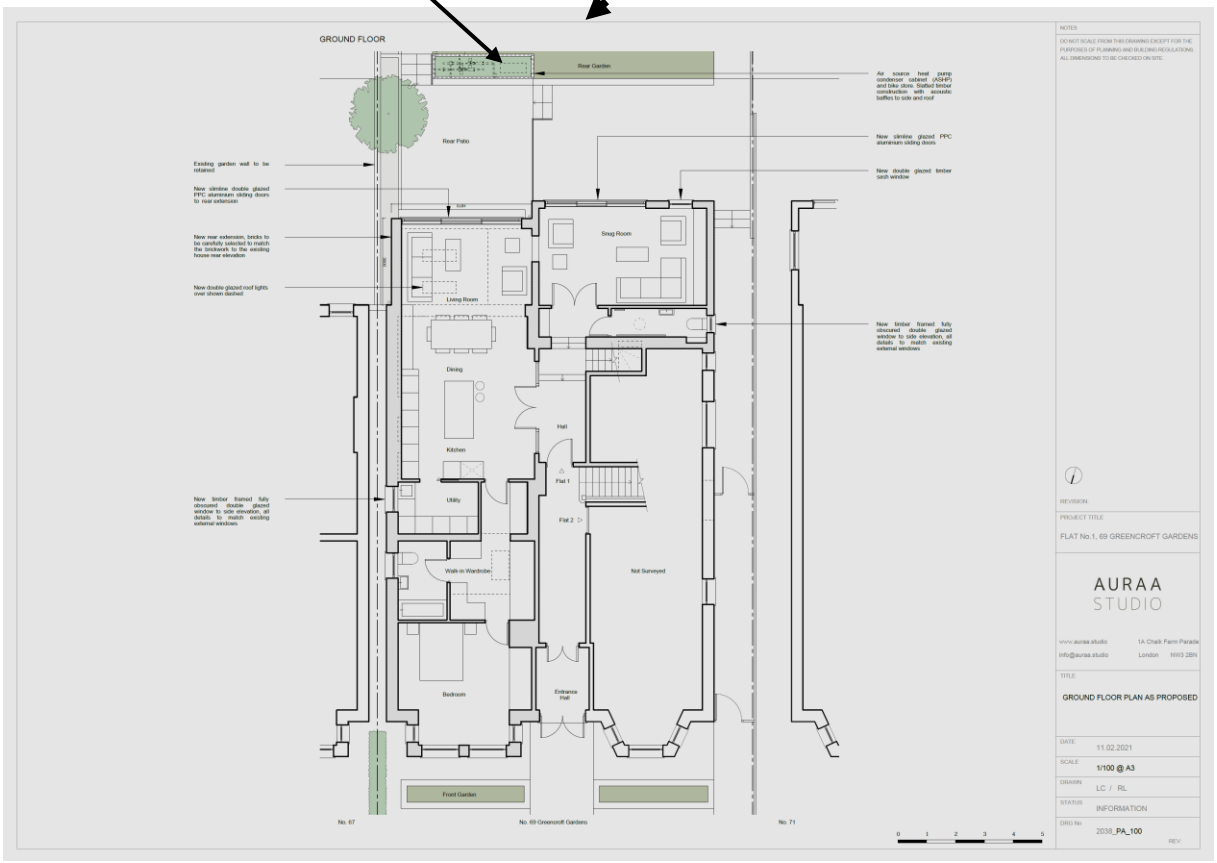
Date: May 2021

PROPOSED LAYOUT DRAWING & PHOTOGRAPH



APPENDIX C

Background Noise Survey Results

Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

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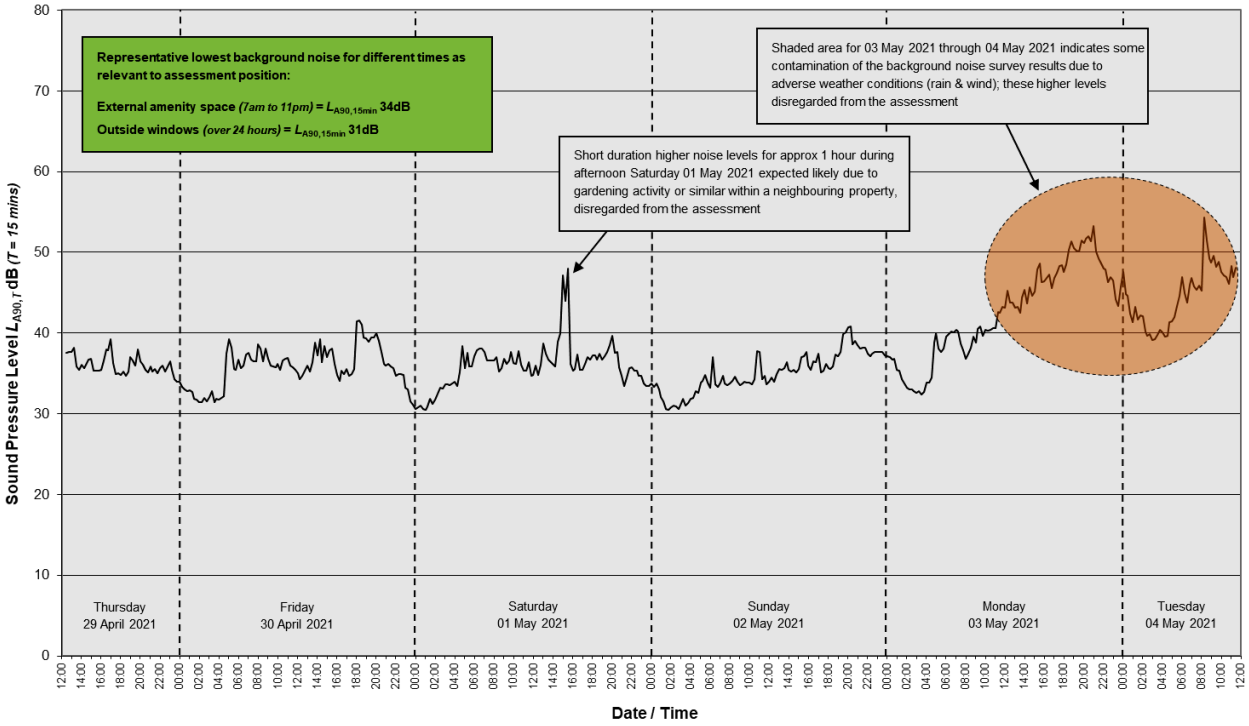
Date: May 2021

NOISE SURVEY RESULTS

Graphical Format Raw Data Six-Day Noise Survey Thursday 29 April 2021 - Tuesday 04 May 2021:



APPENDIX D

Manufacturer's Noise Data For Proposed VRV ASHP Unit

Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

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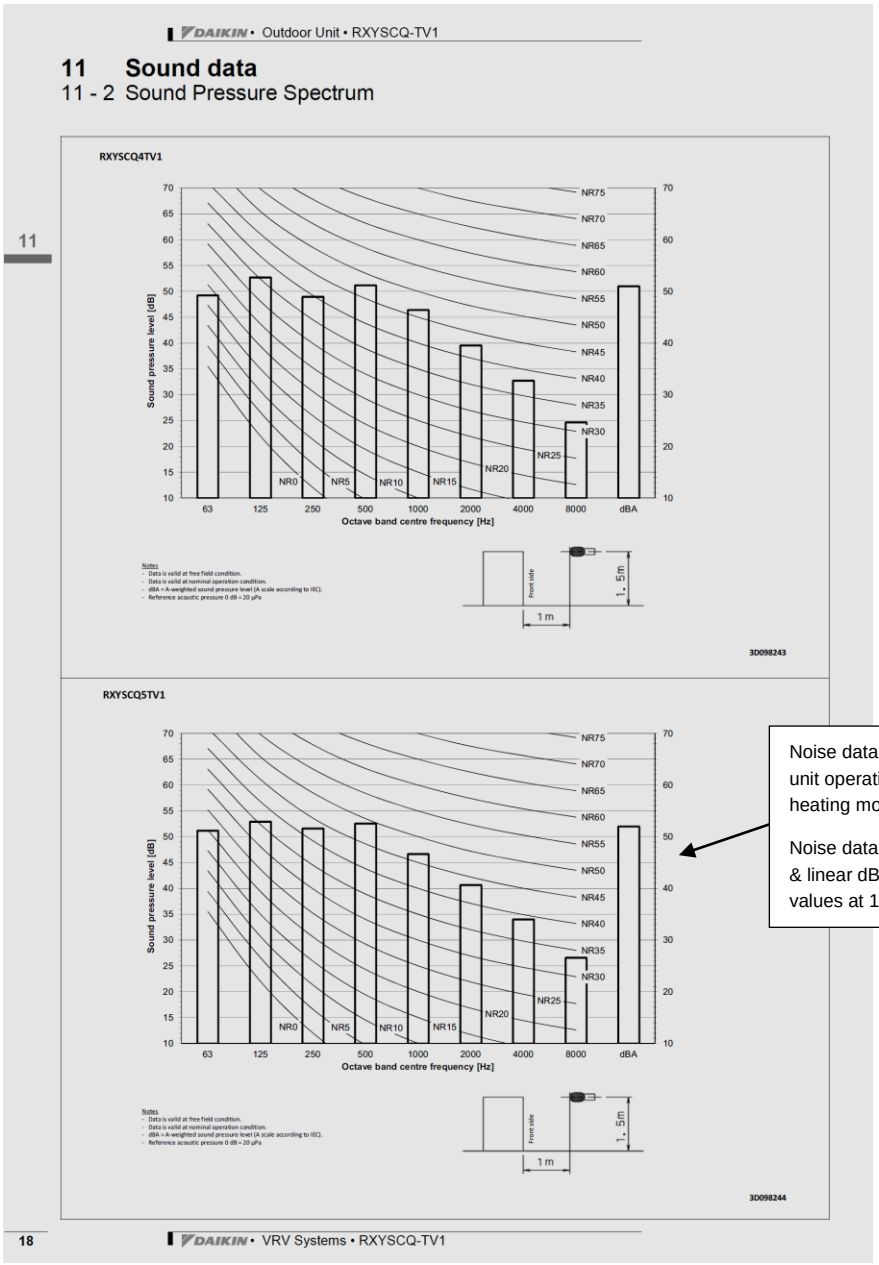
Date: May 2021

MANUFACTURER'S NOISE DATA FOR PROPOSED VRV ASHP UNIT

Daikin model RXYSCQ5TV1



Noise data for Daikin model RXYSCQ5TV1, unit operating full 100% duty cooling or heating mode.

Noise data is in terms of free field overall dBA & linear dB octave band sound pressure level values at 1m in front of the unit.

APPENDIX E

Noise Model Calculation For Proposed VRV ASHP Unit

Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

Report: 21051-002 Appendix E *(page 1 of 3)*

Date: May 2021

NOISE MODEL CALCULATION FOR PROPOSED VRV ASHP UNIT

Assessment Position: Garden area (external amenity space) of neighbouring property 67 Greencroft Gardens

Noise Condition: 1 x VRV ASHP Unit Daikin model RXYSCQ5TV1 operating full 100% duty cooling or heating mode

Noise Mitigation: VRV ASHP Unit in acoustic louvre enclosure *(see Section 6.1 Report 21051-002)*

		Lin dB at Octave Band Centre Frequency Hz							
Equipment & Description	**Overall dBA**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
VRV ASHP UNIT: 1 X Daikin model RXYSCQ5TV1									
Sound pressure level data at 1m (free-field); *Lp dB for unit operating full 100% duty cooling or heating mode*	52	51.0	53.0	51.5	52.5	46.5	40.5	34.0	26.5
Quantity; *0dB unit quantity correction applicable for 1 x unit*		0	0	0	0	0	0	0	0
Noise Mitigation; *unit within acoustic enclosure (300mm depth type acoustic louvres)*		-3	-6	-8	-11	-15	-16	-13	-12
Distance; *≈6m from unit to external amenity space assessment position*		-15.6	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6
Screening; *complete line of sight screening correction applicable (garden boundary wall), limit to -10dB*		-10	-10	-10	-10	-10	-10	-10	-10
Directivity; *nil propagation directivity correction applicable for VRV ASHP units*		0	0	0	0	0	0	0	0
Reflections; *+3dB correction applied for unit adjacent to patio retaining wall (i.e. non free-field conditions)*		3	3	3	3	3	3	3	3
Contribution at assessment position	19	25.4	24.4	20.9	18.9	8.9	1.9	-1.6	-8.1
Cumulative contribution all sources at assessment position	**19**	**25**	**24**	**21**	**19**	**9**	**2**	**-2**	**-8**

The overall noise level at the assessment position from the VRV ASHP unit operating full 100% duty is 19dBA.

Noise generated by the VRV ASHP unit at the assessment position is substantially below the representative lowest background noise, plus the proposed Daikin model RXYSCQ5TV1 generates a broadband characteristic noise (i.e. no strong / dominant prevailing tonal components). Notwithstanding this, the proposed acoustic enclosure noise reduction treatment will tend to supress any residual (albeit non-expected) tonal or other noise characteristics of the unit.

As per the assessment provisions of BS4142:2014, no tonal character correction is applied and the VRV ASHP unit noise Rating Level to the assessment position = $L_{Ar,Tr}$ 19dB.

Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

Report: 21051-002 Appendix E *(page 2 of 3)*

Date: May 2021

NOISE MODEL CALCULATION FOR PROPOSED VRV ASHP UNIT

Assessment Position: Rear terraces / balconies (external amenity space) of upper floor flats 69 Greencroft Gardens

Noise Condition: 1 x VRV ASHP Unit Daikin model RXYSCQ5TV1 operating full 100% duty cooling or heating mode

Noise Mitigation: VRV ASHP Unit in acoustic louvre enclosure *(see Section 6.1 Report 21051-002)*

		Lin dB at Octave Band Centre Frequency Hz							
Equipment & Description	**Overall dBA**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
VRV ASHP UNIT: 1 X Daikin model RXYSCQ5TV1									
Sound pressure level data at 1m (free-field); *Lp dB for unit operating full 100% duty cooling or heating mode*	52	51.0	53.0	51.5	52.5	46.5	40.5	34.0	26.5
Quantity; *0dB unit quantity correction applicable for 1 x unit*		0	0	0	0	0	0	0	0
Noise Mitigation; *unit within acoustic enclosure (300mm depth type acoustic louvres)*		-3	-6	-8	-11	-15	-16	-13	-12
Distance; *≈8m from unit to external amenity space assessment position*		-18.1	-18.1	-18.1	-18.1	-18.1	-18.1	-18.1	-18.1
Screening; *partial line of sight screening correction applicable (patio retaining wall), limit to -5dB*		-5	-5	-5	-5	-5	-5	-5	-5
Directivity; *nil propagation directivity correction applicable for VRV ASHP units*		0	0	0	0	0	0	0	0
Reflections; *+3dB correction applied for unit adjacent to patio retaining wall (i.e. non free-field conditions)*		3	3	3	3	3	3	3	3
Contribution at assessment position	21	27.9	26.9	23.4	21.4	11.4	4.4	0.9	-5.6
Cumulative contribution all sources at assessment position	**21**	**28**	**27**	**23**	**21**	**11**	**4**	**1**	**-6**

The overall noise level at the assessment position from the VRV ASHP unit operating full 100% duty is 21dBA.

Noise generated by the VRV ASHP unit at the assessment position is substantially below the representative lowest background noise, plus the proposed Daikin model RXYSCQ5TV1 generates a broadband characteristic noise (i.e. no strong / dominant prevailing tonal components). Notwithstanding this, the proposed acoustic enclosure noise reduction treatment will tend to supress any residual (albeit non-expected) tonal or other noise characteristics of the unit.

As per the assessment provisions of BS4142:2014, no tonal character correction is applied and the VRV ASHP unit noise Rating Level to the assessment position = $L_{Ar,Tr}$ 21dB.

Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

Report: 21051-002 Appendix E *(page 3 of 3)*

Date: May 2021

NOISE MODEL CALCULATION FOR PROPOSED VRV ASHP UNIT

Assessment Position: Outside nearest windows of neighbouring properties - upper floor flats 69 Greencroft Gardens

Noise Condition: 1 x VRV ASHP Unit Daikin model RXYSCQ5TV1 operating full 100% duty cooling or heating mode

Noise Mitigation: VRV ASHP Unit in acoustic louvre enclosure *(see Section 6.1 Report 21051-002)*

		Lin dB at Octave Band Centre Frequency Hz							
Equipment & Description	**Overall dBA**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
VRV ASHP UNIT: 1 X Daikin model RXYSCQ5TV1									
Sound pressure level data at 1m (free-field); *Lp dB for unit operating full 100% duty cooling or heating mode*	52	51.0	53.0	51.5	52.5	46.5	40.5	34.0	26.5
Quantity; *0dB unit quantity correction applicable for 1 x unit*		0	0	0	0	0	0	0	0
Noise Mitigation; *unit within acoustic enclosure (300mm depth type acoustic louvres)*		-3	-6	-8	-11	-15	-16	-13	-12
Distance; ≈10*m from unit to nearest windows assessment position*		-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
Screening; *partial line of sight screening correction applicable (patio retaining wall), limit to -5dB*		-5	-5	-5	-5	-5	-5	-5	-5
Directivity; *nil propagation directivity correction applicable for VRV ASHP units*		0	0	0	0	0	0	0	0
Reflections; *+3dB correction applied for unit adjacent to patio retaining wall (i.e. non free-field conditions)*		3	3	3	3	3	3	3	3
Contribution at assessment position	19	26.0	25.0	21.5	19.5	9.5	2.5	-1.0	-7.5
Cumulative contribution all sources at assessment position	**19**	**26**	**25**	**22**	**20**	**10**	**3**	**-1**	**-8**

The overall noise level at the assessment position from the VRV ASHP unit operating full 100% duty is 19dBA.

Noise generated by the VRV ASHP unit at the assessment position is substantially below the representative lowest background noise, plus the proposed Daikin model RXYSCQ5TV1 generates a broadband characteristic noise (i.e. no strong / dominant prevailing tonal components). Notwithstanding this, the proposed acoustic enclosure noise reduction treatment will tend to supress any residual (albeit non-expected) tonal or other noise characteristics of the unit.

As per the assessment provisions of BS4142:2014, no tonal character correction is applied and the VRV ASHP unit noise Rating Level to the assessment position = $L_{Ar,Tr}$ 19dB.

APPENDIX F

Details For Noise Reduction Treatment

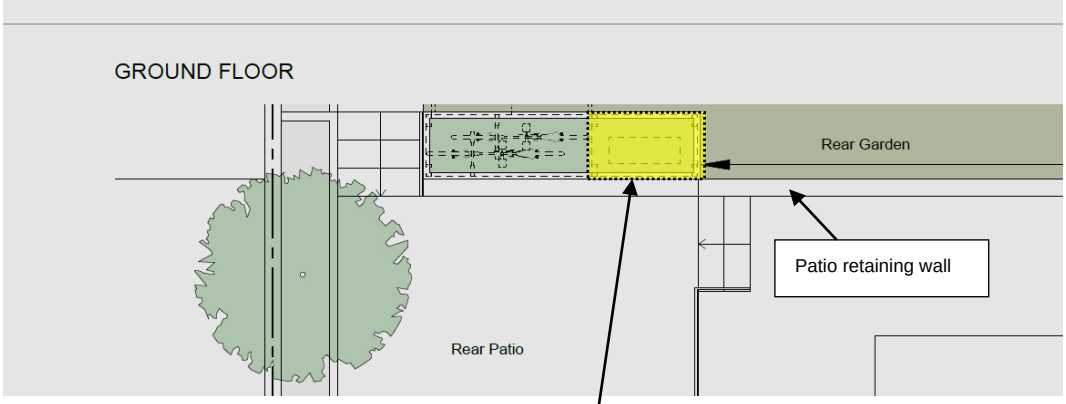
Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

Report: 21051-002 Appendix F *(page 1 of 4)*

Date: May 2021

DETAILS FOR NOISE REDUCTION TREATMENT

Part Copy Enlarged Layout Drawing Indicating VRV ASHP Unit In Acoustic Enclosure *(noise reduction treatment)*



VRV ASHP unit located externally at low level behind patio retaining wall within the rear garden area of the property in an acoustic enclosure acoustic louvre enclosure (indicated yellow)

Photograph of a typical example acoustic louvre enclosure around an external domestic use air conditioning unit / VRV ASHP unit serving a residential dwelling, this example enclosure is wall mounted with acoustic panel sides, top & bottom plus acoustic louvre to front. *This typical acoustic louvre enclosure was required to be painted black for planning reasons.*

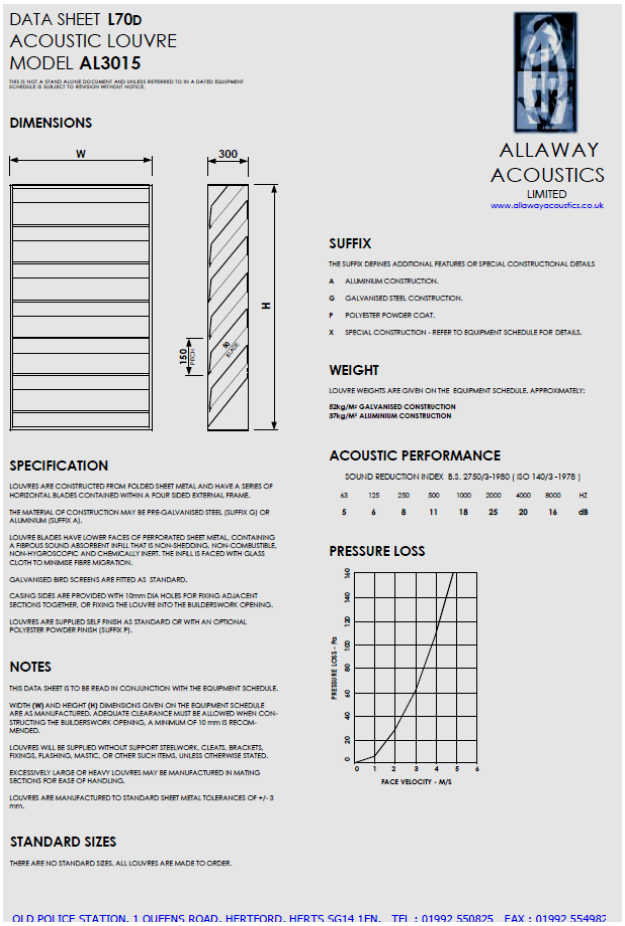
Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

Report: 21051-002 Appendix F *(page 2 of 4)*

Date: May 2021

DETAILS FOR NOISE REDUCTION TREATMENT

Data Sheet For Example 300mm Acoustic Louvre: Allaway Acoustics



DATA SHEET **L70D**
ACOUSTIC LOUVRE
MODEL **AL3015**

THIS IS NOT A STAND ALONE DOCUMENT AND UNLESS REFERRED TO IN A DATED EQUIPMENT SCHEDULE IS SUBJECT TO REVISION WITHOUT NOTICE.

DIMENSIONS

ALLAWAY ACOUSTICS LIMITED
www.allawayacoustics.co.uk

SUFFIX

THE SUFFIX DEFINES ADDITIONAL FEATURES OR SPECIAL CONSTRUCTIONAL DETAILS

A ALUMINIUM CONSTRUCTION.
G GALVANISED STEEL CONSTRUCTION.
P POLYESTER POWDER COAT.
X SPECIAL CONSTRUCTION - REFER TO EQUIPMENT SCHEDULE FOR DETAILS.

WEIGHT

LOUVRE WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE. APPROXIMATELY:

52kg/M² GALVANISED CONSTRUCTION
37kg/M² ALUMINIUM CONSTRUCTION

ACOUSTIC PERFORMANCE

SOUND REDUCTION INDEX B.S. 2750/3-1980 (ISO 140/3-1978)

63	125	250	500	1000	2000	4000	8000	Hz
5	6	8	11	18	25	20	16	dB

SPECIFICATION

LOUVRES ARE CONSTRUCTED FROM FOLDED SHEET METAL AND HAVE A SERIES OF HORIZONTAL BLADES CONTAINED WITHIN A FOUR SIDED EXTERNAL FRAME.

THE MATERIAL OF CONSTRUCTION MAY BE PRE-GALVANISED STEEL (SUFFIX G) OR ALUMINIUM (SUFFIX A).

LOUVRE BLADES HAVE LOWER FACES OF PERFORATED SHEET METAL, CONTAINING A FIBROUS SOUND ABSORBENT INFILL THAT IS NON-SHEDDING, NON-COMBUSTIBLE, NON-HYGROSCOPIC AND CHEMICALLY INERT. THE INFILL IS FACED WITH GLASS CLOTH TO MINIMISE FIBRE MIGRATION.

GALVANISED BIRD SCREENS ARE FITTED AS STANDARD.

CASING SIDES ARE PROVIDED WITH 10mm DIA HOLES FOR FIXING ADJACENT SECTIONS TOGETHER, OR FIXING THE LOUVRE INTO THE BUILDERSWORK OPENING.

LOUVRES ARE SUPPLIED SELF FINISH AS STANDARD OR WITH AN OPTIONAL POLYESTER POWDER FINISH (SUFFIX P).

PRESSURE LOSS

NOTES

THIS DATA SHEET IS TO BE READ IN CONJUNCTION WITH THE EQUIPMENT SCHEDULE.

WIDTH (W) AND HEIGHT (H) DIMENSIONS GIVEN ON THE EQUIPMENT SCHEDULE ARE AS MANUFACTURED. ADEQUATE CLEARANCE MUST BE ALLOWED WHEN CONSTRUCTING THE BUILDERSWORK OPENING. A MINIMUM OF 10 mm IS RECOMMENDED.

LOUVRES WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, CLEATS, BRACKETS, FIXINGS, FLASHING, MASTIC, OR OTHER SUCH ITEMS, UNLESS OTHERWISE STATED.

EXCESSIVELY LARGE OR HEAVY LOUVRES MAY BE MANUFACTURED IN MATING SECTIONS FOR EASE OF HANDLING.

LOUVRES ARE MANUFACTURED TO STANDARD SHEET METAL TOLERANCES OF +/- 3 mm.

STANDARD SIZES

THERE ARE NO STANDARD SIZES. ALL LOUVRES ARE MADE TO ORDER.

OLD POLICE STATION, 1 QUEENS ROAD, HERTFORD, HERTS SG14 1EN. TEL : 01992 550825 FAX : 01992 554982

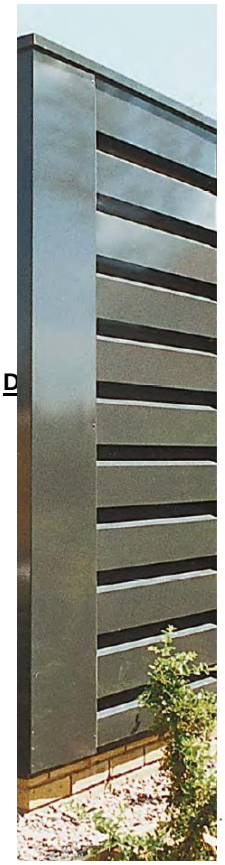
Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

Report: 21051-002 Appendix F *(page 3 of 4)*

Date: May 2021

DETAILS FOR NOISE REDUCTION TREATMENT

Data Sheet For Example 300mm Acoustic Louvre: Kingfisher



Kingfisher

KA ACOUSTIC LOUVRES

KA Acoustic louvres
Acoustically treated louvres providing permanent ventilation combined with reduction of airborne sound transmission into or out of buildings. The louvres also provide weather protection, and are supplied as framed modular panels.

Applications
Can be used to provide airborne sound attenuation at ducted fan inlets and discharge outlets in plant room walls or elsewhere. Also for general plant room ventilation with sound attenuation.

Can be installed behind standard Kingfisher louvres or as an architectural feature of a building in themselves.

Composition
Standard louvre blades: galvanised steel sheet with no further applied finish.

To special order: stainless steel, British Steel HP200 plastic coated steel sheet.

The acoustic medium is non-toxic mineral wool, density 45kg/m³, packed at 10% compression to eliminate voids, and held in position within the louvre blades by perforated galvanised steel sheet.

Accessories
Mitred corners where required, and a variety of edge trims and flashings to suit the installation.

Bird/vermin guard: HDPE or expanded aluminium, hole size 15mm.

Insect guard: HDPE, hole size 4mm.

Single and double access doors also available with the same acoustic treatment.

Size, shape
Blade centres and blade angle are fixed, to achieve the stated acoustic performance.

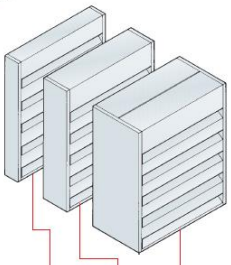
Any practicable height or width of installation is possible.

Maximum module size 2.5 x 2.5m.

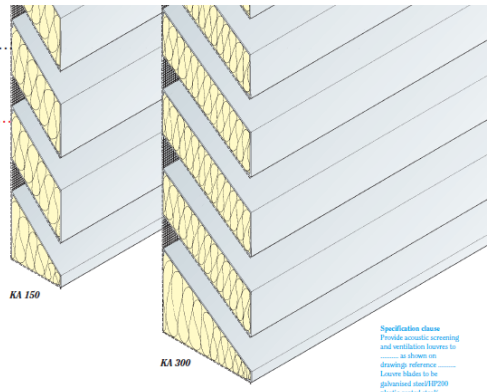
Appearance
Standard finish: galvanised steel.

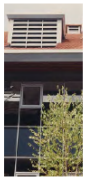
Alternative finishes: polyester powder coating to BS 6496, oven-baked spray coating, HP 200 plastic coating (in a range of BS/RAL colours), stainless steel.

Maintenance
Periodic cleaning is required to maintain appearance for finished products.



Blade type	KA 150	KA 300	KA 600
Overall depth	150mm	270mm	540mm
Free area	36%	37%	37%
Weight	28kg/m²	50kg/m²	100kg/m²

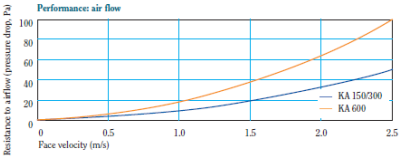




Performance: acoustic
Airborne sound insulation independently measured by Sound Research Laboratories to BS 2750: Part 5.

Louvre type	Depth	Airborne sound reduction index (dB) at octave band mid frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
KA 150	150mm	2	3	4	8	13	11	9	8
KA 300	270mm	4	7	10	12	15	16	13	12
KA 600	540mm	6	8	12	21	32	33	26	24

Performance: air flow



Specification clause
Provide acoustic screening and ventilation louvres to ..... as shown on drawing reference ..... Louvre blades to be galvanised steel/HP200 plastic coated steel/ stainless steel*. Other applied finish to galvanised steel: polyester powder coating to BS 6496/oven-baked spray coating*. Colour: ..... Acoustic medium: non-toxic mineral wool, density 45kg/m³, packed at 10% compression to eliminate voids, and held in position within louvre blades by perforated galvanised steel sheet. Louvre type: KA 150/ KA 300/KA 600*. Accessories: HDPE/ aluminium* bird guard/ insect guard*. Louvres to be supplied by Kingfisher Louvre Systems Ltd, Plymouth Avenue, Brookhill Industrial Estate, Pinxton, Nottingham NG16 6NS. Tel: 01773 814102. Fax: 01773 814103. Email: info@kingfisherlouvres.com *Delete as applicable.

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Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

Report: 21051-002 Appendix F *(page 4 of 4)*

Date: May 2021

DETAILS FOR NOISE REDUCTION TREATMENT

Data Sheet For Example 300mm Acoustic Louvre: McKenzie Martin

McKenzie Martin Ltd

LOUVRE AND NATURAL VENTILATION SPECIALISTS

Acoustic Louvres

McKenzie Martin—Louvres and Natural Ventilation
Eton Hill Works, Eton Hill Road, Radcliffe, Manchester. M26 2US
Www.McKenzieMartin.co.uk Sales@McKenzieMartin.co.uk Tel: 0161 723 2234

Acoustic Louvres

Available Features

- Various Shapes to Suit Requirements
- Concealed Mullions
- Box Frames, Flanges, Cills, Flashing
- Bird/Fly Mesh
- Blanking Plates (Single Skin or Insulated)
- Integral Doors
- Turrets
- Double/Multiple Banks

Available Finishes

- Natural Mill Finish
- Polyester Powder Coated to your choice of RAL
- British Steel Plastisol in a standard RAL colour

The System

Designed as an effective means of reducing sound transmittance whilst allowing weathered ventilation, McKenzie Martin Acoustic Louvres are suitable for vertical mounting into sidewall cladding or brickwork and may be installed singly, in horizontal runs or vertical tiers. The units are available in pitches of 100mm, 150mm and 300mm to suit.

Each model of louvre blade incorporates sound absorption material which is contained within a double layer of perforated mesh and provides sound reduction per the table below. The units are simple to install and maintain and may be used in conjunction with roof ventilators to provide an overall system of natural and or fire ventilation. The louvres are made to measure and offered in a variety of materials and finishes to suit specific requirements

Acoustic Performance

All units have been subjected to a series of controlled sound transmission tests to the specification shown in BS EN ISO 10140-2:2010. The results are shown in the tables below.

100mm Unit		150mm Unit		300mm Unit	
Octave Band Centre Frequency (Hz)	Sound Reduction Index (dB)	Octave Band Centre Frequency (Hz)	Sound Reduction Index (dB)	Octave Band Centre Frequency (Hz)	Sound Reduction Index (dB)
63	-0.9	63	2.1	63	3.0
125	4.6	125	4.7	125	6.7
250	4.2	250	4.8	250	9.3
500	6.0	500	7.4	500	13.4
1000	8.4	1000	13.2	1000	17.7
2000	17.2	2000	23.4	2000	20.4
4000	15.9	4000	20.8	4000	17.0
8000	13.4	8000	16.4	8000	14.7

Manufacturing Options

Top, bottom and side flanges may be formed to whatever mounting detail is required. For additional information please consult the separate form entitled detail for manufacture.

With flanged louvres the box depth can be manufactured to fit inside or outside the building line as required

Where units are to be mounted in continuous horizontal runs joining plates are provided for weathering.

Nylon mesh or expanded aluminium mesh bird guards can be fitted internally if required.

McKenzie Martin—Louvres and Natural Ventilation
Eton Hill Works, Eton Hill Road, Radcliffe, Manchester. M26 2US
Tel: 0161 723 2234 Sales@McKenzieMartin.co.uk www.McKenzieMartin.co.uk

APPENDIX G

Details For Example Suitable Vibration Isolators

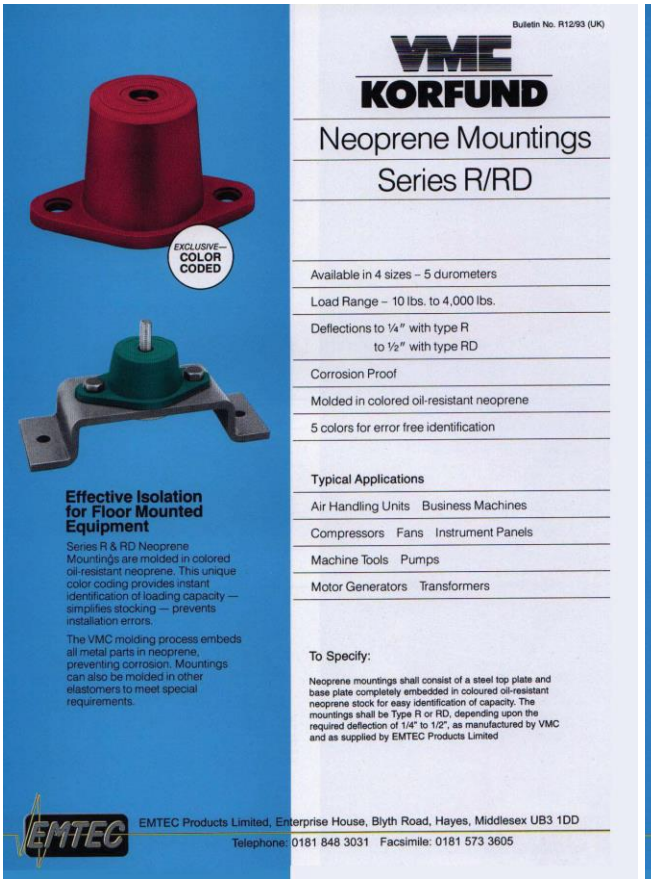
Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

Report: 21051-002 Appendix G *(page 1 of 3)*

Date: May 2021

DETAILS FOR EXAMPLE SUITABLE VIBRATION ISOLATORS

Supplier: EMTEC



Bulletin No. R12/93 (UK)

VMC KORFUND

Neoprene Mountings
Series R/RD

EXCLUSIVE— COLOR CODED

Available in 4 sizes – 5 durometers

Load Range – 10 lbs. to 4,000 lbs.

Deflections to ¼" with type R
to ½" with type RD

Corrosion Proof

Molded in colored oil-resistant neoprene

5 colors for error free identification

Effective Isolation for Floor Mounted Equipment

Series R & RD Neoprene Mountings are molded in colored oil-resistant neoprene. This unique color coding provides instant identification of loading capacity — simplifies stocking — prevents installation errors.

The VMC molding process embeds all metal parts in neoprene, preventing corrosion. Mountings can also be molded in other elastomers to meet special requirements.

Typical Applications

Air Handling Units Business Machines

Compressors Fans Instrument Panels

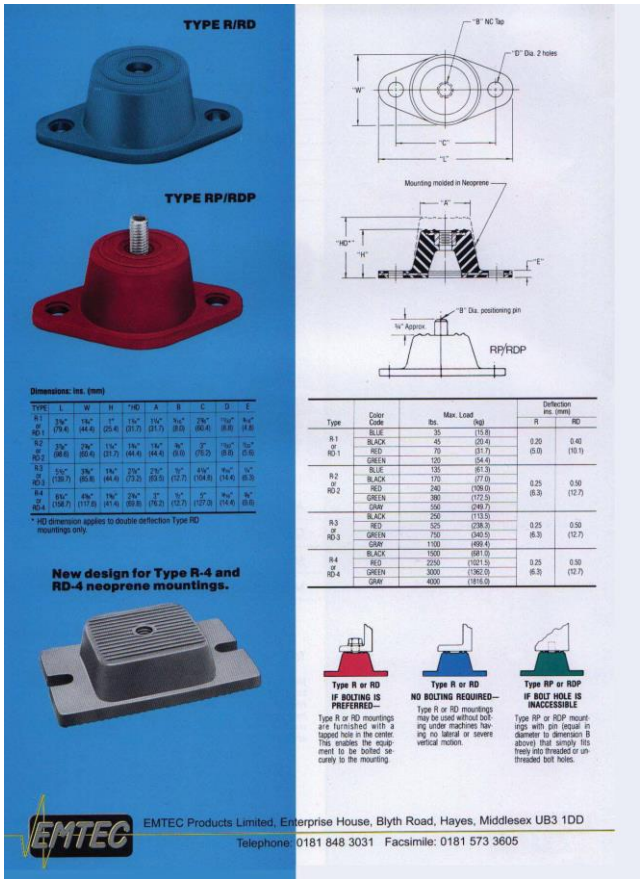
Machine Tools Pumps

Motor Generators Transformers

To Specify:

Neoprene mountings shall consist of a steel top plate and base plate completely embedded in coloured oil-resistant neoprene stock for easy identification of capacity. The mountings shall be Type R or RD, depending upon the required deflection of 1/4" to 1/2", as manufactured by VMC and as supplied by EMTEC Products Limited

EMTEC Products Limited, Enterprise House, Blyth Road, Hayes, Middlesex UB3 1DD
Telephone: 0181 848 3031 Facsimile: 0181 573 3605



TYPE R/RD

TYPE RP/RDP

Dimensions: ins. (mm)

TYPE	L	W	H	*HD	A	B	C	D	E
R-1 or RD-1	3⅛" (79.4)	1¾" (44.4)	1" (25.4)	1¼" (31.7)	1¼" (31.7)	3⅛" (80.0)	2⅝" (60.4)	⅜" (8.6)	⅜" (9.8)
R-2 or RD-2	3⅞" (98.6)	2⅜" (60.4)	1¼" (31.7)	1¾" (44.4)	1¾" (44.4)	3⅜" (9.6)	3" (76.2)	⅜" (8.6)	⅝" (5.6)
R-3 or RD-3	5½" (139.7)	3⅜" (85.6)	1¾" (44.4)	2⅝" (73.2)	2⅝" (83.5)	½" (12.7)	4⅛" (104.8)	⅝" (14.4)	¼" (6.3)
R-4 or RD-4	6⅝" (168.7)	4⅝" (117.6)	1⅝" (41.4)	3⅛" (89.8)	3" (76.2)	½" (12.7)	5" (127.0)	⅝" (14.4)	⅜" (9.6)

* HD dimension applies to double deflection Type RD mountings only.

New design for Type R-4 and RD-4 neoprene mountings.

Mounting molded in Neoprene

RP/RDP

Type	Color Code	Max. Load lbs.	Max. Load (kg)	Deflection ins. (mm) R	Deflection ins. (mm) RD
R-1 or RD-1	BLUE	35	(15.8)		
	BLACK	45	(20.4)	0.20	0.40
	RED	70	(31.7)	(5.0)	(10.1)
	GREEN	120	(54.4)		
R-2 or RD-2	BLUE	135	(61.3)		
	BLACK	170	(77.0)		
	RED	240	(109.0)	0.25 (6.3)	0.50 (12.7)
	GREEN	380	(172.5)		
	GRAY	550	(249.7)		
R-3 or RD-3	BLACK	250	(113.5)		
	RED	525	(238.3)	0.25	0.50
	GREEN	750	(340.5)	(6.3)	(12.7)
	GRAY	1100	(499.4)		
R-4 or RD-4	BLACK	1500	(681.0)		
	RED	2250	(1021.5)	0.25	0.50
	GREEN	3000	(1362.0)	(6.3)	(12.7)
	GRAY	4000	(1816.0)		

Type R or RD
IF BOLTING IS PREFERRED—
Type R or RD mountings are furnished with a tapped hole in the center. This enables the equipment to be bolted securely to the mounting.

Type R or RD
NO BOLTING REQUIRED—
Type R or RD mountings may be used without bolting under machines having no lateral or severe vertical motion.

Type RP or RDP
IF BOLT HOLE IS INACCESSIBLE
Type RP or RDP mountings with pin (equal in diameter to dimension B above) that simply fits freely into threaded or unthreaded bolt holes.

EMTEC Products Limited, Enterprise House, Blyth Road, Hayes, Middlesex UB3 1DD
Telephone: 0181 848 3031 Facsimile: 0181 573 3605

Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

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Date: May 2021

DETAILS FOR EXAMPLE SUITABLE VIBRATION ISOLATORS

Supplier: Christie & Grey

Rubber Turret Mountings

Type RM

Type RM Rubber Turret mountings are designed to provide superior attenuation of medium to high frequency vibration and noise emanating from a wide range of motor driven machines particularly axial and centrifugal fans.

High resilience rubber with low dynamic to static stiffness ratio ensures maximum efficiency, good creep performance and long service life.

DESIGN FEATURES

- Moulded in first grade natural rubber with integral steel base and upper fixing boss.
- Manufactured in three sizes, each available in three rubber compounds identified by a colour spot.
- Static deflections of up to 8 mm with loads from 5 kg to 400 kg.
- Upper fixing screw supplied as standard with optional height adjusters also available.

TYPICAL APPLICATIONS

- Axial and Centrifugal Fans.
- Air Handling Units.
- Refrigeration Plant.
- Pumps.
- Rotary and Multi Cylinder Compressors.
- Floating Floors.
- Isolation of Sensitive Equipment.
- Test Rigs and Special Purpose Machines.

CHRISTIE & GREY Vibration & Shock Control

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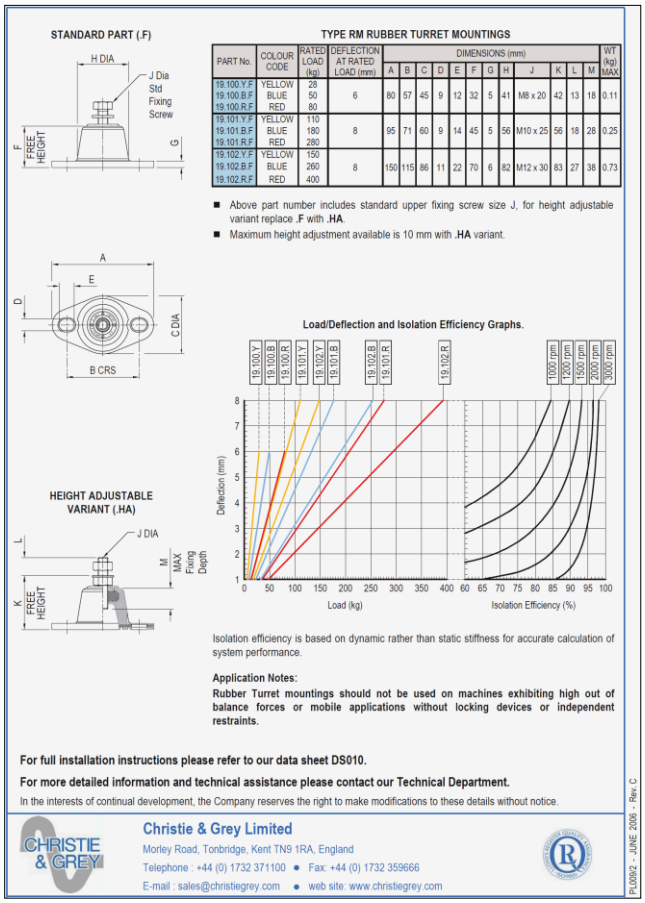

STANDARD PART (.F)

TYPE RM RUBBER TURRET MOUNTINGS

PART No.	COLOUR CODE	RATED LOAD (kg)	DEFLECTION AT RATED LOAD (mm)	DIMENSIONS (mm) A	B	C	D	E	F	G	H	J	K	L	M	WT (kg) MAX
19.100.Y.F	YELLOW	28	6	80	57	45	9	12	32	5	41	M8 x 20	42	13	18	0.11
19.100.B.F	BLUE	50														
19.100.R.F	RED	80														
19.101.Y.F	YELLOW	110	8	95	71	60	9	14	45	5	56	M10 x 25	56	18	28	0.25
19.101.B.F	BLUE	180														
19.101.R.F	RED	280														
19.102.Y.F	YELLOW	150	8	150	115	86	11	22	70	6	82	M12 x 30	83	27	38	0.73
19.102.B.F	BLUE	260														
19.102.R.F	RED	400														

- Above part number includes standard upper fixing screw size J, for height adjustable variant replace **.F** with **.HA**.
- Maximum height adjustment available is 10 mm with **.HA** variant.

Load/Deflection and Isolation Efficiency Graphs.

HEIGHT ADJUSTABLE VARIANT (.HA)

Isolation efficiency is based on dynamic rather than static stiffness for accurate calculation of system performance.

Application Notes:

Rubber Turret mountings should not be used on machines exhibiting high out of balance forces or mobile applications without locking devices or independent restraints.

For full installation instructions please refer to our data sheet DS010.

For more detailed information and technical assistance please contact our Technical Department.

In the interests of continual development, the Company reserves the right to make modifications to these details without notice.

CHRISTIE & GREY

Christie & Grey Limited

Morley Road, Tonbridge, Kent TN9 1RA, England

Telephone : +44 (0) 1732 371100 ● Fax: +44 (0) 1732 359666

E-mail : sales@christiegrey.com ● web site: www.christiegrey.com

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Site: Flat 1, 69 Greencroft Gardens, London NW6 3LJ

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DETAILS FOR EXAMPLE SUITABLE VIBRATION ISOLATORS

Supplier: Vibracoustics

Vibracoustics

Products & Services for Vibration, Noise & Shock Control

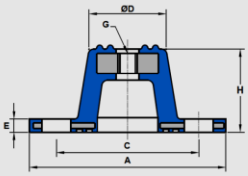
PRODUCT GROUP	42
VI-TURRET MOUNTINGS	

Description:

Vibracoustics Ltd Vi-Turret Mountings are designed principally for the mounting of HVAC systems, with relatively high levels of deflection ideal for the effective attenuation of noise and vibration from rotating equipment with speeds of 1000rpm (16Hz) and above.

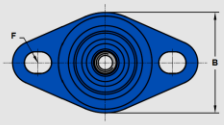
Efficient construction with fully rubber encapsulated metal components for environmental protection, threaded top and stable base fixings with non-skid mounting faces.

Available in a range of sizes and rubber hardness for load capacities 35Kg to 500Kg. Other non-standard sizes available, contact Vibracoustics Ltd technical department for more information.



Typical Applications Include:

- Fans.
- Pumps.
- HVAC.
- Generators.
- Electric motors.
- Compressors.
- General equipment.



Part No.	Dimensions (mm)								Max Load (Kg)	Max Static Deflection (mm)
	H	A	B	C	D	G	F	E		
VS42000 YELLOW	32	80	45	57	41	M8	9x12	5	35	8
VS42000 BLUE	32	80	45	57	41	M8	9x12	5	65	8
VS42000 RED	32	80	45	57	41	M8	9x12	5	100	8
VS42001 YELLOW	45	95	60	71	56	M10	9x14	5	130	10
VS42001 BLUE	45	95	60	71	56	M10	9x14	5	225	10
VS42001 RED	45	95	60	71	56	M10	9x14	5	350	10
VS42002 YELLOW	70	150	86	115	82	M12	11x22	6	185	10
VS42002 BLUE	70	150	86	115	82	M12	11x22	6	320	10
VS42002 RED	70	150	86	115	82	M12	11x22	6	500	10

For applications and technical assistance please contact Vibracoustics, see index Ref 00-A-01

E-mail: mail@vibracoustics.com Website: www.vibracoustics.com Cat Ref: 42-A-01 Iss:21B