Philip Acoustics Ltd.

Consultants in Noise & Vibration
Building Regulations Certification Sound Insulation Testing

REPORT TITLE: ACOUSTIC REPORT FOR A PROPOSED EXTERNAL AIR SOURCE HEAT PUMP AT 20 TANZA ROAD, LONDON NW3 2UB

REPORT REF: 22132-003

ISSUED TO: Retrouvius
Warehouse: 2A Ravensworth Road
Kensal Green
London
NW10 5NR

ISSUED BY: Chris Swiejkowski MEng MIOA

DATE: February 2023

PHILIP ACOUSTICS LTD Registered in England No.: 4560265
Office: 107 Bancroft, Hitchin, Hertfordshire SG5 1NB
Tel: 01462 431877 Email: admin@philipacoustics.co.uk
Member of The Association of Noise Consultants

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SUMMARY

- Philip Acoustics has been commissioned to provide an acoustic (noise & vibration) Noise Impact Assessment report for a new Air Source Heat Pump (ASHP) unit, proposed to be installed to serve an existing residential property at 20 Tanza Road, London NW3 2UB.

- The unit is proposed to be located externally within the rear garden area of the property (close to the rear façade of the building).

- The Noise Impact Assessment is with reference to London Borough of Camden's planning consent acoustic requirements for mechanical services plant / 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 noise survey has been conducted over a six-day period including sample weekdays and a full weekend to establish existing background noise levels during the entire range of possible operational times for the proposed ASHP unit. The noise survey was at a position representative of outside the nearest neighbouring residential property.

- Based on results of the background noise survey and noise model calculations using the ASHP unit manufacturer's noise data (with noise reduction treatment fitted), the overall noise level from the unit complies with London Borough of Camden's planning consent requirements.

- The noise reduction treatment is to fit a proprietary acoustic enclosure to the proposed ASHP unit. Full specification details for the proposed noise reduction treatment are provided in Section 6.1 of the report.

- Proposed location of the ASHP unit is at distance from, and not directly attached to (not structurally fixed to), any neighbouring properties. Therefore, is not expected there would be any vibration from the unit to neighbouring properties. Notwithstanding this, as good practice and to anyhow mitigate possible residual vibration from the ASHP unit to the application property itself, it is advised the unit is installed on conventional proprietary vibration isolators. Specification details for typically suitable vibration isolators are provided in Section 6.2 of the report.

1. INTRODUCTION

A new Vaillant outdoor Air Source Heat Pump (ASHP) unit is proposed to be installed to serve a residential property at 20 Tanza Road, London NW3 2UB.

The unit is proposed to be located externally within the rear garden area (close to the rear façade of the building).

As part of the planning application process for installation of new plant / equipment such as an ASHP unit, the Local Planning Authority (London Borough of Camden) requires validation information in the form of an acoustic report - Noise Impact Assessment 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 report (Noise Impact Assessment) for the proposed 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:

- Criteria - London Borough of Camden planning consent acoustic requirements;
- Measurement survey of existing background noise levels;
- Details of the proposed ASHP unit including location & noise data;
- Calculation & assessment of noise from the ASHP unit;
- Consideration of vibration from the ASHP unit;
- Specification for any noise reduction treatment and/or vibration isolation measures to the ASHP unit as necessary to ensure compliance with the planning consent requirements of London Borough of Camden.

2. 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 ASHP units.

Policy A4: *Noise and 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 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 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 ASHP units 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*". Reference throughout this report to BS4142:2014 relates to this current edition document.

Note that as an aid to clarity and to be 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 ASHP units and similar plant / equipment in similar scenarios and residential area contexts to that as at 20 Tanza Road, that compliance with London Borough of Camden's policy requirements, and as the clarification points below, would mean noise from the proposed ASHP unit is not generally audible / disturbing or otherwise of impact to persons inside or outside neighbouring residential dwellings.

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

a) ASHP Unit Operation

The noise criteria are cautiously/robustly applied for the 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 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 ASHP unit is provided in Section 4 of this report.

b) Rating Noise Level

The noise criterion is 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 ASHP unit noise at the assessment position as per the BS4142:2014 assessment methodology.

c) Assessment Positions

As per Camden's policy requirements, day and night period (as relevant) noise criteria for the 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.

d) Background Noise Level

The noise criterion is applied as "worse case", cautiously/robustly based on the representative minimum existing background noise level over 24 hours (i.e. including as occurs during the middle of the night), based on results of a six-day noise survey including sample weekdays and a full weekend (see Section 3 of the report).

e) Very Low Background Noise Level

In accordance with the guidance and assessment provisions of BS4142:2014 (as Camden's requirements), then for scenarios of very low background noise it is unreasonable / unnecessary to apply a Rating Level noise limit directly relative to the background level, in terms of ensuring amenity protection such that noise from plant / equipment (including such as ASHP units) does not cause disturbance or is otherwise of adverse impact.

This simply due to that there is a lower threshold level at which plant / equipment noise would become inaudible / not noticeable to occupiers of neighbouring properties and thus it being unreasonable and unnecessary to further reduce the plant noise below that level.

BS4142:2014 advises "*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night*."

Where background levels are very low it is instead appropriate to apply a minimum (lower level) threshold cap plant Rating Level limit of $L_{Ar,Tr}$ 30dB at assessment positions. BS4142:1997 advised that noise Rating Levels of below 35dB be considered very low.

Thus a minimum threshold cap plant noise limit (Rating Level) set at $L_{Ar,Tr}$ 30dB is significantly below (i.e. as 5dB betterment) to this guidance and for scenarios of very low background noise levels (i.e. regardless of the low background noise) will maintain surety of protection for the occupants of nearby residential properties from loss of amenity due to noise disturbance.

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 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.

Proposed location for the ASHP unit within the rear garden area of the property is at distance from and not structurally linked/connected to, any 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. BACKGROUND NOISE SURVEY

To assess noise from the ASHP unit against London Borough Of Camden's planning consent noise requirement it is necessary to establish background noise levels representative of at the assessment positions. Details of the conducted background noise survey 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.

3.2 Survey Details & Procedure

Although the ASHP unit would tend to principally 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 background noise climate during the entire range of possible times of unit operation.

The background noise survey was conducted over a six-day period from Thursday 02 February 2023 through Tuesday 07 February 2023 to include sample weekdays and also a full weekend as well as ensure suitable weather conditions (dry with calm / light wind conditions) for sample day and night periods of the survey.

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

The nearest windows of neighbouring properties to proposed location of the ASHP unit are rear elevation windows of the adjacent property at 22 Tanza Road. The nearest of these windows are circa 4-5m distance from the unit. Nearest external amenity space includes rear elevation patio/terrace and rear garden area of the same adjacent property at 22 Tanza Road approximately 4-5m distance from the unit.

The background noise survey position was externally from within the rear garden area of 20 Tanza Road at the site boundary with 22 Tanza Road, 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 and proposed layout drawing are provided in Appendix B, annotated to indicate the proposed location for the ASHP unit within the rear garden area of the property, neighbouring properties and the noise survey measurement position.

3.3 Survey Results, Observations & Air Source Heat Pump Unit Noise Limits

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

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. Tanza Road 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 minimum (lowest) measured $L_{A90,T}$ background noise levels and associated ASHP unit noise limits based on London Borough of Camden's noise requirements (as detailed in Section 2 of the report) are shown in Table 1.

The background levels and limits are split into two separate time period values such that noise from the 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.

ASHP Unit Operating Condition	**Assessment Positions & Relevant Times**	**Representative Minimum Background Noise Level** $L_{A90,15min}$	**ASHP Unit Noise Limit** ***(Rating Level)***
Unit operating full 100% duty potentially over a 24-hour period in heating mode	Assessment Position 1: External amenity space of neighbouring properties *Assessment range: 7am to 11pm*	30dB *(minimum day period background noise level occurs Sundays)*	$L_{Ar,Tr}$ ≤20dB *(10dB below background)* $L_{Ar,Tr}$ ≤15dB *(15dB below background, applicable if unit noise has tonal components)* ***$L_{Ar,Tr}$ ≤30dB (minimum threshold cap 30dBA applicable)***
	Assessment Position 2: Outside windows of neighbouring properties *Assessment range: Over 24 hours*	30dB *(occurs during middle of the night circa 1am to 4am, but not all nights)*	$L_{Ar,Tr}$ ≤20dB *(10dB below background)* $L_{Ar,Tr}$ ≤15dB *(15dB below background, applicable if unit noise has tonal components)* ***$L_{Ar,Tr}$ ≤30dB (minimum threshold cap 30dBA applicable)***

Table 1: Representative minimum background noise levels & associated ASHP unit noise limits

In this instance and because of the very low existing background noise levels (minimum threshold cap $L_{Ar,Tr}$ ≤30dB applicable), the same noise criterion limit applies for the ASHP unit operating during the day period and also during the night period.

4. NOISE FROM AIR SOURCE HEAT PUMP UNIT

Informative Notes:

This acoustic report / noise assessment is based on the applicant's proposed ASHP unit Vaillant aroTHERM plus (12kW). If as part of possible future equipment replacement, an alternative make and / or model ASHP unit 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 details as below remain valid and noise emissions from the alternative replacement unit remain compliant with London Borough of Camden's planning consent noise requirements.

The proposed ASHP unit is a Vaillant aroTHERM plus (12kW). Manufacturer's noise data for the ASHP unit is provided in Appendix D.

The noise data is for the unit operating at full normal (100%) duty in heating mode, in terms of free-field overall dBA sound pressure level at 1m distance from the unit is shown in Table 2.

ASHP Unit & Operating Mode	Overall dBA
Vaillant aroTHERM plus 12kW (*Full 100% duty heating mode)*	52

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

To calculate the noise contribution from the ASHP unit to the assessment positions:

- Position 1: external amenity space/garden of the nearest neighbouring residential property;
- Position 2: outside windows of the nearest neighbouring residential property.

a spreadsheet noise calculation model has been used. The model takes account of the distance between the unit and assessment positions, acoustic directivity, acoustic reflections (i.e. non free-field conditions) and any natural / default line of sight acoustic screening.

The noise model calculation (details provided in Appendix E) also takes account of the noise reduction treatment applied to the ASHP unit (acoustic louvre enclosure) as specified in Section 6.1.

Summary of the noise model calculated noise Rating Level from the ASHP unit to the assessment positions compared with the noise limit requirements is shown in Table 3 on the following page.

Noise from the ASHP unit to outside windows of other neighbouring residential properties and / or garden areas (external amenity spaces), as more distant from and / or more screened from, proposed location of the unit will be lower.

ASHP Unit Operating Condition	Assessment Positions	ASHP Unit Overall Noise Level *(Rating Level)*	Noise Limit *(Rating Level)*	Comment
Unit operating full 100% duty potentially over a 24-hour period in heating mode	Assessment Position 1: External amenity space of neighbouring properties *Assessment range: 7am to 11pm*	$L_{Ar,Tr}$ 28dB	$L_{Ar,Tr}$ ≤30dB	Proposed Vaillant model aroTHERM Plus (12kW) ASHP unit *(with specified acoustic enclosure)* complies with the noise limit requirement
	Assessment Position 2: Outside windows of neighbouring properties *Assessment range: Over 24 hours*	$L_{Ar,Tr}$ 28dB	$L_{Ar,Tr}$ ≤30dB	

Table 3: Noise from proposed ASHP unit to assessment positions

The assessment in Table 3 demonstrates noise from the ASHP unit with the specified acoustic louvre enclosure noise reduction treatment fitted (see Section 6.1), complies with the noise limit requirement. At this level, noise from the ASHP unit will be below existing background levels plus in absolute terms be very low and would not be expected to be audible, cause disturbance or otherwise be of impact detrimental to the amenity of neighbouring residential occupiers.

In addition to the assessment as detailed above and in Table 3, noise from the ASHP unit to outside nearest windows of the neighbouring property 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
Highest noise contribution from the ASHP unit to the Assessment Position *2 (unit in heating mode operation to outside nearest rear elevation windows of adjacent property 22 Tanza Road)*	NR22*	38*	33*	30*	26*	20*	12*	8*	2*
Comment	Noise from the proposed Vaillant model aroTHERM Plus (12kW) unit is substantially below NR35 & complies with the NR value limit								

*NR value calculated using similar size & output power ASHP sound pressure spectrum data (heating mode)

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

Table 4 shows that noise from the ASHP unit readily complies with the NR value noise limit criterion as per London Borough of Camden's requirements.

5. VIBRATION FROM AIR SOURCE HEAT PUMP UNIT

Proposed location of the ASHP unit is at distance from, and not directly attached to (not structurally fixed to), any neighbouring properties. Therefore, is not expected there would be any vibration transmission from the unit to neighbouring properties / buildings.

Notwithstanding this, as good practice and to anyhow mitigate possible residual vibration from the ASHP unit to the application property itself, it is advised the unit is installed on conventional proprietary vibration isolators Specification details for suitable vibration isolators are included in Section 6.2 of the report.

6. SPECIFICATIONS FOR NOISE & VIBRATION TREATMENTS

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

6.1 Noise

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

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.

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 ASHP unit.

It is recommended the 'L-shape' enclosure is installed incorporating a proprietary acoustic louvre to the front (to provide intake / exhaust airflow to the unit) plus solid side fixed to the building walls using proprietary steelwork/frame/channels.

It is anticipated the enclosure may need to be demountable to enable maintenance access to the unit. This would be achieved typically by using easy release acoustic louvre access panels (as opposed to acoustic louvre doors which are much more costly).

The recommended minimum performance requirement for the acoustic louvres is shown in Table 5 below.

Description	Octave Band Centre Frequency (Hz)								Comments
	63	125	250	500	1k	2k	4k	8k	
Acoustic Louvre Insertion Loss dB	4	4	5	8	12	16	15	13	Suitable acoustic louvre would be typically 150mm depth

Table 5: Acoustic louvre performance specification *(typical for nominal 150mm depth acoustic louvres)*

The acoustic louvre in Table 5 is based on using a proprietary nominal 150mm depth type acoustic louvre as available from most acoustic hardware suppliers. Technical data sheet for example suitable 150mm depth acoustic louvres (supplied by Allaway Acoustics) is provided in Appendix F.

6.2 Vibration

Appropriate conventional vibration isolators for the ASHP unit located externally to the rear of the property would be standard type rubber or neoprene turret type mountings (in lay terms "rubber feet"). The vibration isolators should each have a static deflection circa ≥3mm under weight of the unit.

A total of 4 x isolators are typically required for an outdoor ASHP unit; one to each mounting corner position.

Details of three example suppliers and their typically suitable vibration isolators are provided on the following page.

The example suppliers are not listed in any order of preference and copy of each of the supplier's data sheets for the typically suitable proprietary isolators is provided in Appendix F.

Similar suitable / equivalent vibration isolators are available from other suppliers.

Example Supplier 1:

EMTEC: www.emtecproducts.co.uk

Isolator Type: Neoprene Mountings Series R/RD

Vaillant aroTHERM (12kW) (gross weight 194kg) = Isolator R-1 Green (max load per isolator 54.4kg)

Example Supplier 2:

Christie & Grey: www.christiegrey.co.uk

Isolator Type: Rubber Turret Mountings RM

Vaillant aroTHERM (12kW) (gross weight 194kg) = Isolator RM 19.100.B.F Blue (max load per mount 50kg)

Example Supplier 3:

Vibracoustics: www.vibracoustics.com

Isolator type: Vi-Turret Mountings

Vaillant aroTHERM (12kW) (gross weight 194kg) = Isolator VS42000 Blue (max load per mount 65kg)

APPENDIX A

Noise Survey Instrumentation

Site: 20 Tanza Road, London NW3 2UB

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Date: February 2023

NOISE SURVEY INSTRUMENTATION

Six-day Noise Survey Thursday 02 February 2023 - Tuesday 07 February 2023:

- 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 Aerial Image & Proposed Layout Drawing

Site: 20 Tanza Road, London NW3 2UB

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Date: February 2023

SITE LOCATION BLOCK PLAN

Site: 20 Tanza Road, London NW3 2UB

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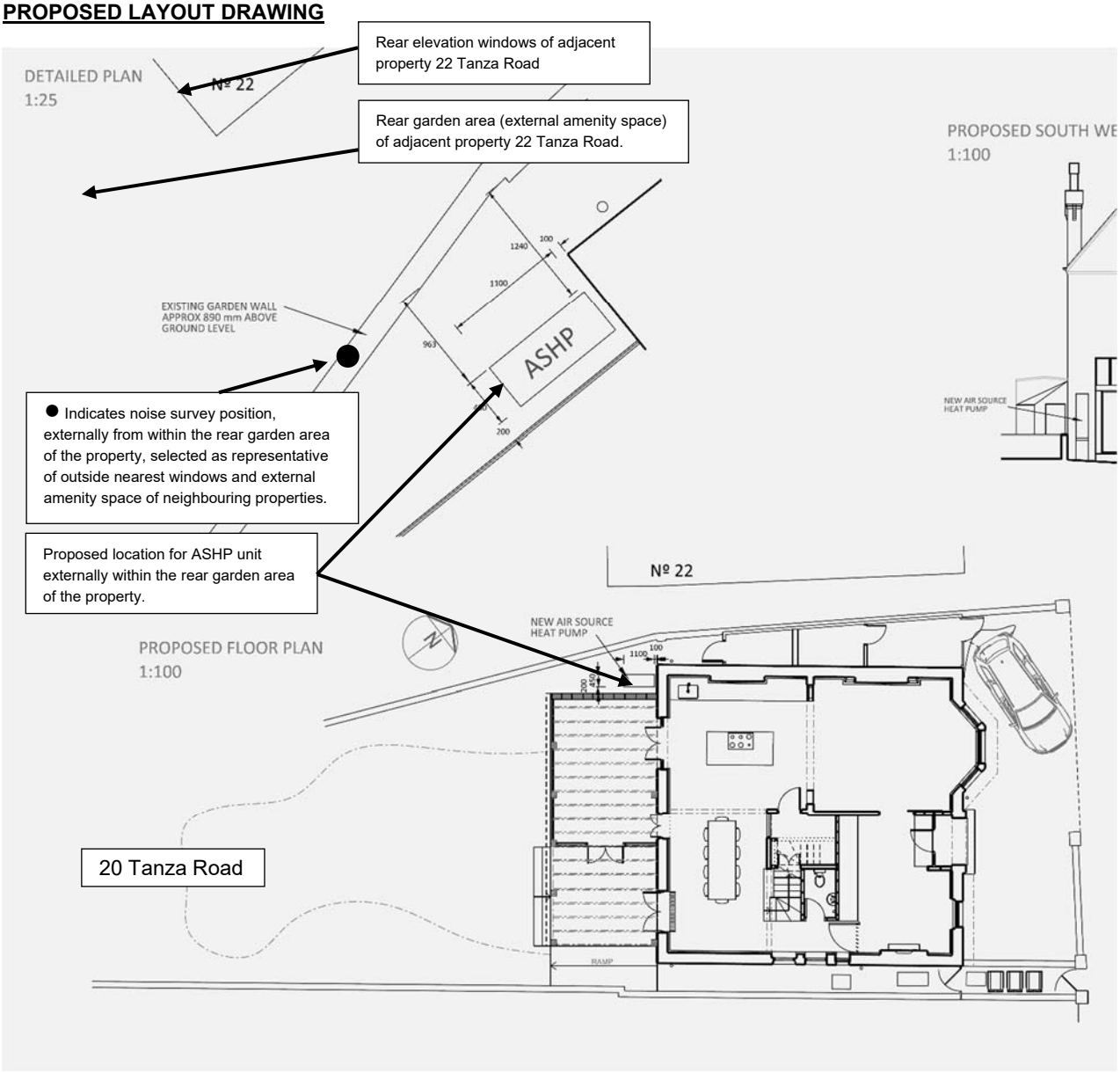
Date: February 2023

PROPOSED LAYOUT DRAWING



APPENDIX C

Background Noise Survey Results

Site: 20 Tanza Road, London NW3 2UB

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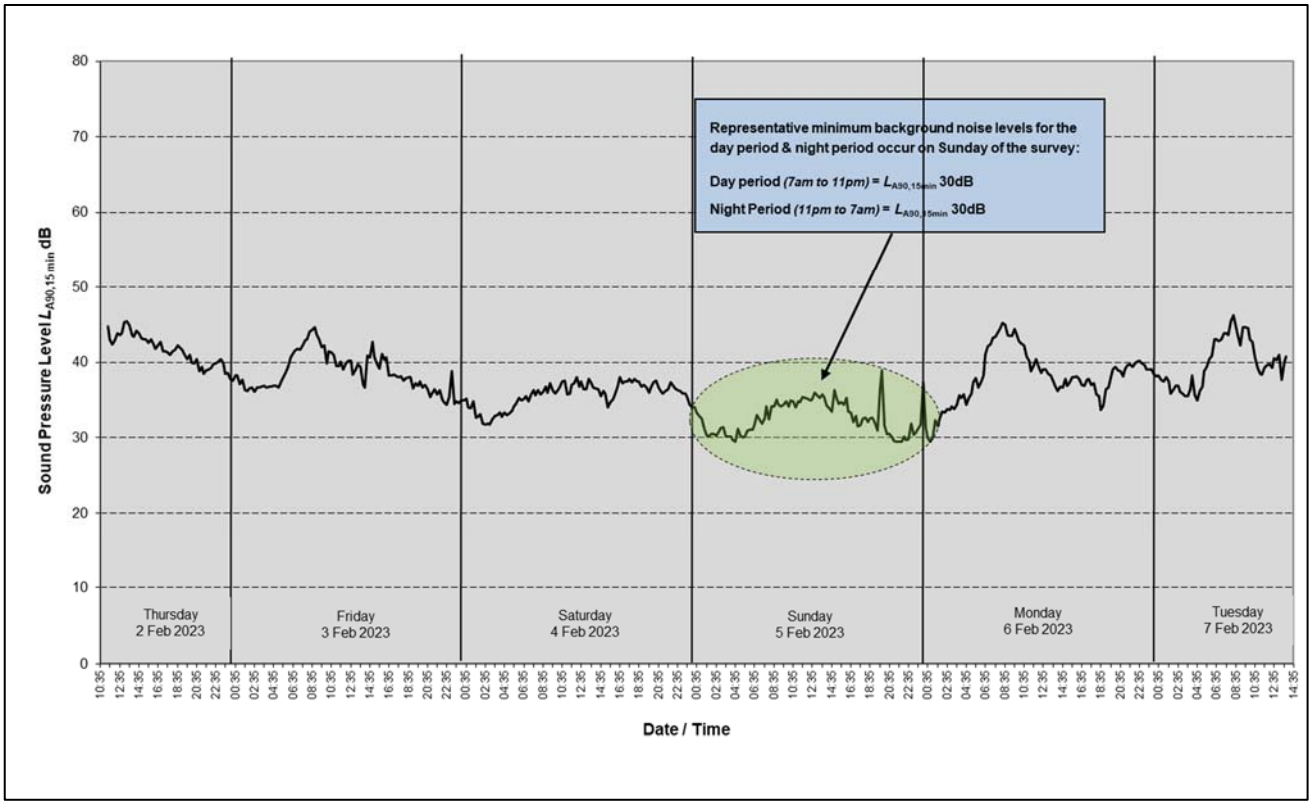
Date: February 2023

NOISE SURVEY RESULTS

Graphical Format Raw Data Six-Day Noise Survey Thursday 02 February 2023 - Tuesday 07 February 2023:



APPENDIX D

Manufacturer Noise Data For Proposed ASHP Unit

Site: 20 Tanza Road, London NW3 2UB

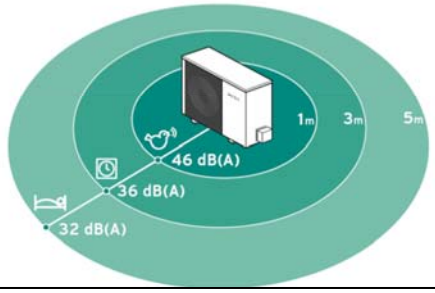
Report: 22132-003 Appendix D *(page 1 of 1)*

Date: February 2023

MANUFACTURER'S NOISE DATA FOR PROPOSED ASHP UNIT

Vaillant model aroTHERM plus (kW12)

Sound power



Model	Sound Power Level A7/W55	Sound Pressure Level		
		1m distance	3m distance	5m distance
aroTHERM plus 3.5kW	54 dB	46 dB(A)	36 dB(A)	32 dB(A)
aroTHERM plus 5kW	54 dB	46 dB(A)	36 dB(A)	32 dB(A)
aroTHERM plus 7kW	55 dB	47 dB(A)	37 dB(A)	33 dB(A)
aroTHERM plus 10kW	60 dB	52 dB(A)	42 dB(A)	38 dB(A)
aroTHERM plus 12kW	60 dB	52 dB(A)	42 dB(A)	38 dB(A)

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 ASHP Unit

Site: 20 Tanza Road, London NW3 2UB

Report: 22132-003 Appendix E *(page 1 of 2)*

Date: February 2023

NOISE MODEL CALCULATION FOR PROPOSED ASHP UNIT

Assessment Position 1: Garden area (external amenity space) of neighbouring property 22 Tanza Road

Noise Condition: 1 x Unit Vaillant model aroTHERM plus (kW12) operating full 100% duty heating mode

Noise Mitigation: ASHP Unit in acoustic louvre enclosure *(see Section 6.1 Report 22132-003)*

Equipment	Equipment Sound Pressure Level Lp dBA	Correction for noise attenuation dBA	Distance to assesment position m	Correction for distance to assessment position dBA	Correction for line of sight screening dBA	Correction for acoustic directivity dBA	Correction for acoustic reflections dBA	Individual Contributions dB
Vaillant Air Source Heat Pump								
aroTHERM plus 12kW (heating mode)	52	-10	4	-12	-5	0	+3	28.0
Overall SPL from ASHP at Assessment Position 1:	**28.0**	**dB(A)**						

The overall noise level at the Assessment Position 1 from the ASHP unit operating full 100% duty (heating mode) is 28dBA.

Noise generated by the ASHP unit at the Assessment Position 1 is substantially below the 'representative target noise level', plus the proposed ASHP unit 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 ASHP unit noise Rating Level to the assessment position = $L_{Ar,Tr}$ 28dB.

Site: 20 Tanza Road, London NW3 2UB

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Date: February 2023

NOISE MODEL CALCULATION FOR PROPOSED ASHP UNIT

Assessment Position 2: Rear windows of neighbouring property 22 Tanza Road

Noise Condition: 1 x Unit Vaillant model aroTHERM plus (kW12) operating full 100% duty heating mode

Noise Mitigation: ASHP Unit in acoustic louvre enclosure *(see Section 6.1 Report 22132-003)*

Equipment	Equipment Sound Pressure Level Lp dBA	Correction for noise attenuation dBA	Distance to assesment position m	Correction for distance to assessment position dBA	Correction for line of sight screening dBA	Correction for acoustic directivity dBA	Correction for acoustic reflections dBA	Individual Contributions dB
Vaillant Air Source Heat Pump								
aroTHERM plus 12kW (heating mode)	52	-10	4	-12	-5	0	+3	28.0
Overall SPL from ASHP at Assessment Position 2:	**28.0**	**dB(A)**						

The overall noise level at the Assessment Position 2 from the ASHP unit operating full 100% duty (heating mode) is 28dBA.

Noise generated by the ASHP unit at the Assessment Position 2 is substantially below the 'representative target noise level', plus the proposed ASHP unit 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 ASHP unit noise Rating Level to the assessment position = $L_{Ar,Tr}$ 28dB.

APPENDIX F

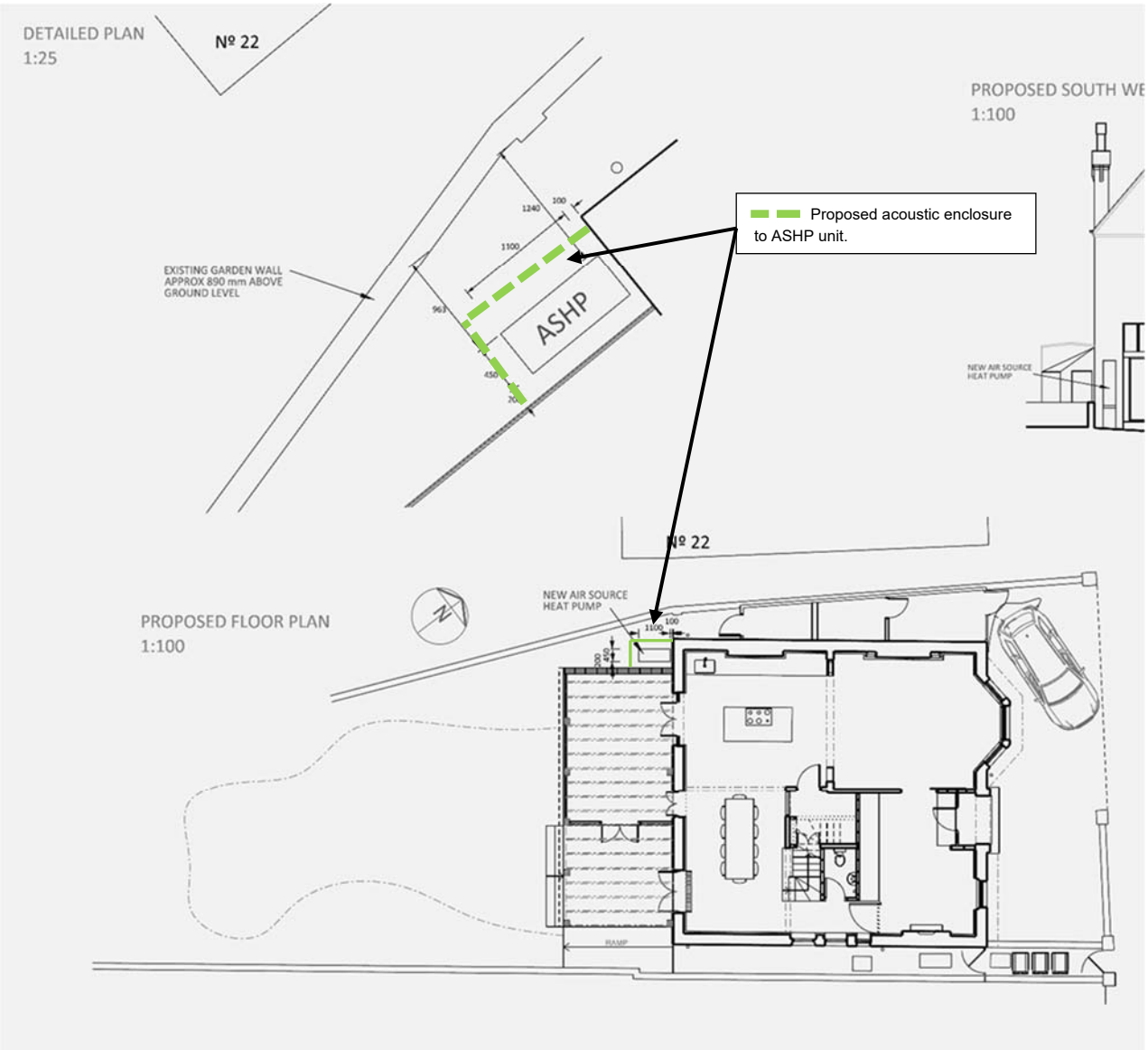
Noise & Vibration Reduction Treatment For Proposed ASHP Unit

Site: 20 Tanza Road, London NW3 2UB

Report: 22132-003 Appendix F *(page 1 of 5)*

Date: February 2023

NOISE & VIBRATION REDUCTION TREATMENT FOR PROPOSED AIR SOURCE HEAT PUMP UNIT



Site: 20 Tanza Road, London NW3 2UB

Report: 22132-003 Appendix F *(page 2 of 5)*

Date: February 2023

NOISE & VIBRATION REDUCTION TREATMENT FOR PROPOSED AIR SOURCE HEAT PUMP UNIT

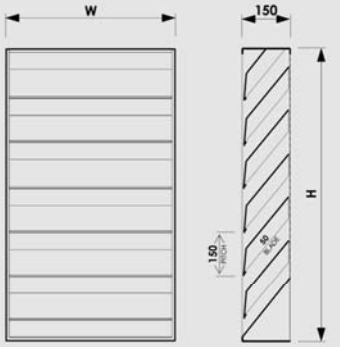
Acoustic Louvre - Supplier: Allaway Acousitcs

DATA SHEET **L60E**
ACOUSTIC LOUVRE
MODEL **AL1515**

allaway acoustics

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

DIMENSIONS



SUFFIX

THE SUFFIX DEFINES ADDITIONAL FEATURES OR SPECIAL CONSTRUCTIONAL DETAILS

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

WEIGHT

LOUVRE WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE. APPROXIMATELY:

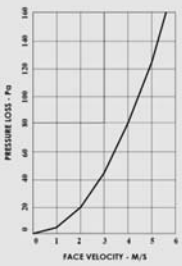
28kg/M² GALVANISED CONSTRUCTION
20kg/M² ALUMINIUM CONSTRUCTION

ACOUSTIC PERFORMANCE

SOUND REDUCTION INDEX: BS EN ISO 10140 - 2

63	125	250	500	1000	2000	4000	8000	HZ
4	4	5	8	12	16	15	13	dB

PRESSURE LOSS



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).

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).

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.

ALLAWAY ACOUSTICS LIMITED Old Police Station, 1 Queens Road, Hertford SG14 1EN
T | 01992 550825 E | enquiries@allawayacoustics.co.uk W | allawayacoustics.co.uk

Site: 20 Tanza Road, London NW3 2UB

Report: 22132-003 Appendix F *(page 3 of 5)*

Date: February 2023

DETAILS FOR EXAMPLE PROPRIETARY VIBRATION ISOLATORS

Supplier: EMTEC

Bulletin No. R12/93 (UK)

VMC KORFUND

Neoprene Mountings
Series R/RD

EXCLUSIVE— COLOR CODED

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.

- 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

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

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

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

Site: 20 Tanza Road, London NW3 2UB

Report: 22132-003 Appendix F *(page 4 of 5)*

Date: February 2023

DETAILS FOR EXAMPLE PROPRIETARY 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.

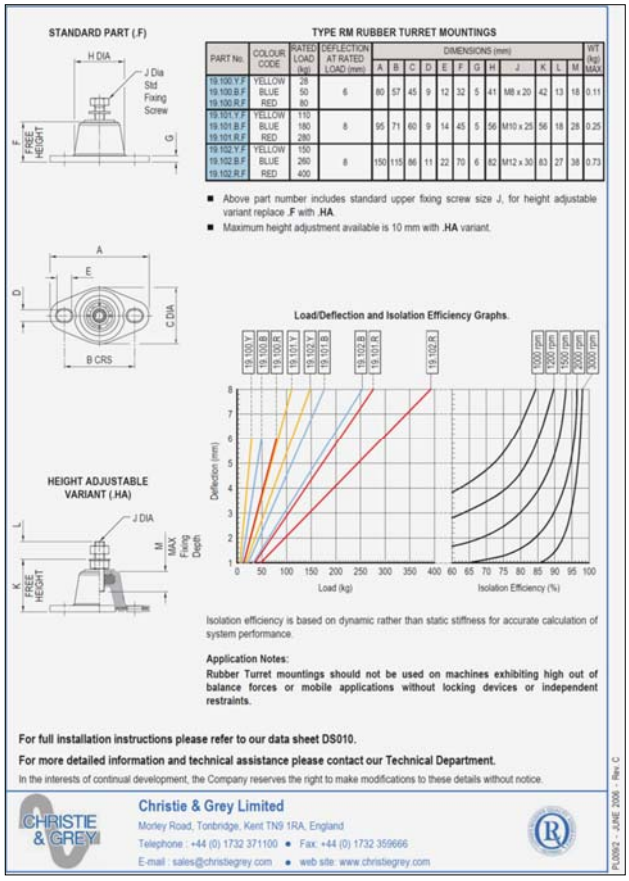
DESIGN FEATURES

- 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



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														
19.100.B.F	BLUE	50	6	80	57	45	9	12	32	5	41	M8 x 20	42	13	18	0.11
19.100.R.F	RED	80														
19.101.Y.F	YELLOW	110														
19.101.B.F	BLUE	180	8	95	71	60	9	14	45	5	56	M10 x 25	56	18	28	0.25
19.101.R.F	RED	280														
19.102.Y.F	YELLOW	150														
19.102.B.F	BLUE	260	8	150	115	86	11	22	70	6	82	M12 x 30	83	27	38	0.73
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

Site: 20 Tanza Road, London NW3 2UB

Report: 22132-003 Appendix F *(page 5 of 5)*

Date: February 2023

DETAILS FOR EXAMPLE PROPRIETARY VIBRATION ISOLATORS

Supplier: Vibracoustics

Vibracoustics™

Products & Services for Vibration, Noise & Shock Control

PRODUCT GROUP 42

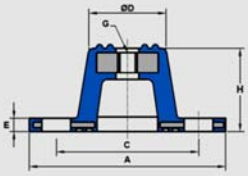
VI-TURRET MOUNTINGS

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.

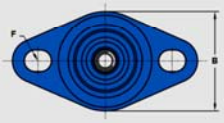
Efficient construction with fully rubber encapsulated metal components for environmental protection, threaded top and stable base fixings with non-skid mounting faces.

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

Vibracoustics is continually seeking to improve products and reserves the right to change designs and specifications without prior notice or alteration of literature.

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