Philip Acoustics Ltd.

Consultants in Noise & Vibration
Building Regulations Certification Sound Insulation Testing

REPORT TITLE: NOISE ASSESSMENT FOR NEW MECHANICAL SERVICES (PLANT) ASSOCIATED WITH APPROVED DEVELOPMENT AT 24 GRAFTON ROAD, LONDON NW5 3DU

London Borough of Camden Planning Reference: 2020/5965/P - Conditions 4 & 5

REPORT REF: 22059-002

ISSUED TO: Celine and Thomas Lefevre
24 Grafton Road
London
NW5 3DU

ISSUED BY: Chris Swiejkowski MEng MIOA

DATE: August 2022

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CONTENTS

SUMMARY

- This acoustic report provides a noise assessment for new mechanical services (plant) proposed to be installed to serve a residential property; 24 Grafton Road, London NW5 3DU.

- The assessment is required by Condition 5 attached to London Borough of Camden's grant of planning permission decision notice; application number 2020/5965/P dated 16 July 2021.

- Condition 4 of the Council's decision notice sets a noise criterion / limit for plant associated with the approved development relative to existing background noise levels.

- Therefore, as part of the assessment a noise survey has been conducted over a five-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 plant units. 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 plant units' manufacturer's noise data, the overall noise level due to the proposed units complies with London Borough of Camden's Condition 4 noise requirement.

- Although not a requirement of the grant of planning permission decision notice or Conditions 4 & 5, consideration of vibration form the proposed plant units is included in the report. Specification details for typically suitable vibration isolators are provided in Section 5 of the report.

1. INTRODUCTION

London Borough of Camden as Local Planning Authority has granted planning permission for development at an existing residential property 24 Grafton Road, London NW5 3DU.

The grant of planning permission decision notice is London Borough of Camden application number 2020/5965/P, date of decision 16 July 2021.

Full description of the development permitted is:

"Erection of mansard roof extension with PV panels, plant at roof level, new rooflight in rear extension, new triple glazed sash window at second floor front elevation, replacement of first floor rear doors with triple glazing, all to dwelling."

Conditions 4 & 5 attached to the permission are with reference to noise from plant units associated with the development, which comprises 1 x Air Source Heat Pump (ASHP) and 1 x Mechanical Ventilation Heat Recovery (MVHR). The ASHP is to be located externally at the third floor terrace / flat roof area and the MVHR unit to be installed internally at third floor level.

Condition 4 sets a noise criterion / limit for the plant (ASHP & MVHR).

Condition 5 requires that a noise impact assessment report for the plant (ASHP & MVHR) be submitted to, and approved by, the Local Planning Authority.

This report provides a noise assessment for the proposed ASHP & MVHR units as required by Condition 5 includes:

- London Borough of Camden Conditions 4 & 5 including noise criterion;
- Measurement survey of existing background noise levels;
- Details of the proposed ASHP & MVHR units including location & manufacturer noise data;
- Calculation & assessment of noise from the ASHP & MVHR units;
- Consideration of vibration from the ASHP & MVHR units;
- Specification for any noise reduction treatment and/or vibration isolation measures to the ASHP & MVHR units.

2. LONDON BOROUGH OF CAMDEN CONDITIONS 4 & 5

Conditions 4 & 5 attached to London Borough of Camden planning permission decision notice for application number 2020/5965/P are reproduced below:

> 4 Noise levels at a point 1 metre external to sensitive facades shall be at least 10dB(A) less than the existing background measurement (LA90), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 15dB(A) below the LA90, expressed in dB(A).
>
> Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies A1 and A4 of the London Borough of Camden Local Plan 2017.
>
> 5 Before the relevant part of work begun, details of the Air Source Heat Pump (ASHP) and Mechanical Ventilation with Heart Recovery (MVHR) shall be provided including an Acoustic Assessment and product specification.
>
> Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies A1 and A4 of the London Borough of Camden Local Plan 2017.

Condition 4 sets a criterion (limit) for the plant / equipment noise relative to the background noise, at neighbouring residential properties, as follows:

- Plant / equipment units' noise shall be at least 10dBA below the background level;
- If the emitted noise has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or distinct impulse (bangs, clicks, clatters, thumps), the plant noise shall be at least 15dBA below the background level.

It is the author's experience of undertaking many surveys and assessments of noise from ASHP and MVHR units and similar types of plant / equipment in similar scenarios and contexts to that as at 24 Grafton Road, that compliance with London Borough of Camden's Condition 4 will readily ensure noise from the ASHP & MVHR units is not audible / disturbing or otherwise of impact to occupiers of neighbouring properties.

General comment and technical clarification points relevant to the Condition 4 noise criterion and associated Condition 5 noise impact assessment requirement are provided on the following page:

a) BS4142:2014

Although not referenced in Conditions 4 & 5, the noise criterion and required noise impact assessment methodology is broadly analogous to the guidance and provisions of relevant British Standard BS4142:2014.

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 of the Conditions 4 & 5, this report retains use of the more familiar term "*noise*" as opposed to the replacement term "*sound*" of BS4142:2014.

b) ASHP & MVHR Units Operating Conditions

The noise criterion is cautiously / robustly applied for the ASHP & MVHR units operating cumulatively (i.e. both at the same time); AGHP operating at standard duty (i.e. normal full 100% capacity) in cooling or heating mode and MVHR unit operating in standard & boost modes, potentially over a complete 24-hour period including during the night. In practice it is expected the units would operate at reduced capacity (and thus with reduced noise output over full duty) for much of the time, particularly the late evening and night period.

c) Assessment Position

As Condition 4 and as per normal convention including the assessment provisions of BS4142:2014, the noise criterion is applied to an assessment position externally outside windows of nearest residential properties. The nearest residential property to location of the ASHP and MVHR units is the adjacent neighbouring dwelling 26 Grafton Gardens.

Gardens (external amenity space) of neighbouring residential dwellings are not materially any closer to, and/or less screened from, the proposed ASHP and MVHR units location as compared with nearest windows.

d) Background Noise Level

The noise criterion is applied as "worse case", cautiously / robustly based on the representative minimum (lowest) existing background noise level $L_{A90,T}$ dB *(T = 15 mins)* as representative of at the assessment position over 24 hours (i.e. including during the night), based on results of a four-day noise survey including sample weekdays and a full weekend (see Section 3 of the report).

3. BACKGROUND NOISE SURVEY

To assess noise from the ASHP & MVHR units against London Borough of Camden Condition 4 noise criterion it is necessary to establish representative minimum (lowest) background noise levels representative of at the assessment position. 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 & MVHR units would tend to principally operate during the daytime and evening periods, as they are to serve a residential property then they 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 units operation.

The background noise survey was conducted over a five-day period from Friday 1 July 2022 through Tuesday 5 July 2022 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 background noise survey position was externally at roof level to the front of the building overlooking Grafton Road facilitated by positioning the instrumentation microphone on a telescopic boom arrangement.

The survey position was selected as representative of outside the nearest neighbouring residential property 26 Grafton Road.

Other neighbouring residential properties along Grafton Road plus to the rear are more distant from, and/or more screened from, the ASHP and MVHR units' location than the adjacent neighbouring property 26 Grafton Road.

An aerial image, site location plan and proposed layout drawings are provided in Appendix B. These indicate the nearest neighbouring property, background noise survey position and proposed location for the ASHP & MVHR units.

3.3 Survey Results, Observations & ASHP and MVHR Units Noise Limit

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

Background noise levels are low and predominantly due to traffic on Grafton Road and streets in the vicinity.

Background noise fluctuates during the day and into the early evening, then gradually reduces during the late evening and night (lowest between circa 1am to 4am), before then increasing again in the morning. This diurnal noise climate profile is normal for this location with underlying noise from traffic on roads and streets in the vicinity.

Summary of the measured representative minimum $L_{A90,T}$ background noise level and associated Condition 4 plant noise criterion (limit) requirements are shown in Table 1.

ASHP & MVHR Units Operating Conditions	**Assessment Position & Relevant Times**	**Representative Minimum Background Noise Level** $L_{A90,15min}$	**Condition 4 Noise Criterion *(limit)***
ASHP unit operating in heating or cooling mode; MVHR unit operating in standard or boost mode	Day Period *(7am to 11pm)* Applicable outside windows to living rooms, dining rooms or bedrooms of neighbouring properties	42dB *(minimum day period background noise level occurs Sundays)*	$L_{Ar,Tr}$ ≤32dB *(10dB below background)* $L_{Ar,Tr}$ ≤27dB *(15dB below background, applicable if unit noise has tonal components)*
	Night Period *(11pm to 7am)* Applicable outside windows to bedrooms of neighbouring properties	37dB *(occurs during middle of the night circa 1am to 4am, but not all nights)*	$L_{Ar,Tr}$ ≤27dB *(10dB below background)* $L_{Ar,Tr}$ ≤22dB *(15dB below background, applicable if unit noise has tonal components)*

Table 1: Measured representative minimum background noise & associated Condition 4 noise limit

4. NOISE FROM ASHP & MVHR UNITS

Informative Notes:

This acoustic report / noise assessment is based on the applicant's proposed Mitsubishi ASHP unit and Zehnder MVHR unit as detailed below. If as part of possible future equipment replacement, an alternative makes and/or models ASHP or MVHR units is selected, then it is important that noise levels for the alternative units be checked / verified by Philip Acoustics or another Acoustic Consultant to ensure noise emissions from the alternative units remain compliant with the planning consent Condition 4 noise limit requirement of London Borough of Camden.

The proposed units are:

- ASHP unit: Mitsubishi model PUZ-WM50VHA;
- MVHR unit: Zehnder model Q350.

Manufacturer's noise data for the units is provided in Appendix D.

The ASHP noise data is for the unit operating at full normal (100%) duty in cooling or heating mode, in terms of free-field overall dBA and linear octave band dB sound pressure levels at 1m distance from the unit. Summary of noise output from the ASHP unit including octave band values is shown in Table 2.

ASHP Unit & Operating Mode	Overall dBA	Octave Band Centre Frequency Hz (Linear dB)							
		63	125	250	500	1k	2k	4k	8k
Mitsubishi PUZ-WM50VHA *Full 100% duty cooling mode*	52	58	54	51	51	47	42	36	30
Mitsubishi PUZ-WM50VHA *Full 100% duty heating mode*	52	58	56	49	49	48	42	36	29

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

The MVHR noise data is for the unit operating in Standard mode (40% speed) and in Boost mode (60% speed), in terms of overall dBA and linear octave band dB sound power levels. Summary of noise output from the MVHR unit including octave band values is shown in Table 3.

Note that the noise assessments in this report are cautiously/robustly carried out with the MVHR unit operating in Boost (60% speed) mode as being "worse-case" with higher noise output than Standard mode.

MVHR Unit & Operating Mode	Overall dBA	Octave Band Centre Frequency Hz (Linear dB)							
		63	125	250	500	1k	2k	4k	8k
Zehnder Q350 – Intake *(Standard mode, 40% speed)*	38	-	48	44	33	26	23	17	19
Zehnder Q350 - Intake *(Boost mode, 60% speed)*	44	-	52	51	40	32	28	21	19
Zehnder Q350 - Exhaust *(Standard mode, 40% speed)*	51	-	57	55	49	43	38	29	23
Zehnder Q350 – Exhaust *(Boost mode, 60% speed)*	59	-	62	64	57	51	49	42	31

Table 3: Proposed MVHR unit noise data; linear sound power levels

Manufacturer noise data indicates the ASHP and MVHR units generate broadband type noise without strong, identifiable or clearly perceptible tonal elements. The Condition 4 requirement that plant noise be at least 10dBA below the background is applied for the assessment.

To calculate the noise contribution from the ASHP and MVHR units to the assessment position 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/or unit's terminals and assessment position, acoustic directivity, acoustic reflections (i.e. non free-field conditions) and any natural / default line of sight acoustic screening. Noise model calculation details are provided in Appendix E.

Summary of the noise model calculated noise Rating Level from the ASHP and MVHR units outside windows of the nearest neighbouring residential property compared with Condition 4 noise limit is shown in Table 4.

Noise from the units 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 units / unit's terminals will be lower.

ASHP & MVHR Units Operating Conditions	**Assessment Position**	**ASHP & MVHR Units Overall Noise Level *(Rating Level)***	**Condition 4 Noise Criterion *(limit)***	**Comments**
ASHP unit operating in heating or cooling mode; MVHR unit operating in standard or boost mode	Nearest front elevation windows of adjacent dwelling 26 Grafton Road	$L_{Ar,Tr}$ 26dB	Day Period *(7am to 11pm)* $L_{Ar,Tr}$ ≤32dB	Complies
		$L_{Ar,Tr}$ 26dB	Night Period *(11pm to 7am)* $L_{Ar,Tr}$ ≤27dB	Complies

Table 4: Noise from proposed units to assessment position *(nearest windows of neighbouring residential property)*

The assessment in Table 4 demonstrates noise from the ASHP and MVHR units complies with London Borough of Camden Condition 4 noise requirement. At this level, noise from the proposed units will be below existing lowest (minimum) background levels and would not be expected to be audible, cause disturbance or otherwise be of impact detrimental to the amenity of neighbouring residential occupiers.

Additionally, it is important to note the noise model calculation and assessment is cautious/robust, in practice noise from the ASHP and MVHR units will be lower and further below the background noise and criterion limit for the following reasons:

- The assessment assumes both ASHP & MVHR units are operating simultaneously (ASHP at normal full 100% duty, MVHR in boost mode) all the time over 24-hours including all through the late evening and night including when background noise levels are lowest, this is extremely unlikely to occur for majority of the time;
- In practice it is likely that the units, if on occasion operable through the night, would operate at reduced capacity/speed and with consequent lower noise output for the late evening and night period;
- The noise limit used for the assessment is cautiously based on the representative lowest / minimum measured background noise level over 24 hours (i.e. including middle of the night), over a five-day noise survey including sample weekdays and a full weekend. Background noise for the majority of the time, including during parts of the night period is higher than the measured minimum value used for the assessment. Correspondingly for these times noise from the units would be further below the background noise and associated noise limit applicable to these times based on the background noise occurring during these times.

5. VIBRATION FROM ASHP & MVHR UNITS

Vibration From MVHR Unit:

It is expected the MVHR unit (installed internally) will be supplied/fitted with proprietary/suitable vibration isolator as part of the manufacturer's package.

Vibration From ASHP Unit:

Proposed location of the ASHP unit at third floor terrace/flat roof of the building is potentially structurally linked, albeit indirectly and at distance, to neighbouring residential properties and therefore it is possible that unit vibration could transmit into neighbouring properties.

Although this is considered extremely unlikely as vibration from this type of modern relatively small domestic use ASHP unit is generally low as good practice it is advised the unit be installed on conventional proprietary vibration isolator mountings.

Appropriate proprietary vibration isolators for the unit would be rubber or neoprene turret type mountings, fitted to under each mounting foot / bracket of the unit. The vibration isolators should each have a static deflection nominally ≥5mm under weight of the unit.

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

Details of three example suppliers and their typically suitable vibration isolators for the Mitsubishi PUZ-WM50VHA are provided below.

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

Mitsubishi PUZ-WM50VHA (gross weight 71kg) = Isolator R-1 Black (max load per isolator 20.4kg)

Example Supplier 2:

Christie & Grey: www.christiegrey.co.uk

Isolator Type: Rubber Turret Mountings RM

Mitsubishi PUZ-WM50VHA (gross weight 71kg) = Isolator RM 19.100.Y.F Yellow (max load per mount 28kg)

Example Supplier 3:

Vibracoustics: www.vibracoustics.com

Isolator type: Vi-Turret Mountings

Mitsubishi PUZ-WM50VHA (gross weight 71kg) = Isolator VS42000 Yellow (max load per mount 35kg)

APPENDIX A

Noise Survey Instrumentation

Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix A *(page 1 of 1)*

Date: August 2022

NOISE SURVEY INSTRUMENTATION

Instrumentation Used:

- Rion sound level meter type NL-32 Class 1 serial number 01103430, Rion preamplifier type NH-21 serial number 34369, Rion microphone type UC-53A serial number 317947, Rion microphone windshield type WS-10, Rion microphone extension cable type EC-04A and tripod / boom arrangement;
- Bruel & Kjaer calibrator type 4231 serial number 2642929;
- Speedtech Instruments Skymaster model SM-28 serial number 19370 (sample weather conditions data).

Instrumentation Calibration Certification:

Description	Type Number	Manufacturer	Date of Calibration Expiration	Calibration Certificate Number
Sound Level Meter *s/n 01103430*	NL-32	Rion	18/02/2024	TCRT22/1132
Microphone *s/n 317947*	UC-53A			
Preamplifier *s/n 34369*	NH-21			
Calibrator *s/n 2642929*	4231	Bruel & Kjaer	18/02/2024	TCRT22/1131

Instrumentation On-Site Calibration Check:

Description	Calibrator Reference Level	Measured Level	Comment
Before survey measurements	94.1dB	94.1dB	Pass
After survey measurements		94.1dB	Pass *(nil significant drift)*

APPENDIX B

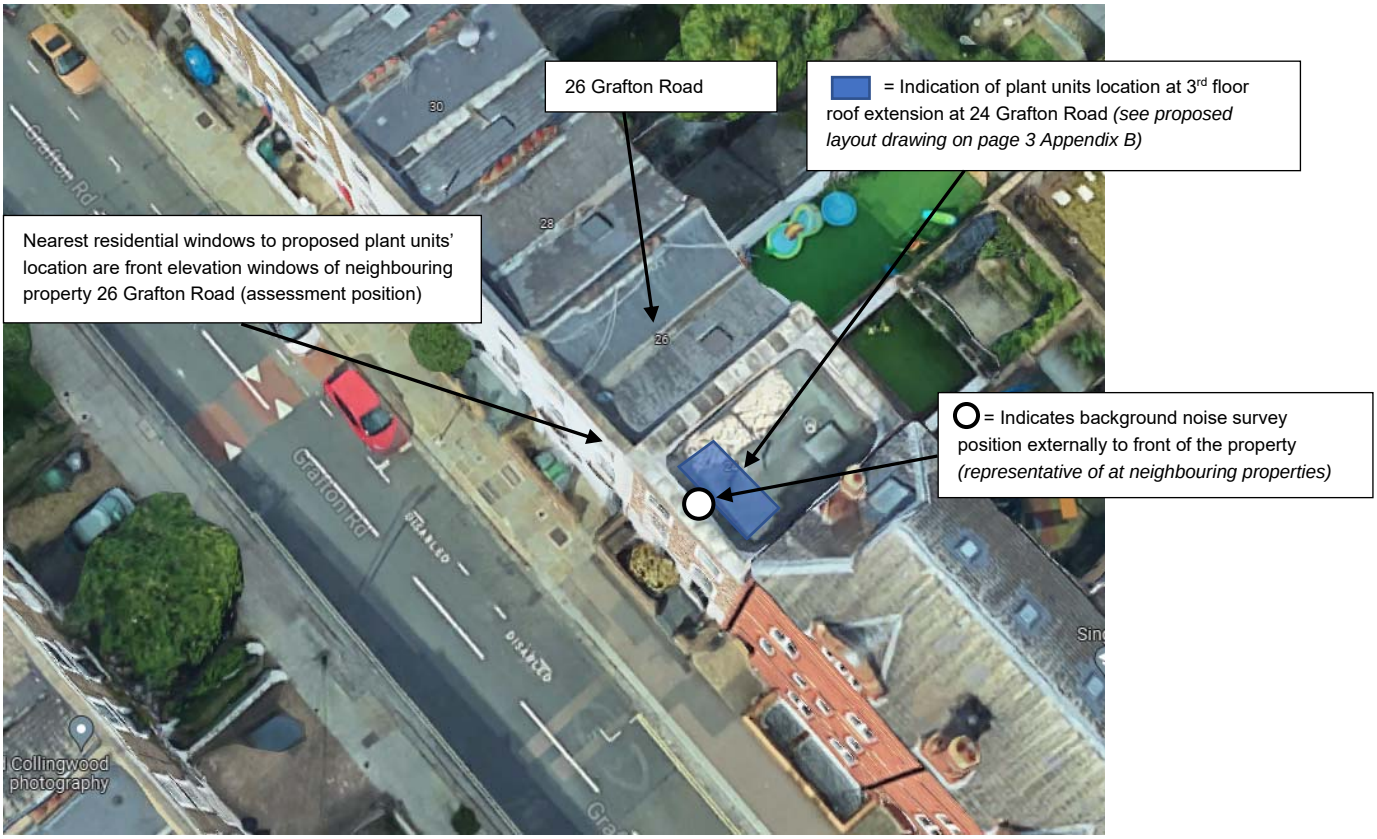
Aerial Image, Site Location Plan & Proposed Layout Drawing

Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix B *(page 1 of 3)*

Date: August 2022

AERIAL IMAGE



Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix B *(page 2 of 3)*

Date: August 2022

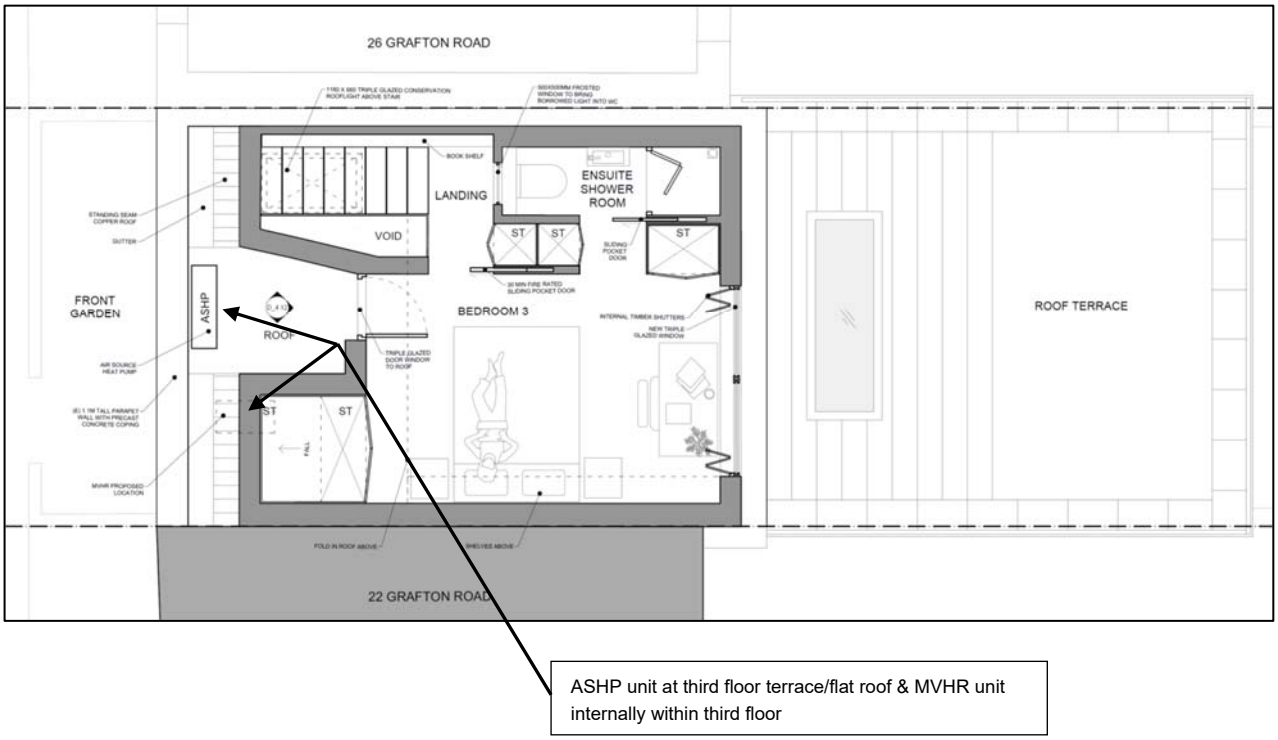
SITE LOCATION BLOCK PLAN

Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix B *(page 3 of 3)*

Date: August 2022

PROPOSED LAYOUT DRAWING



APPENDIX C

Background Noise Survey Results

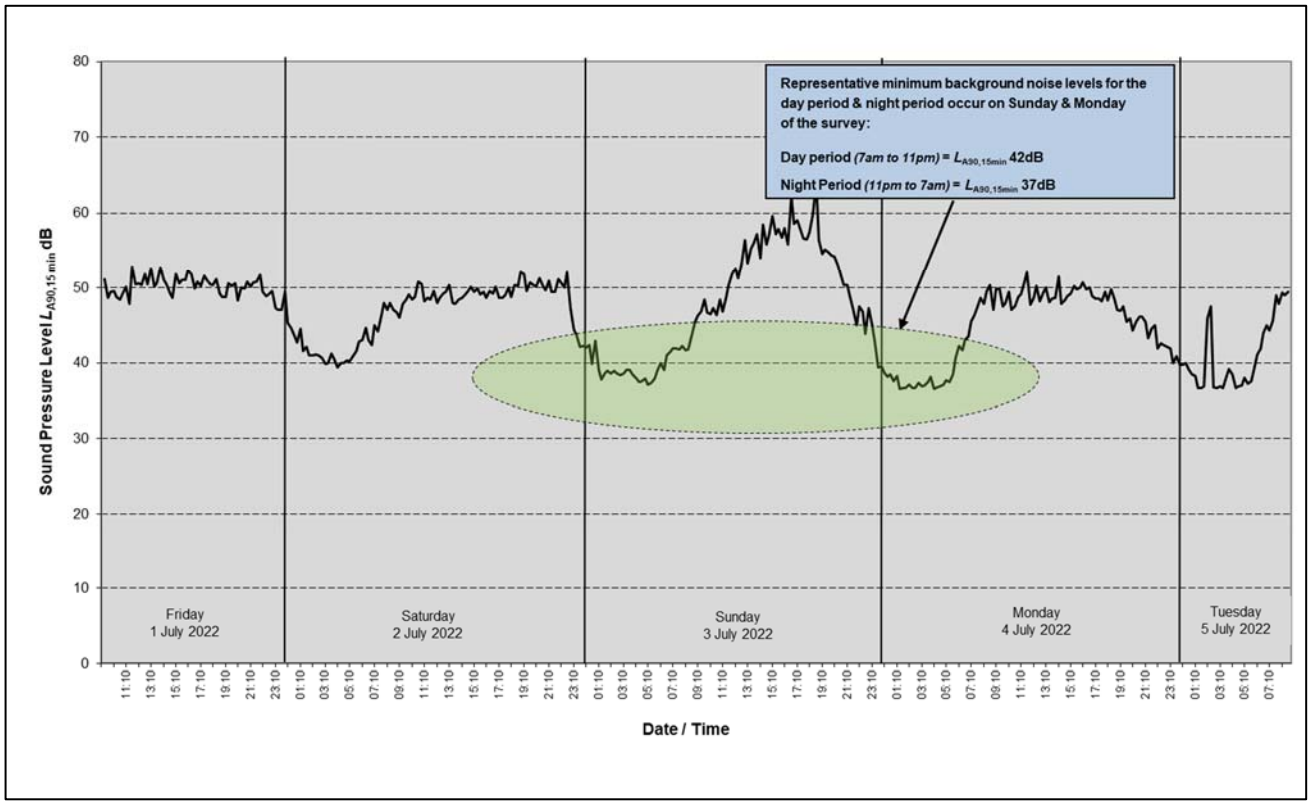
Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix C *(page 1 of 1)*

Date: August 2022

BACKGROUND NOISE SURVEY RESULTS

Raw Data Results For Five-Day Noise Survey 1 July 2022 – 5 July 2022:



APPENDIX D

Manufacturer Noise Data For Proposed Plant Units

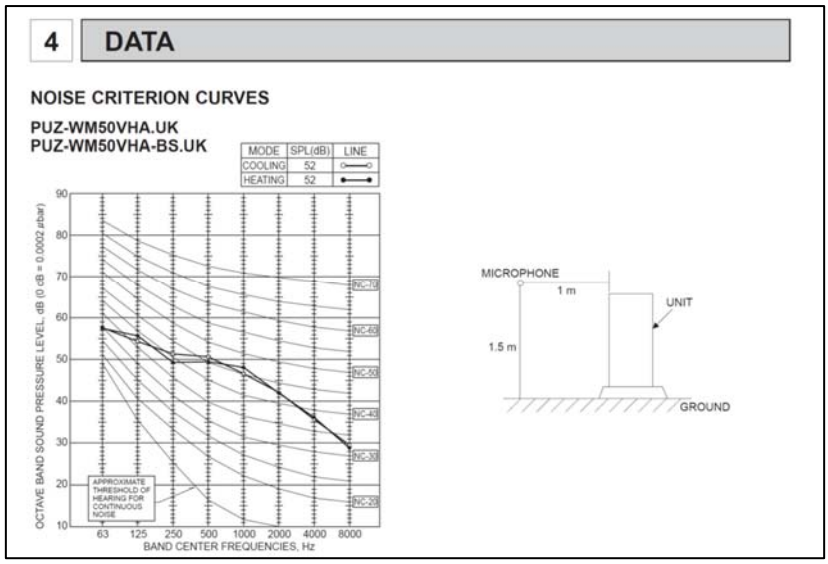
Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix D *(page 1 of 1)*

Date: August 2022

MANUFACTURER NOISE DATA FOR ASHP & MVHR UNITS

ASHP – Mitsubishi model PUZ-WM50VHA



MVHR – Zehnder model Q350

Sound Data

Speed	Test area	Octave Band (Hz) Sound Power Level, dB							dB(A) @
		125	250	500	1000	2000	4000	8000	3m
20%	Casing	35.2	31.2	25.5	19.6	14.8	10.6	16.7	10.4
	Supply/Exhaust	50.7	43.8	39.4	31.9	24.7	13.8	12.3	
	Extract/Intake	41.3	33.5	24.1	18.6	16.3	11.8	18.5	
40%	Casing	42.5	40.8	35.0	28.9	26.1	20.6	19.0	19.6
	Supply/Exhaust	57.1	54.8	49.4	42.7	38.3	29.4	22.9	
	Extract/Intake	47.5	43.5	33.2	26.1	22.6	17.1	18.7	
60%	Casing	48.3	48.4	42.5	36.3	35.1	28.6	20.8	27.1
	Supply/Exhaust	62.2	63.6	57.4	51.2	49.1	41.8	31.3	
	Extract/Intake	52.4	51.3	40.3	32.1	27.6	21.3	18.9	
80%	Casing	54.1	56.1	50.2	43.8	44.1	36.6	22.7	34.9
	Supply/Exhaust	67.4	72.4	65.5	59.8	60.0	54.3	39.8	
	Extract/Intake	57.4	59.3	47.5	38.2	32.7	25.6	19.1	
100%	Casing	55.0	57.2	51.3	44.9	45.5	37.8	22.9	36.1
	Supply/Exhaust	68.1	73.7	66.7	61.1	61.6	56.2	41.1	
	Extract/Intake	58.2	60.5	48.6	39.1	33.4	26.2	19.1	

APPENDIX E

Noise Model Calculation For Proposed Plant Units

Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix E *(page 1 of 2)*

Date: August 2022

NOISE MODEL CALCULATION FOR ASHP & MVHR UNITS

Assessment Position: Nearest top floor windows of neighbouring property 26 Grafton Road

Noise Condition: 1 x Mitsubishi PUZ-WM50VHA operating full (100%) duty cooling mode; 1 x Zehnder Q350 operating in boost mode (60% speed)

Noise Mitigation: None applied

		Lin dB at Octave Band Centre Frequency Hz							
Equipment & Description	**Overall dBA**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
MVHR: Zehnder Q350 Fresh Air intake									
Sound pressure level Lp dB; free-field level at 1m from terminal (boost mode)	26	24	27	31	24	17	14	7	5
Attenuation; none applied		0	0	0	0	0	0	0	0
Distance; *free-field correction for 5.5m from unit's FAI terminal to residential windows*		-15	-15	-15	-15	-15	-15	-15	-15
Screening; *line of sight screening correction applied* limit to -10dB		-10	-10	-10	-10	-10	-10	-10	-10
Directivity; *nil directivity correction applicable for this source*		0	0	0	0	0	0	0	0
Reflections; *nil correction applicable*		0	0	0	0	0	0	0	0
Individual contribution at assessment location	1	-1	2	6	-1	-8	-11	-18	-20
MVHR: Zehnder Q350 Exhaust									
Sound pressure level Lp dB; free-field level at 1m from terminal (boost mode)	34	34	37	44	41	36	35	28	17
Attenuation; none applied		0	0	0	0	0	0	0	0
Distance; *free-field correction for 5.5m from unit's Exhaust terminal to residential windows*		-15	-15	-15	-15	-15	-15	-15	-15
Screening; *line of sight screening correction applied* limit to -10dB		-10	-10	-10	-10	-10	-10	-10	-10
Directivity; *nil directivity correction applicable for this source*		0	0	0	0	0	0	0	0
Reflections; *nil correction applicable*		0	0	0	0	0	0	0	0
Individual contribution at assessment location	18	9	12	19	16	11	10	3	-8
ASHP: Mitsubishi PUZ-WM50VHA									
Sound pressure level Lp dB; free-field level at 1m from unit (cooling mode)	52	58	54	51	51	47	42	36	30
Attenuation; none applied		0	0	0	0	0	0	0	0
Distance; *free-field correction for 5.5m from unit location to residential windows*		-15	-15	-15	-15	-15	-15	-15	-15
Screening; *line of sight screening correction applicable, limit to -15dB*		-15	-15	-15	-15	-15	-15	-15	-15
Directivity; *nil directivity correction applicable for this source*		0	0	0	0	0	0	0	0
Reflections; *correction applicable due to parapet wall*		3	3	3	3	3	3	3	3
Individual contribution at assessment location	25	31	27	24	24	20	15	9	3
Cumulative contribution all sources at assessment position	**26**	31	27	25	25	21	16	10	4

Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix E *(page 2 of 2)*

Date: August 2022

NOISE MODEL CALCULATION FOR ASHP & MVHR UNITS

Assessment Position: Nearest top floor windows of neighbouring property 26 Grafton Road

Noise Condition: 1 x Mitsubishi PUZ-WM50VHA operating full (100%) duty heating mode; 1 x Zehnder Q350 operating in boost mode (60% speed)

Noise Mitigation: None applied

		Lin dB at Octave Band Centre Frequency Hz							
Equipment & Description	**Overall dBA**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
MVHR: Zehnder Q350 Fresh Air intake									
Sound pressure level Lp dB; free-field level at 1m from terminal (boost mode)	26	24	27	31	24	17	14	7	5
Attenuation; none applied		0	0	0	0	0	0	0	0
Distance; *free-field correction for 5.5m from unit's FAI terminal to residential windows*		-15	-15	-15	-15	-15	-15	-15	-15
Screening; *line of sight screening correction applied* limit to -10dB		-10	-10	-10	-10	-10	-10	-10	-10
Directivity; *nil directivity correction applicable for this source*		0	0	0	0	0	0	0	0
Reflections; *nil correction applicable*		0	0	0	0	0	0	0	0
Individual contribution at assessment location	1	-1	2	6	-1	-8	-11	-18	-20
MVHR: Zehnder Q350 Exhaust									
Sound pressure level Lp dB; free-field level at 1m from terminal (boost mode)	34	34	37	44	41	36	35	28	17
Attenuation; none applied		0	0	0	0	0	0	0	0
Distance; *free-field correction for 5.5m from unit's Exhaust terminal to residential windows*		-15	-15	-15	-15	-15	-15	-15	-15
Screening; *line of sight screening correction applied* limit to -10dB		-10	-10	-10	-10	-10	-10	-10	-10
Directivity; *nil directivity correction applicable for this source*		0	0	0	0	0	0	0	0
Reflections; *nil correction applicable*		0	0	0	0	0	0	0	0
Individual contribution at assessment location	18	9	12	19	16	11	10	3	-8
ASHP: Mitsubishi PUZ-WM50VHA									
Sound pressure level Lp dB; free-field level at 1m from unit (heating mode)	52	58	56	49	49	48	42	36	29
Attenuation; none applied		0	0	0	0	0	0	0	0
Distance; *free-field correction for 5.5m from unit location to residential windows*		-15	-15	-15	-15	-15	-15	-15	-15
Screening; *line of sight screening correction applicable, limit to -15dB*		-15	-15	-15	-15	-15	-15	-15	-15
Directivity; *nil directivity correction applicable for this source*		0	0	0	0	0	0	0	0
Reflections; *correction applicable due to parapet wall*		3	3	3	3	3	3	3	3
Individual contribution at assessment location	25	31	29	22	22	21	15	9	2
Cumulative contribution all sources at assessment position	**26**	31	29	24	23	22	16	10	3

APPENDIX F

Details For Example Proprietary Vibration Isolators

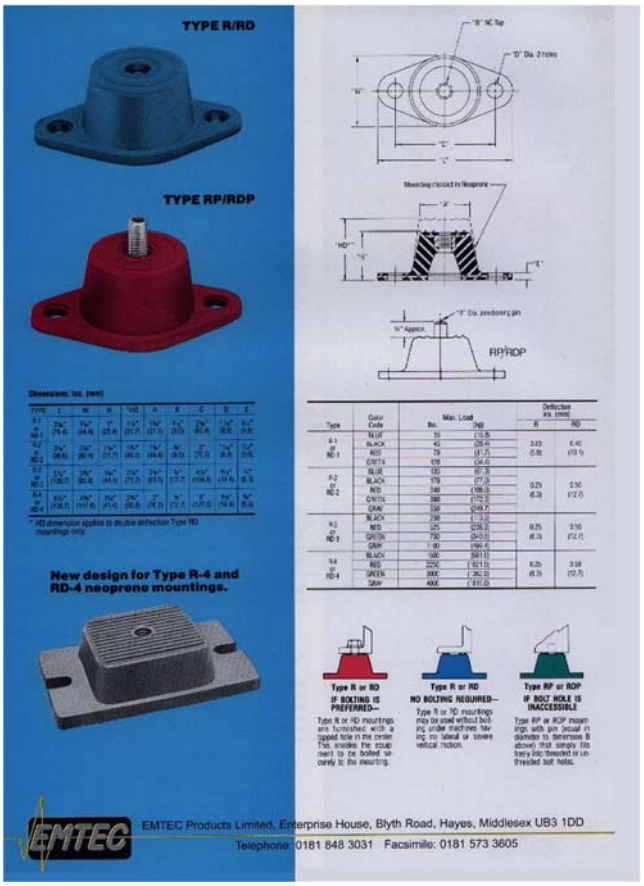
Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix F *(page 1 of 3)*

Date: August 2022

DETAILS FOR EXAMPLE VIBRATION ISOLATORS

Supplier: EMTEC



Site: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix F *(page 2 of 3)*

Date: August 2022

DETAILS FOR EXAMPLE 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.

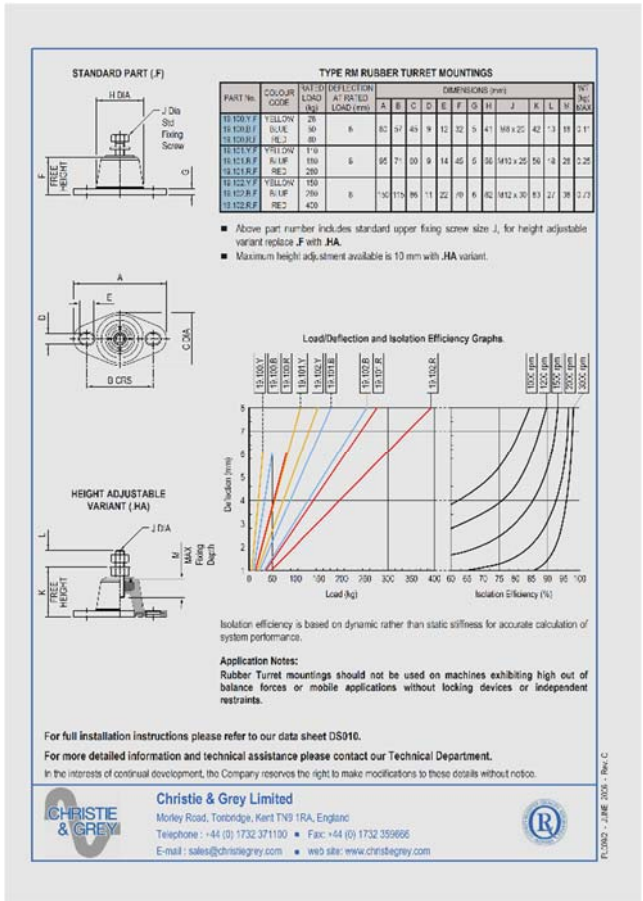
DESIGN FEATURES

- 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 adjustors 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



TYPE RM RUBBER TURRET MOUNTINGS

STANDARD PART (.F)

HEIGHT ADJUSTABLE VARIANT (.HA)

Load/Deflection and Isolation Efficiency Graphs.

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 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: 24 Grafton Road, London NW5 3DU

Report: 22059-002 Appendix F *(page 3 of 3)*

Date: August 2022

DETAILS FOR EXAMPLE VIBRATION ISOLATORS

Supplier: Vibracoustics

Vibracoustics

Products & Services for Vibration, Noise & Shock Control

PRODUCT GROUP 42

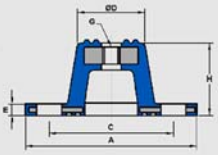
VI-TURRET MOUNTINGS

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.

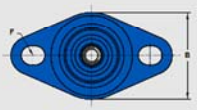
Efficient construction with fully rubber encapsulated metal components for environmental protection, threaded top and stable base fixings with non-skid mounting faces.

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