Philip Acoustics Ltd.

Consultants in Noise & Vibration
Building Regulations Certification Sound Insulation Testing

REPORT TITLE: ACOUSTIC REPORT FOR PROPOSED AIR CONDITIONING UNITS AT 56 SHORTS GARDENS, COVENT GARDEN, LONDON WC2H 9AN

REPORT REF: 23091-002

ISSUED TO: CLAD Studio

ISSUED BY: David R Philip BEng (Hons) MIOA

DATE: February 2024

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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CONTENTS

SUMMARY

- This report provides an acoustic (noise & vibration) assessment for outdoor air conditioning units proposed to be installed to serve office space at 56 Shorts Gardens, Covent Garden, London WC2H 9AN.

- The assessment is conducted with reference to London Borough of Camden's planning consent acoustic requirements for mechanical services plant / equipment (including items such as air conditioning 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 nine-day period. The survey establishes existing background noise levels during operational times of the proposed air conditioning units, at a position representative of outside nearest noise sensitive (residential) properties.

- Based on results of the background noise survey and noise model calculation using the air conditioning units' manufacturer noise data, noise from the air conditioning units is demonstrated to comply with London Borough of Camden's acoustic requirements.

- The report also considers vibration from the air conditioning units. Location for the proposed units is at distance from, and not structurally linked / connected to, neighbouring noise sensitive properties. Notwithstanding this, as good practice it is advised the air conditioning units are installed mounted on proprietary vibration isolators. Specification details for example suitable vibration isolators are provided in Section 6 of the report.

1. INTRODUCTION

Three outdoor air conditioning units are proposed to be installed to serve office space at 56 Shorts Gardens, Covent Garden, London WC2H 9AN.

The air conditioning units are to be positioned at roof terrace level to the rear of the building; as similar to existing air conditioning units serving other properties in the vicinity.

The Local Planning Authority (London Borough of Camden) planning application validation requirements include submission of an acoustic (noise & vibration assessment) report for proposed plant / equipment such as air conditioning units. This is for reason to protect the amenity of residents in the vicinity with regard to possible noise and vibration disturbance.

This acoustic report provides a noise and vibration assessment for the proposed air conditioning units and includes:

- Qualifications & experience;
- Criteria - London Borough of Camden planning consent acoustic requirements;
- Measurement survey of existing background noise levels;
- Details of the proposed air conditioning units, including location & manufacturer noise data;
- Calculation & assessment of noise from the air conditioning units;
- Consideration of vibration from the air conditioning units
- Specification for noise and/or vibration reduction measures as necessary to ensure compliance with London Borough of Camden's requirements.

2. QUALIFICATIONS & EXPERIENCE

This report is prepared and issued by David Philip. David Philip graduated in 1989 from The University of Salford Department of Applied Acoustics with a BEng Honours degree in Electroacoustics. David Philip has been since 1995, and continues to be, a fully elected Member of the Institute of Acoustics (MIOA).

David Philip has been the owner / managing director of Philip Acoustics since the firm was formed in 2002. Prior to the formation of Philip Acoustics, David Philip held senior acoustic consultant positions at Sound Research Laboratories (London office) and Spectrum Acoustic Consultants.

Philip Acoustics has held full membership of the Association of Noise Consultants (ANC) since 2003 and is also a full member of the ANC Registration Scheme of approved independent organisations to undertake Building Regulations Approved Document Part E pre-completion certification sound insulation testing.

David Philip has over 30 years' experience as an Acoustic Consultant both in the UK and internationally and has considerable experience undertaking noise surveys and noise assessments for a wide range of commercial uses and also residential developments.

This experience includes a substantial quantity of noise assessments specifically associated with air conditioning units, air source heat pump units and similar plant / equipment items serving commercial / retail premises and residential properties.

David Philip is fully familiar with London Borough of Camden's planning policy acoustic requirements, provisions of the current (and previous) editions of British Standard BS4142, as well as other acoustics related relevant standards and guidance documents.

The opinions expressed in this report are the true and professional opinions of David Philip. Neither David Philip nor Philip Acoustics is appointed on any incentive fee basis.

3. CRITERIA *(London Borough Of Camden Acoustic Requirements)*

Policy A4: *Noise and 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 air conditioning 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 and Vibration Thresholds" referenced in Policy A4 as applicable for proposed new plant / equipment such as air conditioning units are advised in Table C from section *Industrial and 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 air conditioning units 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 conditioning units etc. 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 and 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 conditioning units and similar equipment that compliance with London Borough of Camden's policy requirements, and as the clarification points below, would mean noise from the proposed air conditioning units is not generally audible / disturbing or otherwise of impact to persons inside or outside neighbouring dwellings.

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

a) Air Conditioning Units Operating Condition

The noise criterion is cautiously/robustly applied for the 3 x air conditioning units operating simultaneously (cumulatively) at full (100%) duty heating or cooling mode throughout office hours 8:30am to 6pm Monday to Friday.

In practice it is expected the units would operate at a reduced capacity (and thus with reduced noise output over full duty) for much of the time.

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 air conditioning units' noise at the assessment position as per the BS4142:2014 assessment methodology.

c) Assessment Position

The noise criterion is applicable to outside nearest residential windows and also to within residential gardens or similar external amenity space.

Any external amenity space of residential properties in the vicinity is not any closer distance from the proposed air conditioning units' location as compared with nearest residential buildings. Compliance with the noise criterion to outside nearest residential buildings will by default also ensure compliance to within external amenity space. Therefore, the assessment position to outside windows of neighbouring residential properties.

d) Background Noise Level

The noise criterion is applied as "worse case", cautiously/robustly based on the representative measured minimum (lower) background noise level $L_{A90,T}$ dB *(T = 15 mins),* representative of at the assessment position 8:30am to 6pm weekdays, based on results of a nine-day noise survey (see Section 4 of the report).

e) **Very Low Background Noise Levels** ***(for information only – not applicable to assessment)***

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

This simply due to that there is a lower threshold level at which plant 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. Previous edition of the standard BS4142:1997 advises 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 from loss of amenity due to noise disturbance.

Notwithstanding the above, it is sometimes appropriate to apply a lower plant noise limit (i.e. below the threshold cap) in consideration to avoid "background noise creep". This potentially occurs in scenarios where multiple plant items serving the same or different directly adjacent premises (multiple air conditioning units etc) are in turn installed in very close / immediate proximity to one another and as then cumulatively contributing a higher overall noise level to the same receptor (noise sensitive properties).

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 air source heat pumps), 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 air conditioning units is at distance from, and not directly attached to (structurally linked to) neighbouring residential properties. Camden's vibration level thresholds will be complied with by default.

Notwithstanding this, and as detailed in Section 6 of the report, it is advised as good practice the air conditioning units are installed mounted on conventional proprietary vibration isolators.

4. BACKGROUND NOISE SURVEY

To assess noise from the proposed air conditioning units against London Borough of Camden's planning consent noise requirement it is necessary to establish existing background noise levels representative of at neighbouring residential properties. Details of the background noise survey are provided in Sections 4.1 to 4.3.

4.1 Survey Instrumentation

Details of the instrumentation used for the background noise survey are provided in Appendix A. The sound level meter was calibration verified before and after the survey.

4.2 Survey Details & Procedure

The air conditioning units are to be operable during office hours 8:30am to 6pm Monday to Friday. The survey was over an extended nine-day period to include a sample of all weekdays; conducted Tuesday 07 November 2023 through Wednesday 15 November 2023.

Weather conditions were monitored and throughout majority of the nine-day survey period were suitable for the background noise survey in accordance with BS4142:2014; dry (nil precipitation) and with light wind, i.e. not adversely contaminating / influencing the survey noise measurements.

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) for the entire survey duration.

The background noise survey position was selected as best practicably accessible representative for outside nearest noise sensitive properties, externally in free-field conditions facilitated by positioning the instrumentation microphone on a telescopic boom and extension cable arrangement from the rear roof terrace area.

Nearest noise sensitive properties are residential dwellings:

- 22 & 24 Betterton Street: Southeast beyond rear of 56 Shorts Gardens; upper floors rear elevation windows of 22 & 24 Betterton Street are in direction towards the rear of 56 Shorts Gardens;
- 62-70 Shorts Gardens: New mixed use development adjacent northeast of 56 Shorts Gardens, includes upper floors residential apartments.

Proposed location of the air conditioning units, background noise survey position and nearest residential properties are indicated on an aerial image, site location plan and proposed roof terrace layout drawing in Appendix B.

4.3 Survey Results, Observations & Air Conditioning Units' Noise Limit

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

Background noise levels are as typical for this rear of buildings Central London / Covent Garden area location, due to underlying noise from traffic and general activity in the local and wider area plus existing plant / equipment serving various surrounding premises in all directions.

Background noise levels follow a normal diurnal profile; fluctuating during the day, then reducing during the evening and into the night, before then increasing again in the morning.

Summary of the representative minimum (lower) $L_{A90,T}$ background noise level and associated air conditioning units' noise limit based on London Borough of Camden's noise requirement (detailed in Section 3 of the report) is shown in Table 1.

Air Conditioning Units Operating Condition	**Assessment Position**	**Representative Minimum Background Noise Level $L_{A90,15min}$**	**Air Conditioning Units' Noise Limit *(Rating Level)***
Proposed air conditioning units operating full (100%) duty heating or cooling mode office hours 8:30am to 6pm Monday to Friday	Outside nearest windows of noise sensitive (residential) properties	49dB *(time range 8:30am to 6pm Monday to Friday)*	$L_{Ar,Tr}$ ≤39dBA *(10dB below background)* $L_{Ar,Tr}$ ≤34dBA *(15dB below background, applicable if units' noise has tonal components)*

Table 1: Measured representative minimum background noise & associated air conditioning units' noise limit

5. NOISE FROM AIR CONDITIONING UNITS

***Informative (1)*: Proposed Air Conditioning Units**

This report and noise assessment is based on the proposed model Mitsubishi air conditioning units as detailed below.

If alternative make and/or model units are selected, including as part of future possible unit replacement, it is important that noise levels for the alternative units be checked by Philip Acoustics or another Acoustic Consultant to ensure the alternative units remain compliant with London Borough of Camden's noise requirements.

The proposed 3 x air conditioning units are listed below:

- **Mitsubishi MUZ-AP60VG** (serving 1st floor main office);
- **Mitsubishi MUZ-AP50VG** (serving 1st floor small office);
- **Mitsubishi MUZ-AP60VG** (serving 2nd floor office).

Manufacturer's noise data for the air conditioning units is provided in Appendix D. The noise data is for the units' operating at full (100%) duty cooling and heating mode, in terms of free-field overall dBA and linear octave band dB sound pressure levels at 1m distance.

For purpose of the noise assessment, it is cautiously / robustly taken as "worse case" the three proposed air conditioning units are operating simultaneously at full (100%) duty, i.e. with no allowance the units may likely operate at reduced duty / capacity (with consequent lower noise output), if at all, for much of the time.

Summary of noise output from the air conditioning units (per unit) including octave band values is shown in Table 2.

Description	Overall dBA	Octave Band Centre Frequency Hz - Linear dB (1)							
		63	125	250	500	1k	2k	4k	8k
Mitsubishi MUZ-AP60VG									
Full 100% duty Cooling Mode	56	61	61	58	54	50	46	40	33
Full 100% duty Heating Mode	57	64	60	58	55	51	48	42	36
Mitsubishi MUZ-AP50VG									
Full 100% duty Cooling Mode	52	55	58	52	50	46	41	36	31
Full 100% duty Heating Mode	52	55	56	53	51	46	42	36	30
***Note (1):** As per normal acoustic reporting convention, displayed octave band values are manufacturer noise data values rounded to nearest whole dB number.*									

Table 2: Air conditioning unit noise data (per unit); free-field sound pressure levels at 1m

Manufacturer noise data indicates the Mitsubishi model MUZ-AP60VG and MUZ-AP50VG air conditioning units generate a nominally broadband type noise without strong, identifiable or clearly perceptible tonal elements. This correlates with experience of the author in measuring and subjectively observing noise levels from installed same and similar model Mitsubishi air conditioning units.

To calculate the noise contribution from the air conditioning units to the assessment position outside nearest noise sensitive (residential) property windows a spreadsheet noise calculation model has been used.

The model takes account of the distance between the units and assessment position, acoustic directivity, acoustic reflections (i.e. non free-field conditions) and any natural / default line of sight acoustic screening due to orientation and intervening buildings / structures etc. where applicable.

Noise assessment positions and noise model calculation details are provided in Appendix E.

The overall calculated noise Rating Level from the proposed air conditioning units to the assessment positions compared with London Borough of Camden's planning consent noise limit requirement is shown in Table 3.

Noise from the air conditioning units to outside windows of other residential properties in the vicinity that are more distant from, and/or more physically screened from, location of the units will be lower.

Assessment Position	**Air Conditioning Units' Operating Condition**	**Air Conditioning Units' Overall Noise Level *(Rating Level)***	**Noise Limit *(Rating Level)***	**Comment**
Assessment Position A: Nearest rear elevation windows of 22 & 24 Betterton Street *(beyond rear of 56 Shorts Gardens)*	3 x units operating full duty Cooling Mode	$L_{Ar,Tr}$ 37dB	$L_{Ar,Tr} \leq$ 39dB	Complies
	3 x units operating full duty Heating Mode	$L_{Ar,Tr}$ 38dB		
Assessment Position B: To nearest upper floors part of new mixed use development at 62-70 Shorts Gardens	3 x units operating full duty Cooling Mode	$L_{Ar,Tr}$ 36dB		
	3 x units operating full duty Heating Mode	$L_{Ar,Tr}$ 37dB		

Table 3: Proposed air conditioning units noise assessment

The assessment demonstrates noise from the proposed air conditioning units complies with London Borough of Camden's requirement.

At this level, noise from the air conditioning unit will be substantially below existing weekdays day period minimum background noise levels 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 on the previous page and in Table 3, noise from air conditioning units to nearest noise sensitive (residential) 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**
Assessment Position A: Nearest rear elevation windows of 22 & 24 Betterton Street *(beyond rear of 56 Shorts Gardens)*									
Air conditioning units' noise to assessment position – Cooling Mode	NR31	42	42	39	35	31	27	21	14
Air conditioning units' noise to assessment position – Heating Mode	NR32	44	41	39	36	32	29	23	17
Excess of air conditioning units' noise on NR limit	-	-	-	-	-	-	-	-	-
Assessment Position B: Nearest upper floors part of new mixed use development 62-70 Shorts Gardens									
Air conditioning units' noise to assessment position – Cooling Mode	NR30	41	41	38	34	30	26	20	14
Air conditioning units' noise to assessment position – Heating Mode	NR31	44	40	38	35	31	28	22	16
Excess of air conditioning units' noise on NR limit	-	-	-	-	-	-	-	-	-

Table 4: Assessment of noise from air conditioning units *(NR value assessment)*

The assessment as detailed in Table 4 demonstrates noise from the air conditioning units complies with (i.e. does not exceed) the NR35 noise limit criterion as per London Borough of Camden's requirements.

6. VIBRATION FROM AIR CONDITIONING UNITS

Location for the proposed air conditioning units is at distance from and separate from (i.e. not directly attached to) noise sensitive (residential) properties. It is not expected there would be vibration transmission from the air conditioning units to neighbouring noise sensitive properties.

Notwithstanding this, as good practice and to anyhow mitigate possible residual vibration from the air conditioning units to the property itself 56 Shorts Gardens plus adjacent other office use premises, it is advised the units are installed mounted on conventional proprietary vibration isolators as per the specification below.

Typically suitable / appropriate proprietary vibration isolators for the air conditioning units are rubber or neoprene turret type mountings with static deflection nominally ≥3mm under the weight / loading of the unit.

4 x isolators are required per unit; one to under each mounting corner position.

Details for three example suppliers and their typically suitable vibration isolators are provided below. The stated weight for is for the proposed air conditioning units themselves (per unit) plus with allowance for refrigerant charge.

The example suppliers are not listed in any order of preference and copy of each of the supplier's data sheets is provided in Appendix F. Other suppliers will be able to offer similar suitable / equivalent vibration isolators.

Example Supplier 1:

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

Mitsubishi MUZ-AP60VG & MUZ-AP50VG (weight 41kg) = Isolator R-1 Blue (max load per isolator ≈ 16kg)

Example Supplier 2:

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

Mitsubishi MUZ-AP60VG & MUZ-AP50VG (weight 41kg) = Isolator RM 19.100.Y.F Yellow (max load per mount ≈ 28kg)

Example Supplier 3:

Fibet Group: www.fibet.co.uk Isolator type: SEM Light Duty Mounts

Mitsubishi MUZ-AP60VG & MUZ-AP50VG (weight 41kg) = Isolator SEM-8525W (max load per mount ≈ 26.5kg)

APPENDIX A

Noise Survey Instrumentation

Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix A *(page 1 of 1)*

Date: February 2024

NOISE SURVEY INSTRUMENTATION

Instrumentation Used:

- Rion sound level meter type NL-31 Class 1, Rion preamplifier type NH-21, Rion microphone type UC-53A, Rion microphone windshield type WS-10, Rion microphone extension cable type EC-04A and tripod / boom arrangement;
- Bruel & Kjaer calibrator type 4231.

Instrumentation Calibration Certificate Details:

Description	Type Number	Manufacturer	Date of Calibration Expiration	Calibration Certificate Number
Class 1 Sound Level Meter *s/n 00773045*	NL-31	Rion	05/08/2024	TCRT22/1493
Microphone *s/n 313002*	UC-53A			
Preamplifier *s/n 25056*	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	94.0dB	94.1dB	Pass
After survey measurements		94.1dB	Pass *(nil significant drift)*

APPENDIX B

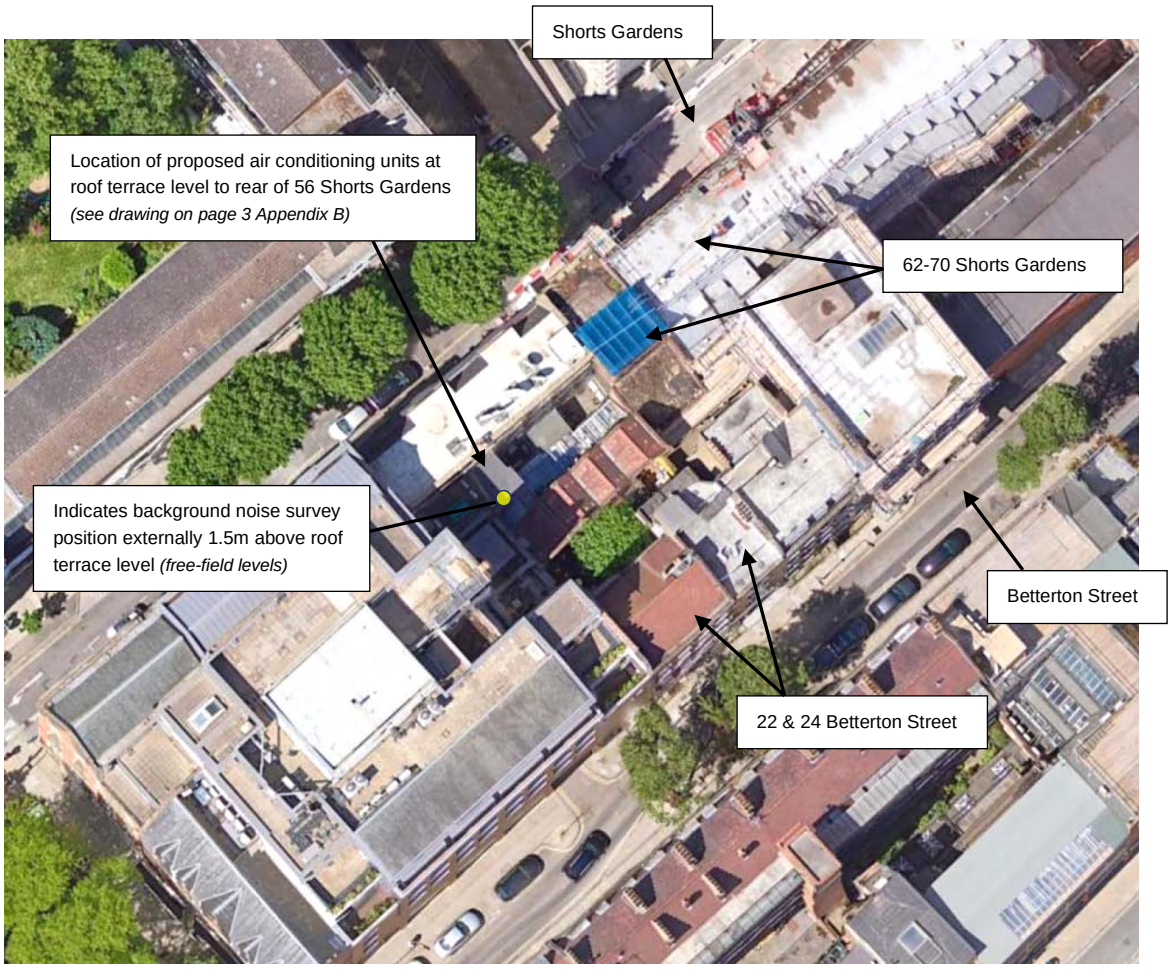
Aerial Image, Site Location Plan & Proposed Roof Terrace Layout Drawing

Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix B *(page 1 of 3)*

Date: February 2024

AERIAL IMAGE

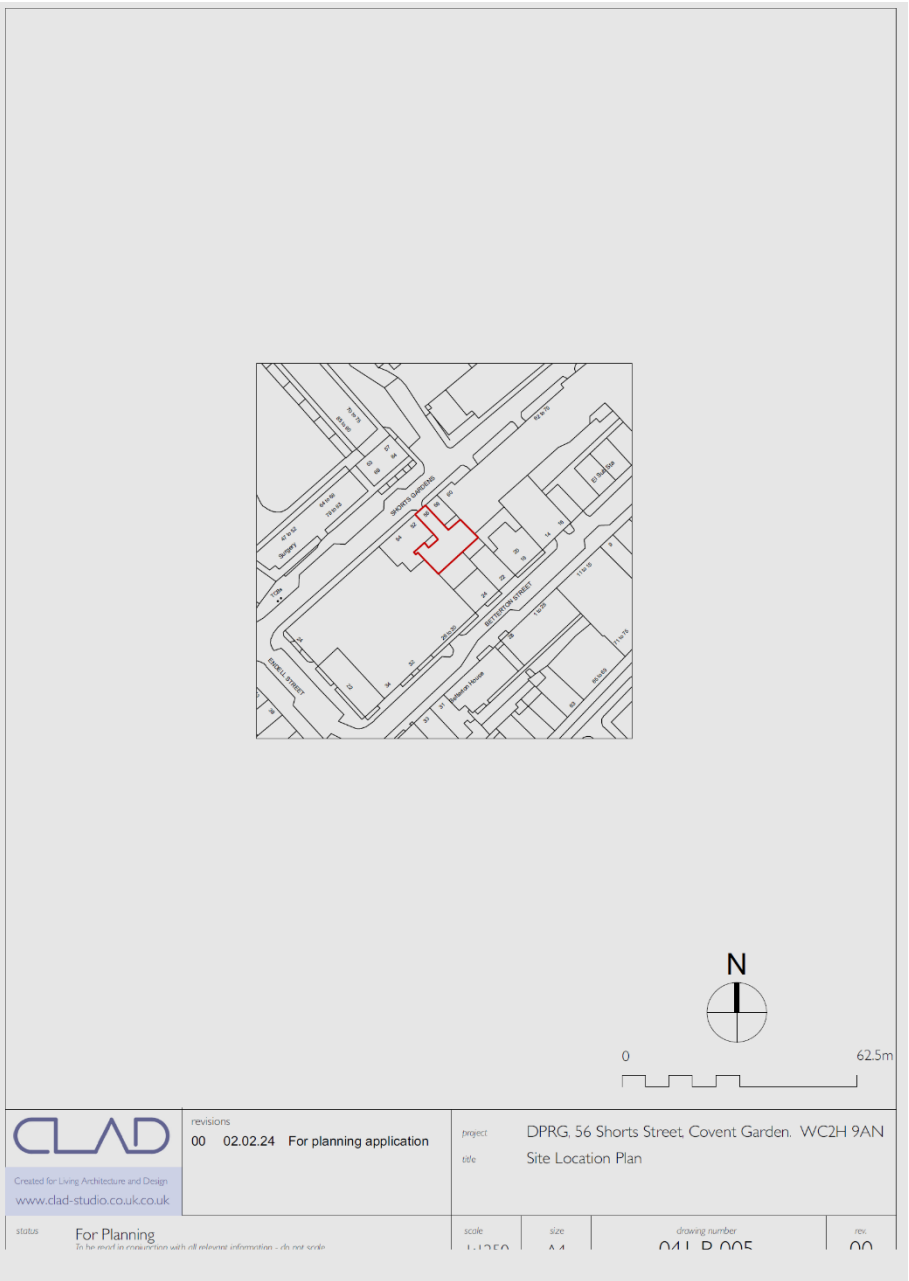


Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix B *(page 2 of 3)*

Date: February 2024

SITE LOCATION PLAN

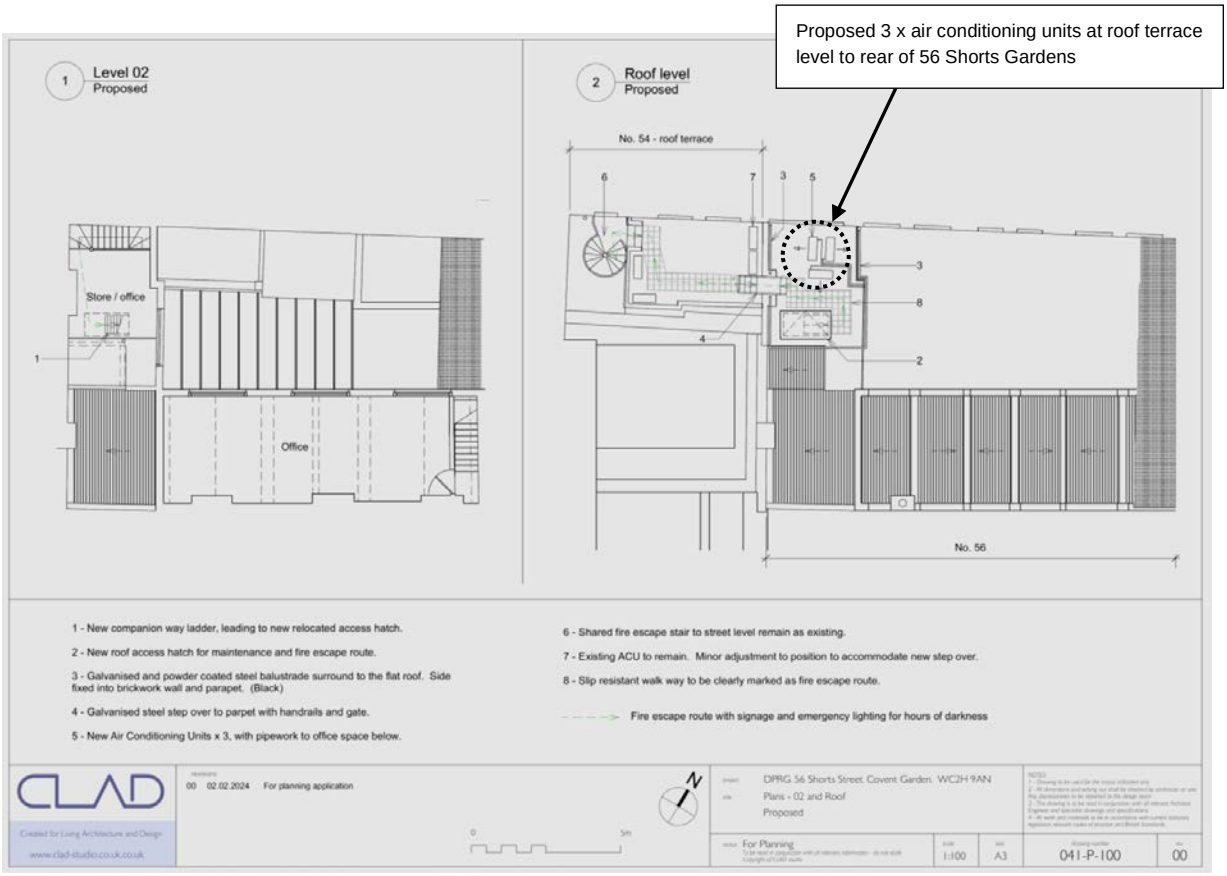


Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix B *(page 3 of 3)*

Date: February 2024

PROPOSED ROOF TERRACE LAYOUT DRAWING



APPENDIX C

Background Noise Survey Results

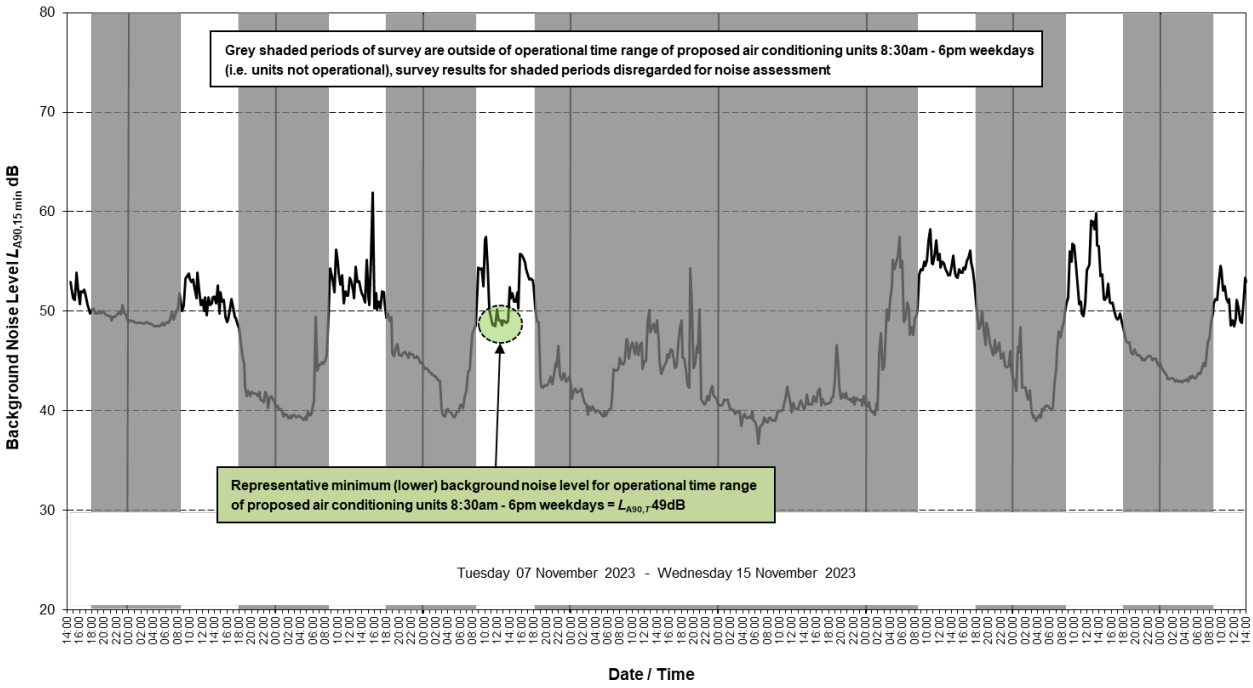
Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix C *(page 1 of 1)*

Date: February 2024

BACKGROUND NOISE SURVEY RESULTS

Nine-Day Noise Survey Tuesday 07 November 2023 – Wednesday 15 November 2023:



APPENDIX D

Manufacturer Noise Data For Proposed Air Conditioning Units

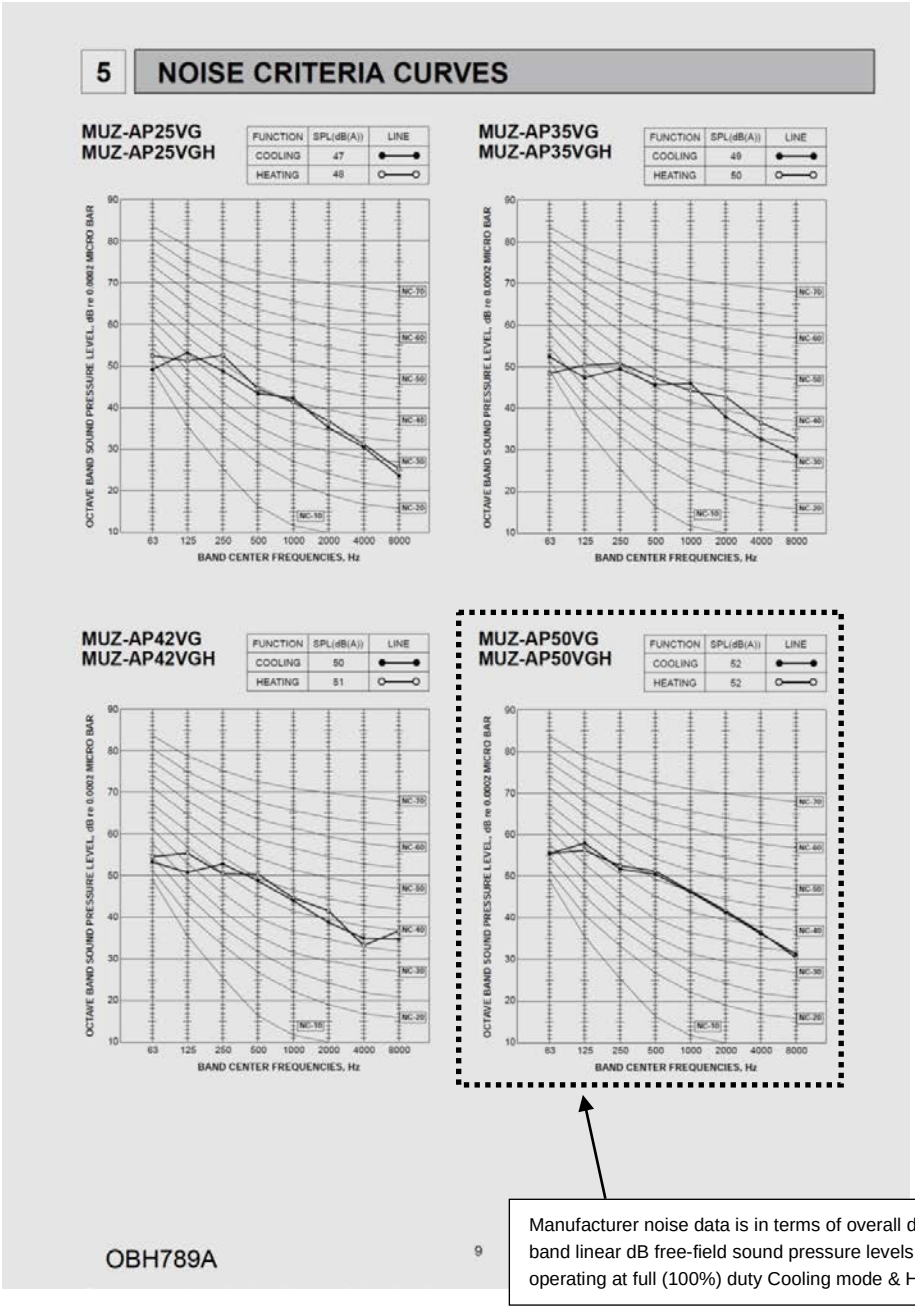
Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix D *(page 1 of 2)*

Date: February 2024

MANUFACTURER NOISE DATA FOR PROPOSED AIR CONDITIONING UNITS

Mitsubishi MUZ-AP50VG



Manufacturer noise data is in terms of overall dBA & octave band linear dB free-field sound pressure levels at 1m; for unit operating at full (100%) duty Cooling mode & Heating mode

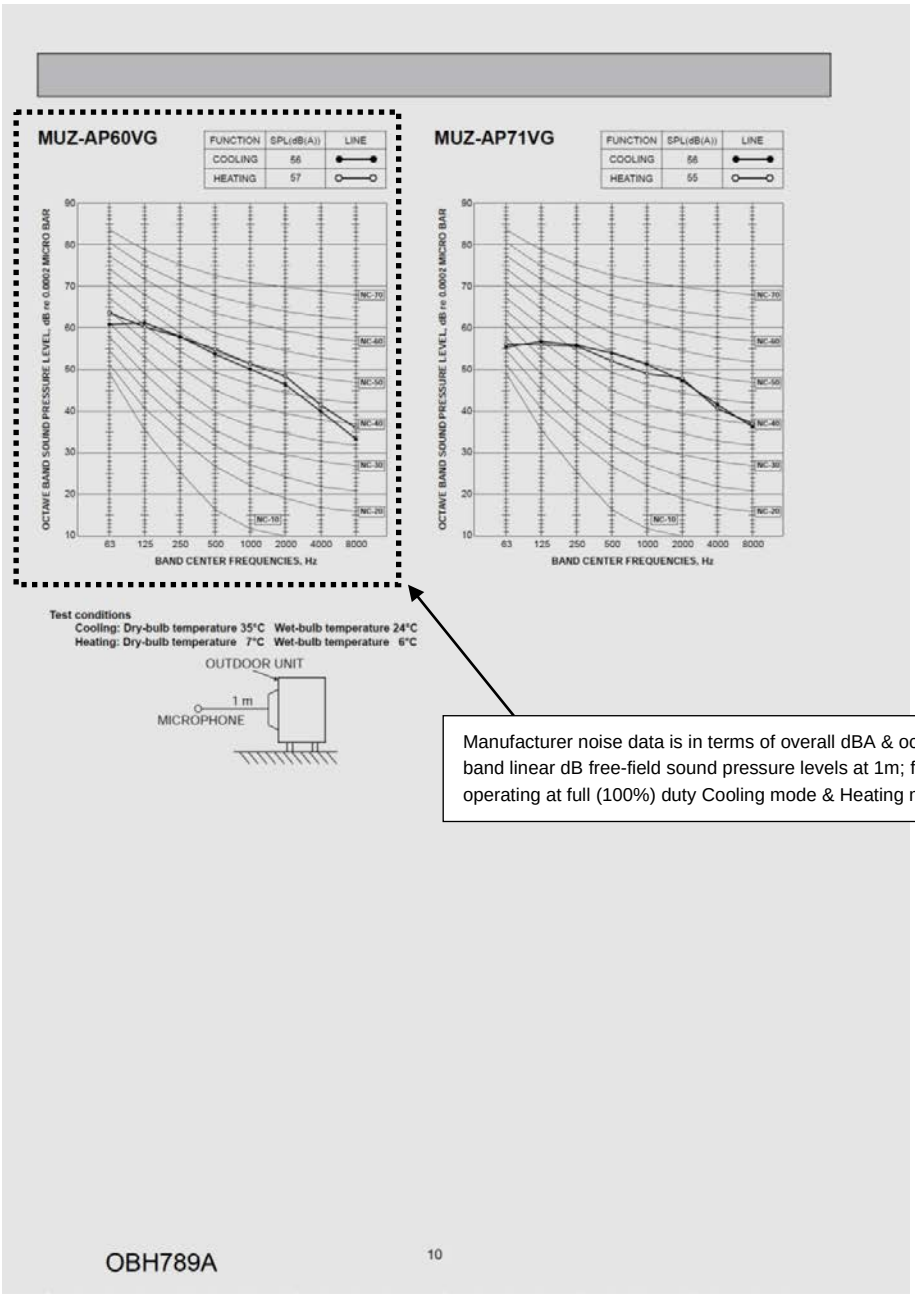
Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix D *(page 2 of 2)*

Date: February 2024

MANUFACTURER NOISE DATA FOR PROPOSED AIR CONDITIONING UNITS

Mitsubishi MUZ-AP60VG



Manufacturer noise data is in terms of overall dBA & octave band linear dB free-field sound pressure levels at 1m; for unit operating at full (100%) duty Cooling mode & Heating mode

APPENDIX E

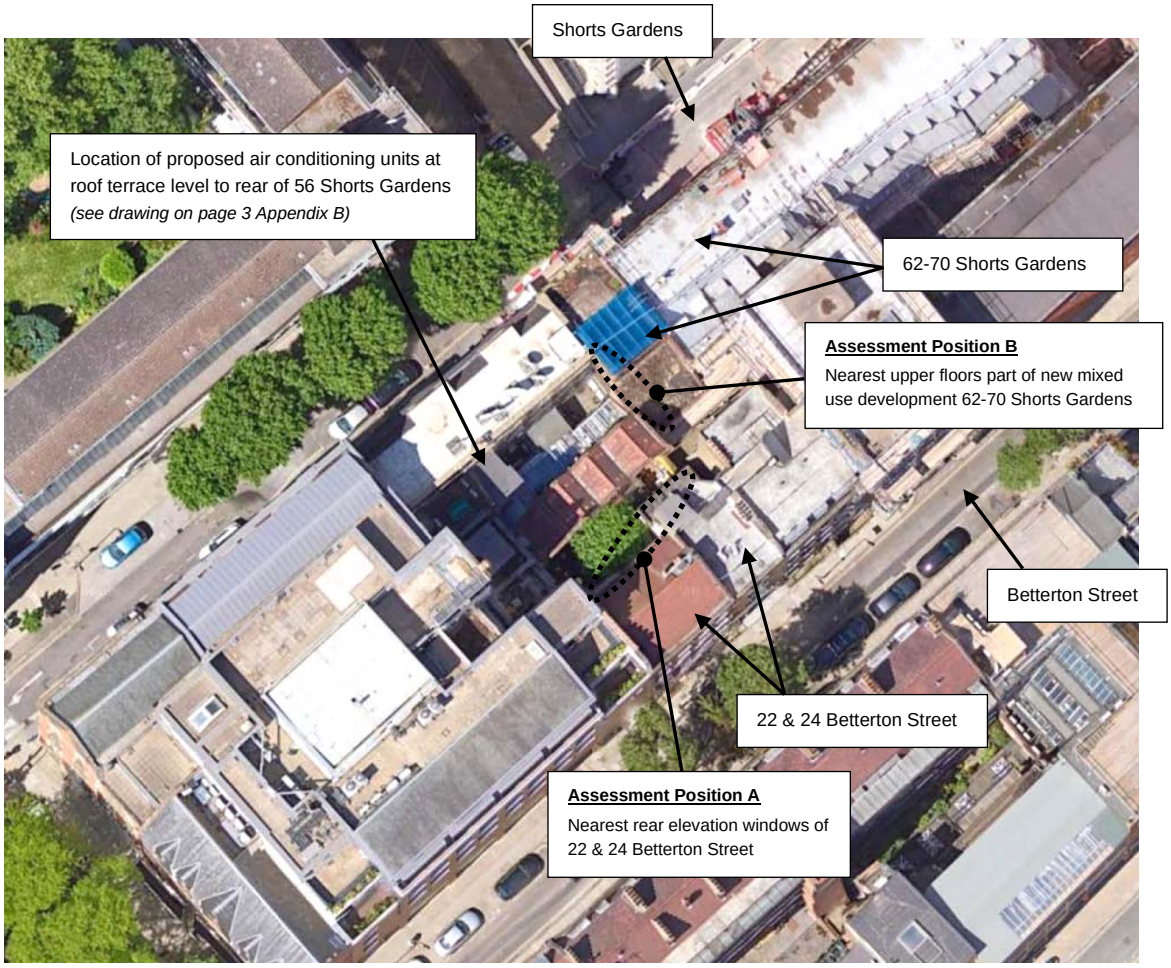
Noise Assessment Positions & Noise Model Calculation

Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix E *(page 1 of 3)*

Date: February 2024

NOISE ASSESSMENT POSITIONS



Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix E *(page 2 of 3)*

Date: February 2024

NOISE MODEL CALCULATION

Assessment Position A: Nearest rear elevation windows of 22 & 24 Betterton Street

Noise Condition: 2 x MUZ-AP60VG & 1 x MUZ-AP60VG Mitsubishi units operating full (100%) duty cooling / heating modes

Noise Mitigation: Non applied

Description	Overall dBA	Lin dB at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
AIR CONDITIONING UNIT: Mitsubishi model MUZ-AP60VG *(2 x units)*									
Noise Data: *sound pressure level at 1m (free-field); Lp dB unit operating full 100% duty Cooling Mode*	56	61	61	58	54	50	46	40	33
Quantity; *+3dB quantity correction applicable for 2 x units MUZ-AP60VG*		3	3	3	3	3	3	3	3
AIR CONDITIONING UNIT: Mitsubishi model MUZ-AP50VG *(1 x unit)*									
Noise Data: *sound pressure level at 1m (free-field); Lp dB unit operating full 100% duty Cooling Mode*	52	55	58	52	50	46	41	36	31
Quantity; *0dB quantity correction applicable for 1 x unit MUZ-AP50VG*		0	0	0	0	0	0	0	0
Combined equivalent overall sound pressure level at 1m (free-field); *Lp dB all 3 x units operating*	60	65	65	62	58	54	50	44	37
Noise Mitigation; *non applied*		0	0	0	0	0	0	0	0
Distance; *free-field correction for ≈14m from units to assessment position*		-23	-23	-23	-23	-23	-23	-23	-23
Screening; *nil line of sight acoustic screening correction applicable*		0	0	0	0	0	0	0	0
Directivity; *nil directivity correction applicable (units radiate noise equally all directions)*		0	0	0	0	0	0	0	0
Non Free-Field / Reflections; *nil correction applied - units on flat roof terrace (not wall mounted)*		0	0	0	0	0	0	0	0
Cumulative Contribution 3 x Air Conditioning Units At Assessment Position (Cooling Mode)	**37**	**42**	**42**	**39**	**35**	**31**	**27**	**21**	**14**

Description	Overall dBA	Lin dB at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
AIR CONDITIONING UNIT: Mitsubishi model MUZ-AP60VG *(2 x units)*									
Noise Data: *sound pressure level at 1m (free-field); Lp dB unit operating full 100% duty Heating Mode*	57	64	60	58	55	51	48	42	36
Quantity; *+3dB quantity correction applicable for 2 x units MUZ-AP60VG*		3	3	3	3	3	3	3	3
AIR CONDITIONING UNIT: Mitsubishi model MUZ-AP50VG *(1 x unit)*									
Noise Data: *sound pressure level at 1m (free-field); Lp dB unit operating full 100% duty Heating Mode*	52	55	56	53	51	46	42	36	30
Quantity; *0dB quantity correction applicable for 1 x unit MUZ-AP50VG*		0	0	0	0	0	0	0	0
Combined equivalent overall sound pressure level at 1m (free-field); *Lp dB all 3 x units operating*	61	67	64	62	59	55	52	46	40
Noise Mitigation; *non applied*		0	0	0	0	0	0	0	0
Distance; *free-field correction for ≈14m from units to assessment position*		-23	-23	-23	-23	-23	-23	-23	-23
Screening; *nil line of sight acoustic screening correction applicable*		0	0	0	0	0	0	0	0
Directivity; *nil directivity correction applicable (units radiate noise equally all directions)*		0	0	0	0	0	0	0	0
Non Free-Field / Reflections; *nil correction applied - units on flat roof terrace (not wall mounted)*		0	0	0	0	0	0	0	0
Cumulative Contribution 3 x Air Conditioning Units At Assessment Position (Heating Mode)	**38**	**44**	**41**	**39**	**36**	**32**	**29**	**23**	**17**

Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix E *(page 3 of 3)*

Date: February 2024

NOISE MODEL CALCULATION

Assessment Position B: Nearest upper floors part of new mixed use development 62-70 Shorts Gardens

Noise Condition: 2 x MUZ-AP60VG & 1 x MUZ-AP60VG Mitsubishi units operating full (100%) duty cooling / heating modes

Noise Mitigation: Non applied

Description	Overall dBA	Lin dB at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
AIR CONDITIONING UNIT: Mitsubishi model MUZ-AP60VG *(2 x units)*									
Noise Data: *sound pressure level at 1m (free-field); Lp dB unit operating full 100% duty Cooling Mode*	56	61	61	58	54	50	46	40	33
Quantity; *+3dB quantity correction applicable for 2 x units MUZ-AP60VG*		3	3	3	3	3	3	3	3
AIR CONDITIONING UNIT: Mitsubishi model MUZ-AP50VG *(1 x unit)*									
Noise Data: *sound pressure level at 1m (free-field); Lp dB unit operating full 100% duty Cooling Mode*	52	55	58	52	50	46	41	36	31
Quantity; *0dB quantity correction applicable for 1 x unit MUZ-AP50VG*		0	0	0	0	0	0	0	0
Combined equivalent overall sound pressure level at 1m (free-field); *Lp dB all 3 x units operating*	60	65	65	62	58	54	50	44	37
Noise Mitigation; *non applied*		0	0	0	0	0	0	0	0
Distance; *free-field correction for ≈15m from units to assessment position*		-24	-24	-24	-24	-24	-24	-24	-24
Screening; *nil line of sight acoustic screening correction applicable*		0	0	0	0	0	0	0	0
Directivity; *nil directivity correction applicable (units radiate noise equally all directions)*		0	0	0	0	0	0	0	0
Non Free-Field / Reflections; *nil correction applied - units on flat roof terrace (not wall mounted)*		0	0	0	0	0	0	0	0
Cumulative Contribution 3 x Air Conditioning Units At Assessment Position (Cooling Mode)	**36**	**41**	**41**	**38**	**34**	**30**	**26**	**20**	**14**

Description	Overall dBA	Lin dB at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
AIR CONDITIONING UNIT: Mitsubishi model MUZ-AP60VG *(2 x units)*									
Noise Data: *sound pressure level at 1m (free-field); Lp dB unit operating full 100% duty Heating Mode*	57	64	60	58	55	51	48	42	36
Quantity; *+3dB quantity correction applicable for 2 x units MUZ-AP60VG*		3	3	3	3	3	3	3	3
AIR CONDITIONING UNIT: Mitsubishi model MUZ-AP50VG *(1 x unit)*									
Noise Data: *sound pressure level at 1m (free-field); Lp dB unit operating full 100% duty Heating Mode*	52	55	56	53	51	46	42	36	30
Quantity; *0dB quantity correction applicable for 1 x unit MUZ-AP50VG*		0	0	0	0	0	0	0	0
Combined equivalent overall sound pressure level at 1m (free-field); *Lp dB all 3 x units operating*	61	67	64	62	59	55	52	46	40
Noise Mitigation; *non applied*		0	0	0	0	0	0	0	0
Distance; *free-field correction for ≈15m from units to assessment position*		-24	-24	-24	-24	-24	-24	-24	-24
Screening; *nil line of sight acoustic screening correction applicable*		0	0	0	0	0	0	0	0
Directivity; *nil directivity correction applicable (units radiate noise equally all directions)*		0	0	0	0	0	0	0	0
Non Free-Field / Reflections; *nil correction applied - units on flat roof terrace (not wall mounted)*		0	0	0	0	0	0	0	0
Cumulative Contribution 3 x Air Conditioning Units At Assessment Position (Heating Mode)	**37**	**44**	**40**	**38**	**35**	**31**	**28**	**22**	**16**

APPENDIX F

Details For Example Vibration Isolators

Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix F *(page 1 of 3)*

Date: February 2024

DETAILS FOR EXAMPLE 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.

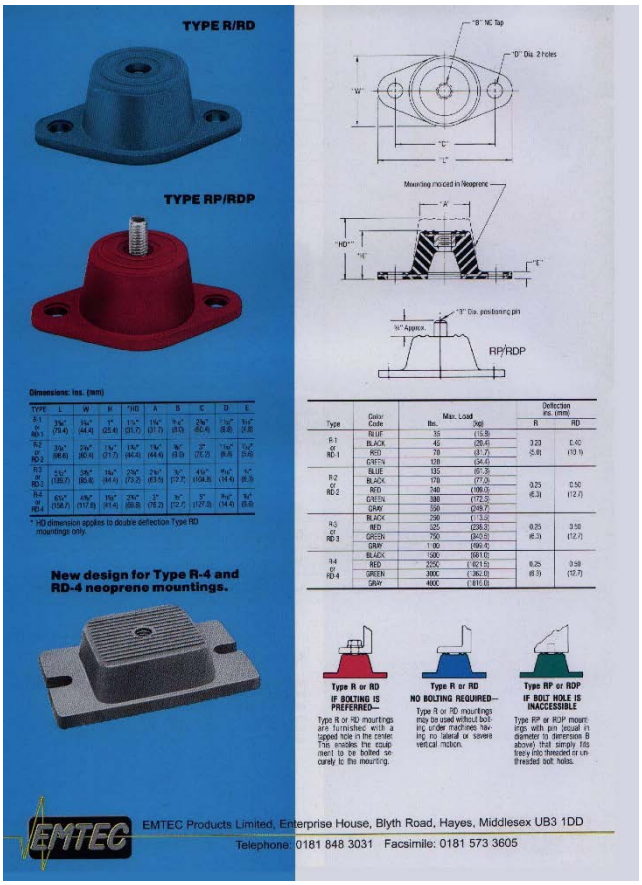
The VMC molding process embeds all metal parts in neoprene, preventing corrosion. Mountings can also be molded in other elastomers to meet special requirements.

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)

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

RP/RDP

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: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix F *(page 2 of 3)*

Date: February 2024

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

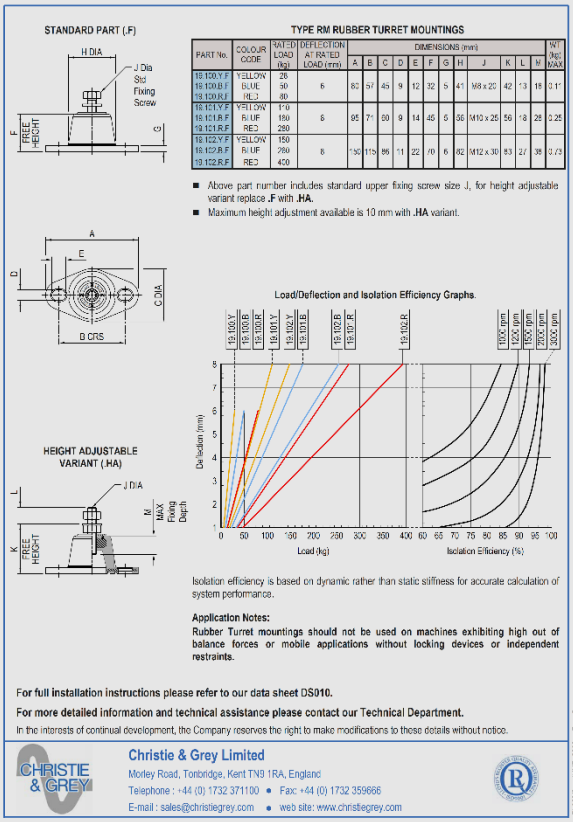
- Moulded in first grade natural rubber with integral steel base and upper fixing boss.
- Manufactured in three sizes, each available in three rubber compounds identified by a colour spot.
- Static deflections of up to 8 mm with loads from 5 kg to 400 kg.
- Upper fixing screw supplied as standard with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

PL0091 - JUNE 2005 - Rev. C



STANDARD PART (.F)

H DIA
J Dia Std Fixing Screw
F FREE HEIGHT
C

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	25														
19.100.B.F	BLUE	50	6	62	57	45	9	12	32	5	41	M8 x 20	42	13	16	0.11
19.100.R.F	RED	80														
19.101.Y.F	YELLOW	100														
19.101.B.F	BLUE	180	8	95	71	60	9	14	45	6	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	280	8	130	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.

A
E
D
C DIA
D CRS

Load/Deflection and Isolation Efficiency Graphs.

HEIGHT ADJUSTABLE VARIANT (.HA)

J DIA
L
M MAX Fixing Depth
K FREE HEIGHT

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

PL0092 - JUNE 2005 - Rev. C

Site: 56 Shorts Gardens, Covent Garden, London WC2H 9AN

Report: 23091-002 Appendix F *(page 3 of 3)*

Date: February 2024

DETAILS FOR EXAMPLE VIBRATION ISOLATORS

Supplier: Fibet Group

fivi STOP® FIBET GROUP

LIGHT DUTY MOUNTS — Type SEM

Low frequency elastomeric noise and vibration isolators for industrial equipment and machinery. The Fibet SEM range of mounts are normally used to insulate the transmission of noise and vibration in vertically applied loads. Their applications can include generators, blowers, pumps, road machines or any equipment that by design is unbalanced. They can also be used for isolating instrumentation in mobile, military or road and can accommodate loads between 1.5daN (approx. 1.5kg) to 170daN's (approx. 173kg) per Mount.

APPLICATIONS

• Measurement equipment • Instruments • Small machinery • Engines • Pumps • Radiators

STANDARD PRODUCTION

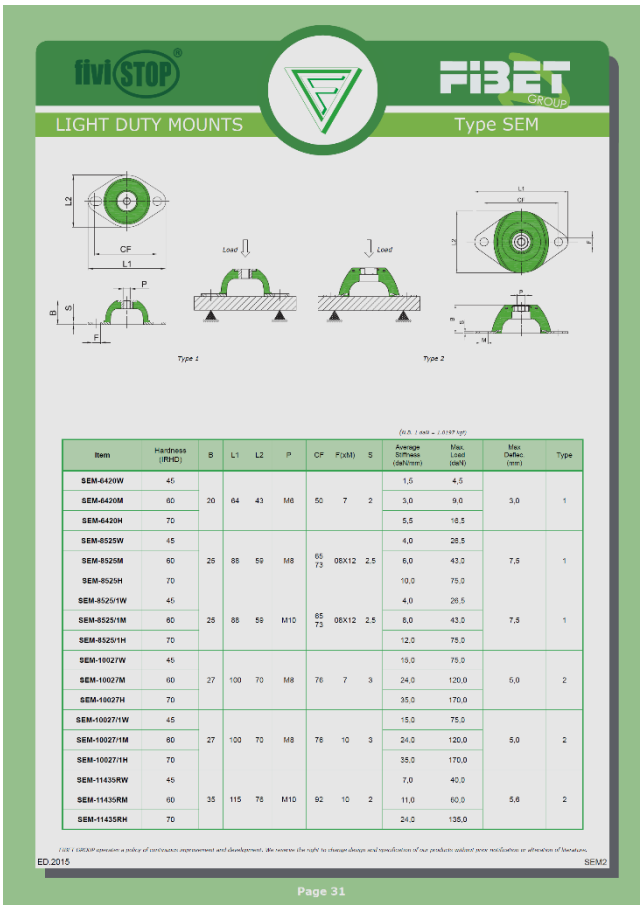
Plates: DD12 or DD13 steel (UNI EN 10111)
Nuts: Resistance class 4 Screws: Resistance class 4.8
Natural rubber NR
Zinc plated in accordance with CE standards CHROME VI free, white
Stiffness tolerance +/- 20%

OPTIONS & ADDITIONAL PARTS

Alternative elastomeric hardness and compounds available

ED.2015 SEM1

Page 30



fivi STOP® FIBET GROUP

LIGHT DUTY MOUNTS — Type SEM

Type 1 Type 2

Item	Hardness (IRHD)	B	L1	L2	P	CF	F(xM)	S	Average Stiffness (daN/mm)	Max. Load (daN)	Max Deflec (mm)	Type
SEM-6420W	45								1,5	4,5		
SEM-6420M	60	20	64	43	M8	50	7	2	3,0	9,0	3,0	1
SEM-6420H	70								5,5	16,5		
SEM-8525W	45								4,0	26,5		
SEM-8525M	60	25	88	59	M8	65/73	08X12	2,5	6,0	43,0	7,5	1
SEM-8525H	70								10,0	75,0		
SEM-8525/1W	45								4,0	26,5		
SEM-8525/1M	60	25	88	59	M10	65/73	08X12	2,5	6,0	43,0	7,5	1
SEM-8525/1H	70								12,0	75,0		
SEM-10027W	45								10,0	75,0		
SEM-10027M	60	27	100	70	M8	76	7	3	24,0	120,0	5,0	2
SEM-10027H	70								35,0	170,0		
SEM-10027/1W	45								15,0	75,0		
SEM-10027/1M	60	27	100	70	M8	76	10	3	24,0	120,0	5,0	2
SEM-10027/1H	70								35,0	170,0		
SEM-11435RW	45								7,0	40,0		
SEM-11435RM	60	35	115	76	M10	92	10	2	11,0	60,0	5,6	2
SEM-11435RH	70								24,0	135,0		

ED.2015 SEM2

Page 31