Philip Acoustics Ltd.

Consultants in Noise and Vibration

**REPORT TITLE:** ACOUSTIC REPORT FOR PROPOSED NEW ROOF LEVEL EXTERNAL AIR CONDITIONING CONDENSERS AT 74 CHARLOTTE STREET, LONDON W1T 4QH

*Planning Inspectorate Appeal Decision APP/X5210/A/13/2193888*

*London Borough Of Camden Planning Reference: 2012/2133/P*

**REPORT REF:** 15020-002

**ISSUED TO:** Pegasus Group
23 Hanover Square
London
W1S 1JB

**ISSUED BY:** David R Philip BEng (Hons) MIOA

**DATE:** July 2015

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## SUMMARY


- Philip Acoustics has been appointed to assess noise from new external air conditioning condensers proposed to be installed at roof level of 74 Charlotte Street, London W1T 4QH. The air conditioning condensers are to serve residential apartments as part of a mixed use redevelopment of the site.

- The assessment is as planning Condition 10 for the development which requires that prior to commencement of the relevant part of the development, details of any mechanical services equipment (plant) including an acoustic report shall be submitted to the Local Planning Authority to demonstrate how the equipment will comply with the specific noise limit requirement as planning Condition 9. The Local Planning Authority is London Borough of Camden.

- Planning Condition 9 requires that overall noise from the proposed equipment shall be at least 5dBA less than the existing background noise ($L_{A90}$ dB) at 1m external to sensitive facades. Where equipment will have a noise that has a distinguishable discrete continuous note (whine, hiss, screech or hum) and/or there are distinct impulses (bangs, clicks, clatters and thumps) then the overall noise from equipment shall be at least 10dBA less than the existing background noise ($L_{A90}$ dB) at 1m external to sensitive facades.

- As part of the assessment, a noise survey has been carried out at the site over at least a 24 hour period to establish lowest existing background noise levels during the entire range of operational times of the proposed air conditioning condensers as representative of outside windows of nearest noise sensitive (residential) properties to the site.

- Based on results of the background noise survey and acoustic calculations using equipment manufacturer's noise data, the assessment shows that the cumulative overall noise level due to the proposed new air conditioning condensers is calculated to comply with the planning Condition 9 noise limit requirement. No additional noise attenuation measures are required to the proposed air conditioning condensers to further reduce noise levels.

- Location for the proposed new air conditioning condensers at roof level of the redevelopment site is not structurally linked to any existing non-associated noise sensitive (residential) properties. Notwithstanding this, and although vibration from the proposed type of modern air conditioning condenser unit is generally low, as good practice and to minimise possible vibration from the condensers to within the development site itself and to adjacent commercial use properties, it is recommended that the condensers be installed using vibration isolators. Specification details for suitable vibration isolators are provided in Section 5 of the report.

## 1. INTRODUCTION

Planning permission has been granted at appeal for the demolition of building behind a retained façade and redevelopment for a new mixed use building including with residential apartments at upper floor levels at 74 Charlotte Street, London W1T 4QH.

The planning permission is subject to conditions; Condition 10 requires that prior to commencement of the relevant part of the development, details of any mechanical services equipment (plant) including an acoustic report shall be submitted to the Local Planning Authority to demonstrate how the equipment will comply with the specific noise limit requirement as Condition 9. The Local Planning Authority is London Borough of Camden.

Philip Acoustics has been appointed as pre-commencement Condition 10 to assess noise from new external air conditioning condensers proposed to be installed at roof level to serve the residential apartments part of the redevelopment.

This acoustic report presents results of the assessment and includes:

- Confirmation of the planning permission noise criterion for mechanical services equipment;
- Measurement of existing background noise levels;
- Calculation of equipment noise levels;
- Consideration of vibration from the equipment;
- Review of noise/vibration control treatments necessary to comply with the planning permission noise criterion for mechanical services equipment.

## 2. NOISE CRITERION

Condition 9 and Condition 10 to the appeal decision planning permission are provided in Appendix A. The appeal decision is reference APP/X5210/A/13/2193888 dated 20 September 2013 with associated London Borough of Camden planning reference 2012/2133/P.

Condition 9 includes specific noise limit requirements for mechanical services equipment (plant) and in summary requires that overall noise from the proposed equipment shall be at least 5dBA less than the existing background noise ($L_{A90}$ dB) at 1m external to sensitive facades. Where equipment will have a noise that has a distinguishable discrete continuous note (whine, hiss, screech or hum) and/or there are distinct impulses (bangs, clicks, clatters and thumps) then the overall noise from equipment shall be at least 10dBA less than the existing background noise ($L_{A90}$ dB) at 1m external to sensitive facades. *Note it is the author's experience and observation based on octave band noise data and on-site noise measurements of similar modern domestic type external air conditioning condenser units, that the type of proposed Samsung air conditioning condensers subject to this assessment generate a typically broadband type of noise (i.e. without any strong tonal or intermittent characteristics sufficient to attract attention) and therefore the more onerous noise limit of 10dBA below the background noise of planning Condition 9 is not considered applicable in this instance.*

The Condition 9 noise limit requirements are as those listed in Table E of Policy DP28 – Noise and Vibration of Section 3 of Camden Development Policies 2010-2025.

Sensitive facades as applicable for this noise assessment are windows of nearest existing residential properties to the front and also rear of redevelopment site as described in Section 3.2.

Neither Condition 9 nor Policy DP28 – Noise and Vibration of Section 3 of Camden Development Policies 2010-2025 include any limits for vibration. Notwithstanding this, equipment vibration is considered in this report and appropriate recommendations are provided for vibration isolation measures.

## 3. BACKGROUND NOISE SURVEY

In order to assess noise from the proposed new air conditioning condensers it is necessary to establish existing background noise levels as representative of outside nearest sensitive facades. Details of the background noise survey carried out by Philip Acoustics are provided in Sections 3.1 to 3.3.

### 3.1 Instrumentation

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

### 3.2 Measurement Procedure

The proposed external air conditioning condensers are to serve new residential apartments within the redevelopment and will potentially operate as required during the day and night. Therefore the noise survey was carried out over at least a full 24 hour period to obtain lowest existing background noise levels during the entire range of possible times of operation for the condensers.

The noise survey was carried out over a five day period from 02 July 2015 to 06 July 2015; the weather included dry and calm conditions during the day, evening and also night-time periods. Note that it is normal practice to undertake background noise surveys over only a 24 hour period, however a longer period of five days was used in this instance so as to include sample weekdays and a weekend (as background noise might potentially be lower during parts of a weekend than during a weekday).

The sound level meter was set up to record background noise levels over 60 minute periods (split into 4 x 15 minute periods to enable more accurate analysis of results as required). Measurements of background noise were recorded as overall $L_{A90}$ dB values.

The external air conditioning condensers are proposed to be positioned at roof level of the redevelopment building. Locations of nearest identified existing noise sensitive (residential) properties are listed below:

- Location A at front of the site: Upper floor residential flats/apartments within buildings directly opposite on Charlotte Street. Nearest windows of these are approximately 27m to the proposed roof top location of the air conditioning condensers and are the physically nearest “straight line” unscreened potential noise sensitive (residential) properties to the air conditioning condensers;
- Location B at rear of the site: Residential flats/apartments within buildings along Chitty Street (north of the site), along Tottenham Street (south of the site) and also along Charlotte Mews (east of the site). Nearest windows of these residential buildings are at least 30m to 40m from the proposed roof top location of the air conditioning condensers and most are partially or wholly screened from the air conditioning condensers by elevation differences and/or intervening buildings;

- Location C. There are also front and rear windows to possible residential flats/apartments on upper floor levels above 66 to 68 Charlotte Street (south to south-east of the site), nearest of these windows are approximately 20m to the proposed roof top location of the air conditioning condensers but will be screened from the air conditioning condensers by elevation differences and/or intervening buildings.

The background noise survey position was at roof level of the existing building at the site using an extension pole and microphone extension lead arrangement selected as being representative of, and as close as accessible to, nearest windows of noise sensitive (residential) properties as identified above including windows of upper floor residential flats/apartments within buildings directly opposite on Charlotte Street.

The background noise survey position was selected well away from any existing installed mechanical equipment in the immediate vicinity so as not to unduly influence the noise survey results.

A proposed layout drawing for the new air conditioning condensers and site location aerial image are provided in Appendix C. The site location aerial image shows direction to the nearest identified potential noise sensitive (residential) properties and background noise survey position.

### 3.3 Measurement Results

A graph showing full raw data background noise level measurements over the five day survey period is provided in Appendix D.

Background noise fluctuates during the day and into the early evening and then gradually reduces during the night before increasing again in the morning. This profile is normal for a central London location where there is traffic and general activity during the day followed by a slight reduction in activity during the night.

Summary of the lowest measured background noise level along with the corresponding planning Condition 9 noise limit requirement are shown in Table 1.

| **Description** | **Lowest Background Noise Level $L_{A90\,(15\,min)}$** | **Planning Condition 9 Noise Limit** |
|---|---|---|
| Lowest background noise level *(occurs at night between about 2am and 4am)* | 44dB | ≤39dBA |

**Table 1:** Lowest measured background noise level and applicable Condition 9 limit

## 4. NOISE FROM MECHANICAL SERVICES EQUIPMENT

There are four proposed new Samsung external air conditioning condensers to be located at roof level of the redevelopment building as indicated on the layout drawing in Appendix C. The air conditioning condensers comprise the following:

- 3 x Samsung model AM040FXMDEH/EU;
- 1 x Samsung model AM060FXMDEH/EU.

Manufacturer noise data for the air conditioning condensers is provided in Appendix E. The noise data is in terms of overall dBA and octave band sound power levels. Summary of overall sound power level data for the air conditioning condensers is shown in Table 2.

| Description | Sound Power Level dBA |
|---|---|
| Samsung model AM040FXMDEH/EU | 66 |
| Samsung model AM060FXMDEH/EU | 69 |

**Table 2:** Samsung air conditioning condenser sound power level data

To calculate the overall cumulative noise contribution from the proposed air conditioning condensers to outside nearest windows of noise sensitive (residential) properties a spreadsheet noise model has been used. The model takes account of accumulation of noise from the equipment ("worse-case" all condensers operating simultaneously), distance between the equipment location and windows, acoustic directivity/reflections and any line of sight acoustic screening due to building orientation and elevation differences etc.

Acoustic calculation details are provided in Appendix F. Summary overall calculated noise levels from the air conditioning condensers to outside nearest windows of noise sensitive (residential) properties compared with the planning Condition 9 noise limit requirement are shown in Table 3.

| Description | Overall Equipment Noise Level (All Condensers Operating) | Planning Condition 9 Noise Limit |
|---|---|---|
| Location A: To outside upper floor residential flats/apartments within buildings directly opposite on Charlotte Street | ≤36dBA | ≤39dBA |
| Location B: To outside upper floor residential flats/apartments within buildings at rear of site *(Chitty Street, Tottenham Street & Charlotte Mews)* | ≤32dBA | ≤39dBA |
| Location C: To outside upper floor residential flats/apartments at 66-68 Charlotte Street *(equipment significantly screened to this location)* | ≤31dBA | ≤39dBA |

**Table 3:** Equipment noise outside windows of nearest residential properties compared with Condition 9 limit

Table 3 shows that overall noise from the proposed air conditioning condensers complies with the applicable planning Condition 9 noise limit requirement to be at least 5dBA below the lowest background noise.

It is not expected that noise from the proposed new external air conditioning condensers would be audible or disturbing to occupants of any noise sensitive (residential) properties in the vicinity. No additional noise attenuation measures are required to the air conditioning condensers to comply with planning Condition 9.

Note that overall noise from the proposed air conditioning condensers is expressed as ≤ (less than or equal to values) as the noise level calculation is considered extremely cautious and in practice noise levels from the condensers will be lower than that in Table 3 for the following reasons:

- The calculations assume all four air conditioning condensers are operating simultaneously and constantly and at 100% duty. In practice this type of condenser operates "on demand" and even when providing significant cooling tends to operate only 60 to 70% of the time. It is unlikely that all of the condensers would operate simultaneously and constantly;
- The calculations (to Location B & Location C) allow for only a modest amount of natural line of sight acoustic screening between the air conditioning condenser's location and windows of residential properties, the actual level of screening will be higher than the values used in the calculation;
- The Condition 9 noise limit for Location A (flats/apartments on upper floor levels to the opposite side of Charlotte Street) is based on a background noise survey at the rear of the site with consequently lower noise levels. It is expected that background noise levels to outside the windows of flats/apartments on upper floor levels to the opposite side of Charlotte Street would be higher and correspondingly for this location any condenser noise would be even further below the noise limit applicable to this location based on the actual background noise at this location;
- The noise limits used for the assessment are cautiously based on the lowest measured background noise level occurring during the very middle of the night. Background noise levels for most of the time are much higher and correspondingly for these times any condenser noise would be even further below the noise limit applicable to these times based on the background noise during these times.

## 5. VIBRATION FROM MECHANICAL SERVICES EQUIPMENT

The location for the proposed new air conditioning condensers at roof level of the redevelopment site is not structurally linked to any existing non-associated noise sensitive (residential) properties.

Notwithstanding this, and although vibration from the proposed type of modern domestic air conditioning condenser unit is generally low, as good practice and to minimise possible vibration from the condensers to within the development site itself and to adjacent commercial use properties, it is recommended that the condensers be installed using vibration isolators. Specification details for suitable vibration isolators are provided below.

It is recommended the new air conditioning units be mounted using high deflection proprietary rubber or neoprene turret mounting type vibration isolators. The mountings should have a static deflection not less than 5mm under operating weight of the units.

Three suggested suppliers and their product details are provided below, the suppliers are not listed in any order of preference, a copy of each of the mounting supplier's data sheets is provided in Appendix G. The mounts are typically 25 to 32mm high and available in various load capacities. The mounts are colour coded to indicate the load capacity and four mounts are required per air conditioning condenser (one to each corner of a condenser unit).

Suggested Vibration Isolator Supplier 1

| | |
|---|---|
| Supplier: | EMTEC |
| Web: | www.emtecproducts.co.uk |
| Mount type: | Neoprene mounting type R-1 |

Suggested Vibration Isolator Supplier 2

| | |
|---|---|
| Supplier: | Allaway Acoustics Ltd |
| Web: | www.allawayacoustics.co.uk |
| Mount type: | Neoprene rubber AV mount type MRS1 |

Suggested Vibration Isolator Supplier 3

| | |
|---|---|
| Supplier: | Christie & Grey Ltd |
| Web: | www.christiegrey.com |
| Mount type: | Rubber turret mount type RM |

# APPENDIX A

Planning Permission Conditions 9 & 10

**Site:** 74 Charlotte Street, London W1T 4QH

**Report:** 15020-002 Appendix A

**Date:** July 2015

**PLANNING PERMISSION CONDITIONS 9 & 10**

The following conditions are attached to appeal decision APP/X5210/A/13/2193888 dated 20 September 2013

9) Noise levels at a point 1m external to sensitive facades shall be at least 5dB(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 facade shall be at least 10dB(A) below the LA90, expressed in dB(A).

10) Prior to the commencement of the relevant part of the development, details of any plant equipment and extract ventilation system shall be submitted to and approved in writing by the Local Planning Authority. Such details to include an acoustic report which shall demonstrate how the acoustic and vibration impact of the equipment would meet the relevant standards (condition 9) and identifying any acoustic isolation and sound attenuation which is required in order to achieve this standard. Furthermore it shall include details of all odour control and filtration mechanisms to be used. The acoustic isolation and odour control shall thereafter be maintained in effective order in accordance with the manufacturers' specifications.

# APPENDIX B

Noise Survey Instrumentation

**Site:** 74 Charlotte Street, London W1T 4QH

**Report:** 15020-002 Appendix B

**Date:** July 2015

## NOISE SURVEY INSTRUMENTATION

Background Noise Survey:

- Rion sound level meter type NL-31 Class 1 serial number 00903983 plus Rion microphone type UC-53A serial number 317502 complete with weatherproof and lockable outdoor environmental kit, microphone extension lead and extension boom arrangement;
- Bruel & Kjaer calibrator type 4231 serial number 2454786 (UKAS certified);
- Speedtech Instruments Skymaster model SM-28 serial number 19370 (for manual weather conditions check).

# APPENDIX C

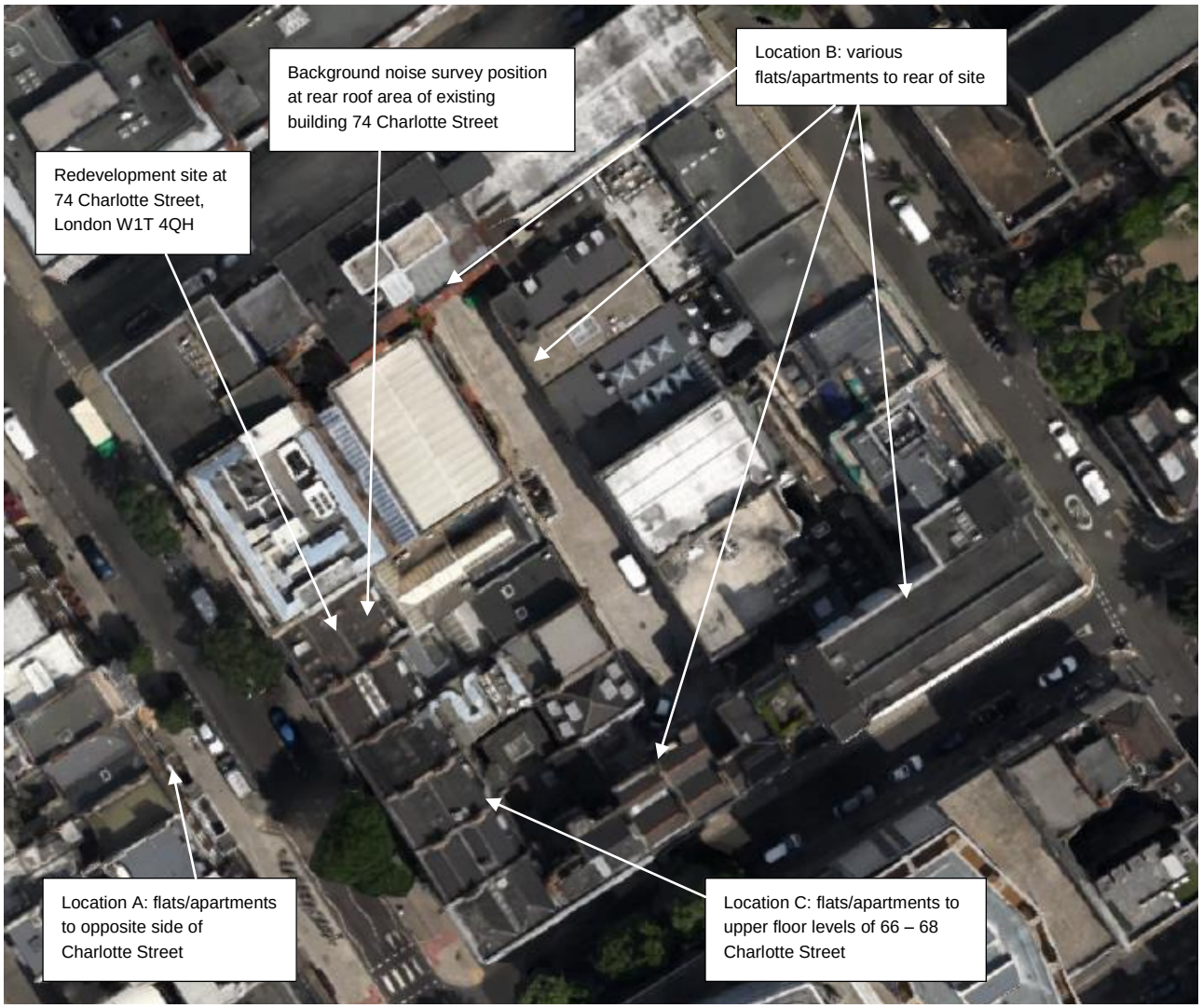
Site Location Aerial Image & Equipment Layout Drawing

**Site:** 74 Charlotte Street, London W1T 4QH

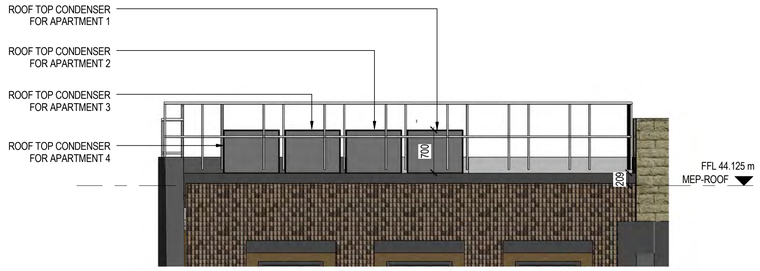
**Report:** 15020-002 Appendix C

**Date:** July 2015

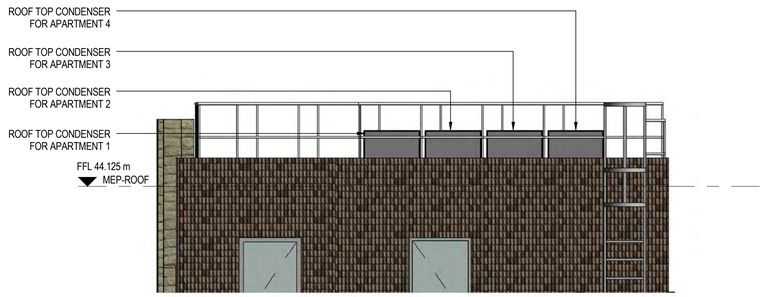
## SITE LOCATION AERIAL IMAGE



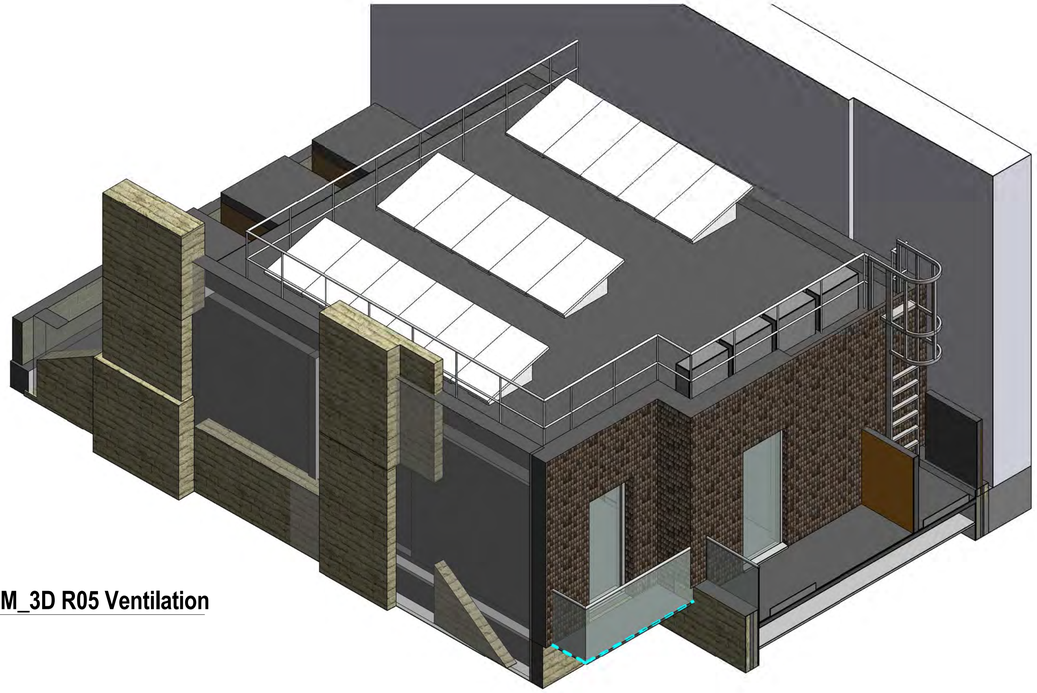

## 01 M_Level R05 - Ventilation Layout
1 : 50




## 02 M_R05 Ventilation Section 01
1 : 50




## 03 M_R05 Ventilation Section 02
1 : 50



## 04 M_3D R05 Ventilation

E

NOTES

CONTRACTORS MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK ON SHOP DRAWINGS

DO NOT SCALE FROM THIS DRAWING





NOTES

1 PLEASE NOTE THAT THIS DRAWING SHOWS THE CONCEPT DESIGN INTENT ONLY. THE CONTRACTOR IS RESPONSIBLE FOR THE DETAILED DESIGN, FULL CO-ORDINATION INCLUDING SPATIAL FIT AND SIZING OF ALL SERVICES. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE MECHANICAL AND ELECTRICAL SPECIFICATION

2 ALL SERVICES SHALL BE COORDINATED WITH THE ARCHITECTS LAYOUTS AND TERMINAL POSITIONS OF GRILLES, LIGHTING, RADIATORS, ETC TO SUIT INTERNAL LAYOUTS

3 THE CONTRACTOR SHALL ENSURE THAT ALL M&E ITEMS AND BUILDERS WORK COMPLY WITH ALL LOCAL AUTHORITY, STATUTORY AND BUILDING CONTROL REQUIREMENTS. THE CONTRACTOR SHALL PROVIDE DETAILED INSTALLATION DRAWINGS FOR APPROVAL BY THE CLIENT

| REV | AMENDMENT | DATE | CHKD |
|---|---|---|---|
| E | PV LAYOUT INCORPORATED, EQUIPMENT LOCATION REVISED | 24-07-15 | C.S. |
| D | ELEVATIONS ADDED, LAYOUT & NOTES UPDATED | 20-07-15 | C.S. |
| C | ISSUE TO ACOUSTIC SPECIALIST | 14-07-15 | C.S. |
| B | ISSUE FOR PLANNING | 15-06-15 | C.S. |
| A | TENDER ISSUE | 01-05-15 | C.S. |

DRAWING STATUS: TENDER

MCBAINS COOPER CONSULTING LTD.
120 OLD BROAD STREET LONDON EC2N 1AR
TELEPHONE: 020 7786 7900 FACSIMILE: 020 7786 7999

CLIENT
KAHUNA

PROJECT
74 CHARLOTTE STREET

DRAWING TITLE
ROOF LEVEL
VENTILATION LAYOUT
PLAN / SECTION / DETAILS

# MECHANICAL

| SCALE | DRAWN BY | CHECKED | DATE |
|---|---|---|---|
| 1 : 50 @ A1 | M.Y. | C.S. | FEB 15 |

| DRAWING NUMBER | REVISION |
|---|---|
| LME57802_ M_920_R05 | E |

# APPENDIX D

Background Noise Survey Results

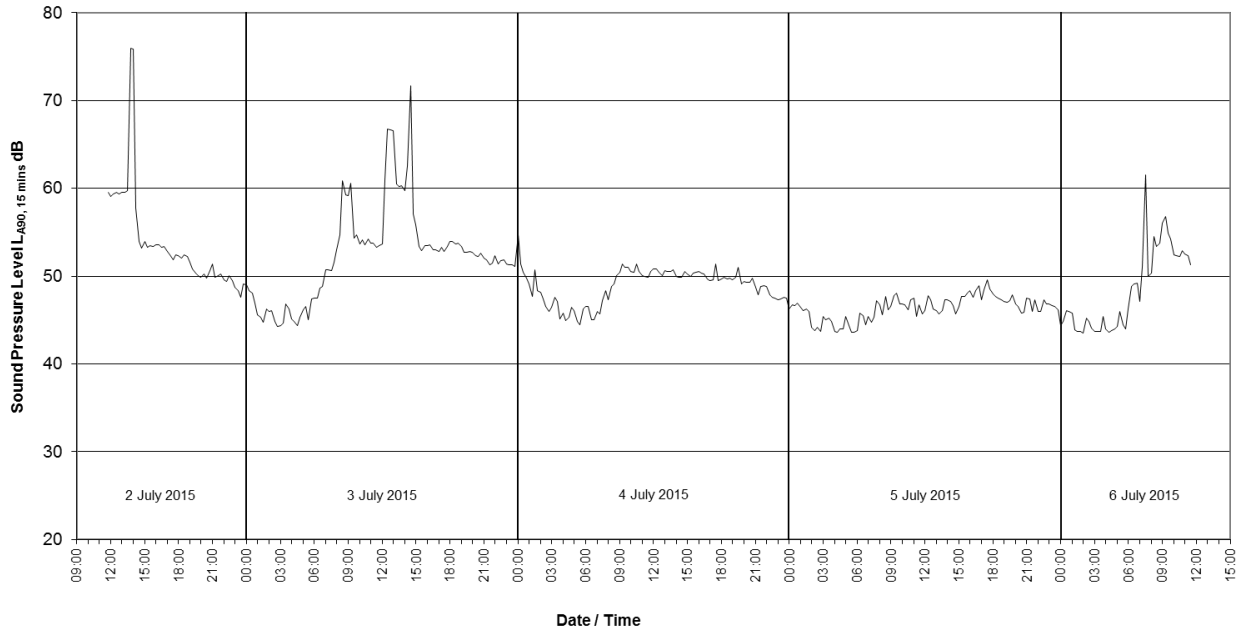
**Site:** 74 Charlotte Street, London W1T 4QH

**Report:** 15020-002 Appendix D

**Date:** July 2015

## BACKGROUND NOISE SURVEY RESULTS

Raw data background noise survey results over five day period 02 July 2015 to 06 July 2015 at rear roof level of existing building at 74 Charlotte Street, London W1T 4QH



# APPENDIX E

Manufacturer Noise Data For Equipment

**Site:** 74 Charlotte Street, London W1T 4QH

**Report:** 15020-002 Appendix E

**Date:** July 2015

## MANUFACTURER NOISE DATA FOR EQUIPMENT

### 4-3. Sound Power

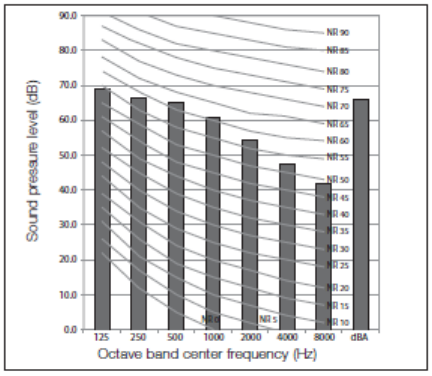
Note
- dBA = A-weighted sound power level.
- Reference power : 1pW
- Measured according to ISO 3741.

Unit: dB(A)

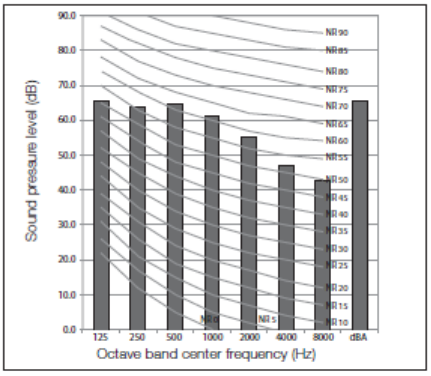
| Model | Sound Power |
|---|---|
| AM040FXMDEH/EU<br>AM040FXMDGH/EU | 66 |
| AM050FXMDEH/EU<br>AM050FXMDGH/EU | 67 |
| AM060FXMDEH/EU<br>AM060FXMDGH/EU | 69 |

### 4-4. NR curves

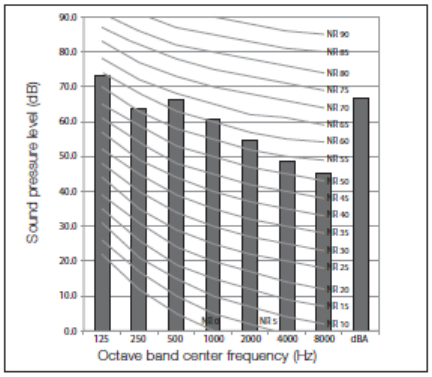
1) AM040FXMDEH/EU, AM040FXMDGH/EU




2) AM050FXMDEH/EU, AM050FXMDGH/EU




3) AM060FXMDEH/EU, AM060FXMDGH/EU



# APPENDIX F

Acoustic Calculations

**Site:** 74 Charlotte Street, London W1T 4QH

**Report:** 15020-002 Appendix F *(page 1 of 3)*

**Date:** July 2015

## ACOUSTIC CALCULATION SHEET

**ASSESSMENT POSITION: Location A: To outside upper floor residential flats/apartments within buildings directly opposite on Charlotte Street**

**NOISE CONDITION: All 4 x external air conditioning condensers operating**

**NOISE MITIGATION: None applied**

| Equipment | Equipment Sound Power Level Lw dBA *(1)* | Correction for noise attenuation dBA *(2)* | Distance to assesment position m *(3)* | Correction for distance to assessment position dBA *(4)* | Correction for line of sight screening dBA *(5)* | Correction for acoustic directivity dBA *(6)* | Correction for acoustic reflections dBA *(7)* | Individual Contributions dB |
|---|---|---|---|---|---|---|---|---|
| *Location: Roof Level* | | | | | | | | |
| AM040FXMDEH/EU | 66 | 0 | 27 | -40 | 0 | 0 | +3 | 29.4 |
| AM040FXMDEH/EU | 66 | 0 | 27 | -40 | 0 | 0 | +3 | 29.4 |
| AM040FXMDEH/EU | 66 | 0 | 27 | -40 | 0 | 0 | +3 | 29.4 |
| AM060FXMDEH/EU | 69 | 0 | 27 | -40 | 0 | 0 | +3 | 32.4 |
| **Overall SPL from sources at assessment position:** | **36 dBA** *(8)* | | | | | | | |

*Notes:*

*Note 1: Equipment Sound Power Levels (Lw dBA) based on manufacturer noise data.*

*Note 2: No noise reduction treatment fitted to equipment.*

*Note 3: Distance is from center of sound source to receiving position outside residential windows.*

*Note 4: Distance correction allows for spherical radiation (see note 7 for correction to take account for non-spherical conditions).*

*Note 5: Nil line of sight acoustic screening applicable for this assessment location.*

*Note 6: Cautiously do not include any directivity benefit in calculation.*

*Note 7: Reflections, allow +3dBA correction to account that the condensers do not radiate noise into spherical conditions.*

*Note 8: Overall predicted sound pressure level at assessment position due to all condensers operating is 38dBA.*

**Site:** 74 Charlotte Street, London W1T 4QH

**Report:** 15020-002 Appendix F *(page 2 of 3)*

**Date:** July 2015

## ACOUSTIC CALCULATION SHEET

**ASSESSMENT POSITION: Location B: To outside residential flats/apartments within buildings in various directions at rear of the site (based on nominal 30m distance)**

**NOISE CONDITION: All 4 x external air conditioning condensers operating**

**NOISE MITIGATION: None applied**

| Equipment | Equipment Sound Power Level Lw dBA *(1)* | Correction for noise attenuation dBA *(2)* | Distance to assesment position m *(3)* | Correction for distance to assessment position dBA *(4)* | Correction for line of sight screening dBA *(5)* | Correction for acoustic directivity dBA *(6)* | Correction for acoustic reflections dBA *(7)* | Individual Contributions dB |
|---|---|---|---|---|---|---|---|---|
| *Location: Roof Level* | | | | | | | | |
| AM040FXMDEH/EU | 66 | 0 | 30 | -41 | -3 | 0 | +3 | 25.5 |
| AM040FXMDEH/EU | 66 | 0 | 30 | -41 | -3 | 0 | +3 | 25.5 |
| AM040FXMDEH/EU | 66 | 0 | 30 | -41 | -3 | 0 | +3 | 25.5 |
| AM060FXMDEH/EU | 69 | 0 | 30 | -41 | -3 | 0 | +3 | 28.5 |
| **Overall SPL from sources at assessment position:** | **32 dBA *(8)*** | | | | | | | |

*Notes:*

*Note 1: Equipment Sound Power Levels (Lw dBA) based on manufacturer noise data.*

*Note 2: No noise reduction treatment fitted to equipment.*

*Note 3: Distance is from center of sound source to receiving position outside residential windows (nominal 30m used).*

*Note 4: Distance correction allows for spherical radiation (see note 7 for correction to take account for non-spherical conditions).*

*Note 5: Some line of sight acoustic screening applicable for this assessment location, cautiously limit screening benefit to -3dBA.*

*Note 6: Cautiously do not include any directivity benefit in calculation.*

*Note 7: Reflections, allow +3dBA correction to account that the condensers do not radiate noise into spherical conditions.*

*Note 8: Overall predicted sound pressure level at assessment position due to all condensers operating is 32dBA.*

**Site:** 74 Charlotte Street, London W1T 4QH

**Report:** 15020-002 Appendix F *(page 3 of 3)*

**Date:** July 2015

## ACOUSTIC CALCULATION SHEET

**ASSESSMENT POSITION: Location C: To outside windows of potential upper floor residential flats/apartments at 66 to 68 Charlotte Street**

**NOISE CONDITION: All 4 x external air conditioning condensers operating**

**NOISE MITIGATION: None applied**

| Equipment | Equipment Sound Power Level Lw dBA *(1)* | Correction for noise attenuation dBA *(2)* | Distance to assesment position m *(3)* | Correction for distance to assessment position dBA *(4)* | Correction for line of sight screening dBA *(5)* | Correction for acoustic directivity dBA *(6)* | Correction for acoustic reflections dBA *(7)* | Individual Contributions dB |
|---|---|---|---|---|---|---|---|---|
| *Location: Roof Level* | | | | | | | | |
| AM040FXMDEH/EU | 66 | 0 | 20 | -37 | -8 | 0 | +3 | 24.0 |
| AM040FXMDEH/EU | 66 | 0 | 20 | -37 | -8 | 0 | +3 | 24.0 |
| AM040FXMDEH/EU | 66 | 0 | 20 | -37 | -8 | 0 | +3 | 24.0 |
| AM060FXMDEH/EU | 69 | 0 | 20 | -37 | -8 | 0 | +3 | 27.0 |
| **Overall SPL from sources at assessment position:** | **31 dBA *(8)*** | | | | | | | |

*Notes:*

*Note 1: Equipment Sound Power Levels (Lw dBA) based on manufacturer noise data.*

*Note 2: No noise reduction treatment fitted to equipment.*

*Note 3: Distance is from center of sound source to receiving position outside residential windows.*

*Note 4: Distance correction allows for spherical radiation (see note 7 for correction to take account for non-spherical conditions).*

*Note 5: Significant line of sight acoustic screening applicable for this assessment location, cautiously limit screening benefit to -8dBA.*

*Note 6: Cautiously do not include any directivity benefit in calculation.*

*Note 7: Reflections, allow +3dBA correction to account that the condensers do not radiate noise into spherical conditions.*

*Note 8: Overall predicted sound pressure level at assessment position due to all condensers operating is 31dBA.*

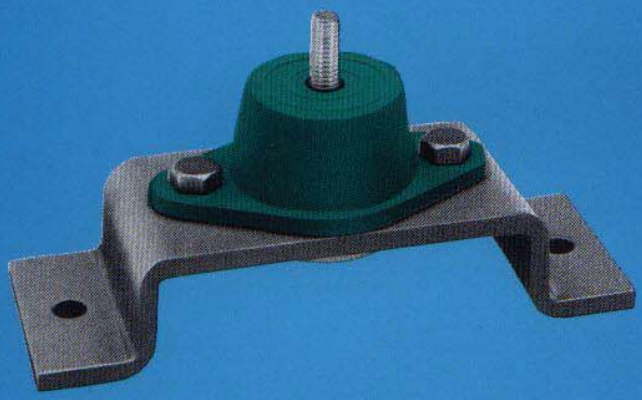
# APPENDIX G

Suggested Details For Vibration Isolators

Bulletin No. R12/93 (UK)

VMC
KORFUND

# Neoprene Mountings
# Series R/RD

- 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:

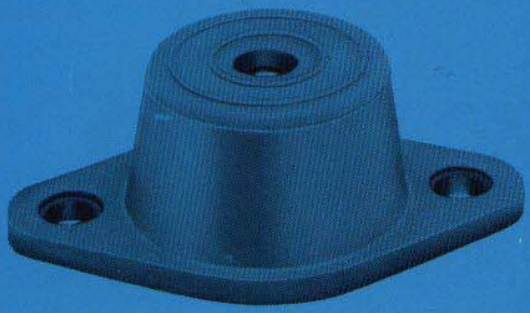
Neoprene mountings shall consist of a steel top plate and base plate completely embedded in coloured oil-resistant neoprene stock for easy identification of capacity. The mountings shall be Type R or RD, depending upon the required deflection of 1/4" to 1/2", as manufactured by VMC and as supplied by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

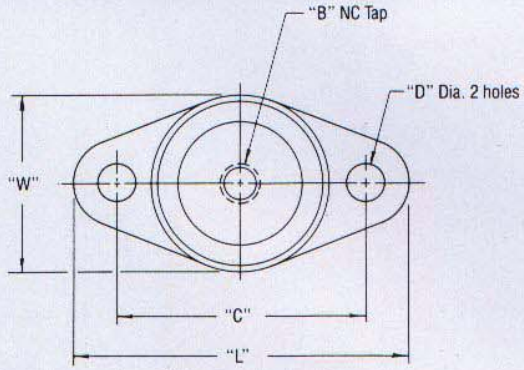
EMTEC

EMTEC Products Limited, Enterprise House, Blyth Road, Hayes, Middlesex UB3 1DD

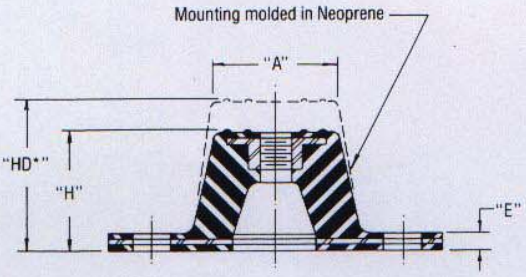
Telephone: 0181 848 3031  Facsimile: 0181 573 3605

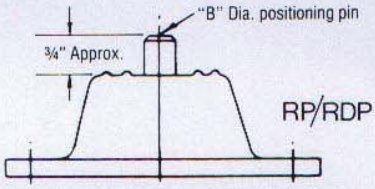
## TYPE R/RD






## TYPE RP/RDP



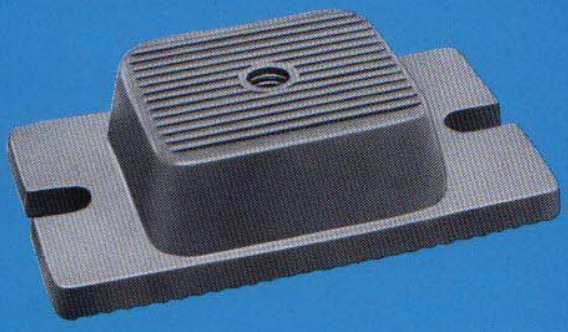

**Dimensions: ins. (mm)**

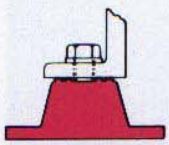
| TYPE | L | W | H | *HD | A | B | C | D | E |
|---|---|---|---|---|---|---|---|---|---|
| R-1 or RD-1 | 3⅛" (79.4) | 1¾" (44.4) | 1" (25.4) | 1¼" (31.7) | 1¼" (31.7) | 5/16" (8.0) | 2⅜" (60.4) | 11/32" (8.8) | 3/16" (4.8) |
| R-2 or RD-2 | 3⅞" (98.6) | 2⅜" (60.4) | 1¼" (31.7) | 1¾" (44.4) | 1¾" (44.4) | ⅜" (9.6) | 3" (76.2) | 11/32" (8.8) | 7/32" (5.6) |
| R-3 or RD-3 | 5½" (139.7) | 3⅜" (85.8) | 1¾" (44.4) | 2⅞" (73.2) | 2½" (63.5) | ½" (12.7) | 4⅛" (104.8) | 9/16" (14.4) | ¼" (6.3) |
| R-4 or RD-4 | 6¼" (158.7) | 4⅝" (117.6) | 1⅝" (41.4) | 2¾" (69.8) | 3" (76.2) | ½" (12.7) | 5" (127.0) | 9/16" (14.4) | ⅜" (9.6) |

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

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

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

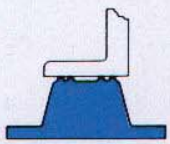




**Type R or RD**

**IF BOLTING IS PREFERRED—**

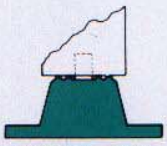
Type R or RD mountings are furnished with a tapped hole in the center. This enables the equipment to be bolted securely to the mounting.



**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.

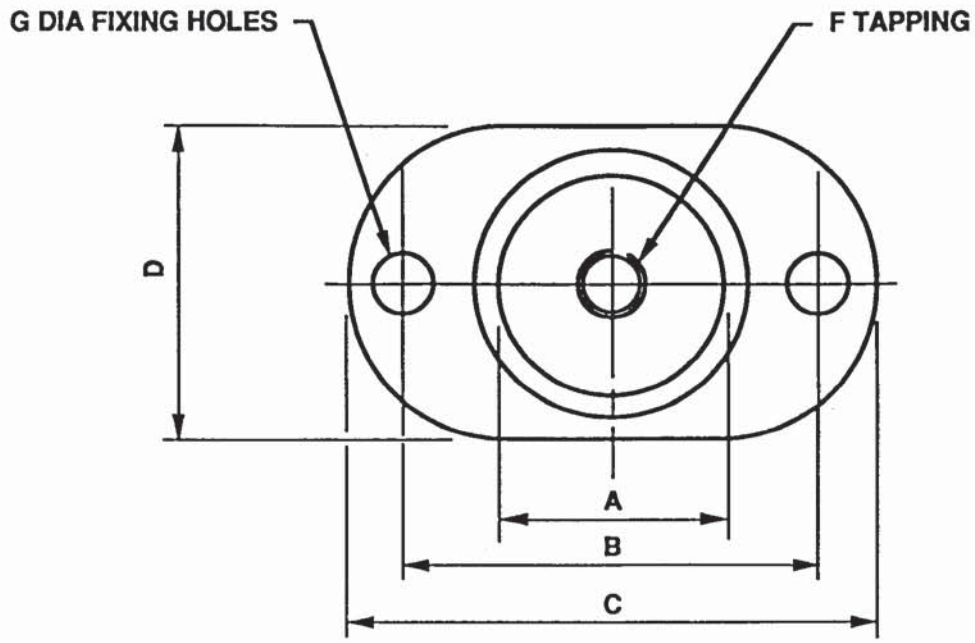
EMTEC Products Limited, Enterprise House, Blyth Road, Hayes, Middlesex UB3 1DD

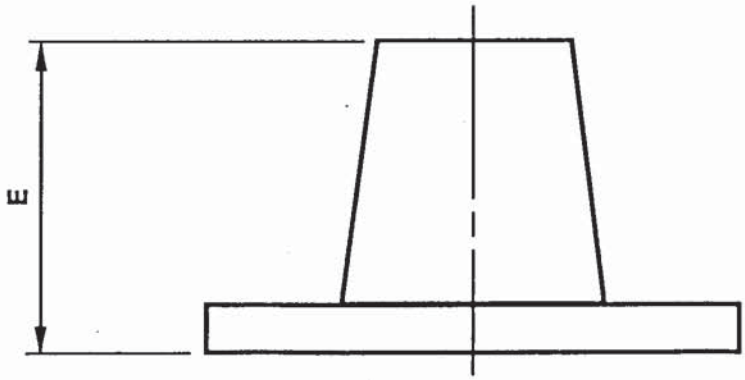
Telephone: 0181 848 3031 Facsimile: 0181 573 3605

**DRAWING No.**
**A4-3407A**

**NEOPRENE RUBBER AV MOUNTS**
**RANGE MRS0 - MRS4**

# ALLAWAY ACOUSTICS LTD




## DIMENSIONAL DATA

| MOUNT TYPE | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| MRS 0 | 22 | 50 | 61 | 38 | 18 | 6 | 4 |
| MRS 1 | 29 | 59 | 74 | 41 | 32 | 8 | 7 |
| MRS 2 | 43 | 75 | 98 | 61 | 39 | 12 | 11 |
| MRS 3 | 30 | 60 | 74 | 41 | 37 | 8 | 6 |
| MRS 4 | 41 | 76 | 98 | 60 | 59 | 12 | 11 |

Allaway Acoustics Ltd Old Police Station 1 Queens Road Hertford Herts. SG14 1EN. Tel: 01992 550825 Fax: 01992 554982

ALLAWAY ACOUSTICS
LIMITED

| Mount Type | Colour | Weight Range - Kg From | To | Nominal Deflection |
|---|---|---|---|---|
| MRS0 | Blue | 2.5 | 5 | 3.0mm |
| MRS0 | Yellow | 4 | 8 | 3.0mm |
| MRS0 | Green | 7 | 14 | 3.0mm |
| MRS0 | White | 9 | 18 | 3.0mm |
| MRS1 | Blue | 9 | 18 | 4.0mm |
| MRS1 | Yellow | 14 | 28 | 4.0mm |
| MRS1 | Green | 20 | 40 | 4.0mm |
| MRS1 | White | 27 | 54 | 4.0mm |
| MRS1 | Red | 36 | 72 | 4.0mm |
| MRS2 | Blue | 18 | 60 | 5.0mm |
| MRS2 | Green | 54 | 108 | 5.0mm |
| MRS2 | White | 90 | 180 | 5.0mm |
| MRS2 | Red | 135 | 270 | 5.0mm |
| MRS2 | Black | 180 | 360 | 5.0mm |
| MRS3 | Blue | 9 | 18 | 9.0mm |
| MRS3 | Yellow | 14 | 28 | 9.0mm |
| MRS3 | Green | 20 | 40 | 9.0mm |
| MRS3 | White | 27 | 54 | 9.0mm |
| MRS3 | Red | 36 | 72 | 9.0mm |
| MRS4 | Blue | 18 | 60 | 10.0mm |
| MRS4 | Green | 54 | 108 | 10.0mm |
| MRS4 | White | 90 | 180 | 10.0mm |
| MRS4 | Red | 135 | 270 | 10.0mm |
| MRS4 | Black | 180 | 360 | 10.0mm |

in business 30 YEARS

**Head Office:** Old Police Station, 1 Queens Road, Hertford, Hertfordshire, SG14 1EN. Tel: 01992 550825. Fax: 01992 554982.
**Northern Office:** Tradeforce Building, Cornwall Place, Bradford, West Yorkshire, BD8 7JT. Tel: 01274 306388. Fax: 01274 308305.
Registered in England 958950 Registered Office: 1 Queens Road, Hertford, Herts, SG14 1EN

# 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.

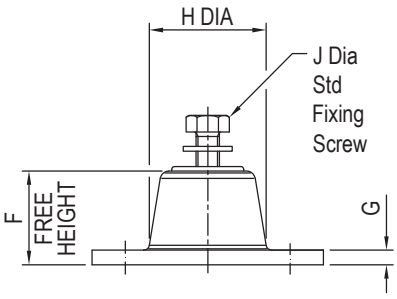
## TYPICAL APPLICATIONS

- 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

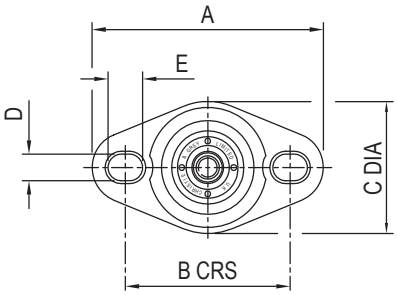
## STANDARD PART (.F)



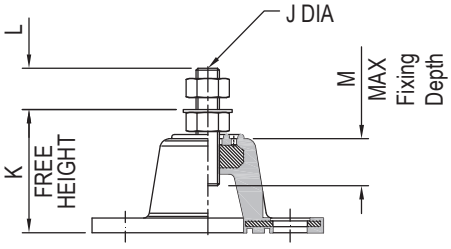

## TYPE RM RUBBER TURRET MOUNTINGS

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

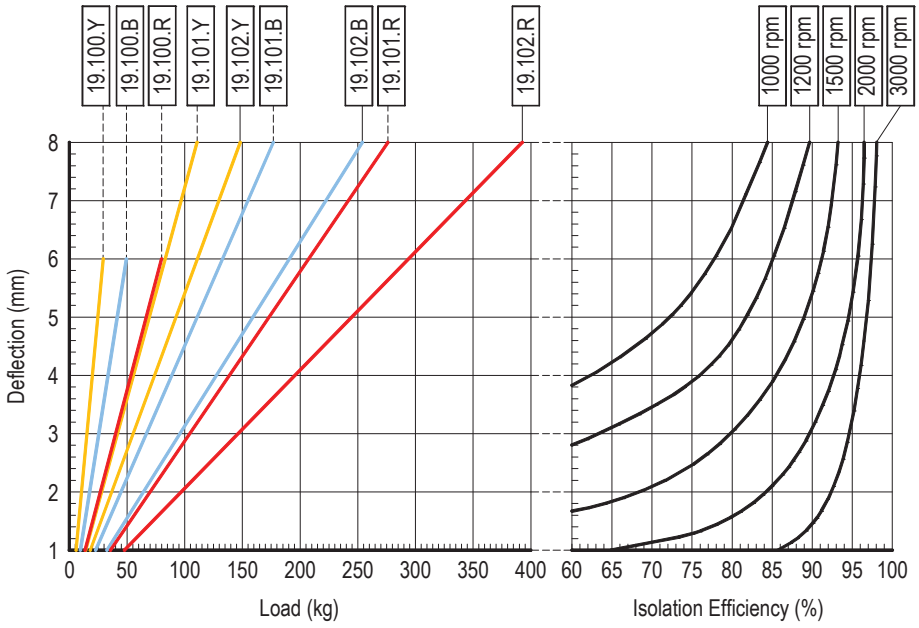
- Above part number includes standard upper fixing screw size J, for height adjustable variant replace **.F** with **.HA**.
- Maximum height adjustment available is 10 mm with **.HA** variant.




## 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**

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