Philip Acoustics Ltd.

Consultants in Noise and Vibration

REPORT TITLE: ACOUSTIC REPORT IN SUPPORT OF PLANNING APPLICATION FOR EXTERNAL AIR CONDITIONING EQUIPMENT AT ZEPPELIN BUILDING 59-61 FARRINGDON ROAD, LONDON EC1M 3JB

REPORT REF: 14251-003

ISSUED TO: gpad Ltd
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DATE: November 2014

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CONTENTS

SUMMARY

- Philip Acoustics has been commissioned to assess noise and vibration from proposed new air conditioning equipment to be installed externally at first floor flat roof level to rear of the Zeppelin Building 59-61 Farringdon Road, London EC1M 3JB. The assessment considers London Borough of Camden's planning consent noise conditions for mechanical services equipment.

- As part of the assessment, a noise survey has been carried out at the site to establish lowest existing background noise levels during the entire range of operational times of the proposed equipment at location representative of outside windows of nearest noise sensitive premises. Nearest noise sensitive premises are offices within upper floor levels of the Zeppelin Building 59-61 Farringdon Road and offices within adjoining buildings.

- Based on acoustic calculations using proposed equipment manufacturer's noise data, the noise level contribution due to the proposed equipment is calculated to be below existing background noise levels and comply with London Borough of Camden's planning consent noise requirements.

- The assessment includes benefit of noise reduction treatment (acoustic louvre enclosure) to the proposed equipment. Specification details for the required acoustic louvre enclosure are included in Section 5 of the report.

- Location for the new equipment is structurally linked, albeit indirectly and at distance, to other office space within Zeppelin Building and within adjoining buildings and therefore it is possible that equipment vibration could transmit into these properties. Although this is considered very unlikely as location of the equipment is remote from these and because vibration from this type of modern equipment is generally low, as good practice, it is recommended that the equipment be installed on vibration isolators. Specification details for suitable vibration isolators are included in Section 6 of the report.

1. INTRODUCTION

New air conditioning equipment is proposed to be installed externally at first floor flat roof level to rear of the Zeppelin Building 59-61 Farringdon Road, London EC1M 3JB. The equipment is to provide air conditioning for office use space within the basement and ground floor levels of the building.

It is anticipated that as part of the planning process for the new equipment, the Local Planning Authority (London Borough of Camden) will require information in the form of an acoustic report regarding noise from the proposed new equipment in order to seek to protect the amenity of occupants of noise sensitive buildings in vicinity with regard to possible noise emissions from the equipment.

Philip Acoustics has therefore been commissioned to provide an acoustic assessment for the new equipment. This report presents results of the assessment and includes:-

- Confirmation of London Borough of Camden's planning consent noise requirements;
- 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 London Borough of Camden's planning consent requirements.

2. LONDON BOROUGH OF CAMDEN NOISE REQUIREMENTS

Policy DP28 – Noise and Vibration of Section 3 of Camden Development Policies 2010-2025 covers in detail noise issues relating to a wide range of planning and noise pollution scenarios, including mechanical services equipment.

Policy DP28 includes the statement *"The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds"*. Camden's noise limit thresholds for plant and machinery are listed in Table E of Policy DP28. A copy of page 133 from Camden Development Policies 2010-2025 Policy DP28 showing Table E is included in Appendix A.

In summary, London Borough of Camden's noise conditions are:

i. That overall dBA noise from equipment shall be designed to at least 5dB below the existing L_{A90} dB background noise level;

ii. That, where it is anticipated any equipment will have a noise that has a distinguishable discrete note (whine, hiss, screech or hum) and/or there are distinct impulses (bangs, clicks, clatters and thumps) then the overall dBA noise from equipment shall be designed to at least 10dB below the existing L_{A90} dB background noise level. *Note it is the author's experience and observation based on octave band noise data and on-site noise measurements of similar modern air conditioning condensers, that the type of proposed Mitsubishi 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 as item (ii) of London Borough of Camden's planning consent noise conditions is not considered applicable in this instance.*

Although not specifically included within Table E of Policy DP28, Philip Acoustics Ltd is aware that London Borough of Camden also has noise conditions guidance that for each octave band (63Hz to 8KHz) then noise from equipment shall be designed to not add more than 1dB to the existing lowest L_{90} dB octave band background noise level.

All of the above are applicable over a period of 60 minutes and measured at 1m external to noise sensitive facades. For this development the nearest noise sensitive façade is taken as relating to windows of existing first floor offices within the building itself.

3. BACKGROUND NOISE SURVEY

In order to assess noise from the proposed new equipment it is necessary to establish representative background noise levels at the nearest noise sensitive facade. 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 meters were calibrated before and after the survey measurements using the UKAS certified calibrator.

3.2 Measurement Procedure

Although the proposed air conditioning equipment is to serve commercial (office) space within the building and will therefore operate mainly during office opening hours (nominally in the range 8am-6pm) the survey was carried out over at least a full 24 hour period to obtain background noise levels during the entire range of operational times for the equipment.

Proposed location of the new equipment on the rear first floor flat roof and direction to the potential nearest noise sensitive windows are indicated on a drawing in Appendix C.

The background noise survey location was selected at first floor flat roof to rear of the Zeppelin Building 59-61 Farringdon Road using an extension pole and microphone extension lead arrangement to obtain levels representative of outside the nearest windows of potential noise sensitive premises.

The noise survey was carried out over a 24-hour period from 28 October 2014 to 29 October 2014; the weather included dry and calm conditions during the day and also the night-time periods.

In accordance with London Borough of Camden's noise conditions, the sound level meter was set up to record background noise levels over 60 minute periods (split into 12 x 5 minute periods to enable more accurate analysis of results as required). Measurements of background noise were recorded as overall L_{A90} dB values.

In addition to the overall L_{A90} dB values, several manual samples of linear L_{90} dB octave band background noise were also recorded using the Bruel & Kjaer 2260 sound level meter to establish typical background noise octave band spectra.

3.3 Measurement Results

Existing background noise levels in the vicinity are dominated by traffic and general activity in the area as well as by existing mechanical services equipment serving other commercial properties in the vicinity.

The lowest recorded background noise level in terms of overall L_{A90} dB and associated equipment octave band values are shown in Table 1. A graph showing the overall raw data L_{A90} dB values over the entire background noise survey period is provided in Appendix D.

Description	Overall L_{A90} dB	Octave Band Centre Frequency (Hz) (linear L_{90} dB)							
		63	125	250	500	1k	2k	4k	8k
Lowest measured background noise level $L_{90\ (60\ minutes)}$	52	57	58	56	49	41	32	30	28
London Borough of Camden noise limit	47	52	53	51	44	36	27	25	23

Table 1: Lowest measured background noise levels and London Borough of Camden's noise conditions (*overall noise limit 5dBA below background level and octave band limit to not add more than 1dB to existing octave band noise levels*)

4. NOISE FROM MECHANICAL SERVICES EQUIPMENT

The proposed new equipment consists of the following:

- 1 off Mitsubishi air conditioning unit model FDC140KXEN6;
- 1 off Mitsubishi air conditioning unit model FDC155KXES6.

Proposed location of the equipment is described in Section 3.2 of the report and indicated on a drawing in Appendix C. Manufacturer's noise data for the equipment is provided in Appendix E.

The manufacturer noise data for Mitsubishi air conditioning units is in terms of overall free-field dBA sound pressure level at 1m. Summary of noise from the unit including octave band values published by manufacturer is shown in Table 2.

The client has advised the equipment will have the capability to operate in both heating and cooling modes. For the purpose of this noise assessment it is taken that the equipment is operating in heating mode, which has slightly higher noise output and therefore is "worse case".

Description	Overall dB(A)	Octave Band Centre Frequency (Hz) (Linear dB)							
		63	125	250	500	1k	2k	4k	8k
Mitsubishi FDC140KXEN6 *(heating mode)*	55	60	55	52	51	50	50	39	33
Mitsubishi FDC155KXES6 *(heating mode)*	56	61	56	53	51	51	51	40	34

Table 2: Equipment free field sound pressure levels at 1m *(based on manufacturer's noise data)*

To calculate the overall noise contribution from the equipment to outside the nearest windows of potential noise sensitive premises a spreadsheet based noise model calculation has been used. The model takes account of the distance between the air conditioning equipment location and windows, acoustic directivity, acoustic reflections and any natural line of sight acoustic screening (nil applicable).

The noise model also takes account of acoustic louvre enclosure noise reduction treatment to the equipment as specified in Section 5 of the report. Acoustic calculation details are provided in Appendix F.

Summary overall calculated noise level from the equipment to outside the nearest windows of potential noise sensitive premises compared with London Borough of Camden's overall dBA noise limit is shown in Table 3 below.

Description	**Equipment Overall Noise Level**	**London Borough of Camden Noise limit**
Assessment position to outside nearest non-associated (commercial) windows	45.3dBA	47dBA

Table 3: Equipment noise at nearest windows compared with noise limit

Table 3 shows that the overall equipment noise level is at least 5dBA below the lowest background noise. In addition, the equipment octave band noise levels are calculated to also comply with London Borough of Camden's octave band noise condition limits. Therefore the proposed new Mitsubishi FDC140KXEN6 and Mitsubishi FDC155KXES6 air conditioning units with the specified noise reduction treatment applied (acoustic louvre enclosure see Section 5) comply with London Borough of Camden's noise condition limits.

5. NOISE REDUCTION TREATMENT

Note that whilst this report is based on the specific proposed make and model of air conditioning equipment as detailed in Section 4 of this report, if during later design stages or during construction, an alternative make and model of the equipment is selected then it is important that noise levels for the alternative equipment be checked by Philip Acoustics or another Acoustic Consultant to ensure the treatments specified below remain valid and noise emissions will remain compliant with London Borough of Camden's noise requirement.

In order to comply with London Borough of Camden's noise requirement it is necessary to specify noise reduction treatment to the proposed Mitsubishi air conditioning units.

It is recommended that the most practicable way to reduce noise from the air conditioning units would be to enclose them within a proprietary acoustic louvre enclosure.

Note that consideration of non-acoustic issues such as structural, visual and airflow aspects are outside the scope of this acoustic report and would be by others.

It is recommended to install a 'C-shape' acoustic louvre enclosure to the party wall behind the units incorporating:

- Acoustic louvres to front of the enclosure to provide intake / exhaust airflow to the units;
- 50mm solid acoustic panels or acoustic louvres to both sides of the enclosure;
- Solid roof (need not be acoustic louvers/panels, this could be formed by a normal "lean to" pitched timber lid or roof with felt covering or similar, constructed from minimum 18mm ply or similar thickness/density material;

It is assumed that the existing party wall behind the units is (or will be) higher than the units if not, it is important that any gap between the top of the party wall and roof of the enclosure is blanked off using proprietary acoustic louvre or solid acoustic panel.

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

A concept sketch drawing for the recommended acoustic louvre enclosure is provided in Appendix G.

The recommended minimum performance requirement for acoustic louvres is shown in Table 4.

Description	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Acoustic Louvre Insertion Loss dB	4	4	5	8	12	16	15	13

Table 4: Acoustic louvre performance specification

The acoustic louvre in Table 4 is based on a proprietary 150mm deep type acoustic louvre available from Allaway Acoustics. Most other acoustic hardware suppliers should be able to readily supply an equivalent performance acoustic louvre.

Acoustic hardware suppliers for the specified enclosure would be able to assist with advice on airflow ventilation and system pressure drop. Details of possible acoustic hardware companies who could supply the specified type of enclosure, location of the enclosure around the units and technical data sheets for the example acoustic panels and acoustic louvres are provided in Appendix G.

6. VIBRATION FROM MECHANICAL SERVICES EQUIPMENT

Location for the new equipment is structurally linked, albeit indirectly and at distance, to other office space within Zeppelin Building and within adjoining buildings and therefore it is possible that equipment vibration could transmit into these properties. Although this is considered very unlikely as location of the equipment is remote from the adjacent building and because vibration from this type of modern equipment is generally low, as good practice it is recommended that the equipment be installed on vibration isolators

It is recommended the air conditioning equipment be mounted using proprietary rubber or neoprene turret type vibration isolators. The isolators should be selected to each have a static deflection not less than 5mm under load of the unit.

Details of example suitable proprietary rubber / neoprene turret type vibration isolator mountings from three acoustic hardware companies listed below are provided in Appendix H.

Suggested Supplier A

Supplier:	Allaway Acoustics Ltd
Telephone:	01992 550825
Website:	www.allawayacoustics.co.uk

Suggested Supplier B

Supplier:	Christie & Grey
Telephone:	01732 371100
Website:	www.christiegrey.com

Suggested Supplier C

Supplier:	EMTEC
Telephone:	020 8848 3031
Website:	www.emtecproducts.co.uk

APPENDIX A

London Borough Of Camden Noise Conditions For Mechanical Services Equipment

Table D: Noise levels from places of entertainment on adjoining residential sites at which planning permission will not be granted

Noise description and measurement location	Period	Time	Sites adjoining places of entertainment
Noise at 1 metre external to a sensitive façade	Day and evening	0700-2300	L_{Aeq}, 5m shall not increase by more than 5dB*
Noise at 1 metre external to a sensitive façade	Night	2300-0700	L_{Aeq}, 5m shall not increase by more than 3dB*
Noise inside any living room of any noise sensitive premises, with the windows open or closed	Night	2300-0700	L_{Aeq}, 5m (in the 63Hz Octave band measured using the 'fast' time constant) should show no increase in dB*

* As compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL_{Aeq},

Key evidence and references

- Camden's Noise Strategy, 2002
- The London Plan (Consolidated with Alterations since 2004), 2008
- Planning Policy Guidance 24: Planning and noise

APPENDIX B

Noise Survey Instrumentation

Site: The Zeppeln Building, 59-61 Farringdon Road, London EC1M 3JB

Report: 14251-003 Appendix B

Date: November 2014

NOISE SURVEY INSTRUMENTATION

24-hour Background Noise Survey Location 1:

- Rion sound level meter type NL-31 Class 1 serial number 01193690 plus Rion microphone type UC-53A serial number 317534 complete with weatherproof and lockable outdoor environmental kit, microphone extension lead and extension boom arrangement;
- Bruel & Kjaer calibrator type 4231 serial number 2642929 (UKAS certified).

Sample Octave Band Values:

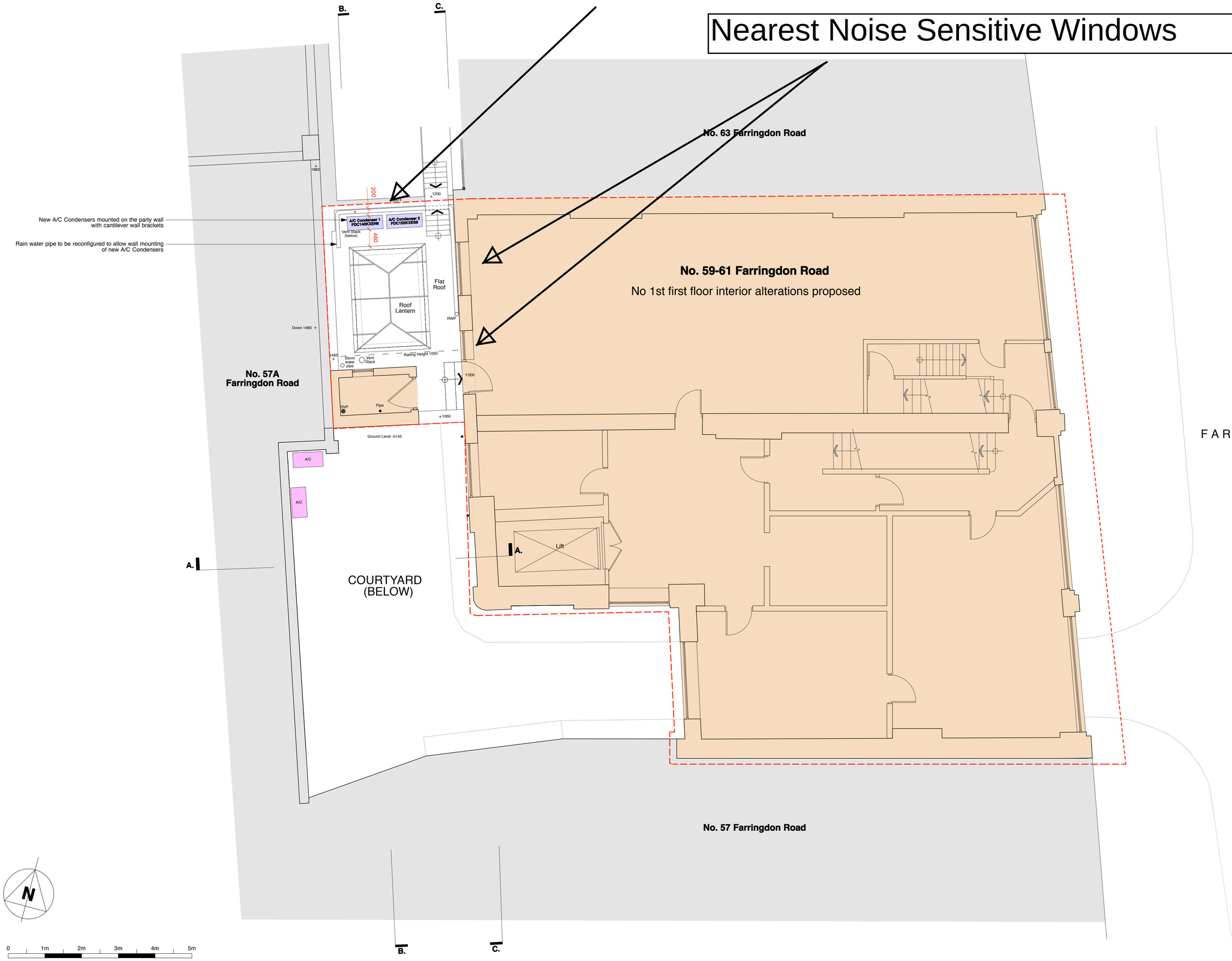
- Bruel & Kjaer sound level meter type 2260 serial number 2497368 plus Bruel & Kjaer microphone type 4189 serial number 2508712

APPENDIX C

Drawing Showing Proposed Equipment Locations

Proposed A/C Equipment Location

Nearest Noise Sensitive Windows



Legend

- **Existing A/C Units** (Belonging to 57A Farringdon Road)
- **Proposed A/C Unit**
- **Application Site** (No alterations to existing building)
- **Surrounding Buildings**

N

0 1m 2m 3m 4m 5m

PROPOSED FIRST FLOOR PLAN

PRELIMINARY

rev.	date	notes

gpad architecture & interior design

CLIENT
KENRIGHT PROPERTIES LTD

PROJECT
ZEPPELIN BUILDING
59-61 FARRINGDON ROAD
LONDON EC1M 3JB

TITLE
PROPOSED FIRST FLOOR PLAN

DWG NO **398C-PA.04** REV **P2**

DRAWN BY **J.W / JE**

SCALE **1:50@A1**

CHECKED BY

DATE **November 2014**

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FILE NAME

PRINT SIZE **A1**

APPENDIX D

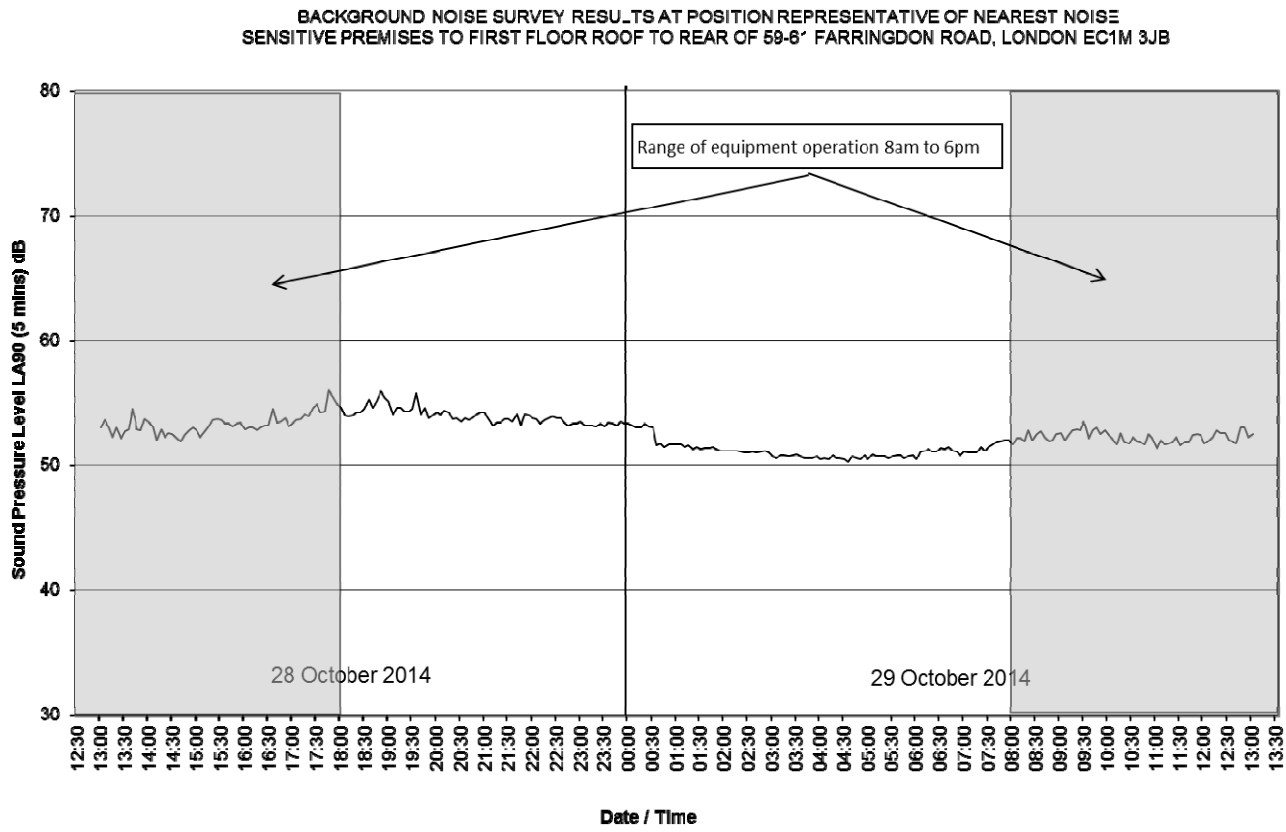
Background Noise Survey Results

Site: The Zeppeln Building, 59-61 Farringdon Road, London EC1M 3JB

Report: 14251-003 Appendix D

Date: November 2014

BACKGROUND NOISE SURVEY RESULTS



APPENDIX E

Manufacturer Noise Data For Proposed Equipment

Noise level

Measured based on JIS B 8616

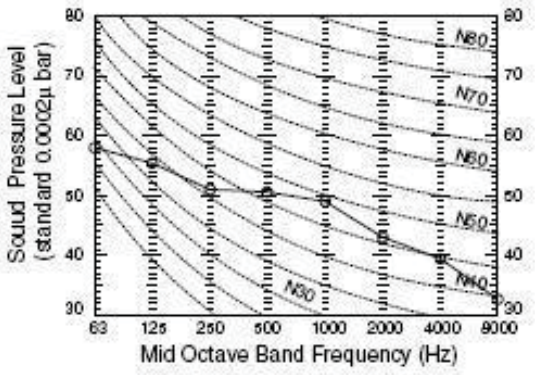
Mike position as highest noise level in position as below

Distance from front side 1m

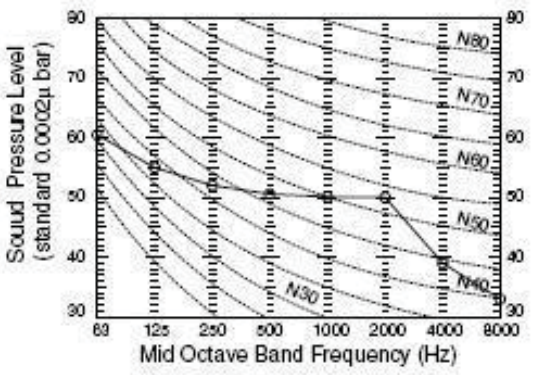
Height 1m

Models FDC140KXEN6

Noise level 53 dB (A) at 50Hz



Noise level 55 dB (A) at 60Hz



Noise level

Measured based on JIS B 8616

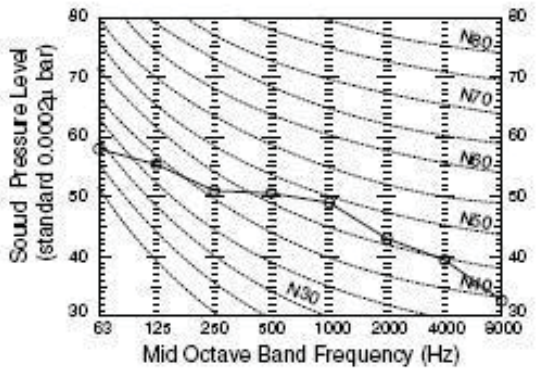
Mike position as highest noise level in position as below

Distance from front side 1m

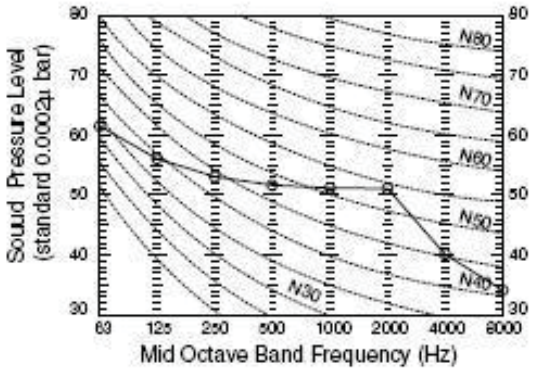
Height 1m

Models FDC155KXES6

Noise level 53 dB (A) at 50Hz



Noise level 56 dB (A) at 60Hz



APPENDIX F

Acoustic Calculations

Site: The Zeppelin Building, 59-69 Farringdon Road, London EC1M 3JB

Ref: 14251-003 Appendix F

Date: November 2014

ACOUSTIC CALCULATION SHEET

ASSESSMENT POSITION: To outside nearest noise sensitive windows of offices at 59-61 Farringdon Road

NOISE CONDITION: 1 x Mitsubishi FDC140KXEN6 A/C Unit, 1 x Mitsubishi FDC155KXES6 A/C Unit

NOISE MITIGATION: With acoustic enclosure fitted to the proposed equipment location (as per Section 5 of report 14251-003)

Equipment	Sound Pressure Level at 1m Lp dBA *(1)*	Attenuation dB *(2)*	Correction for noise directivity dB *(3)*	Distance to assesment position m *(4)*	Correction for distance to assessment position dB *(5)*	Correction for line of sight screening dB *(6)*	Correction for acoustic reflections dB *(7)*	Individual Contributions dBA
First Floor Flat Roof Level								
1No Mitsubishi FDC140KXEN6	55	-11	0	3	-10	0	+3	37
1No Mitsubishi FDC155KXES6	56	-11	0	1.5	-4	0	+3	44
Overall SPL from sources at assessment position:	**45.3 dB(A)**							

Notes:

Note 1: Free-field overall dBA sound pressure level at 1m based on manufacturer noise data.

Note 2: Specified acoustic enclosure reduces equipment noise by differing amounts at different frequencies; the equivalent overall dBA noise level reduction for the specified acoustic enclosure is -11dB.

Note 3: Cautiously no directivity benefit allowed for.

Note 4: Distance is from center of sound source (Air Conditioning equipment location) to outside center of nearest noise sensitive (commercial) windows.

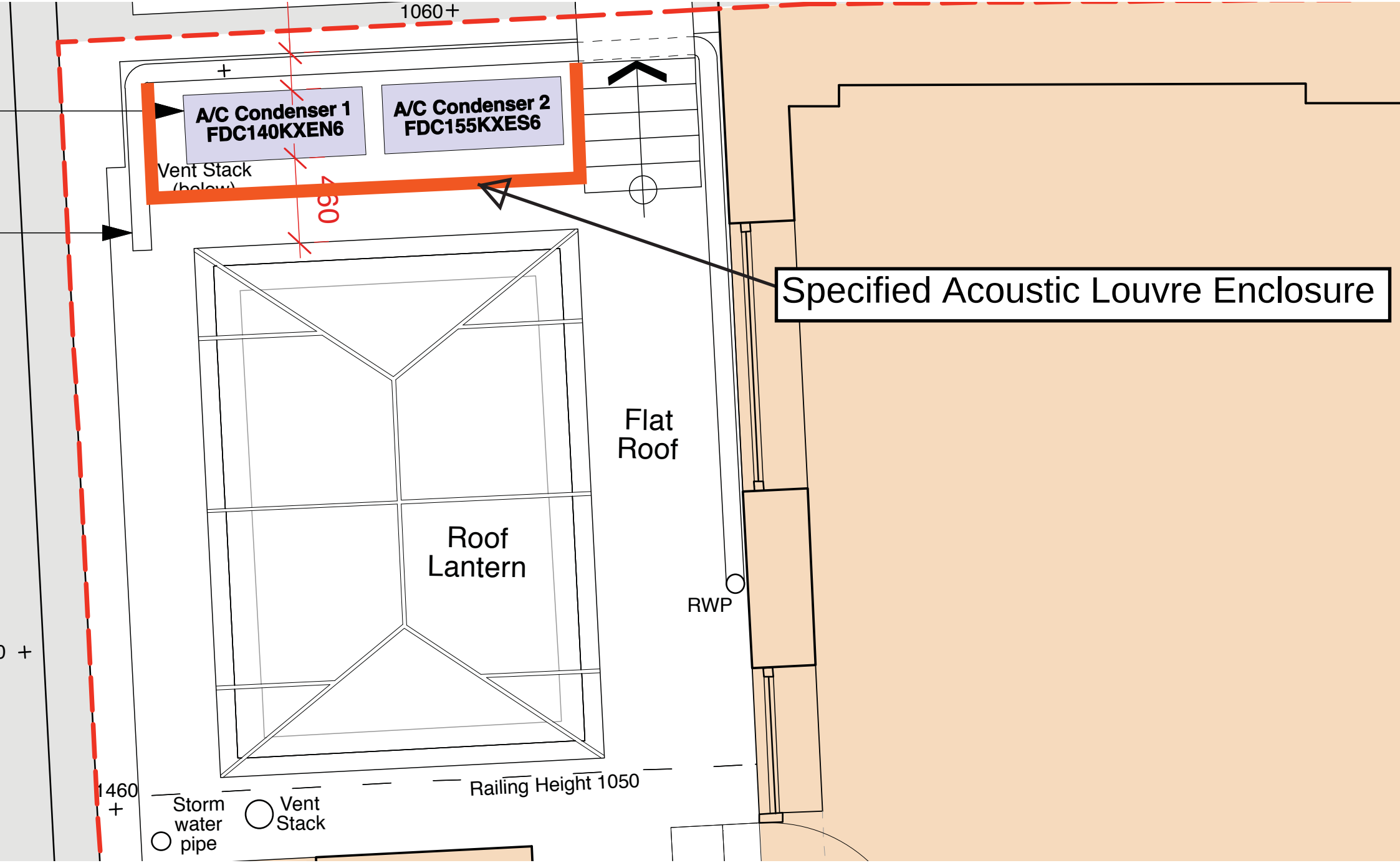
Note 5: Distance correction for point source sound radiation within hemispherical flat reflecting plane.

Note 6: Cautiously no line of sight acoustic screening allowed for.

Note 7: Air Conditioning equipment is located in non free-field conditions, cautiously allow +3dB correction to account for noise reflections off surrounding vertical surface.

APPENDIX G

Noise Reduction Treatment

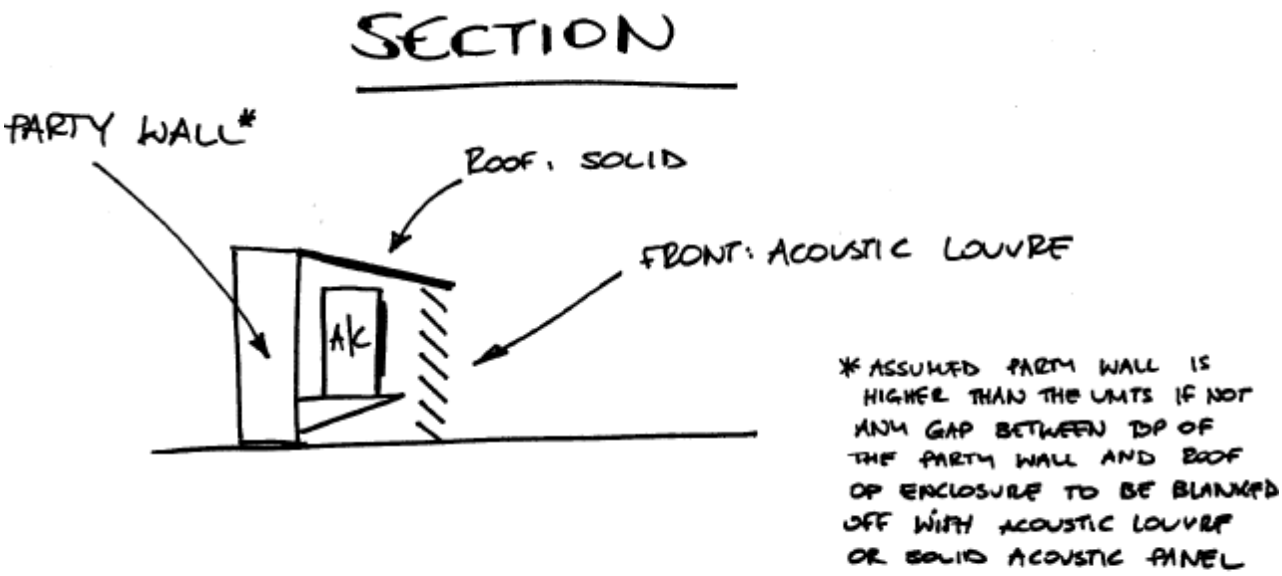

1060
A/C Condenser 1
FDC140KXEN6
A/C Condenser 2
FDC155KXES6
Vent Stack
(below)
460
Specified Acoustic Louvre Enclosure
Flat
Roof
Roof
Lantern
RWP
1460
Storm
water
pipe
Vent
Stack
Railing Height 1050

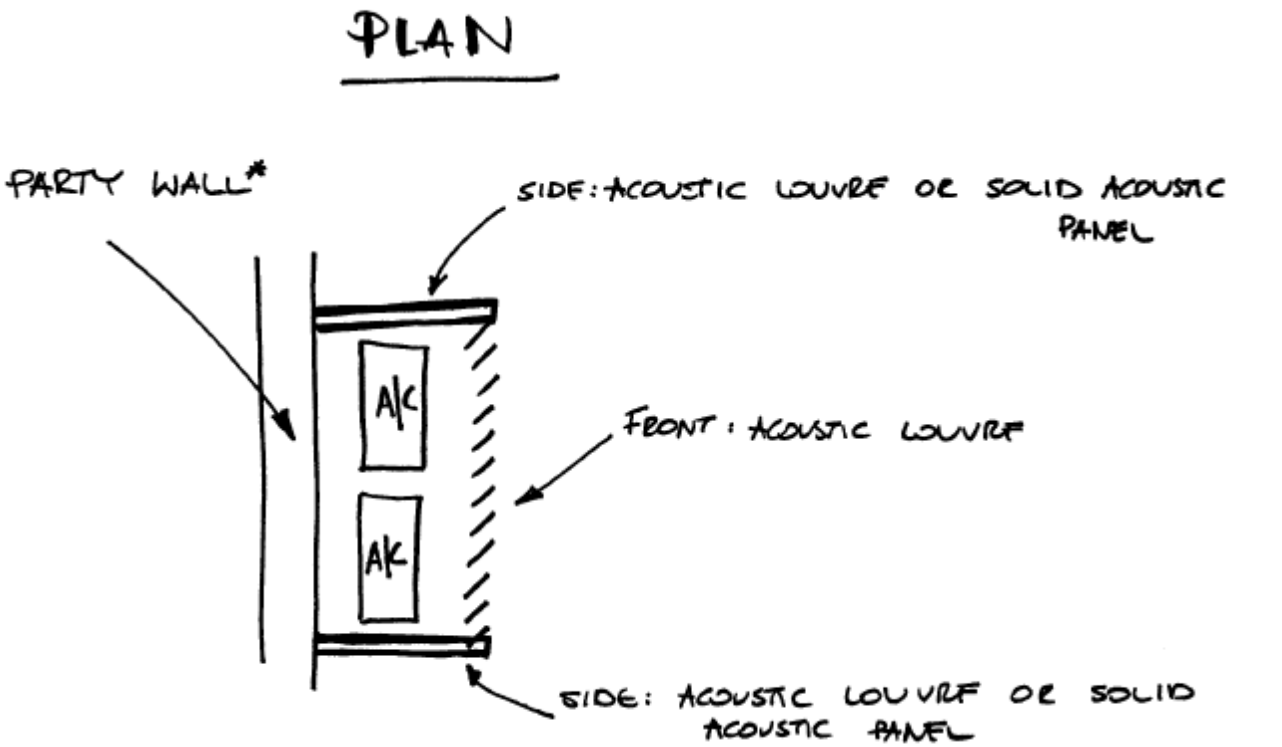
Site: The Zeppelin Building, 59-61 Farringdon Road, London EC1M 3JB

Ref: 14251-003 Appendix G

Date: November 2014

CONCEPT SKETCH DRAWINGS FOR RECOMMENDED ACOUSTIC LOUVRE ENCLOSURE





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DATA SHEET L60D
ACOUSTIC LOUVRE
MODEL AL1515

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

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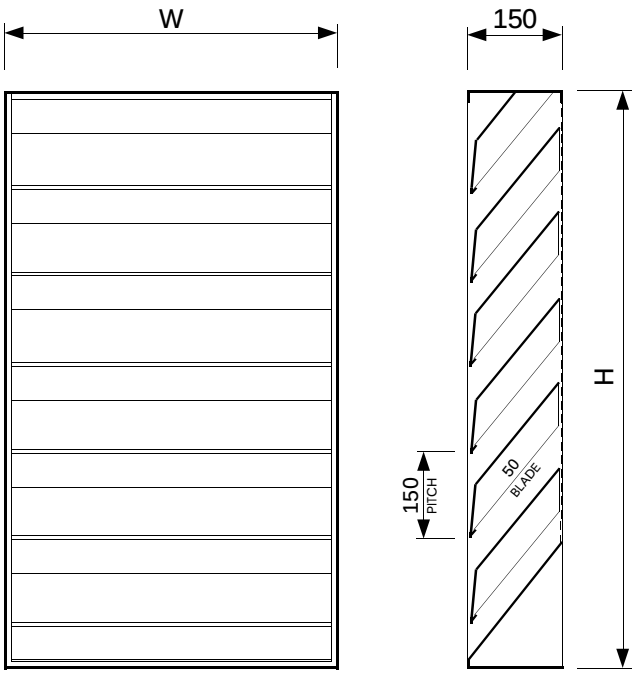
DIMENSIONS



SUFFIX

THE SUFFIX DEFINES ADDITIONAL FEATURES OR SPECIAL CONSTRUCTIONAL DETAILS

A ALUMINIUM CONSTRUCTION.

G GALVANISED STEEL CONSTRUCTION.

P POLYESTER POWDER COAT.

X SPECIAL CONSTRUCTION - REFER TO EQUIPMENT SCHEDULE FOR DETAILS.

WEIGHT

LOUVRE WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE. APPROXIMATELY:

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

SPECIFICATION

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

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

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

GALVANISED BIRD SCREENS ARE FITTED AS STANDARD.

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

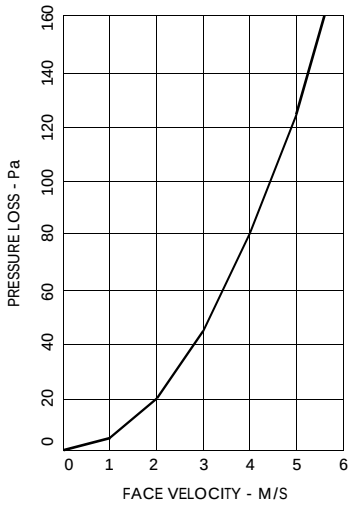
LOUVRES ARE SUPPLIED SELF FINISH AS STANDARD OR WITH AN OPTIONAL POLYESTER POWDER FINISH (SUFFIX P).

ACOUSTIC PERFORMANCE

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

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

PRESSURE LOSS



NOTES

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

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

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

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

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

STANDARD SIZES

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

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

Site: The Zeppelin Building, 59-69 Farringdon Road, London EC1M 3JB

Report: 14251-003 Appendix G

Date: November 2014

DETAILS OF POSSIBLE ACOUSTIC HARDWARE SUPPLIERS

NOISE REDUCTION TREATMENTS

Not listed in any order of recommendation or preference

- Allaway Acoustics: 01992 550825, www.allawayacoustics.co.uk
- AG Fabrications Ltd: 01268 785365, www.agfabrications.co.uk
- Environmental Equipment Corporation Ltd: 01932 230940, www.eecnoisecontrol.co.uk
- EMTEC: 020 8848 3031, www.emtecproducts.co.uk

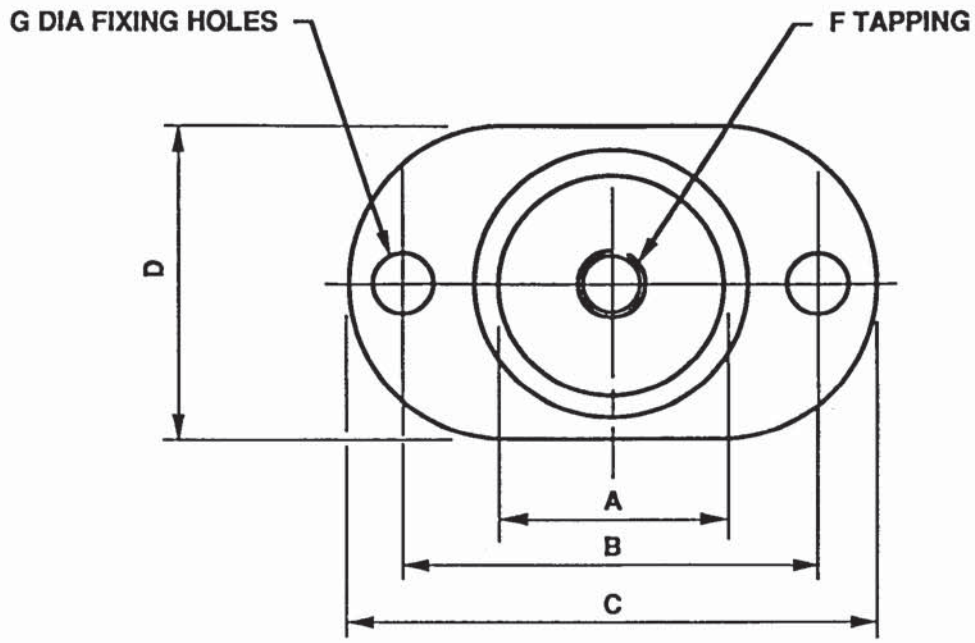
APPENDIX H

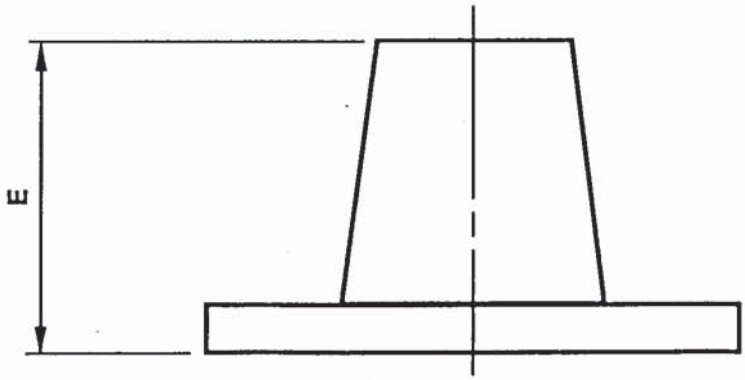
Suggested Details For Vibration Isolators

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

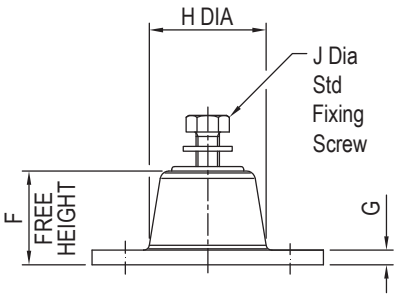
- Moulded in first grade natural rubber with integral steel base and upper fixing boss.
- Manufactured in three sizes, each available in three rubber compounds identified by a colour spot.
- Static deflections of up to 8 mm with loads from 5 kg to 400 kg.
- Upper fixing screw supplied as standard with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

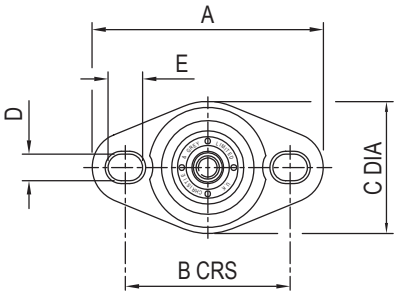
STANDARD PART (.F)



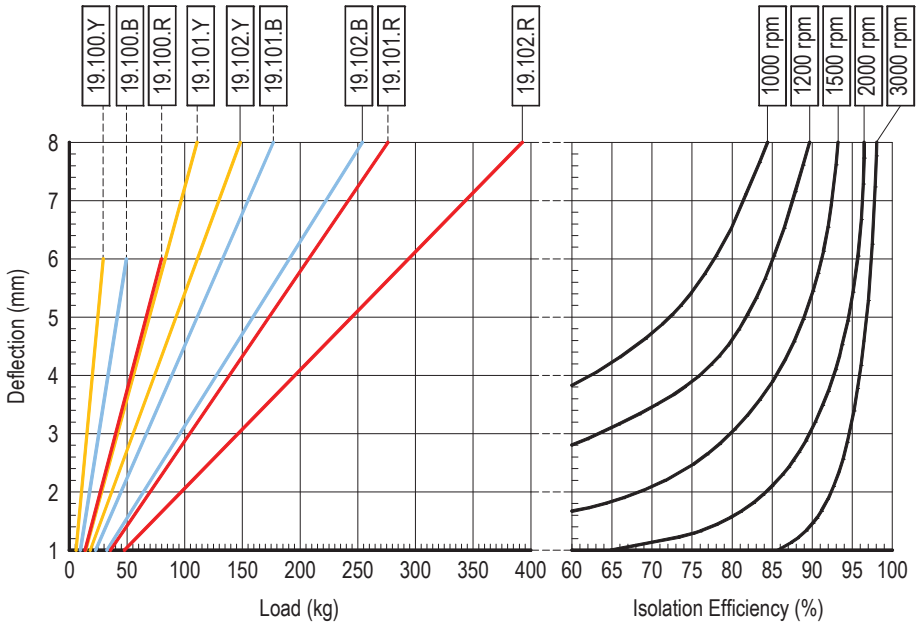
TYPE RM RUBBER TURRET MOUNTINGS

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														

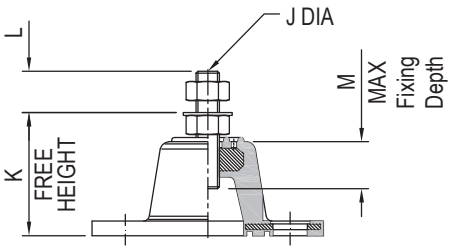
- Above part number includes standard upper fixing screw size J, for height adjustable variant replace **.F** with **.HA**.
- Maximum height adjustment available is 10 mm with **.HA** variant.



Load/Deflection and Isolation Efficiency Graphs.



HEIGHT ADJUSTABLE VARIANT (.HA)



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

Application Notes:

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

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

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

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

Christie & Grey Limited

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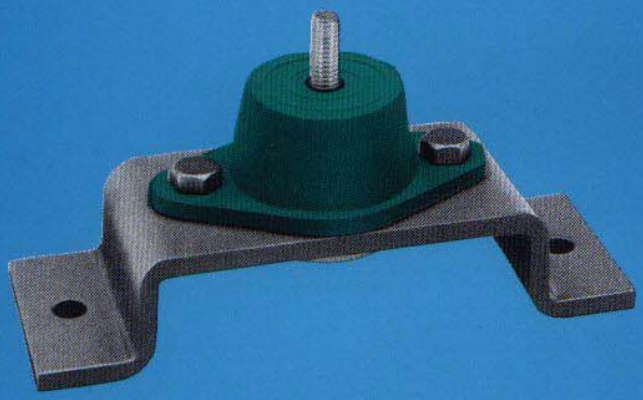
E-mail : sales@christiegrey.com • web site: www.christiegrey.com

PL009/2 - JUNE 2006 - Rev. C

Bulletin No. R12/93 (UK)

VMC
KORFUND

Neoprene Mountings
Series R/RD



Effective Isolation for Floor Mounted Equipment

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

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

- Available in 4 sizes – 5 durometers
- Load Range – 10 lbs. to 4,000 lbs.
- Deflections to ¼" with type R
  to ½" with type RD
- Corrosion Proof
- Molded in colored oil-resistant neoprene
- 5 colors for error free identification

Typical Applications

Air Handling Units Business Machines

Compressors Fans Instrument Panels

Machine Tools Pumps

Motor Generators Transformers

To Specify:

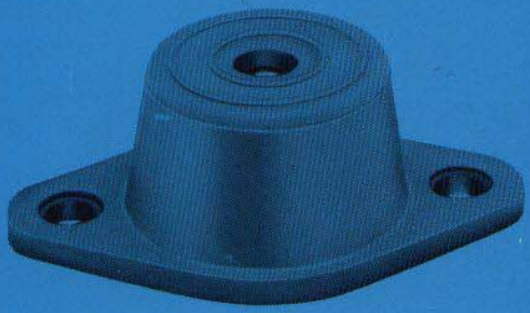
Neoprene mountings shall consist of a steel top plate and base plate completely embedded in coloured oil-resistant neoprene stock for easy identification of capacity. The mountings shall be Type R or RD, depending upon the required deflection of 1/4" to 1/2", as manufactured by VMC and as supplied by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

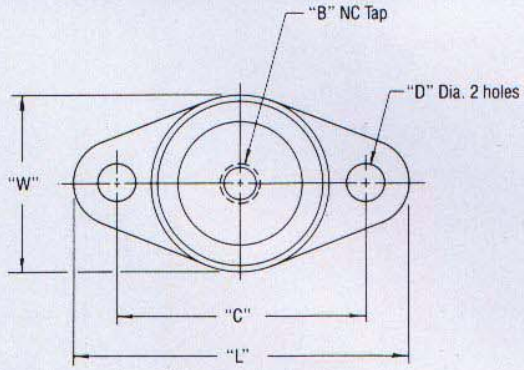
EMTEC

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

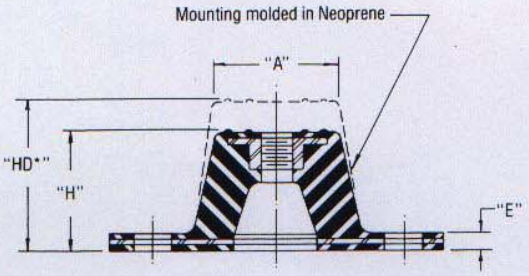
Telephone: 0181 848 3031 Facsimile: 0181 573 3605

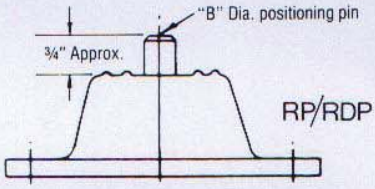
TYPE R/RD





TYPE RP/RDP





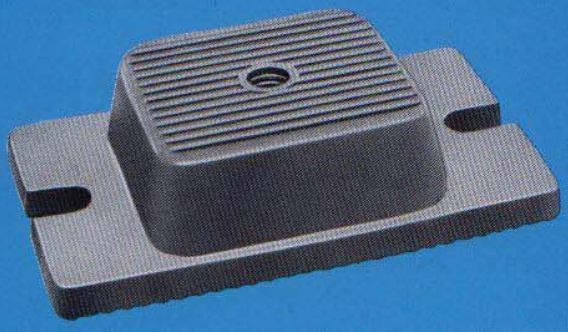
Dimensions: ins. (mm)

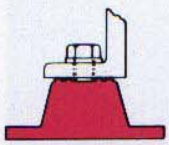
TYPE	L	W	H	*HD	A	B	C	D	E
R-1 or RD-1	3⅛" (79.4)	1¾" (44.4)	1" (25.4)	1¼" (31.7)	1¼" (31.7)	5/16" (8.0)	2⅜" (60.4)	11/32" (8.8)	3/16" (4.8)
R-2 or RD-2	3⅞" (98.6)	2⅜" (60.4)	1¼" (31.7)	1¾" (44.4)	1¾" (44.4)	⅜" (9.6)	3" (76.2)	11/32" (8.8)	7/32" (5.6)
R-3 or RD-3	5½" (139.7)	3⅜" (85.8)	1¾" (44.4)	2⅞" (73.2)	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.	(kg)	Deflection ins. (mm) R	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.

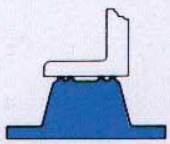




Type R or RD

IF BOLTING IS PREFERRED—

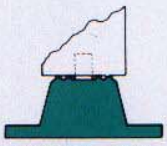
Type R or RD mountings are furnished with a tapped hole in the center. This enables the equipment to be bolted securely to the mounting.



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