Acoustic Assessment of Air Conditioning Condensers at High Holborn House, 52-54 High Holborn, London

Report Reference: 140406-002B

Date: May 2014

ACA Acoustics Limited
Hamilton House, Mabledon Place, Bloomsbury, London WC1H 9BB
Tel: 0207 554 8567
Email: info@aca-acoustics.co.uk
Website: www.aca-acoustics.co.uk

Registered in England & Wales No: 08228154

ACA ACOUSTICS

Site Address:	High Holborn House 52-54 High Holborn London WC1V 6RL
Client:	Amalga Consultants 10 Falconers Park Sawbridgeworth Hertfordshire CM21 0AU
Report Reference:	140406-002
Revision:	A: First Issue B: Condenser location confirmed
Author:	Rob Cant MIOA
Date:	May 2014

ACAACOUSTICS

CONTENTS

0. SUMMARY

- ACA Acoustics Limited have been commissioned by Amalga Consultants Limited on behalf of the client to assess noise emissions from proposed new air conditioning condensers to be installed during the refurbishment of existing commercial offices at High Holborn House, High Holborn, London.

- The assessment is required in order to provide evidence that noise emissions from the condensers complies with London Borough of Camden Council's acoustic requirements. London Borough of Camden Council's requirement, applicable at this site, is that noise from the new equipment shall be designed to 10dBA below the prevailing background level at 1m outside windows of the nearest affected noise-sensitive property.

- A noise survey has been carried out in the vicinity to establish existing background noise levels. Whilst on site the author identified closest noise-sensitive properties as commercial offices within adjoining buildings; the nearest window is approximately 20m from the condenser location.

- Lowest background noise levels during likely operating times of the new condensers over the noise survey were measured at LAF90 50dBA. Background noise levels are primarily due to traffic in the vicinity and existing mechanical services equipment items. Based on results of the noise survey and London Borough of Camden Council's planning consent requirement, the overall noise limit for the equipment to outside nearest noise-sensitive windows is set at ≤40dBA.

- Based on calculations using manufacturer's noise data, the overall noise level for the equipment is 39dBA outside the nearest noise-sensitive windows. This achieves London Borough of Camden Council's planning consent requirement. Noise from the equipment should not be detrimental to the amenity of any occupiers in the vicinity.

- The condensers are indirectly structurally linked to non-associated properties and therefore, although considered unlikely for this type of condenser, it is possible that vibration or vibration-induced noise could transmit into the adjoining buildings. It is recommended that the condensers are installed on vibration isolators; specification for suitable isolators is included in this report.

1. INTRODUCTION

New air conditioning condensers are proposed to be installed during the refurbishment of commercial offices at High Holborn House, 52-54 High Holborn, London.

The Planning Department of London Borough of Camden Council requires information in the form of an acoustic report regarding noise from the new equipment. The report is required to demonstrate that the new condensers will comply with London Borough of Camden Council's acoustic requirements applicable for mechanical services equipment affecting nearby noise-sensitive properties.

ACA Acoustics Limited has been commissioned by the client to carry out an assessment of noise from the condensers and, where necessary, make recommendation to reduce noise and vibration levels from the equipment to comply with London Borough of Camden Council's planning requirements.

This report presents results of the noise survey and assessment and includes:

- Review of London Borough of Camden Council's noise requirements;
- Measurement of existing background noise levels;
- Calculation of equipment noise levels;
- Review of any noise/vibration control treatments necessary to the equipment to ensure compliance with the requirements of London Borough of Camden Council.

2. LONDON BOROUGH OF CAMDEN COUNCIL PLANNING CONSENT ACOUSTIC REQUIREMENTS

London Borough of Camden Council's policies relating to noise from new mechanical services equipment are contained within the Council's Local Development Framework; Policy DP28.

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

Noise level from plant and machinery at which planning permission will not be granted:	
Noise at 1m external to a sensitive façade;	*5dBA < LA90*
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1m external to a sensitive façade;	*10dBA < LA90*
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1m external to a sensitive façade;	*10dBA < LA90*
Noise at 1m external to sensitive façade where LA90 > 60dB	*55dB LAeq*

Table 1: London Borough of Camden Council noise related planning conditions

Each of the above is applicable over a period of 60 minutes and measured at 1m external to noise-sensitive facades (typically nearest residential or non-associated commercial office windows).

Air conditioning condensers will have the potential to operate intermittently as required by the load on the system and as such may be considered to exhibit distinct impulses. Therefore the more onerous noise condition of 10dBA below the existing background noise is used for the assessment in this report.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The development site is at High Holborn House, 52-54 High Holborn, London WC1V 6RL. High Holborn House is set at the junction of High Holborn and Brownlow Street, bordered by buildings facing onto Hand Court and Bedford Row to the north and west.

Planning permission is sought for new air conditioning condensers to be installed within a basement lightwell. The equipment comprises Mitsubishi condensers along with associated pipework and ancillaries.

From experience on previous projects within the Borough, the author understands that London Borough of Camden consider commercial offices to be noise-sensitive and would require equivalent criteria outside commercial offices as would be required for residential dwellings. As such closest noise-sensitive windows to the equipment location are to upper level floors of the adjoining building, approximately 20m from the condenser location and screened by the position within the basement lightwell.

Drawing showing proposed location of the new condensers is shown in Figure A below.

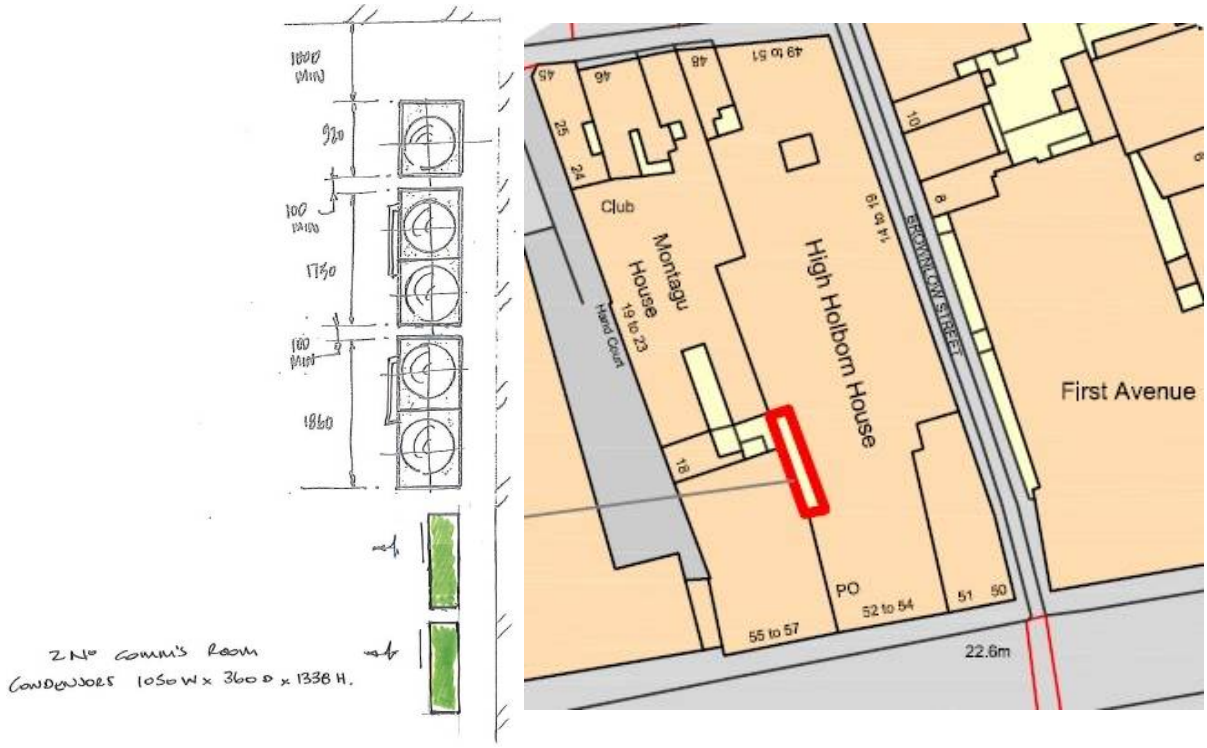

Figure A: Drawing showing location of new condensers

4. NOISE SURVEY

In order to assess noise from the mechanical services equipment in accordance with London Borough of Camden Council's requirements it is necessary to establish representative background noise levels at the nearest noise-sensitive properties. Details of the background noise survey carried out by ACA Acoustics Limited are provided in Sections 4.1 to 4.3 below.

4.1 Noise Measurement and Assessment Procedure

It is anticipated that the new condensers will have the potential to operate at any time during normal office hours, taken to be between 7am and 7pm latest, as required by the load on the system.

The background noise measurement position was selected at roof level towards the rear of the building facing away from High Holborn to measure at a position equivalent to closest noise-sensitive windows.

The site was considered secure and therefore an unmanned noise survey was carried out over nominally a 48-hour period between Tuesday 29th April and Thursday 1st May 2014. During the survey the weather included dry and calm periods.

4.2 Instrumentation

The following equipment was used during the noise survey; the sound level meter was calibrated before and after the survey measurements with no change noted:

Equipment	Serial Number
Rion sound level meter type NL-31 Class 1 complete with weatherproof and lockable outdoor environmental kit	00773045
Bruel & Kjaer calibrator type 4231 (UKAS Certified)	02326801
Microphone extension cable and telescopic boom arrangements	-

Table 2: Equipment used

4.3 Noise Measurement Results

Complete results of the noise survey are provided in graphical form in Figure B on the following page.

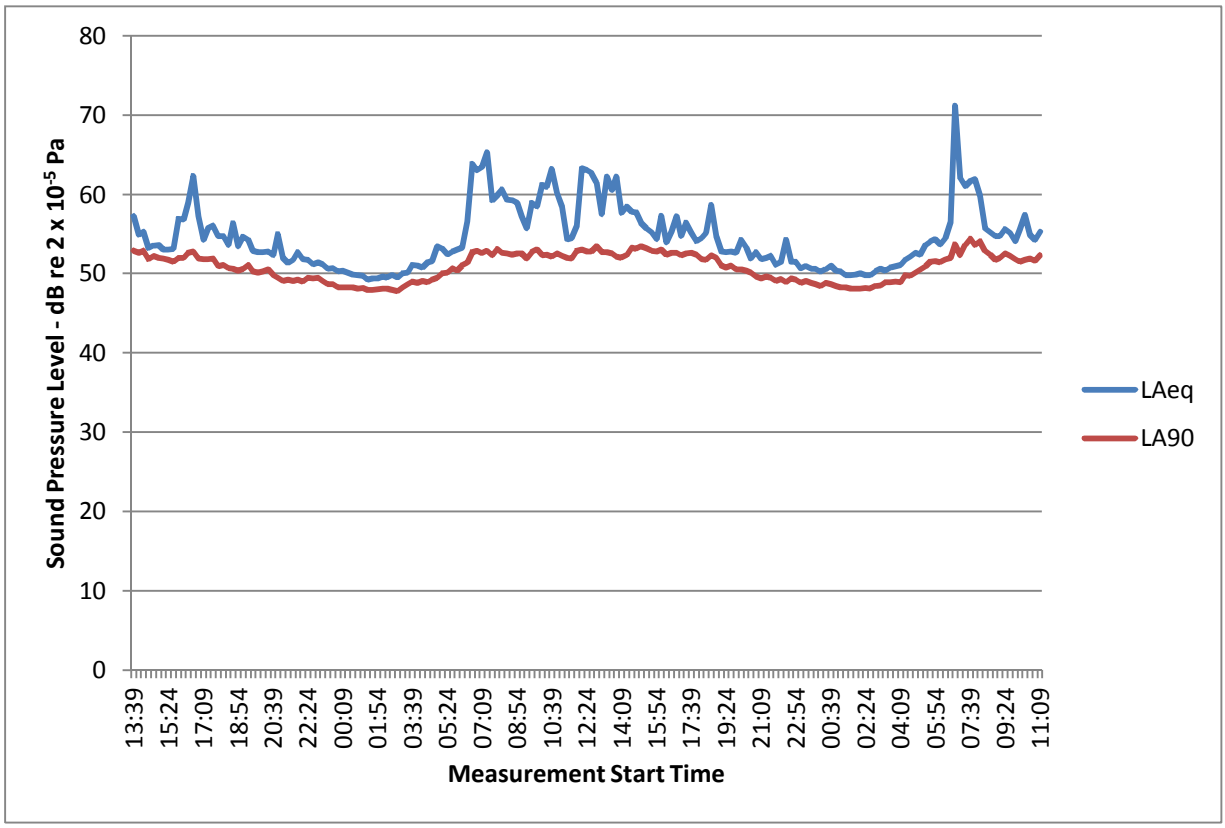

Figure B: Noise Survey Results: 29th April – 1st May 2014

The lowest measured background noise level during proposed operating times of the condensers during the survey was LA90 50dB.

The values recorded by ACA Acoustics Limited are used as basis for acoustic design such that noise from the proposed equipment is ≤40dBA outside nearest noise-sensitive windows (≥10dBA below the lowest recorded values). Summary of measured noise levels are provided in Table 3 below.

LA90 07:00 – 19:00	London Borough of Camden Noise Limit
50dB	≤ 40dBA

Table 3: Summary noise survey results and London Borough of Camden noise limit

The limit to achieve London Borough of Camden Council's requirement outside noise-sensitive windows is 40dBA; this is 10dBA below the lowest measured background noise level. At this level the equipment noise will not increase the background noise and will not be disturbing or detrimental to the amenity of nearby occupants.

5. NOISE FROM MECHANICAL SERVICES EQUIPMENT

The planning application includes installation of new air conditioning condensers along with associated pipework and ancillaries.

Noise levels from the proposed equipment can be determined from manufacturer's noise data. Manufacturer's data for each model used in terms of single-figure A-weighted sound pressure levels at 1m is shown in Table 4 below.

Description	dBA at 1m
Mitsubishi PURY-P250YJM-A	57
Mitsubishi PURY-P450YJM-A	60
Mitsubishi PURY-P250YJM-A	60
Mitsubishi PUHZ-ZRP100VKA (2 No)	51

Table 4: Equipment noise levels

A computer noise model has been used to calculate the noise contribution from the equipment to outside nearest noise-sensitive windows. The model takes account of distance between the condensers and noise-sensitive windows, acoustic screening and acoustic reflections.

The cumulative calculated noise level from the proposed condensers outside the nearest noise-sensitive windows compared with the planning requirement is shown in Table 5. Summary print-outs from the calculation model is included in Appendix A.

Description	Calculated Equipment Noise Levels	London Borough of Camden Council Noise Limit
All equipment operating	39dBA	≤ 40dBA

Table 5: Calculated equipment noise at nearest noise-sensitive windows

Table 5 shows that the overall noise level from the equipment is at least 10dBA below the lowest measured background noise and achieves London Borough of Camden Council's planning consent requirements.

Resultant noise from the equipment will not be disturbing or detrimental to the amenity of nearby existing occupants.

6. RECOMMENDATIONS FOR NOISE & VIBRATION CONTROL TREATMENTS

As discussed in Section 5, noise from the condensers is at least 10dBA below the prevailing background noise at 1m outside nearest noise-sensitive properties and achieves the requirements of London Borough of Camden Council; no noise control treatments are necessary.

The proposed condensers are indirectly structurally connected to non-associated noise-sensitive properties. It is recommended that the condensers are installed on vibration isolators to control vibration and structure-borne noise to this adjoining property. Suitable isolators are typically rubber or neoprene turret type mounts providing a deflection of not less than 6mm at the working load.

The type of vibration isolators proposed are readily available from the condenser manufacturer or any reputable acoustic hardware manufacturer.

ACAACOUSTICS

APPENDIX A

Acoustic Calculations

Project Information

Project: High Holborn House, 52-54 High Holborn, London
Client: Amalga Consultants Limited
Reference: 140406-C02-A
Date: 06/05/2014

ISO 9613-2:1996 ENVIRONMENTAL NOISE PROPAGATION CALCULATION

Calculation Model: Condensers to closest noise-sensitive properties

Description				Octave Band Centre Frequency - Hz (dB)								Notes
				63	125	250	500	1k	2k	4k	8k	
Source Lw	Type:	Mitsubishi		88	90	86	84	78	74	69	64	1 No PURY-P500 (60dBA at 1m), 1 No PURY-P450 (60dBA at 1m), 1 No PURY-P250 (57dBA at 1m) & 2 No PUHZ-ZRP100 (51dBA at 1m)
	Source:	Manufacturer's Data	85 dBA									
Directivity Correction (Dc)				5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	
	Source Height	1.5	m									
	Receiver Height	10.5	m									
	Distance	20	m									
	Directivity Index	3										
Geometrical Divergence (Adiv) - 20m				37	37	37	37	37	37	37	37	Calculated using parallelepiped method
Atmospheric Absorption (Aatm)				0	0	0	0	0.1	0.2	0.5	1.7	
	Temperature	15	°C									
	Relative Humidity	80	%									
Ground Effect (Agr)				-3	6.1	2.7	1.7	-0.4	-0.8	-0.8	-0.8	
	Source Height	1.5	m									
	Receiver Height	10.5	m									
	Source Ground	Soft Ground - G = 1										
	Receiver Ground	Soft Ground - G = 1										
	Middle Ground	Soft Ground - G = 1										
Screening (Abar)				9	8.3	14.5	18.3	20	20	20	20	Condenser screened within lightwell from adjoining buildings
	Source to Barrier	9.4	m									
	Barrier to Receiver	14.0	m									
	Parallel Distance	2	m									
Miscellaneous (Amisc)				0	0	0	0	0	0	0	0	
Reflections (Lw,im + A)				51.7	45.8	39.6	34.9	26.5	20.5	15	8.4	
Calculated Lp at Receiver:		**39.2 dBA**		**54.3**	**48.2**	**41.7**	**37**	**29.8**	**25.2**	**19.8**	**13.5**	

Attenuation

Attenuated Lp at Receiver:		**39 dBA**		**54.3**	**48.2**	**41.7**	**37**	**29.8**	**25.2**	**19.8**	**13.5**	