

THE  
**EQUUS**  
PARTNERSHIP

Member of the Association of Noise Consultants

CONSULTANTS IN  
ACOUSTICS

**THE ACADEMY HOTEL,  
17-25 GOWER STREET, LONDON WC1**

**ENVIRONMENTAL NOISE SURVEYS AND  
CONDENSER PLANT NOISE ASSESSMENTS**

**Report Reference: EPL/3144/ENA/01**

**August 2013**

**Report prepared for:**

Kinlochs and Son Ltd.  
Unit D4 Laser Quay  
Culpepper Close  
Medway City Estate  
Rochester  
Kent  
ME2 4HU

The EQUUS Partnership Ltd  
Reigate Business Mews  
38 Albert Road North  
Reigate  
Surrey  
RH2 9EG

Registered in England No: 3611876

 0044 1737 249162

 0044 7973 343845

 [steve.g@equuspartnership.co.uk](mailto:steve.g@equuspartnership.co.uk)

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## **EXECUTIVE SUMMARY**

The owner/occupier of The Academy Hotel has recently been served a Listed Building Enforcement Notice by London Borough of Camden under Section 38 of the Planning (Listed Buildings and Conservation Areas) Act 1990. The Notice refers to numerous air conditioning units etc. installed on the outside of the hotel which are clearly visible from neighbouring properties at the rear of the subject premises.

Kinlochs and Son Ltd. (in conjunction with Leonard Engineering Design Associates and The EQUUS Partnership Ltd.) has been instructed to consider possible alternative means of allowing the hotel to retain the much needed facility of comfort cooling within the guest rooms and public areas etc., whilst creating minimal visual impact. A possible solution has been developed which involves the installation of two independent, self-contained, condenser plant acoustic enclosures located within the rear garden areas of the hotel.

The EQUUS Partnership Ltd. has been commissioned to assess the likely environmental noise impact of the proposed condenser plant enclosures on nearby noise-sensitive (residential) properties. Reference has been made to the London Borough of Camden Local Development Framework 'Camden Development Policies 2010-2025', specifically Development Policy DP28, which relates to restricted environmental noise emissions from plant and machinery.

This report presents the results of environmental noise surveys undertaken to establish the ambient and background noise conditions prevailing in the vicinity of the subject premises, discusses London Borough of Camden's current noise control Planning policy, and assesses environmental noise emissions from the proposed condenser plant enclosures. Acoustic performance Specifications are given for the noise mitigation measures necessary to satisfy the requirements of Development Policy DP28.

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## **1 SUBJECT PREMISES AND SURROUNDING BUILDINGS**

The subject premises are located near to the junction of Gower Street and Store Street in London WC1. Gower Street is a busy one-way thoroughfare with three lanes of traffic light controlled highway, and consequently, the local traffic flow is very heavy during the daytime/evening period and still relatively heavy through the night.

The subject property is flanked by residential premises, and in the surrounding area there are numerous similar buildings, including other hotels, and dwelling flats along Gower Street and Ridgmount Street. Based on visual site observations, the approximate distances of the proposed condenser plant enclosures to the closest / most exposed noise-sensitive (residential) windows are as listed below:

- Rear windows of No's. 10-16 Ridgmount Street at approximately 12m from the proposed condenser plant enclosure in the Conservatory Garden.
- Rear windows of No. 27 Gower Street at approximately 12m from the proposed condenser plant enclosure in the Conservatory Garden.
- Rear windows of No. 15A Gower Street at approximately 14m from the proposed condenser plant enclosure in the Library Garden.

## **2 EXISTING AND PROPOSED CONDENSER PLANT**

### **2.1 Existing Plant Locations**

The existing condenser units are mainly located at the rear of the subject premises as shown on Leonard Engineering Design Associates drawings 2745-M201 (Rev. 2) and 2745-M202 (Rev. 2). There are an additional 5 no. units located in the basement lightwell at the front of the premises.

### **2.2 Proposed Plant Locations**

The intended locations of the proposed 2 no. independent, self-contained, condenser plant enclosures are shown on Leonard Engineering Design Associates drawings 2745-M203 (Rev 3) and 2745-M204 (Rev 3). It is proposed that 1 no. condenser will be installed in a single enclosure located within the Conservatory Garden of the hotel, and 2 no. units will be installed in a single enclosure located at the end of the Library Garden of the hotel.

## 2.3 Proposed Condenser Manufacturer's Noise Data

The following manufacturer's 'free-field' octave band sound pressure levels have been provided for each of the 3 no. proposed Mitsubishi condenser units. The data relates to the measured noise level at 1m from the side of the unit:

Conservatory Garden Condenser: Octave Band Sound Pressure Levels (dB re: $2 \times 10^{-5}$ Pa)									
Operating Mode	63	125	250	500	1k	2k	4k	8k	(A)
PURY-P500YJM-A (Standard mode)	62	65	63	57	54	49	44	38	<b>(60)</b>
PURY-P500YJM-A (Low noise mode)	61	57	47	42	40	36	34	28	<b>(47)</b>

Library Garden Condensers: Octave Band Sound Pressure Levels (dB re: $2 \times 10^{-5}$ Pa)									
Operating Mode	63	125	250	500	1k	2k	4k	8k	(A)
PURY-P600YJM-A (Standard mode)	68	67	64	59	56	52	48	46	<b>(62)</b>
PURY-P600YJM-A (Low noise mode)	64	63	52	48	45	42	43	41	<b>(53)</b>
PURY-P250YJM-A (Standard mode)	59	62	60	54	51	46	41	35	<b>(57)</b>
PURY-P250YJM-A (Low noise mode)	58	54	44	39	37	33	31	25	<b>(44)</b>

There is no measurement data for vertical noise emissions from these units. For the purposes of this noise assessment, the following discharge sound pressure level corrections have therefore been assumed:

<b>Assumed Discharge Corrections - Octave Band Sound Pressure Levels (dB re: 2x10<sup>-5</sup> Pa)</b>									
<b>Operating Mode</b>	<b>63</b>	<b>125</b>	<b>250</b>	<b>500</b>	<b>1k</b>	<b>2k</b>	<b>4k</b>	<b>8k</b>	<b>(A)</b>
Assumed Corrections for Discharge Noise	+2	+3	+3	+2	+2	+2	+2	+2	<b>(2)</b>

### **3 ENVIRONMENTAL NOISE SURVEYS**

It is understood the proposed comfort cooling plant would only need to operate at full duty during daytime/evening hours - i.e. between 07:00 and 23:00 hours - and could operate at reduced capacity overnight. It was therefore considered appropriate for daytime and night-time environmental noise surveys to be undertaken. Noise measurements were made with the existing hotel condenser plant switched off (as far as was practicable) to enable more accurate background noise measurements to be made, and with the plant operating under normal summer conditions with almost full hotel occupation.

‘Critical period’ environmental noise surveys were undertaken between 1<sup>st</sup> and 2<sup>nd</sup> August, 2013, to establish the typical ambient and background noise conditions prevailing in the vicinity of the subject premises during the most noise-sensitive daytime and night-time periods.

The weather conditions during the daytime survey were dry and extremely hot, with a clear sky, and light breeze. This good weather continued overnight, remaining very warm, with just a gentle breeze and some occasional gusts. There was no precipitation at any time during the environmental noise surveys. These weather conditions are considered acceptable for the purposes of this environmental noise assessment.

#### **3.1 Noise Measurement Locations**

Initial inspections around the subject premises revealed the most appropriate noise measurement locations to be as follows:

- Position A:** Conservatory Garden area at rear of subject premises near to closest dwelling window at rear of No's. 10-16 Ridgmount Street.
- Position B:** Conservatory Garden area at rear of subject premises above boundary wall to closest dwellings at rear of No. 27 Gower Street.
- Position C:** Library Garden area at rear of subject premises (this measurement position should be reasonably indicative of the ambient/background noise conditions outside the closest dwelling windows at the rear of No.15A Gower Street).
- Position D:** Pavement level outside the front of No. 27 Gower Street (this measurement position should be reasonably indicative of the ambient/background noise conditions outside the closest dwelling windows at the front of properties along Gower Street).

### 3.2 Noise Survey Procedure

Measurements of the  $L_{A90}$ ,  $L_{Aeq}$  and  $L_{Amax}$  sound levels were made over sample periods in each hour at each of the above positions. The noise levels measured during each period are taken to be representative of the typical noise climate during that hour at each location.

The noise measuring instrumentation was fully manned at all times. Any short-term noise sources that could have been construed as unrepresentative, such as low level aircraft flyovers, occasional gusts of wind, etc., were excluded from the measurement samples. The 'back erase' facility of the real time analyser was employed to eliminate such short term extraneous noises.

Please refer to **Appendix A** for an explanation of the acoustic terminology used in this Report.

### 3.3 Instrumentation

The following instrumentation was used for the environmental noise surveys:

Brüel and Kjær Precision Real Time Analyser	Type 2260B
Brüel and Kjær ½" Condenser Microphone	Type 4189
Brüel and Kjær Sound Level Calibrator	Type 4230
Brüel and Kjær ½" Windshield	Type UA 0237

The real time analyser was calibrated prior to each survey and the calibration was checked again upon completion. No drift was found to have occurred.

### 3.4 Noise Survey Results

The environmental noise levels measured at each of the selected noise measurement positions are tabulated below. Please note that the ambient/background readings taken with the hotel condensers switched off are highlighted in red:

#### Measurement Position A (Conservatory Garden - Close to Rear of No's. 10-16 Ridgmount St):

Measurement Period	Condenser Plant Operating Condition	Measured Sound Pressure Level, dB re 20µPa		
		L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>Amax</sub>
<b>Daytime Period:</b>				
14.00 - 15.00 hours	All condensers off except one unit in garden lightwell	49.2	50.8	57.8
15.00 - 16.00 hours	-	-	-	-
16.00 - 17.00 hours	All condensers off	50.2	52.2	57.6
17.00 - 18.00 hours	Approx. 50% of local condensers operating	51.0	52.8	66.2
18.00 - 19.00 hours	Approx. 50% of local condensers operating	49.8	51.4	58.4
19.00 - 20.00 hours	Approx. 50% of local condensers operating	48.6	50.1	62.5
<b>Night-Time Period:</b>				
23.00 - 00.00	Approx. 50-75% of local condensers operating	46.8	48.4	62.9
00.00 - 01.00	Approx. 50-75% of local condensers operating	45.8	47.5	57.2
01.00 - 02.00	Approx. 50-75% of local condensers operating	46.4	47.9	60.0
02.00 - 03.00	Approx. 50-75% of local condensers operating	45.8	47.7	55.6
02.00 - 03.00	All condensers off	46.0	47.6	54.7

**Measurement Position B (Conservatory Garden - close to rear of No. 27 Gower Street):**

Measurement Period	Condenser Plant Operating Condition	Measured Sound Pressure Level, dB re 20µPa		
		L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>Amax</sub>
<b>Daytime Period:</b>				
14.00 - 15.00 hours	All condensers off except one unit in garden lightwell	48.4	50.1	58.2
15.00 - 16.00 hours	-	-	-	-
16.00 - 17.00 hours	Approx. 50% of local condensers operating	50.4	52.5	59.2
17.00 - 18.00 hours	Approx. 50% of local condensers operating	50.8	52.7	62.4
18.00 - 19.00 hours	Approx. 50% of local condensers operating	49.2	52.5	60.2
19.00 - 20.00 hours	Approx. 50% of local condensers operating	48.6	52.1	64.3
<b>Night-Time Period:</b>				
23.00 - 00.00	Approx. 50-75% of local condensers operating	48.0	49.9	65.4
00.00 - 01.00	Approx. 50-75% of local condensers operating	47.0	49.1	62.7
01.00 - 02.00	Approx. 50-75% of local condensers operating	45.6	47.6	60.8
02.00 - 03.00	Approx. 50-75% of local condensers operating	45.2	47.9	63.4
02.00 - 03.00	<b>All condensers off</b>	<b>44.6</b>	<b>47.0</b>	<b>56.9</b>

**Measurement Position C (Library Garden - close to rear of No. 15A Gower Street):**

Measurement Period	Condenser Plant Operating Condition	Measured Sound Pressure Level, dB re 20µPa		
		L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>Amax</sub>
<b>Daytime Period:</b>				
14.00 - 15.00 hours	-	-	-	-
15.00 - 16.00 hours	All condensers off	48.8	53.2	69.7
16.00 - 17.00 hours	Approx. 50% of local condensers operating	48.8	52.4	61.9
17.00 - 18.00 hours	Approx. 50% of local condensers operating	49.0	52.8	67.4
18.00 - 19.00 hours	Approx. 50% of local condensers operating	48.8	52.6	68.1
19.00 - 20.00 hours	Approx. 50% of local condensers operating	48.6	52.8	68.9
<b>Night-Time Period:</b>				
23.00 - 00.00	Approx. 50-75% of local condensers operating	44.4	48.9	58.8
00.00 - 01.00	Approx. 50-75% of local condensers operating	44.6	49.0	62.0
01.00 - 02.00	Approx. 50-75% of local condensers operating	44.4	47.7	61.4
02.00 - 03.00	Approx. 50-75% of local condensers operating	-	-	-
03.00 - 04.00	All condensers off	43.2	47.7	61.0

**Measurement Position D (Pavement Level Outside Front of No. 15A Gower Street):**

Measurement Period	Condenser Plant Operating Condition	Measured Sound Pressure Level, dB re 20µPa		
		L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>Amax</sub>
<b>Daytime Period:</b>				
14.00 - 15.00 hours	-	-	-	-
15.00 - 16.00 hours	All condensers at front of building off	63.2	73.1	87.2
16.00 - 17.00 hours	All condensers at front of building off	60.8	71.1	80.0
17.00 - 18.00 hours	All condensers at front of building off	62.7	72.1	77.2
18.00 - 19.00 hours	All condensers at front of building off	61.4	70.8	81.4
19.00 - 20.00 hours	All condensers at front of building off	57.2	69.3	88.2
<b>Night-Time Period:</b>				
23.00 - 00.00	All condensers at front of building off	58.0	69.8	82.3
00.00 - 01.00	All condensers at front of building off	54.8	68.4	82.7
01.00 - 02.00	All condensers at front of building off	49.8	66.5	83.1
02.00 - 0.300	-	-	-	-
03.00 - 04.00	All condensers at front of building off	49.0	68.4	84.6

### 3.5 Daytime Ambient/Background Noise Climate

The daytime ambient noise levels at the rear of the subject premises (Positions A to C) were generally found to be caused by the heavy road traffic flowing along Gower Street, together with fairly regular traffic movements along Store Street and Chenies Street, each controlled by traffic

lights at their respective junctions with Gower Street. There was also some underlying plant noise emanating from the subject premises and also from other buildings in the locality. There was hardly any change in the ambient / background noise levels when the subject condenser plant was switched off. In fact, due to natural fluctuations in ambient noise conditions, the daytime noise levels at Position C actually appeared to increase slightly with the subject condensers switched off.

The daytime ambient noise levels at the front of the subject premises (Position D) were entirely dominated by road traffic movements along Gower Street, especially due to buses and lorries etc. accelerating away from the traffic lights.

### **3.6 Night-Time Ambient/Background Noise Climate**

The night-time ambient noise levels at the rear of the subject premises (Positions A to C) were still generally found to be controlled by road traffic flowing along Gower Street and the surrounding roads, together with some underlying plant noises emanating from the subject premises and from other buildings in the locality. Again, the ambient / background noise levels hardly altered when the subject condenser plant was switched off.

The night-time ambient noise levels at the front of the subject premises (Position D) was still entirely dominated by road traffic movements along Gower Street which remained quite busy throughout the night. Although the traffic volume was lower than during the daytime, there was still a noticeably high proportion of buses, lorries, and large vans etc.

## **4 PLANT NOISE EMISSION CRITERIA**

Reference has been made to the London Borough of Camden Local Development Framework 'Camden Development Policies 2010-2025' to determine the Council's current policies relating to environmental noise. Table E of Development Policy DP28 (Noise and Vibration) prescribes the following environmental noise emission limits from plant and machinery:

**Table E of Development Policy DP28: 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	5 dB(A)<L <sub>A90</sub>
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	10 dB(A)<L <sub>A90</sub>
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10 dB(A)<L <sub>A90</sub>
Noise at 1 metre external to sensitive façade where L <sub>A90</sub> >60 dB	Day, evening and night	0000-2400	55 dB L <sub>Aeq</sub>

In view of the above requirements, a fairly cautious approach (i.e. 'safe' in Planning terms) would be to ensure that the 'Condenser Plant Noise Emission Limits' tabulated below are adopted in this instance. These noise limits are applicable to the proposed condenser units operating together, allow for the possibility that the residual noise might contain a 'distinguishable discrete continuous note' (although this is unlikely given the degree of noise control that will be required), and further assume that all the existing condensers will be de-commissioned:

Receiver Location (1m from Façade)	Recommended L <sub>Aeq</sub> Condenser Plant Noise Emission Limits (dB re 2 x 10 <sup>-5</sup> Pa.)		
	Daytime (07.00 - 19.00)	Evening (19.00 - 23.00)	Night-Time (23.00 - 07.00)
Rear windows of No's. 10-16 Ridgmount Street	39 dB L <sub>Aeq</sub>	37 dB L <sub>Aeq</sub>	35 dB L <sub>Aeq</sub>
Rear windows of No. 27 Gower Street	38 dB L <sub>Aeq</sub>	38 dB L <sub>Aeq</sub>	35 dB L <sub>Aeq</sub>
Rear windows of No. 15A Gower Street	39 dB L <sub>Aeq</sub>	35 dB L <sub>Aeq</sub>	33 dB L <sub>Aeq</sub>

## 5 PLANT NOISE ASSESSMENTS

### 5.1 Proposed Noise Mitigation Measures

Calculations have been undertaken to assess the environmental noise emissions due to operation of the proposed condenser plant based on the manufacturer's noise data confirmed in Section 2.0 above.

Due allowance has been made for the proposed condenser plant locations, the distance between the plant and neighbouring windows, typical directivity characteristics, geometrical spreading, and acoustic screening / reflection effects due to the neighbouring building features etc.

Initial calculations clearly indicated that noise mitigation measures would be required in the form of intake and discharge attenuators fitted directly onto the condensers in conjunction with the use of free standing solid acoustic panelled screens to form the plant enclosures. Suitable specifications for these noise mitigation measures are detailed below:

The intake and discharge attenuators will need to be bespoke 'acoustic kits' as manufactured by Ambient Acoustics ([www.noisecontrol-uk.com](http://www.noisecontrol-uk.com)). These comprise 250mm deep intake acoustic louvres and a 600mm long discharge attenuator. The overall effective attenuation performance of the 'acoustic kits' shall be as tabulated below:

Overall Average Attenuation Performance of Ambient Acoustics 'Acoustic Kit'									
Attenuation Device	63	125	250	500	1k	2k	4k	8k	(A)
Intake Acoustic Louvres and Discharge Attenuator	2	4	5	6	10	10	8	7	<b>(8)</b>

Please refer to Ambient Acoustics datasheet in **Appendix B**.

Each of the free standing plant enclosures shall be formed from proprietary sound absorptive acoustic panels constructed as specified below:

*Proprietary acoustic panelled enclosures shall be installed with a height of at least 850mm above the installed height of the condensers (i.e. approximately 3m in height). The enclosures shall include all necessary support posts to allow for potential wind loading and stresses etc. The acoustic panels shall be 50mm thick type EP/50UF as manufactured by Allaway Acoustics ([www.allawayacoustics.co.uk](http://www.allawayacoustics.co.uk)) or equal and approved, comprising a sound absorptive perforated facing towards the plant and a solid sheet external facing. The acoustic panelled enclosures shall comply with the minimum acoustic performances tabulated below. The acoustic panelled enclosures shall be continuous on all four sides (i.e. without any gaps between panels and/or below the screen):*

Table 3144/CPE/1: Acoustic Performance of Condenser Plant Enclosures								
Acoustic Performance	63	125	250	500	1k	2k	4k	8k
Minimum Sound Reduction Indices	17	19	26	33	38	42	45	44
Minimum Sound Absorption Coefficients	0.10	0.25	0.65	1.00	1.00	1.00	0.95	0.90

Please refer to Allaway Acoustics datasheet contained in **Appendix C**.

It is important that the selected manufacturer ensures that: (i) the access door to each enclosure has an airborne sound insulation performance at least equivalent to the acoustic panelled screen, (ii) the access doors have a sound absorptive (perforated) inner face, and, (iii) the access doors are suitably detailed to prevent any sound leakage.

**Please note:**

In order to provide further control of night-time noise emissions the condensers should be programmed to operate in 'low noise mode' between 23.00 and 07.00 hours (i.e. 'night setback').

## 5.2 Rear Windows of No's. 10-16 Ridgmount Street

Calculations indicate the following 'worst case' daytime / evening condenser unit noise level outside the closest rear window of No's. 10-16 Ridgmount Street (i.e. operating at full duty) allowing for the noise mitigation measures specified above:

'Worst case' condenser plant noise outside dwelling window - 37 dB  $L_{Aeq}$ .

It may be seen that the calculated condenser unit noise emission level just accords with the most stringent daytime/evening '*Condenser Plant Noise Emission Limit*' of 37 dB  $L_{Aeq}$  referred to in Section 4 of this Report.

Further calculations indicate the 'worst case' night-time condenser unit noise level outside the closest rear window of No's. 10-16 Ridgmount Street (i.e. operating in low noise mode) allowing for the noise mitigation measures specified above would be 27 dB  $L_{Aeq}$ . This is substantially below the night-time '*Condenser Plant Noise Emission Limit*' of 35 dB  $L_{Aeq}$  referred to in Section 4 of this Report.

## 5.3 Rear Windows of No. 27 Gower Street

Calculations indicate the following 'worst case' daytime / evening condenser unit noise level outside the closest rear window of No. 27 Gower Street (i.e. operating at full duty) allowing for the noise mitigation measures specified above:

'Worst case' condenser plant noise outside dwelling window - 33 dB  $L_{Aeq}$ .

It may be seen that the calculated condenser unit noise emission level is well below the most stringent daytime/evening '*Condenser Plant Noise Emission Limit*' of 38 dB  $L_{Aeq}$  referred to in Section 4 of this Report.

Further calculations indicate the 'worst case' night-time condenser unit noise level outside the closest rear window of No. 27 Gower Street (i.e. operating in low noise mode) allowing for the noise mitigation measures specified above would be 23 dB  $L_{Aeq}$ . This is substantially below the night-time '*Condenser Plant Noise Emission Limit*' of 35 dB  $L_{Aeq}$  referred to in Section 4 of this Report.

## 5.2 Rear Windows of No. 15A Gower Street

Calculations indicate the following 'worst case' daytime / evening cumulative condenser unit noise level outside the closest rear window of No. 15 Gower Street (i.e. operating at full duty) allowing for the noise mitigation measures specified above:

'Worst case' cumulative condenser plant noise outside dwelling window - 34 dB  $L_{Aeq}$ .

It may be seen that the calculated cumulative condenser unit noise emission level is below the most stringent daytime/evening '*Condenser Plant Noise Emission Limit*' of 35 dB  $L_{Aeq}$  referred to in Section 4 of this Report.

Further calculations indicate the 'worst case' night-time cumulative condenser unit noise level outside the closest rear window of No. 15 Gower Street (i.e. operating in low noise mode) allowing for the noise mitigation measures specified above would be 27 dB  $L_{Aeq}$ . This is substantially below the night-time '*Condenser Plant Noise Emission Limit*' of 33 dB  $L_{Aeq}$  referred to in Section 4 of this Report.

## 6 STRUCTURE-BORNE NOISE AND VIBRATION

### 6.1 Vibration Isolation of Condenser Plant

The condensers are to be mounted on paving slabs to reduce the overall installed height of the plant. In order to reduce the risk of increased re-radiated noise due to vibration of framing and panels etc. each condenser shall be mounted on low height rubber-in-shear pedestal mountings selected to achieve approximately 3mm static deflection, whilst ensuring that sufficient lateral stability is achieved. A suitable specification for these mountings is given in the attached *Specification 3144/RIS*. Other alternative vibration isolation systems may be suitable subject to review by The EQUUS Partnership.

**N.B.** The supplier of the vibration isolation equipment will need to be given accurate point loading information for each mounting point to enable the most appropriate isolation methods to be selected. Due consideration should also be given to providing lateral restraint depending upon each unit's centre of gravity.

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## 6.2 Vibration Isolation of Pipework

The associated pipework shall be fitted with suitable flexible connections and be suspended from proprietary supports with oversized clamps incorporating neoprene inserts (such as manufactured by Müpro or equal and approved). There shall be no direct contact between the pipework and the building structure / fabric at any point.

## 6.3 Vibration Isolation of Services Penetrations

Penetrations of the building structure by pipework and other services shall be acoustically sleeved to prevent transmission of noise and/or vibration through the building. In principle, this can normally be achieved by sleeving the penetration with a 25 mm thickness of mineral wool slab having a density of at least 140 kg/m<sup>3</sup>. Care shall be taken to seal any gaps using heavy grout (where applicable) and the whole shall be finished with a liberal application of dense, non-hardening mastic, and shall be weather protected as necessary.

An illustration showing the principle of acoustically sealing and isolating services penetrations through builderswork is contained in the attached **Sketch 3144/SPD/1**. This detail may need to be modified (subject to review by The EQUUS Partnership) in order to accommodate any necessary fire rating provisions and/or other requirements.

## 7 CONCLUSIONS

Environmental noise surveys and assessments have been undertaken by The EQUUS Partnership Ltd. in connection with an investigation by Kinlochs and Son Ltd. to consider possible alternative means of providing comfort cooling within the guest rooms and public areas etc. of The Academy Hotel, 17-25 Gower Street, London WC1. A possible solution has been developed which involves the installation of two independent, self-contained, condenser plant acoustic enclosures located within the rear garden areas of the hotel.

Fully manned environmental noise surveys have been undertaken during daytime and night-time periods in order to ascertain the ambient and background noise levels in the vicinity of The Academy Hotel during 'critical' periods of proposed condenser plant operation.

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Based on manufacturer's technical data for the proposed condenser plant, and considering the prevailing background noise levels in the vicinity of the subject premises, airborne noise emissions to the closest noise-sensitive (residential) properties have been assessed. It has been established that the condensers would need to be fitted with bespoke 'acoustic kits' (intake louvres and discharge attenuator), and they would need to be enclosed by proprietary solid acoustic screens of approximately 3m height.

In addition, in order to provide further control of night-time noise emissions, the condensers should be programmed to operate in 'low noise mode' between 23.00 and 07.00 hours (i.e. 'night setback') as a further safeguard to protect the amenity of neighbouring dwellings.

The acoustic performance requirements for the bespoke acoustic kits and the proprietary sound absorbing acoustic screens forming the plant enclosures are specified herein. Further advice has been given regarding suitable means of controlling structure-borne noise and vibration transmissions from the condenser plant.

Calculations demonstrate that daytime and night-time environmental noise emissions from the proposed condenser plant enclosures to neighbouring dwellings would be expected to comply with standard policy guidance issued by London Borough of Camden provided all noise mitigation measures specified in this report are fully implemented.

Any changes to the proposed plant selections, operating conditions and/or unit locations should be referred back to The EQUUS Partnership for further advice.

Report Prepared by:

**Steven G. Gardner MIOA**.....



Report Checked by:

**Paul B. Gray Bsc(Hons), MIOA**.....



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## APPENDIX A

### Glossary of Acoustic Terminology

**Decibel (dB)**

The Decibel is a logarithmic unit used to express ratios of quantities such as sound pressure or sound power. The logarithmic nature of the unit means that decibel values cannot be added or subtracted in the usual way. An auditory sensation of halving or doubling of loudness equates to a decrease or increase of around 10 dB.

**dB(A) or LA**

“A” weighted sound pressure level (sound level) measurements correspond roughly to the subjective impression of loudness of the average listener.

**L<sub>90</sub>**

The L<sub>90</sub> is the sound level that is exceeded for 90% of the measurement period, and is generally considered to describe the background noise, since it inherently excludes the sounds of transient events.

**L<sub>eq</sub>**

The L<sub>eq</sub> index is used as a method of averaging temporally or spatially varying sound levels. At a given position, it may be defined as the notional sound level which contains the same amount of acoustical energy as the actual (time varying) sound level over the same measurement period.

**L<sub>max</sub>**

The L<sub>max</sub> is the maximum sound level recorded during the measurement period.

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## **SPECIFICATION 3144/RIS (SHEET 1 OF 1)**

### **SPECIFICATION FOR LOW HEIGHT RUBBER-IN-SHEAR ANTI-VIBRATION PEDESTAL MOUNTS**

The low height rubber-in-shear anti-vibration pedestal mounts shall be formed from oil resistant rubber or neoprene and shall be designed to operate in shear.

The pedestal mounts shall be selected to have an (unloaded) free height of not more than 20mm unless agreed in advance with the Acoustic Consultant.

The pedestal mounts shall have steel plates incorporated into the upper and lower surfaces to provide strength and rigidity.

The upper steel surface of the pedestal mounts shall be threaded to enable a mechanical fixing to the plant.

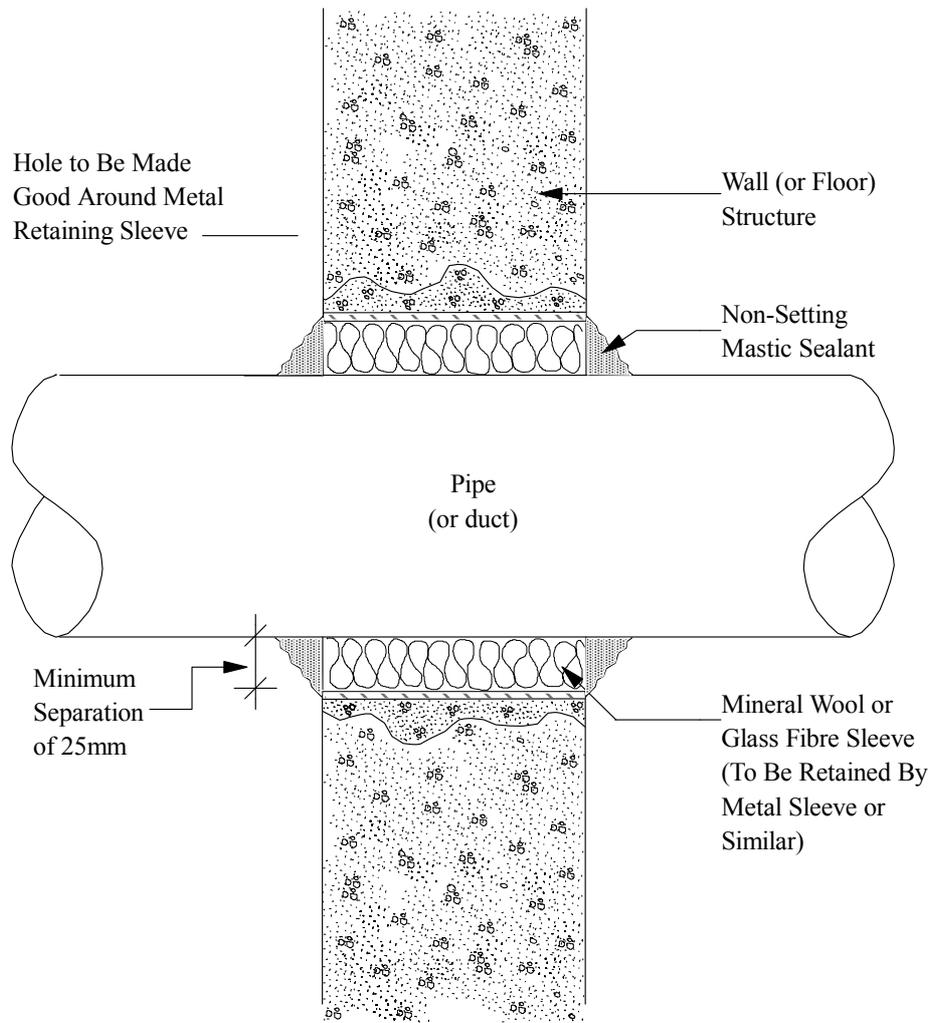
The base of the pedestal mounts shall have pre-drilled holes to enable fixing to the supporting steelwork structure.

The facility shall be available for a levelling device to be fitted.

Each mounting shall achieve the specified static deflection under the design operating loads and conditions which may necessitate the use of differing 'Shure' hardnesses.

It is the supplier's responsibility to ensure that all mountings provided are suitable for the environmental conditions present at the installation site including ozone protection and appropriate treatment to prevent corrosion.

Suitable pedestal mounts may be Type 'PM' obtainable from Anti-Vibration Methods (Rubber) Ltd. or an equal and approved alternative may be suitable subject to review by the Acoustic Consultant.



**Principle of Acoustically Sealing and Isolating  
Services Penetrations Through Builderswork**

**SKETCH 3144/SPD/1**

# **APPENDIX B**

## **Ambient Acoustics Datasheet**

# Air Conditioning

## Product Information

### Acoustic Kits

PUHY and PURY series units (YJM-A)

Making a  
World of  
Difference



A range of Acoustic Kits designed for noise reduction. An industry first, these kits offer up to an 8dBA noise level reduction from standard.

### Key Features

- Up to 8dBA noise reduction
- Manufacturer approved
- From £607 to £2326\*

\* May vary slightly depending on application and size of order



Air Conditioning | Commercial Heating  
Domestic Heating | Photovoltaics



# Air Conditioning

## Product Information

### Acoustic Kits

PUHY and PURY series units (YJM-A)

Making a World of Difference

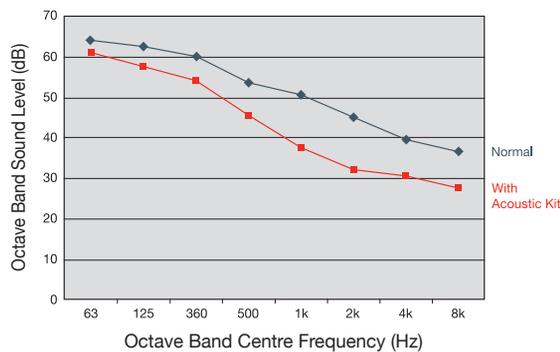
#### TYPES OF KIT

Both a 'full kit' and 'top only' kit are available. The 'full kit' comprises of left, right and back louvres with a top attenuator. The 'top only' has a top attenuator only.

If space is an issue, then the 'top only' kit is available which can still reduce the noise level by up to 4dBA.

The noise level is calculated from an average of the noise at a height of 1m and distance of 1m from the front, back, left, right and 1m above the top. All noise measurements are performed in an anechoic chamber.

#### PURY-EP200YJM-A ACOUSTIC NOISE LEVEL DATA\*



\* Indication only

#### SUPPLY AND/OR INSTALLATION

Please contact Ambient Acoustics directly for supply and installation costs.

Installation costs will vary depending on location and number of units to be fitted with acoustic kits.

Ambient Acoustics Ltd  
PO Box 1585, Wedmore, Somerset, BS28 4WZ  
Tel: 01934 712802  
Fax: 01934 710420  
Email: sales@ambientacoustics.co.uk

Ambient Acoustics is an independent supplier of acoustic attenuation products, all warranties and liabilities rest with Ambient Acoustics Ltd. The acoustic attenuation kits have been tested and approved by Mitsubishi Electric UK.

#### BASIC ACOUSTIC KIT COSTS



S-module



L-module



XL-module

For all Y and R2 Series (YJM-A)

3 models are available, small, large and extra large. Small fits on the S-module outdoor units, large fits on the L-module outdoor units and extra large on the XL-module outdoor units.

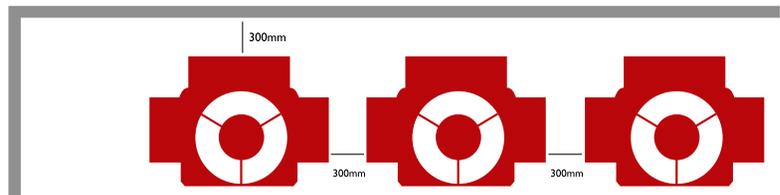
S-module	Complete acoustic kit target price	£1452
	Top attenuator only target price	£607
L-module	Complete acoustic kit target price	£1585
	Top attenuator only target price	£648
XL-module	Complete acoustic kit target price	£2326
	Top attenuator only target price	£1102

All costs include delivery.

#### INSTALLATION

Due to the wrap around coil of the YJM, the louvres are attached to 3 sides of the unit. Therefore, when installing multiple module systems, a 300mm gap between each louvre is required.

See diagram below.



1 full kit per outdoor unit is required, unless specifying top attenuator only. In this case, space units as normal.



Telephone: 01707 282880

email: airconditioning@meuk.mee.com web: www.mitsubishielectric.co.uk/aircon

UNITED KINGDOM Mitsubishi Electric Europe Living Environmental Systems Division  
Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, England General Enquiries Telephone: 01707 282880 Fax: 01707 278881  
IRELAND Mitsubishi Electric Europe Westgate Business Park, Ballymount, Dublin 24, Ireland  
Telephone: Dublin (01) 419 8800 Fax: Dublin (01) 419 8890 International code: (003531)

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www.greengateway.mitsubishielectric.co.uk  
Mitsubishi Electric's commitment to the environment



# **APPENDIX C**

## **Allaway Acoustics Datasheet**

# DATA SHEET E40c

## ACOUSTIC ENCLOSURE PANEL

### MODEL EP50/UF

IMPORTANT : THIS IS NOT A STAND ALONE DOCUMENT AND UNLESS REFERRED TO IN A DATED AND

## SPECIFICATION

THE ACOUSTIC ENCLOSURE PANEL COMPRISES A COMBINATION OF SOUND ABSORBENT MATERIALS AND HIGH MASS BARRIERS CONTAINED WITHIN A METAL CASING HAVING AN PLAIN OUTER AND PERFORATED INNER FACE, OFFERING EXCELLENT SOUND REDUCTION AND ABSORPTION PROPERTIES.

PANELS ARE CONSTRUCTED FROM GALVANISED STEEL (SUFFIX G), ZINTEC (SUFFIX Z), PLASTIC COATED STEEL (SUFFIX L) OR ALUMINIUM (SUFFIX A).

THE OUTER CASING IS FORMED FROM PLAIN SHEET METAL AND INSIDE FACE FROM PERFORATED METAL.

PANELS CONTAIN A FIBROUS SOUND ABSORBENT INFILL THAT IS NON-SHEDDING, NON-COMBUSTIBLE, NON-HYGROSCOPIC AND CHEMICALLY INERT. THE INFILL IS FACED WITH GLASS CLOTH TO PREVENT FIBRE MIGRATION.

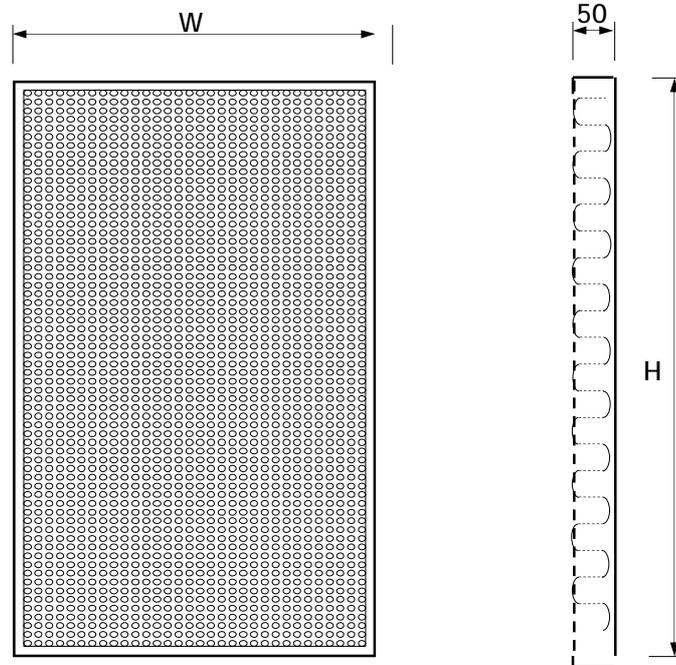
INFILL DENSITY - 45kg/m<sup>3</sup>.

INFILL THICKNESS -50mm.

THE CASING CAN BE SUPPLIED WITH A PERIMETER FLANGE FOR FIXING ADJACENT SECTIONS TOGETHER, FIXING THE PANELS INTO THE BUILDERSWORK OPENING OR FIXING INTO THE FRAMEWORK OF AN ACOUSTIC ENCLOSURE (OPTION F).

POLYESTER POWDER FINISH AVAILABLE (SUFFIX P)

## DIMENSIONS



## FEATURES

ARCHITECTURAL/INDUSTRIAL APPLICATION

ALL METAL CONSTRUCTION

HIGH SECURITY

HIGH ACOUSTIC RATING

HIGH SOUND ABSORPTION

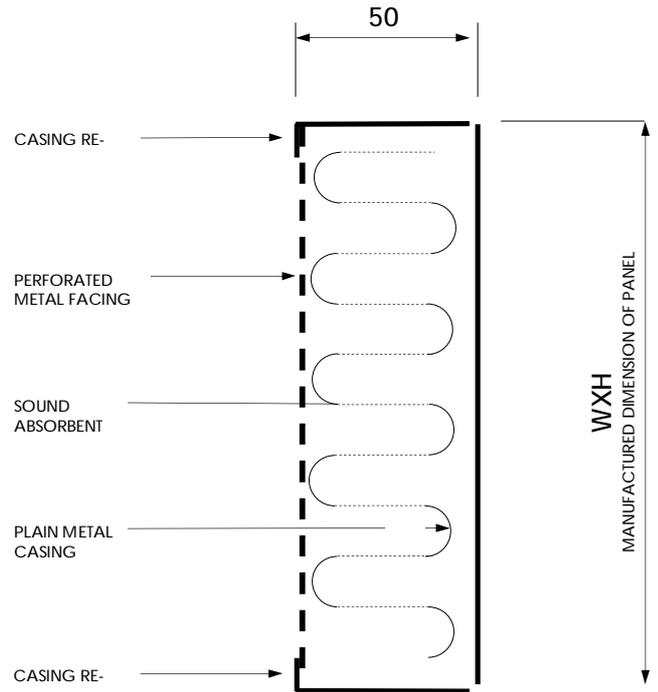
INTERNAL/EXTERNAL USE

OPTIONAL POLYESTER FINISH



ALLAWAY ACOUSTICS LIMITED

## CONSTRUCTION



## ACOUSTIC PERFORMANCE

SOUND REDUCTION INDEX B.S.2750/3-1980

63	125	250	500	1000	2000	4000	8000	Hz
17	19	26	33	38	42	45	44	dB

SOUND ABSORPTION B.S.3638 -1987

63	125	250	500	1000	2000	4000	8000	Hz
.10	.25	.65	1.00	1.00	1.00	.95	.90	-

## NOTES

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

PANELS WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, BRACKETS, FIXINGS OR MASTIC UNLESS OTHERWISE STATED.

PANELS MORE THAN 1800 WIDE OR 2500 HIGH MAY BE MANUFACTURED IN SECTIONS FOR ON SITE ASSEMBLY.

## SUFFIX

A - ALUMINIUM SUBSTRATE

G - GALVANISED STEEL SUBSTRATE

Z - ZINTEC SUBSTRATE

L - PLASTIC COATED STEEL

P - STOVED POLYESTER POWDER COAT

F - PERIPHERAL FIXING FRAME

SP - SPECIAL CONSTRUCTION, REFER TO EQUIPMENT SCHEDULE FOR DETAILS.

## WEIGHT

ACTUAL PANEL WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE.

APPROXIMATE WEIGHT:  
38kg/M<sup>2</sup> GALVANISED  
41kg/M<sup>2</sup> ALUMINIUM

## BUILDERSWORK

THE W AND H DIMENSIONS GIVEN ON THE CERTIFIED EQUIPMENT SCHEDULE ARE AS MANUFACTURED.

ADEQUATE CLEARANCE MUST BE ALLOWED WHEN CONSTRUCTING THE BUILDERSWORK OPENING,

## STANDARD

THERE ARE NO STANDARD SIZES.

PANELS ARE MANUFACTURED TO ORDER.