



252 Grays Inn Road, London

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## **Plant Noise Impact Assessment**

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## 1.0 Introduction

- 1.1 Holtz Acoustics has been commissioned to undertake a plant impact assessment for the proposed plant installation at 252 Grays Inn Road, London.
- 1.2 A background noise survey and plant impact assessment for planning has previously been undertaken by Hoare Lea based on an outline design for air conditioning plant.
- 1.3 The design has now progressed and the current scheme requires assessment against the noise levels established in the Hoare Lea report.
- 1.4 A the plant noise impact assessment has been undertaken based on the assessment methodology and criteria in the planning report. This report should be read in conjunction with the Hoare Lea report submitted as a part of the planning application.
- 1.5 The author of this report, James Patterson, is a member of the Institute of Acoustics, the professional body for acoustic consultants in the UK.

## 2.0 Plant Noise Assessment

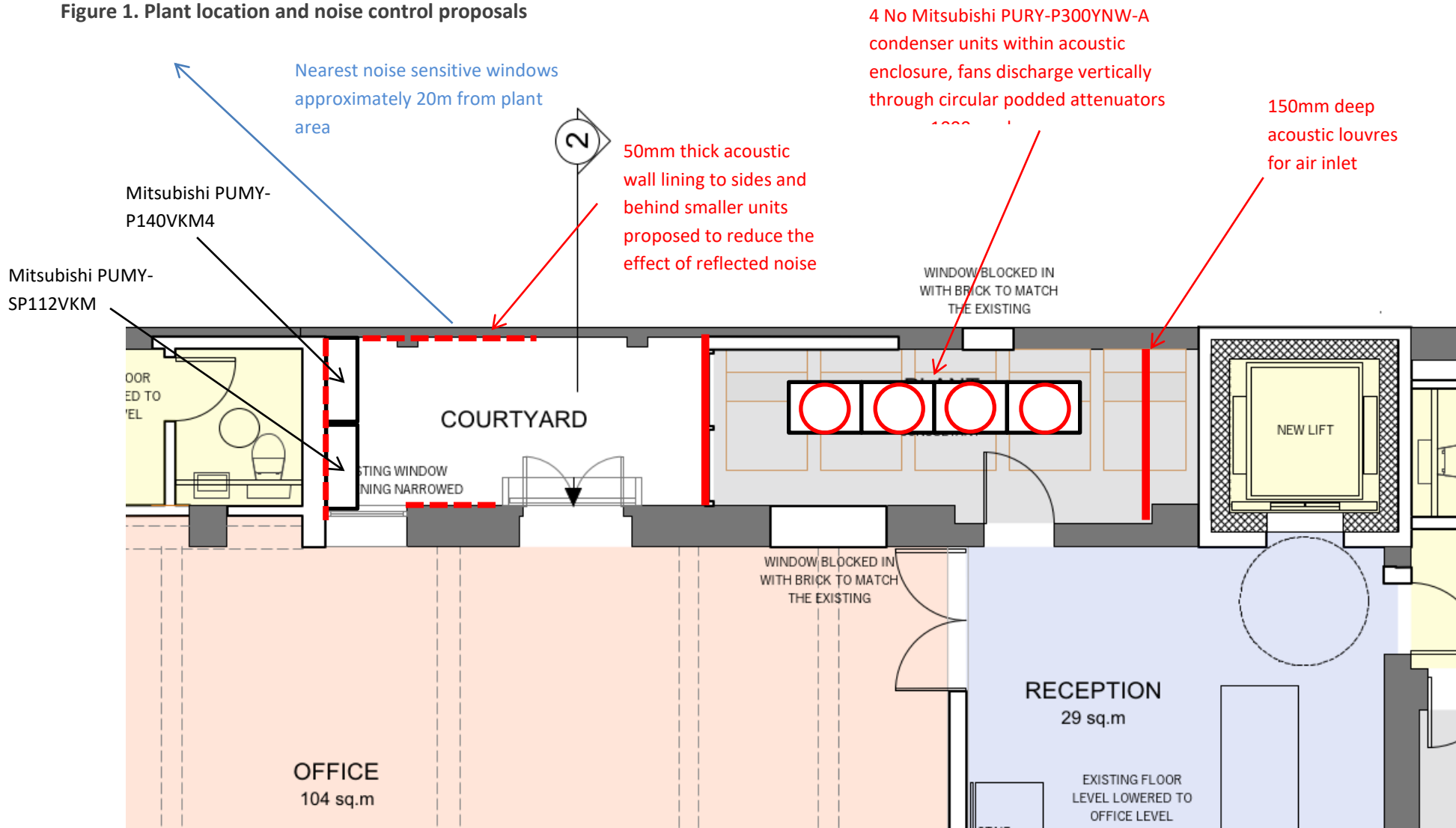
- 2.1 The following limiting plant noise rating levels are established in the planning report.

**Table 1. Limiting plant noise levels**

<b>Period</b>	<b>Limiting Plant Noise Rating Level, dB</b>
Daytime (0700-2300hrs)	35
Night-time (2300-0700hrs)	32

- 2.2 It is proposed that the plant is located in the rear courtyard which will be enclosed with a lid as per the scheme for planning. However the planning scheme did not allow for suitable air flow in and out of the enclosure therefore the scheme has been partially redesigned.
- 2.3 The main condensers selections have been finalised, these are located in the same location as indicated in the planning submission. The units are now served by air from the sides via acoustic louvres and air discharges vertically through the lid of the enclosure via circular podded attenuators.
- 2.4 Two smaller horizontal discharge condenser units are located to north end of the courtyard where they benefit from significant acoustic screening from the side of the building and parapet wall.
- 2.5 The courtyard and plant area are shown below in Figure 1.

Figure 1. Plant location and noise control proposals



- 2.6 The nearest noise sensitive windows are those of the apartment block to the north of the plant area approximately 20m away.
- 2.7 It is proposed that 4No Mitsubishi PURY-P300YNW-A units are located within the plant enclosure. These have been oversized to allow them to run at 50% duty whilst maintain cooling capacity. This significantly reduces their noise levels.
- 2.8 The manufacturer's published noise level for this unit running at 50% is 47 dBA at 1m, unit data is included in Appendix A.
- 2.9 A summary of the plant impact assessment for these units is included in Tables 2 and 3 below.

**Table 2. Noise breakout from sides of plant enclosure.**

Calculation Step	Level (dBA)	Notes
Sound pressure Level SWL	66	Mitsubishi PURY-P300YNW-A capped at 50% fan speed
Number of units	+6	$10\log(4)$ , 4 units
Plant room reverberation time	-7	Based upon $T=0.2$ seconds, $10\log(0.2)$
Plant room volume	0	Based upon $V=30\text{m}^3$ , - $10\log(30) +14$
Reverberant level inside plant room $L_p$	65	
Inside to outside correction	+2	$L_{w,out} = L_{p,in} + 10\log(S) - 6$
Sound power level out of side louvres $L_w$	67	
Acoustic louvre overall insertion loss	-7	150mm deep louvre
Distance attenuation	-25	Based upon BS 12354-4
Screening losses	-5	Assuming a partial line of sight break provided by building edge.
Sound pressure level at nearest noise sensitive windows	<b>30</b>	

**Table 3. Noise from attenuator terminals.**

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Mitsubishi SWL PURY-P300YNW-A	74	72	66	65	59	54	52	53
Correction for 4 Units	6	6	6	6	6	6	6	6
End reflection based on 700mm circular duct	-6	-2	0	0	0	0	0	0
Directivity and SWL to SPL conversion (2 surfaces and 45 degrees)	-6	-5	-4	-3	-3	-3	-3	-3
Distance losses over 20m	-26	-26	-26	-26	-26	-26	-26	-26
Typical losses through a 1000mm long circular podded attenuator	-6	-10	-18	-31	-34	-36	-33	-27
Level at nearest noise sensitive window	36	35	24	11	2	-5	-4	3
							<b>dBA</b>	<b>21</b>

- 2.10 It is also proposed that two smaller horizontal discharge condensers are located at the north end of the courtyard. These will be 1 No Mitsubishi PUMY-P140VKM4 and 1 No Mitsubishi PUMY-SP112VKM. The manufacturer's published sound pressure levels for these units are 51 dBA at 1m and 49 dBA at 1m respectively. A summary of the plant calculations for these units is shown below in Table 4.

**Table 4. Plant noise calculation summary from courtyard condensers.**

Calculation Step	Level (dBA)	Notes
Cumulative Sound pressure Level SPL	53 at 1m	1 No PUMY-P140VKM4 and 1 No PUMY-SP112VKM
Locally reflective surfaces	-	Acoustic wall lining to area behind the units and side walls of the courtyard (see Figure 1)
Screening losses	-5	Line of sight broken by building edge and parapet wall. This is considered a conservative estimate.
Distance losses	-26	Spreading losses over 20m
Sound pressure level at nearest noise sensitive window	<b>22</b>	

2.11 The cumulative level from all proposed plant noise sources is as follows.

<b>Source</b>	<b>Calculated Level at Nearest Noise Sensitive Windows (dBA)</b>	<b>Notes</b>
Plant enclosure louvre breakout	30	See Table 2
Plant enclosure discharge attenuators	21	See Table 3
Courtyard condensers	22	See Table 4
Cumulative Level	<b>31</b>	Via decibel/logarithmic addition
Design criteria	32	Night-time criterion established in Hoare Lea report.


2.12 As demonstrated the cumulative plant level does not exceed the design criteria established in the planning report. The proposed plant therefore meets the noise requirements of the London Borough of Camden.

2.13 The plant should be installed on suitably selected anti-vibration mounts to ensure vibration is transfer to the building below and adjoining buildings is limited.

## Appendix A: Plant Noise Data

### Mitsubishi PURY-P300YNW-A- Capped at 50% fan speed

**Flexible Noise Setting** New



The low-noise mode, which conventionally only had one pattern, has been increased to four patterns so that a mode can be selected from a total of five patterns, including the rated pattern. The low-noise mode has four patterns 85%, 70%, 60% and 50% in respect to the fan speed. This can be set with the outdoor unit's DIP switch. The pattern can be selected according to the customer's requests when low-noise operation is required.

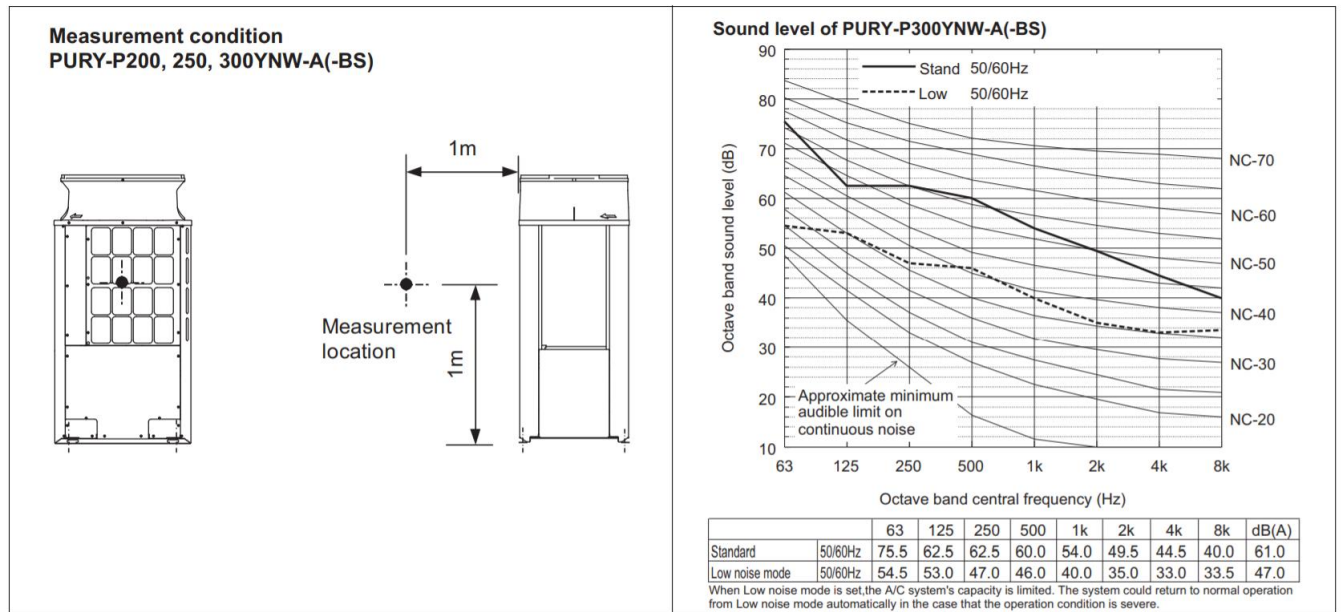
\*In the low noise mode, the capacity will reduce.



#### PWL (dBA)

		Fan Speed Setting	Capacity	P200		P250		P300		P350		P400		P450		P500		P550	
				PWL (dBA)	kW cooling	PWL (dBA)	kW cooling	PWL (dBA)	kW cooling	PWL (dBA)	kW cooling	PWL (dBA)	kW cooling	PWL (dBA)	kW cooling	PWL (dBA)	kW cooling	PWL (dBA)	kW cooling
Foot Print (W x D) mm				920 x 740		920 x 740		920 x 740		1240 x 740		1240 x 740		1240 x 740		1750 x 740		1750 x 740	
Cooling	100%	100%	76	20	78.5	25.1	80	30	81	35.8	83	40.3	83	44.8	82	50.1	83.5	56.4	
	85%	90%	71	18	73.5	22.6	74.5	27	76	32.2	77	36.3	78.5	40.3	76.5	45.1	78	50.8	
	70%	75%	66.5	15	69.5	18.8	70.5	22.5	73	26.9	73	30.2	74	33.6	73.5	37.6	74.5	42.3	
	60%	70%	64	14	66.5	17.6	67.5	21	70.5	25.1	72	28.2	73	31.4	73	35.1	73	39.5	
	50%	60%	63	12	64	15.1	66	18	68	21.5	71	24.2	72	26.9	72.5	30.1	72.5	33.8	

**Mitsubishi PURY-P300YNW-A- Octave Band Levels** used to Estimate SWL in attenuator calculations and overall losses across a 150mm deep acoustic louvre.





## Mitsubishi PUMY-P140VKM4 and Mitsubishi PUMY-SP112VKM

PUMY-P OUTDOOR UNITS		PUMY-P112VKM4	PUMY-P140VKM4
NUMBER OF CONNECTABLE INDOOR UNITS	Branch box / Mixed*1	8 / 10	8 / 10
CAPACITY (kW)	Heating (nominal)	14.0	18.0
	Cooling (nominal)	12.5	15.5
	Heating (UK)	13.9	17.8
	Cooling (UK)	10.0	12.4
COP / EER (NOMINAL)		4.61 / 4.48	4.03 / 3.43
SCOP / SEER		-	-
MAX AIRFLOW (m <sup>3</sup> /min)	Heating / Cooling	110	110
SOUND PRESSURE LEVEL (dBA)		49	51