Technical Note

Date: 18th November 2014
Ref: A799/TN01
By: David O'Neill – Director Ion Acoustics
To: Knight Harwood: Richard Harvell/Gary Sumsion

Scheme: Royal College of Ophthalmologists External Plant
Title: External Plant Noise Emissions Planning Note
Planning Application 2013/0666/P

Introduction

The Royal College of Ophthalmologists development at 18 Stephenson Way in Camden has a planning permission which includes a condition relating to plant noise emissions. To discharge this conditions an assessment of the plant noise emissions to demonstrate compliance with the local authority criteria is required. This document is prepared to fulfil that requirement.

This should be read in conjunction with the Ion Acoustics report A580/R01a dated 9th March 2013 which documents the baseline noise survey and plant limits derived from the measured noise levels.

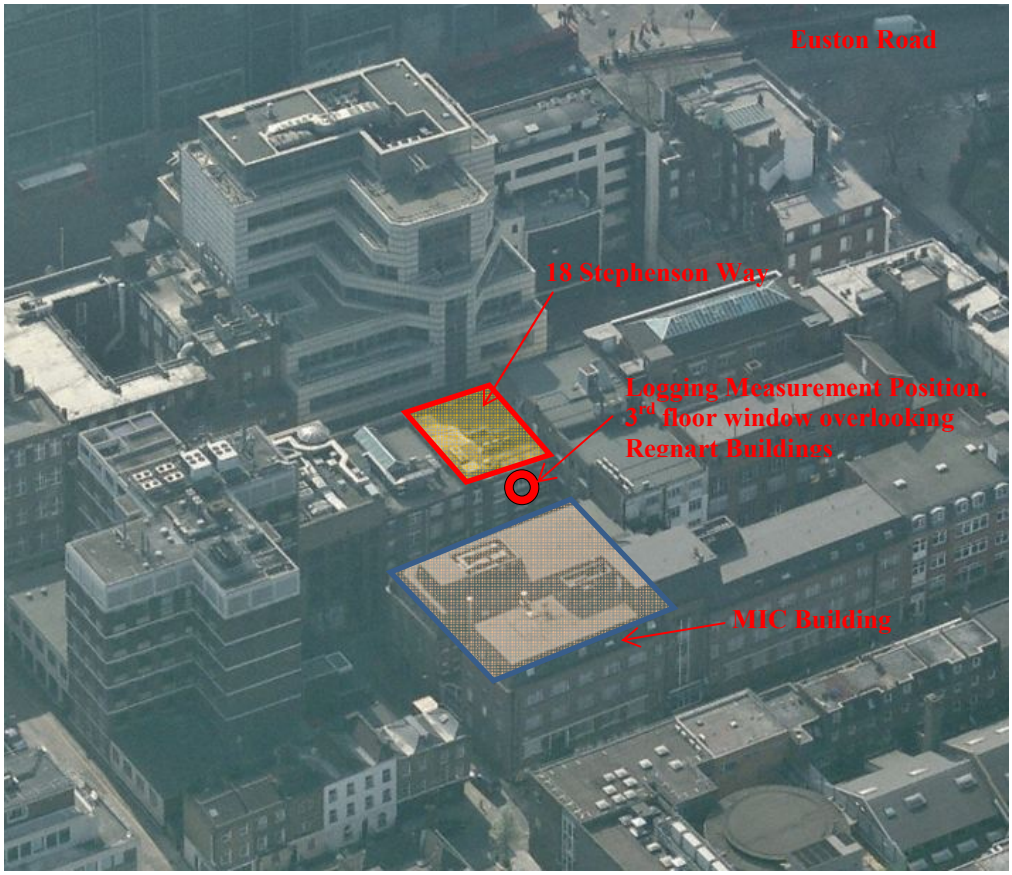

Figure 1: Site location looking south (image from Bing.com)

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Planning Noise Criteria
Planning condition number 5 states:

"*Noise levels at a point 1 metre external to sensitive façade shall be at least 5dB(A) less than the existing background measurement (LA90) expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous noise (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the LA90, expressed in dB(A).*"

The baseline noise levels measured were relatively high and steady, with a lowest background noise level of L_{A90} 68 dB (see report A580/R01a). Hence, for compliance with the planning condition the levels should be no greater than 63 dB for steady plant (or 58 dB(A)) if any of the characteristics described in the condition apply.

Scheme and Plant Proposals
The plant scheme has been prepared by Knight Harwood. The primary plant is located on the roof and basement, with three additional extract fans on ground and first floors which have an external grille at basement levels. The sound power data for the plant, taken from manufacturer's information, is given in the calculation. Specifically the plant comprises:

Roof (Figure 2):

- AHU 5.1: AHU2 on roof
- 3 x Panasonic condensers U-16MF2E8
- 1 x Panasonic condenser U-71EP1E5A
- 1 x heat pump condenser
- Toilet extract fan TEF 5.1

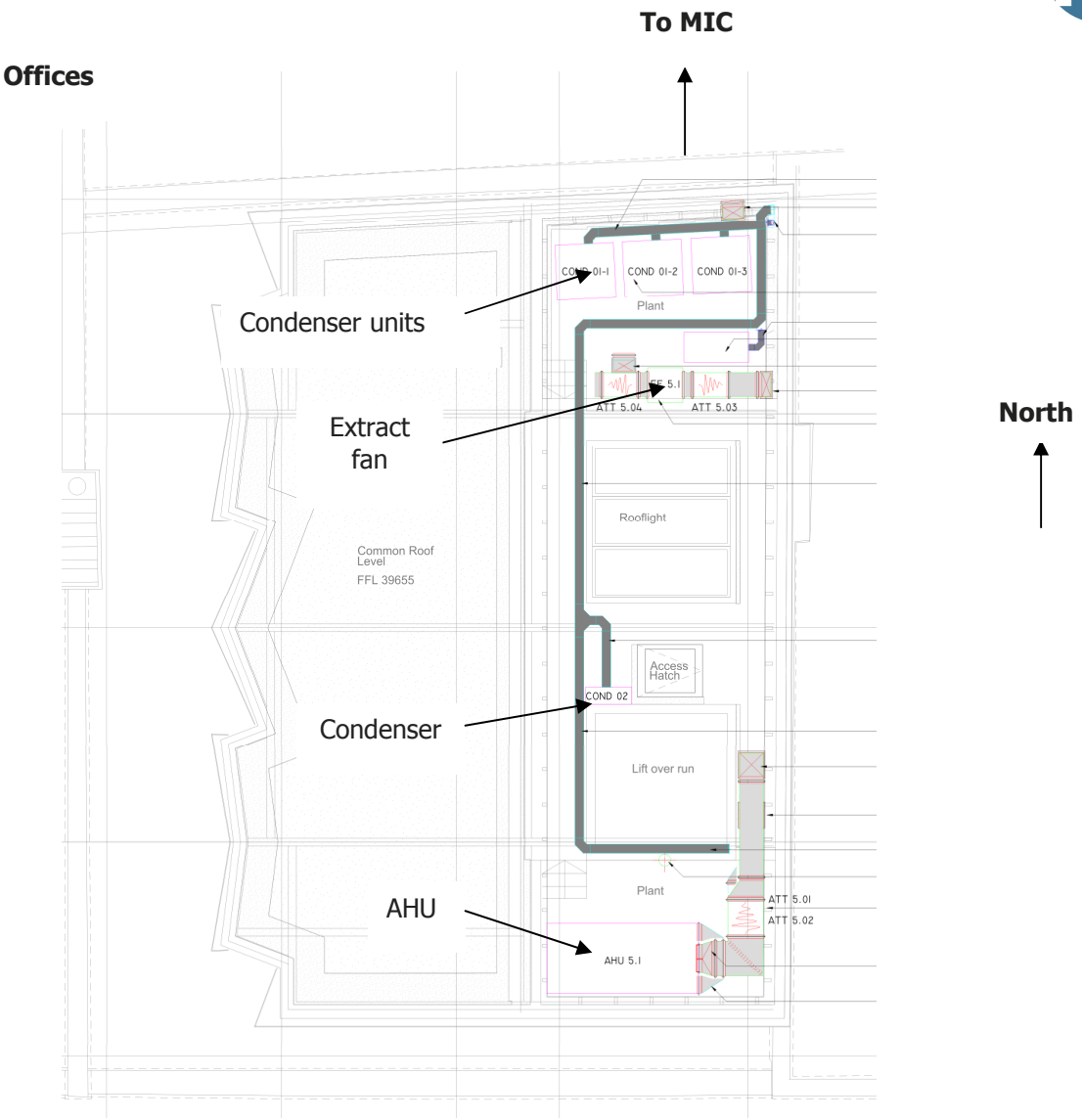

Figure 2: Roof plant arrangement

Basement:

- AHU B.1. AHU 1 inside at basement
- Fans which terminate at the basement services louvre:
    - Kitchen extract
    - Toilet extract
    - Skills Centre extract.

Figure 3: Basement plant arrangement

Calculations of Noise Emissions

Calculations have been carried to two locations to represent the worst affected locations

- Closest building to rear (north) of the building – MIC building which is a conference centre located across Regnart Buildings. The closest windows are about 8.3m from the rear façade
- Closest window (offices) to the basement louvres – this is an office building, so is not as sensitive as residential or conference use, however the noise levels here have been checked and assessed.

The highest plant emissions levels are to the MIC building. The full calculation to that location is attached. The levels calculated assuming all of the plant operating simultaneously are:

Rear MIC Façade:	55dB
Ground floor Office:	49dB

These levels are 11 dB and 17 dB below the background noise level respectively and therefore comfortably compliant with the criterion given in planning condition 5.

It is noted that a requirement to not exceed 55 dB outside windows of other buildings was also imposed in the project performance requirements. That limit is also met.

Summary

Calculations have been prepared of the noise emissions from the building services plant installed at 18 Stephenson Way for the Royal College of Ophthalmologists. These noise levels have been compared with the baseline background noise levels measured prior to the development works. The plant noise is more than 10 dB below the background noise levels and therefore is compliant with the planning condition 5 imposed by London Borough of Camden in the planning permission for the scheme.

David O'Neill BEng CEng MSc MIOA
Director
Ion Acoustics Ltd

Calculation of plant noise

Summary of calculated noise levels

	Royal College of Ophthalmologists, 18 Stephenson Way, Camden												
	to rear upper floor mansard windows of MIC building to north												
	17/11/14					Octave Band Centre Frequency, Hz							
	SUMMARY	distance (m)			dB	63	125	250	500	1000	2000	4000	dB(A)
		horiz	vert	distanc	shielding							**total**	**55.0**
	roof plant				background LA90			66	dB			difference	-11.0
1	3 x U-16MF2E8	9.9	3.5	10.5	0	60.3	60.3	56.3	51.3	50.3	43.3	37.3	**54.7**
2	1 x U-71PE1E5A	17	3.5	17.36	0	26.2	27.2	26.2	26.2	22.2	14.2	10.2	**26.8**
3	toilet extract fan	12.2	3.5	12.69	0	25.9	35.9	23.9	15.9	7.9	-21.1	-24.1	**21.9**
4	toilet casing breakout	12.2	3.5	12.69	0	33.9	32.9	20.9	7.9	-7.1	-5.1	-2.1	**18.8**
5	AHU exhaust	20.3	3.5	20.6	5	32.7	32.2	35.2	33.7	33.7	21.2	16.2	**36.2**
6	AHU fresh air inlet	20.3	3.5	20.6	5	27.7	29.7	30.7	22.7	14.7	13.7	8.7	**25.4**
7	AHU casing breakout	20.3	3.5	20.6	5	32.7	24.7	15.7	15.7	4.7	4.7	-1.3	**16.3**
8	Heat Pump Condenser	11.5	3.5	12.02	5	41.4	39.4	39.4	36.4	27.4	25.4	20.4	**36.7**
	basement plant												
9	AHU exhaust	9.6	13	16.16	0	40.3	41.3	40.8	33.8	28.3	26.3	23.3	**36.6**
10	AHU fresh air inlet	9.6	13	16.16	0	39.3	39.3	31.8	26.8	22.3	19.3	16.3	**30.0**
11	basement toilet extract	9.6	13	16.16	0	27.3	29.3	24.8	28.8	23.3	19.3	16.3	**29.0**
12	kitchen extract	9.6	13	16.16	0	25.3	27.3	23.8	27.8	27.3	23.3	16.3	**30.8**
13	skills centre extract	9.6	13	16.16	0	27.3	40.3	28.8	28.8	18.3	21.3	18.3	**30.2**

Calculations

	INDIVIDUAL PLANT CALCULATIONS															
	Condensers							Octave Band Centre Frequency, Hz								
1	3 x U-16MF2E8							63	125	250	500	1000	2000	4000	dB(A)	
	SPL @ 1m							73.0	73.0	69.0	64.0	63.0	56.0	50.0	67.4	
	Lp = SPL - 20 log d/dref + DI - shielding															
	d ref			1	m											
	d			10.50	m			20.4	20.4	20.4	20.4	20.4	20.4	20.4		
	DI			3	dB			3.0	3.0	3.0	3.0	3.0	3.0	3.0		
	shield			0	dB			0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	number of units			3				4.8	4.8	4.8	4.8	4.8	4.8	4.8		
	Lp							60.3	60.3	56.3	51.3	50.3	43.3	37.3	54.7	dB(A)
2	1 x U-71PE1E5A															
	SPL @ 1m							48.0	49.0	48.0	48.0	44.0	36.0	32.0	48.7	
	Lp = SPL - 20 log d/dref + DI - shielding															
	d ref			1	m											
	d			17.36	m			24.8	24.8	24.8	24.8	24.8	24.8	24.8		
	DI			3	dB			3.0	3.0	3.0	3.0	3.0	3.0	3.0		
	shield			0	dB			0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	number of units			1				0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Lp							26.2	27.2	26.2	26.2	22.2	14.2	10.2	26.8	dB(A)
3	**toilet extract fan**							70.0	77.0	61.0	59.0	54.0	56.0	50.0		
	Attenuator 5.04 (600mm long)							0.0	2.0	1.0	8.0	9.0	14.0	11.0		
	end reflection, 250mm, 250mm							13.0	8.0	4.0	1.0	0.0	0.0	0.0		
							Lw	57.0	67.0	56.0	50.0	45.0	42.0	39.0		
	Atmosphere					distance	12.7m	33.1	33.1	33.1	33.1	33.1	33.1	33.1		
			directivity : 90°,90°, 250mm, 250mm					2.0	2.0	1.0	-1.0	-4.0	-30.0	-30.0		
							Lp	25.9	35.9	23.9	15.9	7.9	-21.1	-24.1	21.9	dB(A)
						a w td		-0.3	19.8	15.3	12.7	7.9	-19.9	-23.1		
4	**toilet casing breakout**							64.0	63.0	51.0	38.0	23.0	25.0	28.0		
	Lp = Lw - 20 log r - 11 + DI															
	r	12.69				20 log r		22.1	22.1	22.1	22.1	22.1	22.1	22.1		
	-11							-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0		
	DI			3				3.0	3.0	3.0	3.0	3.0	3.0	3.0		
	shield			0				0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Lp							33.9	32.9	20.9	7.9	-7.1	-5.1	-2.1	18.8	dB(A)
	calculation continued							Octave Band Centre Frequency, Hz								
								63	125	250	500	1000	2000	4000	dB(A)	
5	**AHU exhaust**							80.0	75.0	75.0	73.0	74.0	74.0	69.0		
	radiused bend, 500mm							0.0	0.0	1.0	2.0	3.0	3.0	3.0		
	end reflection, 500mm, 500mm							8.0	4.0	1.0	0.0	0.0	0.0	0.0		
							Lw	72.0	71.0	74.0	73.0	74.0	74.0	69.0		
	Atmosphere					distance	20.6m	37.3	37.3	37.3	37.3	37.3	37.3	37.3		
			directivity : 0°,90°, 500mm, 500mm					3.0	3.5	3.5	3.0	2.0	-10.5	-10.5		
							Lp	37.7	37.2	40.2	38.7	38.7	26.2	21.2	41.2	dB(A)
	shielding		5				nielding	32.7	32.2	35.2	33.7	33.7	21.2	16.2	36.2	dB(A)
6	**AHU fresh air inlet**							74	71	68	58	49	47	42		
	radiused bend, 500mm							0.0	0.0	1.0	2.0	3.0	3.0	3.0		
	end reflection, 500mm, 500mm							8.0	4.0	1.0	0.0	0.0	0.0	0.0		
							Lw	66.0	67.0	67.0	58.0	49.0	47.0	42.0		
	Atmosphere					distance	20.6m	37.3	37.3	37.3	37.3	37.3	37.3	37.3		
			directivity : 0°,0°, 500mm, 500mm					4.0	5.0	6.0	7.0	8.0	9.0	9.0		
							Lp	32.7	34.7	35.7	27.7	19.7	18.7	13.7	30.4	dB(A)
	shielding		5				nielding	27.7	29.7	30.7	22.7	14.7	13.7	8.7	25.4	dB(A)
7	**AHU casing breakout**				SWL			72	64	55	55	44	44	38	55.6	
	Lp = Lw - 20 log r - 11 + DI															
	r	20.60				20 log r		26.3	26.3	26.3	26.3	26.3	26.3	26.3		
	-11							-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0		
	DI			3				3.0	3.0	3.0	3.0	3.0	3.0	3.0		
	shield			5				5.0	5.0	5.0	5.0	5.0	5.0	5.0		
	Lp							32.7	24.7	15.7	15.7	4.7	4.7	-1.3	16.3	dB(A)
8	**Heat Pump Condenser unit**															
	heat pump condenser unit						SWL	76.0	74.0	74.0	71.0	62.0	60.0	55.0		
	r	12.02				20 log r		21.6	21.6	21.6	21.6	21.6	21.6	21.6		
	-11							-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0		
	DI			3				3.0	3.0	3.0	3.0	3.0	3.0	3.0		
	shield			5				5.0	5.0	5.0	5.0	5.0	5.0	5.0		
	Lp							41.4	39.4	39.4	36.4	27.4	25.4	20.4	36.7	dB(A)

	Basement Plant					Octave Band Centre Frequency, Hz								
	Basement Swegon AHU					63	125	250	500	1000	2000	4000	dB(A)	
9	**AHU exhaust**					80.0	76.0	73.0	73.0	74.0	72.0	68.0		
	radiused bend, 500mm					0.0	0.0	1.0	2.0	3.0	3.0	3.0		
	exhaust attenuator Att B.04					0.0	0.0	1.0	10.0	17.0	18.0	17.0		
	end reflection, 400mm, 600mm					8.0	4.0	1.0	0.0	0.0	0.0	0.0		
					Lw	72.0	72.0	71.0	63.0	57.0	54.0	51.0		
	Atmosphere			distance	16.2m	35.2	35.2	35.2	35.2	35.2	35.2	35.2		
			directivity : 45°,0°, 500mm, 500mm			3.5	4.5	5.0	6.0	6.5	7.5	7.5		
					Lp	40.3	41.3	40.8	33.8	28.3	26.3	23.3	36.6	dB(A)
	shielding	0			hielding	40.3	41.3	40.8	33.8	28.3	26.3	23.3	36.6	dB(A)
10	**AHU fresh air inlet**				SWL	79.0	76.0	71.0	71.0	63.0	65.0	62.0		
	radiused bend, 500mm					0.0	0.0	1.0	2.0	3.0	3.0	3.0		
	inlet attenuator Att B.03					0.0	0.0	0.0	10.0	9.0	15.0	15.0		
	mitred bend, 700mm					0.0	2.0	8.0	5.0	3.0	3.0	3.0		
	end reflection, 500mm, 500mm					8.0	4.0	1.0	0.0	0.0	0.0	0.0		
					Lw	71.0	70.0	62.0	56.0	51.0	47.0	44.0		
	Atmosphere			distance	16.2m	35.2	35.2	35.2	35.2	35.2	35.2	35.2		
			directivity : 45°,0°, 500mm, 500mm			3.5	4.5	5.0	6.0	6.5	7.5	7.5		
					Lp	39.3	39.3	31.8	26.8	22.3	19.3	16.3	30.0	dB(A)
	shielding	0			hielding	39.3	39.3	31.8	26.8	22.3	19.3	16.3	30.0	dB(A)
11	basement toilet extract fan													
	EF B.1					73.0	69.0	60.0	59.0	57.0	53.0	47.0		
	radiused bend, 200mm					0.0	0.0	0.0	0.0	1.0	2.0	3.0		
	outlet attenuatorATT B.06					0.0	0.0	0.0	0.0	5.0	6.0	3.0		
	end reflection, 200mm, 200mm					14.0	9.0	5.0	1.0	0.0	0.0	0.0		
					Lw	59.0	60.0	55.0	58.0	52.0	47.0	44.0		
	Atmosphere			distance	16.2m	35.2	35.2	35.2	35.2	35.2	35.2	35.2		
			directivity : 45°,0°, 500mm, 500mm			3.5	4.5	5.0	6.0	6.5	7.5	7.5		
					Lp	27.3	29.3	24.8	28.8	23.3	19.3	16.3	29.0	dB(A)
	shielding	0			hielding	27.3	29.3	24.8	28.8	23.3	19.3	16.3	29.0	dB(A)
12	kitchen extract					48.0	49.0	56.0	39.0	38.0	38.0	33.0		
	EF B.1					73.0	69.0	60.0	59.0	57.0	53.0	47.0		
	radiused bend, 150mm					0.0	0.0	0.0	0.0	1.0	2.0	3.0		
	radiused bend, 200mm					0.0	0.0	0.0	0.0	1.0	2.0	3.0		
	end reflection, 150mm, 150mm					16.0	11.0	6.0	2.0	0.0	0.0	0.0		
					Lw	57.0	58.0	54.0	57.0	56.0	51.0	44.0		
	Atmosphere			distance	16.2m	35.2	35.2	35.2	35.2	35.2	35.2	35.2		
			directivity : 45°,0°, 500mm, 500mm			3.5	4.5	5.0	6.0	6.5	7.5	7.5		
					Lp	25.3	27.3	23.8	27.8	27.3	23.3	16.3	30.8	dB(A)
	shielding	0			hielding	25.3	27.3	23.8	27.8	27.3	23.3	16.3	30.8	dB(A)
13	skills centre extract					70.0	77.0	61.0	59.0	54.0	56.0	50.0		
	EF 1.02					0.0	3.0	0.0	7.0	7.0	13.0	9.0		
	radiused bend, 150mm					0.0	0.0	0.0	0.0	1.0	2.0	3.0		
	mitred bend, 150mm					0.0	0.0	0.0	1.0	7.0	7.0	4.0		
	end reflection, 550mm, 150mm					11.0	6.0	2.0	0.0	0.0	0.0	0.0		
					Lw	59.0	71.0	59.0	58.0	47.0	49.0	46.0		
	Atmosphere			distance	16.2m	35.2	35.2	35.2	35.2	35.2	35.2	35.2		
			directivity : 45°,0°, 500mm, 500mm			3.5	4.5	5.0	6.0	6.5	7.5	7.5		
					Lp	27.3	40.3	28.8	28.8	18.3	21.3	18.3	30.2	dB(A)
	shielding	0			hielding	27.3	40.3	28.8	28.8	18.3	21.3	18.3	30.2	dB(A)