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REPORT No. 640733-3

107 GRAYS INN ROAD
LONDON

PLANT NOISE ASSESSMENT REPORT

DATE: 11th September 2014

Presented By: Paul Cotton

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1.0 Introduction

1.1 Noico Ltd has been commissioned to undertake a noise assessment of the proposed new plant items being installed at 107 Grays Inn Road, London. Air conditioning equipment is to be installed within a plant room located on the 4th floor.

1.2 The purpose of the assessment is to ensure that the proposed new plant does not exceed the design noise criteria as detailed within Hawkins Environmental Ltd noise assessment report dated 21st February 2014; summarised as follows, and set in accordance with the requirements of the London Borough of Camden.

	Daytime plant operation (07:00-23:00hrs)
1 metre from facade of nearest residential building	38.9 L_{Aeq}

2.0 Plant Noise Assessment

2.1 Plant location

The new plant items are to be located within a purpose built plant room located on the fourth floor. These comprise 6 no. air conditioning condenser units.

The plant room will provide intake air through 4 openings. The first opening is to be 3300mm wide by 2200mm high, located to the rear of 107 Grays Inn Road and directly facing Brownlow Mews. The remaining 3 openings are to be 700mm wide by 1100mm high and all face Grays Inn Road.

Discharge air is to be handled by a rooftop opening measuring 3600mm wide by 2500mm high.

2.2 The windows of the nearest noise sensitive properties are highlighted as follows:

Properties located on Brownlow Mews, located an approximate distance of 7.5 metres away and directly facing the plant compound.

Properties immediately adjacent to 107 Grays Inn Road - understood to be a retirement home - and located an approximate distance of 4 metres from the nearest intake opening. There is no direct line of sight between the windows of the retirement home and the intake/discharge openings of the plant room.

2.3 Plant details

The plant included within our assessment is detailed as follows together with confirmed noise data as advised by the equipment manufacturers.

Plant reference/description	Operating noise level
Daikin REMQ12 – 2 no.	60dB(A) at 1 metre
Daikin REMQ16 – 1 no.	60dB(A) at 1 metre
Uniflo CAP 0361 – 3 no.	38.8dB(A) at 5 metres (at 56% speed)

It is our understanding that only 2 of the Uniflo units will operate at any one time and this is reflected within our calculations.

3.0 Calculations

3.1 Daytime plant operation (07:00hrs – 23:00hrs)

The following calculations have been based on daytime plant operation only, with all items of plant operating at maximum duty (with the exception of the Uniflo units which operate at 56% duty).

Intake to Brownlow Mews

Frequency	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Hz**
Uniflo - CAP 0361 - 56% fan speed - SPL @ 5m	49	42	41	38	31	27	21	21	dB
Distance correction to 1m = $20\log_{10}(5/1)$	14	14	14	14	14	14	14	14	dB
Resultant SPL at 1m	63	56	55	52	45	41	35	35	dB
2 no. sources (only 2 running at any 1 time)	3	3	3	3	3	3	3	3	dB
Resultant SPL @ 1m from 2no. CAP 0361	66	59	58	55	48	44	38	38	dB
Daikin REMQ12 SPL @ 1m (inc + 3dB for 2 sources)	66	63	63	60	58	54	48	47	dB
Daikin REMQ16 SPL @ 1m	66	64	63	59	54	50	45	44	dB
Combined SPL @ 1m from all plant	71	68	67	64	60	56	50	49	dB
Plantroom reverberation	1	1	1	1	1	2	1	2	dB
Theoretical SPL by louvre	72	69	68	65	61	58	51	51	dB
SPL to SWL at louvre = $10\log_{s}(7.2)$ (S = area of louvre)	9	9	9	9	9	9	9	9	dB
Theoretical SWL at louvre	81	78	77	74	70	67	60	60	dB
End reflection	-2	0	0	0	0	0	0	0	dB
SWL to SPL @ 1m from receiver = $-20\log_{10}R$ (7.5) - 11	-29	-29	-29	-29	-29	-29	-29	-29	dB
Directivity (Q=4)	6	6	6	6	6	6	6	6	dB
Resultant SPL @ 1m from receiver	56	55	54	51	47	44	37	37	dB
A-weighting correction	-26	-16	-9	-3	0	1	1	-1	dB
Resultant SPL(A) @ 1m from residential property	30	39	45	48	47	45	38	36	dB
Single figure SPL @ 1m from residential facade								53.0	dB(A)
Target noise criteria								38.9	dB(A)
Excess								14.1	dB(A)

Intake to Grays Inn Road

Frequency	63	125	250	500	1k	2k	4k	8k	Hz
Uniflo - CAP 0361 - 56% fan speed - SPL @ 5m	49	42	41	38	31	27	21	21	dB
Distance correction to 1m = $20\log_{10}(5/1)$	14	14	14	14	14	14	14	14	dB
Resultant SPL at 1m	63	56	55	52	45	41	35	35	dB
2 no. sources (only 2 running at any 1 time)	3	3	3	3	3	3	3	3	dB
Resultant SPL @ 1m from 2no. CAP 0361	66	59	58	55	48	44	38	38	dB
Daikin REMQ12 SPL @ 1m (inc + 3dB for 2 sources)	66	63	63	60	58	54	48	47	dB
Daikin REMQ16 SPL @ 1m	66	64	63	59	54	50	45	44	dB
Combined SPL @ 1m from all plant	71	68	67	64	60	56	50	49	dB
Plantroom reverberation	1	1	1	1	1	2	1	2	dB
Theoretical SPL by louvre	72	69	68	65	61	58	51	51	dB
SPL to SWL at louvre = $10\log_s(0.77)$ (S = area of louvre)	-1	-1	-1	-1	-1	-1	-1	-1	dB
Theoretical SWL at louvre	71	68	67	64	60	57	50	50	dB
End reflection	-5	-2	0	0	0	0	0	0	dB
Directivity (Q=2) & 30° angle	6	6	6	7	8	8	8	8	dB
Screening	-5	-6	-6	-6	-7	-8	-8	-8	dB
SWL to SPL @ 1m from receiver = $-20\log_{10}R$ (4) - 11	-23	-23	-23	-23	-23	-23	-23	-23	dB
SWL to SPL @ 1m from receiver = $-20\log_{10}R$ (5) - 11	-25	-25	-25	-25	-25	-25	-25	-25	dB
SWL to SPL @ 1m from receiver = $-20\log_{10}R$ (6) - 11	-27	-27	-27	-27	-27	-27	-27	-27	dB
Resultant SPL @ 1m from receiver (from louvre 1)	44	43	44	42	38	34	27	27	dB
Resultant SPL @ 1m from receiver (from louvre 2)	42	41	42	40	36	32	25	25	dB
Resultant SPL @ 1m from receiver (from louvre 3)	40	39	40	38	34	30	23	23	dB
Resultant SPL at receiver from all 3 louvres	47	46	47	45	41	37	30	30	dB
A-weighting correction	-26	-16	-9	-3	0	1	1	-1	dB
Resultant SPL(A) @ 1m from residential property	21	30	38	42	41	38	31	29	dB
Single figure SPL @ 1m from residential facade								46.0	dB(A)
Target noise criteria								38.9	dB(A)
Excess								7.1	dB(A)

Exhaust to Grays Inn Road

Frequency	63	125	250	500	1k	2k	4k	8k	Hz
Uniflo - CAP 0361 - 56% fan speed - SPL @ 5m	49	42	41	38	31	27	21	21	dB
Distance correction to 1m = $20\log_{10}(5/1)$	14	14	14	14	14	14	14	14	dB
SPL @ 1m to SWL ($20\log_{10}R$ (R (distance) =1) + 11	11	11	11	11	11	11	11	11	dB
2 no. sources (only 2 running at any 1 time)	3	3	3	3	3	3	3	3	dB
Resultant theoretical SWL of 2no. CAP 0361	77	70	69	66	59	55	49	49	dB
Daikin REMQ12 SWL (inc + 3dB for 2 sources)	88	88	84	82	78	72	67	61	dB
Daikin REMQ16 SWL	84	84	80	79	74	68	63	62	dB
Combined SWL of all plant	90	89	85	84	79	73	68	65	dB
SWL to SPL at receiver incl' dist' corr' = $-20\log_{10}R$ (5) -11	-25	-25	-25	-25	-25	-25	-25	-25	dB
Screening effect	-7	-8	-9	-10	-11	-14	-16	-16	dB
Angle 90° & Directivity	-4	-4	-4	-10	-10	-10	-10	-10	dB
End reflection	-1	0	0	0	0	0	0	0	dB
A-weighting correction	-26	-16	-9	-3	0	1	1	-1	dB
Resultant SPL(A) @ 1m from residential property	27	36	38	36	33	25	18	13	dB
Single figure SPL @ 1m from residential facade								42.0	dB(A)
Target noise criteria								38.9	dB(A)
Excess								3.1	dB(A)

4.0 Noise Control Measures

It can be seen that the plant will exceed the criterion and it will therefore be necessary to treat the plant room intake and discharge openings in order to achieve the local authority requirement at the nearest affected residential windows.

The intake openings will require attenuation in the form of acoustic louvres which shall provide the following minimum SRI (sound reduction index):

Louvre to Brownlow Mews

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Minimum SRI	4	6	13	19	28	30	23	20

Louvres to Grays Inn Road

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Minimum SRI	2	2	7	13	19	20	14	13

The exhaust opening shall require aerodynamic acoustic beams to provide the following minimum SRI:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Minimum SRI	2	3	5	11	14	13	9	9

With the above measures in place, the design noise criteria will be achieved with respect to the mechanical plant to be installed on this project.

5.0 Conclusion

5.1 A plant noise assessment has been carried out on the proposed new equipment to be located within a fourth floor plant room at 107 Grays Inn Road, London.

5.2 It has been established that providing suitable Intake and exhaust attenuation will ensure the design noise criteria will be achieved, and hence the planning noise requirements of the local authority (the London Borough of Camden) will be met in full.