

Design Note.

To:	Jonathan Maynard, Kieron Hodgson
Cc:	Peter O'Donnell
From:	Gregor King, Graduate Engineer
Date:	22 February 2024
Project:	Nike Manchester
File ref:	NOTE-1014721-5A-KG-20240222-Plant noise verification testing-Rev00.docx

External plant noise commissioning.

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	22/02/2024	First issue	GK	AP	PM

This document has been prepared for Woods Bagot only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This document has been based solely on the specific design assumptions and criteria stated herein.

Acoustic commissioning measurements were undertaken of the Nike Manchester Arndal rooftop plant on 19 February 2024 to assess noise emissions from the new building services plant. Details of the measurements and assessment of noise egress levels to the nearby sensitive premises are provided below.

The commissioning measurements carried out to date and subsequent assessment demonstrate compliance with the relevant Planning Condition.

It was not possible to carry out noise measurements of the VRF / condenser units as the controls system could not be overridden to force them to run during the testing. These units are only understood to operate at full duty during the hottest summer months. However, it should be noted that the measured noise levels from the ventilation plant align with the noise data used as the previous assessment basis. Assessment of the condenser units based on the condenser noise data is provided in Hoare Lea report *REP-1014721-5A-AP-20230328-Manchester-Planning noise assessment report-Rev02*.

1. Criteria.

1.1 Planning conditions.

The relevant Planning Condition is provided below for reference.

1. 3) a) *Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.*
2. b) *Prior to the operation of the scheme a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.*

1.2 Plant noise limits.

Suitable plant noise limits have been provided previously for the development within Hoare Lea report REP-1014721-5A-AP-20230328-Manchester-Planning noise assessment report-Rev02. A summary is provided below.

An environmental noise survey has been carried out and a noise egress assessment undertaken in accordance with BS 4142:2014 and Manchester City Council (MCC) requirements. The survey was carried out between 16 March and 22 March 2023.

The closest noise-sensitive receptor to the proposed development has been identified as the Atana Apartments residential premises to the north.

The representative background sound levels at the nearby sensitive receptors were 54 dB LA90,15min during the daytime (07:00 to 23:00 hrs) and 52 dB LA90,15min during the night-time (23:00 to 07:00 hrs).

Based on MCC criteria, all plant, equipment and machinery associated with the development shall be controlled to ensure that the overall sound pressure levels at 1 m from the façade of the nearest noise sensitive premises (Atana Apartments) do not exceed 49 dB LAeq,T during the daytime (07:00 to 23:00 hrs) and 47 dB LAeq,T during the night-time (23:00 to 07:00 hrs) . If the plant contains any tonal characteristics a further correction will be required.

The criteria are summarised below on this basis.

Period	Plant noise limit at 1 m from the façade of the closest noise-sensitive receptor, dB LAeq,T
Daytime (0700-2300)	49
Night-time (2300-0700)	47

Table 1: Plant noise emissions limits, from REP-1014721-5A-AP-20230328-Manchester-Planning noise assessment report-Rev02.

2. Proposed external equipment.

The newly installed plant includes four new VRF units, three condenser units, an air handling unit and a toilet extract fan. All plant is installed on the roof of the building.

All plant are proposed approximately 31 m from the closest noise-sensitive receptor. Measurement results and assessment.

2.1 Noise measurements summary.

A sample of noise measurements were undertaken in the vicinity of the newly installed plant to establish the level of noise emissions from each unit.

Measurements were carried out while all plant was understood to be operating at design duty, along with background measurements with no new plant operating. This allows for the plant noise levels to be corrected for background noise. The background noise level in the vicinity of the plant was driven by other rooftop plant and environment noise from Manchester City centre.

At the time of the verification testing, it was not possible to override the controls system and force the VRF and condenser units to operate at full duty. It was therefore not possible to obtain representative measurements of these units. The units are not currently operational due to the ambient temperatures. It is understood that they will only operate at full duty during the hottest summer months.

Further details of the measurements and equipment used are provided in Appendix A.

A summary of the noise levels measured are provided in Table 2.

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	L _{Aeq}
<i>AHU</i>									
AHU Exhaust, 1m from grille	65	65	59	53	52	47	40	30	57
AHU Intake, 1m from grille	67	66	58	53	51	46	39	30	57
AHU Casing, 1m from unit	65	64	58	56	53	46	39	26	58
<i>Toilet Extract Fan</i>									
TEF, 1 m from unit	68	65	59	52	50	47	44	36	57
<i>Background noise levels</i>									
Background level 1	66	61	57	56	51	45	38	26	57
Background level 2	65	62	57	57	51	45	37	26	58
Background level 3	64	61	58	56	50	43	36	23	57

Table 2 Measured noise levels

It can be seen that the measured noise levels in close vicinity to the plant were similar to the background noise levels. Subjectively, the plant was only faintly audible above the background when in close proximity to the units.

The background-corrected noise levels for the plant are presented in Table 3.

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	L _{Aeq}
<i>AHU</i>									
AHU Exhaust, 1m from grille	55	62	55	47	44	42	36	28	52
AHU Intake, 1m from grille	62	64	47	47	41	39	35	29	51
AHU Casing, 1m from unit	53	60	45	47	48	41	35	18	51
<i>Toilet Extract Fan</i>									
TEF, 1 m from unit	65	63	53	47	41	42	42	35	52

Table 3 Measured noise levels – background corrected to represent noise from plant without contributions from background noise.

2.2 Assessment.

Calculations have been carried out based on the measured noise levels presented above to predict noise emissions to the nearby sensitive premises.

The calculations have been based on continuous operation of the plant items during the day and night periods, although in practice it is expected that plant noise levels may reduce during the night. Appropriate distance corrections have been taken based on the relative locations of the plant and commissioning measurement position in relation to the nearest residential premises (Atana Apartments). No screening corrections have been taken as the nearby residential premises overlook the rooftop plant area.

Based on the measured noise levels and distance / screening corrections, the predicted noise levels at the Atana Apartments are set out in Table 3.

	Calculated plant noise levels at nearest dwellings								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	L _{Aeq}
AHU	34	38	28	22	20	16	10	2	27
TEF	35	33	23	17	10	13	13	5	22
Total noise level	38	39	30	23	20	18	15	7	28

The noise levels are compliant with the criteria set out in Section 1.

Appendix A - Measurement & equipment details.

Measurements.

Attended noise measurements were carried out in the vicinity of the new plant on 19 February 2024.

Measurements were conducted over 3x 30 second periods per measurement with a B&K 2250 sound level meter (SLM). The SLM was mounted approximately 1.2 m above ground level. The microphone of the SLM was fitted with a windshield. The meter was calibrated before and after the survey and no significant drift was noted.

Equipment details.

Table B1 summarises the details of the equipment used during the environmental noise survey. All equipment used was within dates of calibration and calibration certificates are available on request.

Table B1 Equipment used during environmental noise survey.

Item	Description	Serial Number	Calibration Date
Sound Level Meter	Brüel and Kjær Sound Level Meter type 2250 Brüel and Kjær Microphone type 4189 Brüel and Kjær Pre-Amplifier type ZC-0032	s/n 3003815 s/n 2887159 s/n 29116	20/11/2023