

First Street – Block D**Technical Note – Condition 15 – Plant Noise Measurements**

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Checked by:	Warren King (MIOA)

1.0 Introduction

1.1 Acoustic and Engineering Consultants Ltd (AEC) has been appointed by Downing Living to undertake noise measurements and prepare a technical note to review whether Condition 15 placed on the scheme by Manchester City Council (MCC), can be discharged.

1.2 Condition 15 of MCC's Planning Permission for the scheme states that:

"Prior to occupation of The residential accommodation; a scheme for the acoustic insulation of any externally mounted ancillary equipment associated with the development to ensure that it achieves a background noise level of 5dB below the existing background (LA90) at the nearest noise sensitive location 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 equipment. The approved scheme shall be completed before the premises is occupied and a verification report submitted for approval by the City Council as local planning authority and any non-compliance suitably mitigated in accordance with an agreed scheme prior to occupation. The approved scheme shall remain operational thereafter.

Reason - To secure a reduction in noise in order to protect future residents from noise nuisance, pursuant to policies SP1, H1 and DM1 of the Core Strategy."

1.3 Noise associated with plant serving Block D were assessed at design stage in AEC Report: P3921/R9/PJK. AEC has been informed by Downing Construction that the plant presented in that report has been installed on-site.

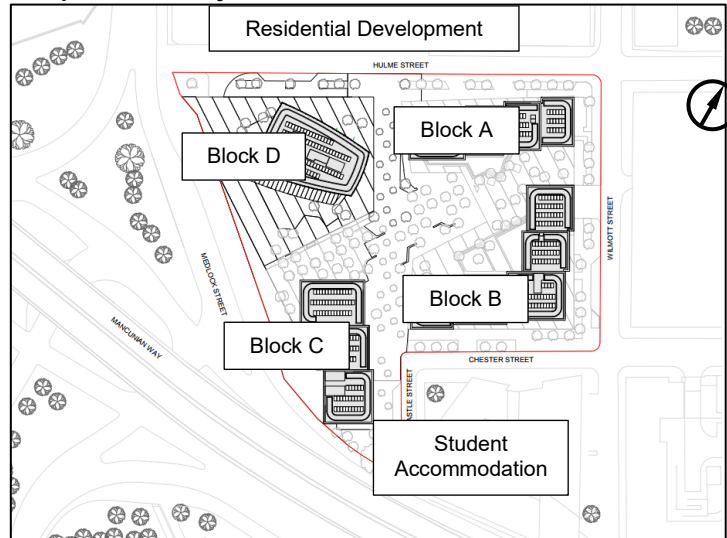
2.0 Site Description and Plant Locations**Site Location**

2.1 The site is located within Manchester City Centre, as identified on Figure 2.1. The site is bound by a number of minor and major roads, such as a fly over section of the Mancunian Way (A57M) which is a two-lane part of Manchester's inner ring road.

2.2 The development is surrounded by various areas of unoccupied land as well as some student accommodation blocks located to the south-east. There is also a new residential development to the north. These two will form the nearest noise sensitive receptors to the proposed development and their location is identified on Figure 2.1.

- 2.3 The scheme includes four accommodation blocks. Block D is 45 storeys high and the site layout is presented in Figure 2.1, below.

Figure 2.1 – Proposed Site Layout and Location of Nearest Noise Sensitive Receptors



Roof Top Plant

- 2.4 The roof top plant room is surrounded by a 3m high solid barrier. Two air source heat pumps have been installed in this area. However, only one of the Clade Oak 250kW units would operate at any one time, as they are designed to run alternatively.

Plant Rooms

- 2.5 The location of the ground floor podium plant rooms serving Block D are shown on Figure 2.2, below.

Figure 2.2 – Location of Plant Rooms



2.6 The following items of plant have been installed within the plant rooms:

Plant Room A

- Emergency Generator

Plant Room B

- Water Tank

Plant Room C

- Water Tank
- A Dutypoint VWV4-05-6V110D02 booster set
- Four Grundfos pumps

Plant Room D

- Water Tank

3.0 Noise Level Limits

- 3.1 The daytime and night-time plant noise level limits to comply with Condition 15 were presented in Table 4.1 of the AEC Report: P3921/R9/PJK and are reproduced in Table 3.1, below. These levels are based on the typical background noise levels measured around the site and the requirements of controlling plant noise to 5dB below the existing background noise level.

Table 3.1 – Plant Noise Level Limits

Period	Plant Noise Limit, dBL _{Aeq,T}
Daytime (0700h to 2300h)	52
Night-time (2300h to 0700h)	49

- 3.2 The noise level limits presented above relate to both the residential development being constructed to the north of the site and the existing student accommodation to the south-east. As all the plant can operate during the daytime and night-time, this assessment is based on achieving the night-time noise level limit. Doing so would mean that the daytime noise level limit is inherently met.
- 3.3 In relation to noise from the emergency generator, Manchester City Council typically allow for noise from this source to be 10dB above the typical daytime background noise level. Therefore, noise from the emergency generator needs to be controlled to no greater than 62dB(A) external to the nearest noise sensitive receptor during the daytime period.

4.0 Noise Measurements and Assessment

General

- 4.1 All measurements were undertaken in general accordance with BS7445-1: 2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*' and BS 4142:2014+A:2019 '*Methods for rating and assessing industrial and commercial sound*' (BS4142). The calibration certificates for the measurement equipment used by AEC is presented in Appendix A.

Roof Top Plant

- 4.2 During the noise survey, only one of the air source heat pumps was operating, as per their operating schedule. The noise level of this unit was measured at 65dB(A) at 1 m.
- 4.3 This measured noise level has been used to calculate the noise level from the air source heat pumps external to the student accommodation to the south-east and the new residential scheme to the north, taking into account distance attenuation and acoustic screening. The determined noise levels are presented in Table 4.1 below.

Table 4.1 – Air Source Heat Pump Noise Level External to Student Accommodation

Receptor	Unit Model	Noise Level at 1m, dB	Distance to receptor		Screening Attenuation, dB	Resultant, dBA
			metres	attenuation		
Student Accommodation	Clade Oak 250kW	65	100	-40	-15	10
New Residential		65	30	-30	-15	20

Plant Rooms

- 4.4 It is understood that the plant located in the Plant Rooms B and D is associated with the sprinkler system and the wet risers and will operate only during an emergency. Therefore, during the survey there was no noise associated with plant being generated in this plant room.
- 4.5 In Plant Room C, a reverberant noise level of 50dB(A) was measured with the plant operating under normal duty. It was not possible to accurately measure a noise level external to the plant rooms due to the low noise levels breaking out and the background noise climate which was dominated by the M57 Mancunian Way.

Total Noise Levels

- 4.6 The total noise levels external to the nearest noise sensitive receptors due to the different noise sources presented above, have been determined and are presented in Tables 4.2 and 4.3, for the Student Accommodation and new residential scheme, respectively. The night-time noise level limit, has been provided for comparison purposes.

Table 4.2 – Resultant Noise Level External to the Student Accommodation

Source	Noise Level, dB
Roof Top Plant	10
Plant Rooms	< 20
Resultant Noise Level	20
Noise Level Limit	49

Table 4.3 – Resultant Noise Level External to the New Residential Block

Source	Noise Level, dB
Roof Top Plant	20
Plant Rooms	< 20
Resultant Noise Level	23
Noise Level Limit	49

- 4.7 Tables 4.2 and 4.3 demonstrate that Planning Condition 15 has been complied with and can be discharged.

Emergency Plant

- 4.8 Noise levels of 72 and 66dB(A) were measured at 1m from extract flue on the podium level above the emergency generator and from the louvred door, respectively.
- 4.9 The resultant ambient noise level external to the new residential block would be around 50dB(A) which is below the agreed noise level of 62dB(A).

CERTIFICATE OF CALIBRATION

Certificate Number:
206751

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Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 98.58 kPa Temperature: 21.7 °C Humidity: 36.6 %
After Pressure: 98.58 kPa Temperature: 21.7 °C Humidity: 38.6 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ8R6309
Attenuator	Cirrus Research	ZE 952	93892
Environmental Monitor	Comet	T7510	16966334

Additional instrument information

Instruction manual:

Reference level range: Single range

Pattern approval: No

Source of pattern approval: -

Preamplifier

Model: MV-200F

Serial number: 5719F

Microphone

Model: MK.224

Serial number: 206255A

Test results summary

Test	Result
Toneburst response	Complies
Electrical noise-floor	Complies
Linearity	Complies
Electrical Frequency weightings	Complies
Frequency and time weightings at 1 kHz	Complies
C-weighted peak	Complies
Overload indication	Complies
High level stability	Complies
Long-term stability	Complies
Acoustic Frequency weightings	Complies

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 10 January 2024 CERTIFICATE NUMBER 206756



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

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Test engineer:
D. Swahell
Electronically signed:

Microphone

Microphone capsule

Manufacturer: Cirrus Research plc
Model: MK224
Serial Number: 206255A

Calibration procedure

Date of calibration: 10 January 2024
Open circuit: 32.9 mV/Pa
Sensitivity at 1 kHz: -29.7 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942-2003 Class 1.

Environmental conditions

Pressure: 102.60 kPa
Temperature: 21.0 °C
Humidity: 39.0 %

CERTIFICATE OF CALIBRATION

Certificate Number:

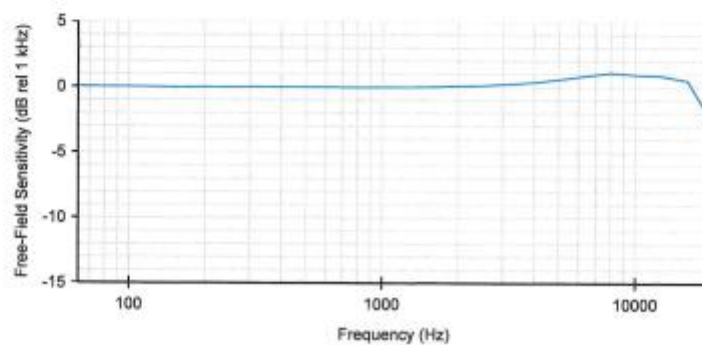
206756

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Free-Field Frequency Response : Tabular

Frequency (Hz)	Free-Field Sensitivity (dB rel 1 kHz)	Actuator Response (dB)
63	0.06	-0.19
80	0.05	-0.09
100	0.05	-0.04
125	0.04	-0.01
160	0.00	-0.02
200	0.02	0.02
250	0.01	0.01
315	0.03	0.01
400	0.00	0.00
500	0.01	-0.00
630	0.00	-0.00
800	-0.00	-0.02
1 000	0.00	-0.02
1 250	0.01	-0.04
1 600	0.04	-0.07
2 000	0.10	-0.09
2 500	0.16	-0.15
3 150	0.25	-0.26
4 000	0.40	-0.43
5 000	0.61	-0.64
6 300	0.88	-1.08
8 000	1.12	-1.96
10 000	0.98	-3.72
12 500	0.91	-5.60
16 000	0.54	-7.41
20 000	-2.39	-11.44

Free-Field Frequency Response : Graphical



CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **18 January 2024** CERTIFICATE NUMBER **206780**



Cirrus Research plc
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Bridlington Road
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United Kingdom

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Approved signatory

M.Berry

Electronically signed:

Sound Calibrator : IEC 60942:2003

Instrument information

Manufacturer: Brüel & Kjær

Notes:

Model: 4230

Serial number: 1441331

Class: 1

Test summary

Date of calibration: 18 January 2024

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The sound calibrator has been shown to conform to the Class 1 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of sound calibrator conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the sound calibrator to the requirements of IEC 60942:2003.

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

206780

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Environmental conditions

The following conditions were recorded at the time of the test:

Pressure: 99.81 kPa

Temperature: 25.4 °C

Humidity: 39.3 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	0994818
Acoustic Calibrator	Brüel and Kjær	4231	2610257
Environmental Monitor	Comet	T7510	21962628

Initial Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	94.00	94.04	94.03	94.03	94.03	0.03	±0.40	0.11 dB
Distortion (%)	< 3.00	0.87	0.83	1.03	0.91	0.91	+3.00	0.13 %
Frequency (Hz)	1000.0	1020.4	1020.2	1021.0	1020.5	20.5	±10.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

Adjusted Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	94.00	94.05	94.04	94.05	94.05	0.05	±0.40	0.11 dB
Distortion (%)	< 3.00	0.90	0.93	0.93	0.92	0.92	+3.00	0.13 %
Frequency (Hz)	1000.0	1004.4	1005.0	1004.4	1004.6	4.6	±10.0	0.1 Hz

End of results

CERTIFICATE OF CALIBRATION

Certificate Number:
198673

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Environmental conditions

The following conditions were recorded at the time of the test:

Pressure: 101.36 kPa
Temperature: 23.6 °C
Humidity: 51.4 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	0994818
Acoustic Calibrator	Brüel and Kjær	4231	2610257
Environmental Monitor	Comet	T7510	21962628

Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	94.00	94.06	94.05	94.04	94.05	0.05	±0.40	0.11 dB
Distortion (%)	< 3.00	0.20	0.35	0.13	0.23	0.23	+3.00	0.13 %
Frequency (Hz)	1000.0	1000.3	1000.3	1000.3	1000.3	0.3	±10.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

End of results