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PROJECT TECHNICAL MEMORANDUM

JOB TITLE	:	Viadux Phase 1
REF	:	HT: 27528/PTM10/R1
DATE	:	23 July 2024
FROM	:	Jake Howarth
ISSUED TO	:	Design Team

RE: VIADUX PHASE 1, MANCHESTER PLANNING CONDITION 20B DISCHARGE NOTE

The Viadux Phase 1 development has been granted planning permission subject to a number of conditions. Condition 20b relates to noise from fixed building services plant and this Technical Memorandum sets out the results of the on-site testing carried out on the installed building services plant.

1.0 Condition 20b

Planning condition 20b is as follows:

> *"(b) The approved scheme shall be implemented and prior to the first occupation of the development (or phases 1 and 2) and post construction survey (including appropriate mitigation measures and timescales for implementation if necessary) shall be submitted for approval in writing by the City Council, as Local Planning Authority. The measures agreed thereafter retained and maintained in situ."*

This Memo is specifically to discharge part b of condition 20 only.

2.0 Project Criteria

2.1 External Plant Noise Emissions

Based on the planning requirements and the lowest background noise levels recorded during the Fisher Acoustics survey, we would propose the following plant noise emission limits for the development to be achieved with plant operating cumulatively at 1m from noise sensitive windows (including apartment windows within the development).

Location	BS 4142 Plant Noise Rating Limit, $L_{Ar,Tr}$ (dB)	
	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
The Axis	50	45
Beetham Tower	45	42
Viadux Phase 1	45	42

NB: In most areas the nearest noise sensitive receptors are likely to be apartment windows within the development site.

2.2 Emergency Plant

It is suggested that the noise level from any emergency plant is no more than 10dB(A) greater than the ambient noise level (measured as an L_{Aeq} noise level) at any proposed or existing residential receptor.

Location	BS 4142 Plant Noise Rating Limit, $L_{Ar,Tr}$ (dB)
	Daytime (07:00 to 19:00)
The Axis	75
Beetham Tower	67
Viadux Phase 1	67

2.3 Tenant Requirements

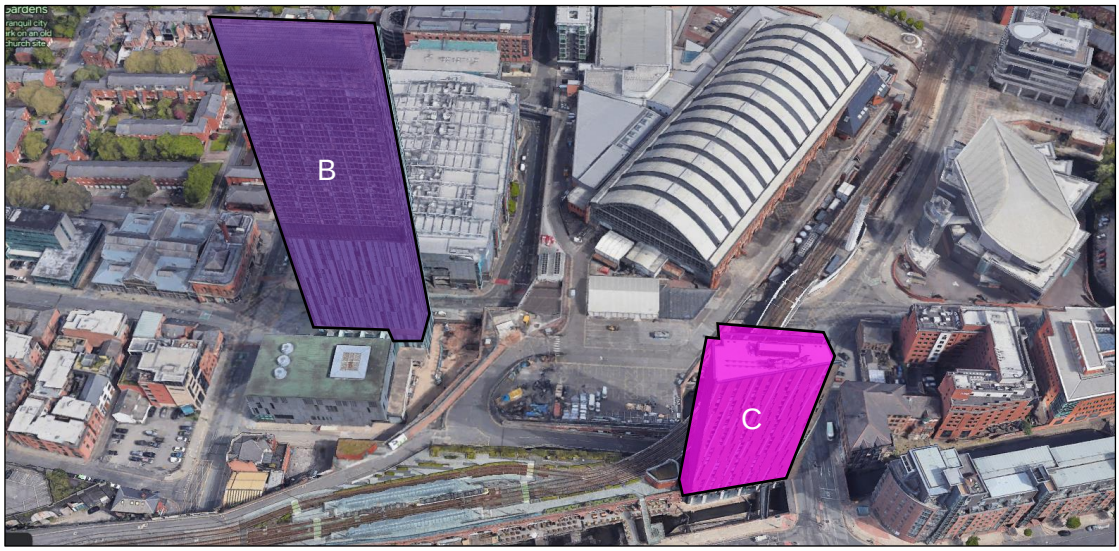
A suitable form of words should be included in the tenant's handbook making tenants responsible for controlling noise from their activities (including plant) to suitable levels.

3.0 Noise Sensitive Receptors

Externally, the nearest noise sensitive receptors to the plant areas are the residential apartments that are part of the Viadux development (Receptor Ax), situated on each façade. The other receptors likely to be affected are the Beetham Tower (Receptor B) and Axis (Receptor C). The following images highlight the location of each of the noise sensitive receptors.



Level 3 floor plan highlighting receptors Ax on each façade.



Satellite image highlighting the location of Receptor B and Receptor C

4.0 Summary of Installed Building Services

The following assessments will be split up into separate plant items and concluded with an assessment of cumulative noise impact assessment. The plant item categories are as follows:

- **Internally Mounted Plant (Ducted to Atmosphere)**
  - Extract Fans
  - Air Handling Units
  - Heat Recovery Units

- **Externally Mounted Plant**
  - Condenser Units
  - Smoke Extract Fan

4.1 Installation Locations

The commissioned plant is generally installed at Ground, First, Mezzanine and Second Floor locations. Exact layouts and duct runs are outlined in our discharge note for Condition 20a (ref. 27528/PTM9 dated 9 February 2024).

5.0 Survey

5.1 Methodology

Hann Tucker Associates attended site on 19/03/2024, 25/03/2024, 14/05/2024 and 23/07/2024 to take measurements of the installed building services plant. Measurements were generally taken at 1m from the unit or grille, except where noted in the table in Section 5.2. Background measurements with the plant switched off were also taken at all positions.

The surveys were carried out by James Hardacre BEng (Hons), AMIOA with the exception of the survey carried out on 23/07/2024 which was carried out by George Grenfell MSc, MIOA.

5.2 Results

The following table outlines the background corrected results of the measurements taken on site. While on site it was noted that noise from a number of the units was not discernible over the prevailing background noise climate. Analysis of the measurements taken while on site further support this as the background measurements are generally within ±1.5 dB of the measurements taken with the units in operation. As such, for the relevant units (denoted by *) a worst case level of 10 dB below the level measured with the unit in operation is presented.

Unit	Measurement Type	Measurement Distance	Measured Level (L_{Aeq})
EF/00/01	Source	1m	59*
EF/00/02	Source	1m	59*
EF/01/01	Source	3m	64
EF/01M/03	Source	4.5m	45*
EF/02/01	Source	1m	50*
AHU/00/01 Inlet and Outlet	Source	1m	72
AHU/00/02 Inlet and Outlet	Source	1m	60

Unit	Measurement Type	Measurement Distance	Measured Level (L_{Aeq})
HRU/01M/01 FAI***	Receiver (A_N)	N/A	57*
HRU/01M/01 Exhaust**	Receiver (A_N)	N/A	56*
HRU/02/01 FAI	Source	1m	49*
HRU/02/01 Extract	Source	1m	48*
HRU/02/02 FAI	Source	1m	55*
HRU/02/02 Extract	Source	1m	55*
HRU/02/03 FAI	Source	1m	54*
HRU/02/03 Extract	Source	1m	53*
EC/01/01	Source	1m	59
EC/01/02	Source	1m	60
ECU (All)	Source Inc. Façade	1m from façade	48
H&V FAI	Source	1m	56
H&V Exhaust	Source	1m	67

**During our time on site this unit was not installed or operational, as such the noise level is assumed to be as per the manufacturer data sheet

***Due to the location of the grilles of this unit source measurements were not possible, as such measurement were taken out of residential windows closest to the grille location

Full octave band data collected on site is present in Appendix A at the end of this report.

6.0 Assessment

6.1 Extract Fans

We understand that the extract fans could operate 24/7.

It should be noted that the plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained.

The following table outlines our assessment of the measured on site plant noise levels with reference to distance and screening corrections.

Description	Sound Pressure Level (dBA)					
	Receptor A_N	Receptor A_S	Receptor A_E	Receptor A_W	Receptor B	Receptor C
EF/00/01	59	59	59	59	59	59
Screening Loss	-18	-17	-17	-17	-18	-

Description	Sound Pressure Level (dBA)					
	Receptor A_N	Receptor A_S	Receptor A_E	Receptor A_W	Receptor B	Receptor C
Distance Loss	-32	-21	-21	-21	-33	-31
EF/00/01 Noise Level 1m from Receptor	**9**	**21**	**21**	**21**	**8**	**28**
EF/00/02	59	59	59	59	59	59
Screening Loss	-18	-17	-17	-17	-18	-
Distance Loss	-32	-21	-21	-21	-33	-31
EF/00/02 Noise Level 1m from Receptor	**9**	**21**	**21**	**21**	**8**	**28**
EF/01/01	64	64	64	64	64	64
Screening Loss	-14	-14	-25	-14	-8	-5
Distance Loss	-12	-15	0	-12	-20	-22
EF/01/01 Noise Level 1m from Receptor	**38**	**35**	**39**	**38**	**36**	**37**
EF/01M/03*	44	44	44	44	44	44
Screening Loss	-14	-14	-25	-14	-8	-5
Distance Loss	-12	-15	0	-12	-20	-22
EF/01M/03 Noise Level 1m from Receptor	**18**	**15**	**19**	**18**	**16**	**17**
EF/02/01	50	50	50	50	50	50
Screening Loss	-14	-15	-	-25	-25	-
Distance Loss	-27	-14	-10	-23	-32	-36
EF/02/01 Noise Level 1m from Receptor	**9**	**21**	**40**	**2**	**<0**	**14**
Cumulative EF Noise at Receptor	**38**	**36**	**42**	**38**	**36**	**38**

As indicated in the table above, plant noise emissions from the installed extract fans should be compliant with the limits at each of the nearest noise sensitive receptors.

6.2 Air Handling Units (AHU)

We understand that the air handling units could operate 24/7.

It should be noted that the plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained.

The following table outlines our assessment of the measured on site plant noise levels with reference to distance and screening corrections.

Description	Sound Pressure Level (dBA)					
	Receptor A_N	Receptor A_S	Receptor A_E	Receptor A_W	Receptor B	Receptor C
AHU/00/01 Noise 1m from Façade	72	72	72	72	72	72
Screening Loss	-18	-17	-17	-17	-18	-25
Distance Loss	-32	-21	-21	-21	-33	-32
Predicted AHU/00/01 Noise Level 1m from Receptor	**22**	**34**	**34**	**34**	**21**	**15**
AHU/00/02 Noise 1m from Façade	60	60	60	60	60	60
Screening Loss	-18	-17	-17	-17	-18	-
Distance Loss	-32	-21	-21	-21	-33	-31
Predicted AHU/00/02 Noise Level 1m from Receptor	**10**	**22**	**22**	**22**	**9**	**29**
Cumulative AHU Noise at Receptor	**22**	**34**	**34**	**34**	**21**	**29**

6.3 Heat Recovery Units (HRUs)

We understand that the installed heat recovery units could operate 24/7.

It should be noted that the installed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained.

While on-site measurements of HRU/01M/01 were taken at the closest receptor, the results of which are presented in Section 5.2. On the surface these indicate that this unit may not achieve the project criteria. However, the on-site subjective assessment indicated that the noise emissions from the unit were inaudible. As such, it can be determined that this unit achieves the criteria at the nearest sensitive receptor and so has been disregarded from the rest of the assessment.

The following table outlines our assessment of the measured on site plant noise levels with reference to distance and screening corrections.

Description	Sound Pressure Level (dBA)					
	Receptor A_N	Receptor A_S	Receptor A_E	Receptor A_W	Receptor B	Receptor C
HRU/02/01 FAI	49	49	49	49	49	49
Screening Loss	-14	-14	20	-9	-8	-
Distance Loss	-22	-25	-9	-22	-30	-32
HRU/02/01 FAI Noise Level 1m from Receptor	**13**	**10**	**20**	**18**	**11**	**17**
HRU/02/01 Extract	48	48	48	48	48	48
Screening Loss	-14	-14	20	-9	-8	-
Distance Loss	-22	-25	-9	-22	-30	-32
HRU/02/01 Extract Noise Level 1m from Receptor	**12**	**9**	**19**	**17**	**10**	**16**
HRU/02/02 FAI	55	55	55	55	55	55
Screening Loss	-14	-14	20	-9	-8	-
Distance Loss	-22	-25	-9	-22	-30	-32
HRU/02/02 FAI Noise Level 1m from Receptor	**19**	**16**	**26**	**24**	**17**	**23**
HRU/02/02 Extract	55	55	55	55	55	55
Screening Loss	-14	-14	20	-9	-8	-
Distance Loss	-22	-25	-9	-22	-30	-32
HRU/02/02 Extract Noise Level 1m from Receptor	**19**	**16**	**26**	**24**	**17**	**23**
HRU/02/03 FAI	54	54	54	54	54	54
Screening Loss	-14	-14	20	-9	-8	-
Distance Loss	-22	-25	-9	-22	-30	-32
HRU/02/03 FAI Noise Level 1m from Receptor	**18**	**15**	**25**	**23**	**16**	**22**
HRU/02/03 Extract	53	53	53	53	53	53
Screening Loss	-14	-14	20	-9	-8	-
Distance Loss	-22	-25	-9	-22	-30	-32
HRU/02/03 Extract Noise Level 1m from Receptor	**17**	**14**	**24**	**22**	**15**	**21**
Cumulative HRU Noise at Receptor	**25**	**22**	**32**	**30**	**23**	**29**

As indicated in the table above, plant noise emissions from the installed units should be compliant with the limits at each of the nearest noise sensitive receptors.

6.4 External Condenser Units (ECU)

We understand that the installed units would operate during the daytime only.

It should be noted that the installed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained.

The following table outlines our assessment of the measured on site plant noise levels with reference to distance and screening corrections.

Description	Sound Pressure Level (dBA)					
	Receptor A_N	Receptor A_S	Receptor A_E	Receptor A_W	Receptor B	Receptor C
ECU Noise 1m from Façade	48	48	48	48	48	48
Screening Loss	16	-	16	-	-	-
Distance Loss	27 (44m)	17 (10m)	20 (21m)	17 (10m)	27 (44m)	31 (70m)
Predicted ECU Noise Level 1m from Receptor	**5**	**31**	**16**	**31**	**21**	**17**

As indicated in the table above, plant noise emissions from the installed units with the corresponding attenuators should be compliant with the limits at each of the nearest noise sensitive receptors.

6.5 Pool Plant Assessment

We understand that the installed pool plant could operate 24/7.

It should be noted that the installed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained.

The following table outlines our assessment of the measured on-site plant noise levels with reference to distance and screening corrections.

Description	Sound Pressure Level (dBA)					
	Receptor A_N	Receptor A_S	Receptor A_E	Receptor A_W	Receptor B	Receptor C
H&V FAI	56	56	56	56	56	56
Screening Loss	-17	-21	-21	-21	-18	-
Distance Loss	-33	-26	-26	-27	-35	-26
Calculated H&V FAI Noise 1m from Receptor	**6**	**9**	**9**	**8**	**3**	**30**
H&V FAI	67	67	67	67	67	67
Screening Loss	-17	-21	-21	-21	-18	-
Distance Loss	-33	-26	-26	-27	-35	-26
Calculated H&V Exhaust Noise 1m from Receptor	**17**	**20**	**20**	**19**	**14**	**41**
Cumulative H&V Noise at Receptor	**17**	**20**	**20**	**19**	**14**	**41**

As indicated in the table above, plant noise emissions from the installed pool plant should be compliant with the limits at each of the nearest noise sensitive receptors.

7.0 Cumulative Noise Egress

On the basis of the above section, the following table outlines the cumulative resultant noise levels at each receptor due to building services plant noise and compares it again the criteria set out in Section 2.1.

Description	Predicted cumulative plant noise level SPL at 1m from each Receptor dB					
	Receptor A_N	Receptor A_S	Receptor A_E	Receptor A_W	Receptor B	Receptor C
Predicted Noise Levels Daytime	38	39	42	40	36	43
Predicted Noise Levels Night-time	38	39	42	40	36	43
Criteria (Daytime/Night-time)	45/42	45/42	45/42	45/42	45/42	50/45
Compliance Note (Daytime/Night-time)	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓

(1) Note that daytime noise levels on the A_S and A_W facades are being driven by the external condenser units in the Level 01 louvred plantroom, however we understand that these units do not serve apartments and so should not be operating during night-time hours.

As indicated above, it is predicted that installed plant items should be compliant with the agreed criteria during daytime and night-time periods.

Yours sincerely

Jake Howarth

for HANN TUCKER ASSOCIATES

Appendix A

Plant Noise & Attenuator Data

Extract Fan Noise Data

The noise data provided for each of the installed extract fans is listed in the table below:

Unit Ref	Measurement Ref.	Z weighted Sound levels (dB) at octave band frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
EF/00/01	Operational	72	69	66	63	65	61	57	51
	Background	72	65	62	59	62	58	52	42
EF/00/02	Operational	74	69	67	65	64	62	57	53
	Background	69	63	66	62	68	61	52	42
EF/01/01	Manufacturer	63	73	81	76	72	68	64	58
EF/01M/03	Manufacturer	66	64	55	52	49	44	43	36
EF/02/01	Operational	64	59	57	56	57	52	46	32
	Background	66	58	54	53	55	50	43	30

AHU Noise Data

The noise data provided for each of the installed Air Handling Units is listed in the table below:

Unit Ref	Measurement Reference	Z weighted Sound levels (dB) at octave band frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
AHU/00/01	Operational	70	63	67	65	70	68	63	53
	Operational	71	63	66	63	69	68	63	52
	Background	69	65	67	65	70	68	61	50
AHU/00/02	Operational	71	70	70	65	66	63	56	50
	Operational	71	67	68	68	66	64	58	52
	Background	70	66	67	64	71	68	63	50

HRU Noise Data

Noise data for the installed units, as provided by the manufacturer is provided in the table below:

Unit Ref	Measurement Reference	Z weighted Sound levels (dB) at octave band frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
HRU/01M/01 FAI**	Operational	73	72	72	63	62	58	51	39
	Background	73	71	72	62	62	58	51	41

Unit Ref	Measurement Reference	Z weighted Sound levels (dB) at octave band frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
HRU/01M/01 Exhaust**	Operational	72	71	71	61	60	57	50	38
	Background	67	67	68	58	59	55	50	39
HRU/02/01 FAI	Operational	63	56	54	54	55	50	42	30
	Background	73	59	57	57	56	54	47	34
HRU/02/01 Extract	Operational	66	57	53	55	55	54	45	29
	Background	73	59	56	56	55	52	47	33
HRU/02/02 FAI	Operational	68	58	58	59	60	60	54	42
	Background	74	65	61	59	58	56	51	36
HRU/02/02 Extract	Operational	77	65	62	62	59	57	54	51
	Background	69	62	60	60	56	54	49	40
HRU/02/03 FAI	Operational	71	59	56	58	58	58	54	51
	Background	74	65	61	59	58	56	51	36
HRU/02/03 Extract	Operational	73	61	60	59	59	57	50	40
	Background	69	62	60	60	56	54	49	40