



PROJECT TECHNICAL MEMORANDUM

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FROM : Tom Bonnert
ISSUED TO : Briggs & Forrester

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RE: MANCHESTER CITY COLLEGE PLANT NOISE EGRESS

1.0 Introduction

Hann Tucker Associates (HTA) has been commissioned to undertake a review of the Briggs & Forrester (B&F) ventilation design for the Manchester City College new-build development.

This memo provides an assessment of noise egress of the fixed plant and machinery associated with the development in Manchester.

Plant noise limits have previously been specified by Hoare Lea (HL) during the planning stage of the development. This report provides an assessment against these limits, and outlines any guidance for required noise mitigation measures to items of plant.

2.0 Previously Established Noise Limits

Environmental background sound levels, and corresponding limits, have been established at the site during planning stage of the scheme based upon measurements undertaken by HL.

The plant noise limits previously set are presented in the following table. It is also understood that a plant noise limit of L_{Aeq} 70 dB shall apply within the rooftop plant deck at a distance of 1m above the roof to any teaching spaces, and a plant noise limit of L_{Aeq} 50 dB shall apply within the external terrace spaces.



Time of day	Maximum allowable sound pressure level at 1m from the nearest noise sensitive premises (L_{Aeq} , dB) *
Premises overlooking New Bridge Street	
Daytime (07:00 to 23:00)	51
Night time (23:00 to 07:00)	45
Premises away from New Bridge Street	
Daytime (07:00 to 23:00)	46
Night time (23:00 to 07:00)	40

3.0 Site Description

The site is adjacent to New Bridge Street (inner ring-road) to the south and Great Ducie Street to the west. There are existing noise sensitive receptors situated to the south west and north west of the site. See site plan below.



Site Plan (© maps.google.co.uk)



4.0 Plant Noise Assessment

4.1 Overview

Hann Tucker Associates have undertaken an assessment of atmospheric plant noise emissions based on manufacturer noise level data of the proposed building services plant. The following sections outline the basis of the plant noise egress assessment and our findings.

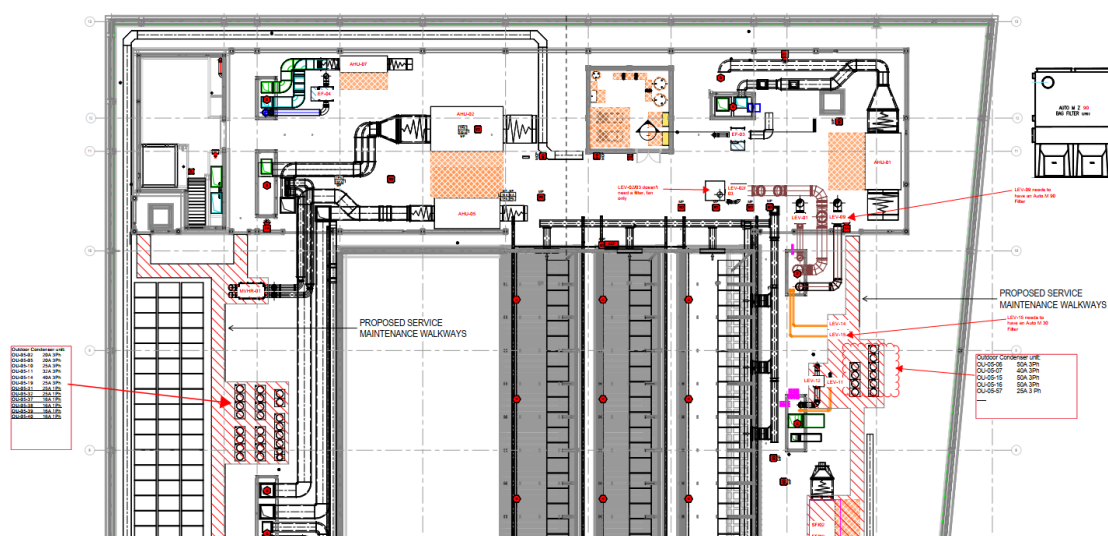
Given that this assessment is to determine plant noise egress for proposed units, the assessment presented herein is limited to assessing the plant installation based supplied manufacturer data with a view to calculating the noise level at the surrounding receptors. The calculations take into account distance propagation losses, any screening provided by the site geometry, as well as any noise mitigation measures included within the installation.

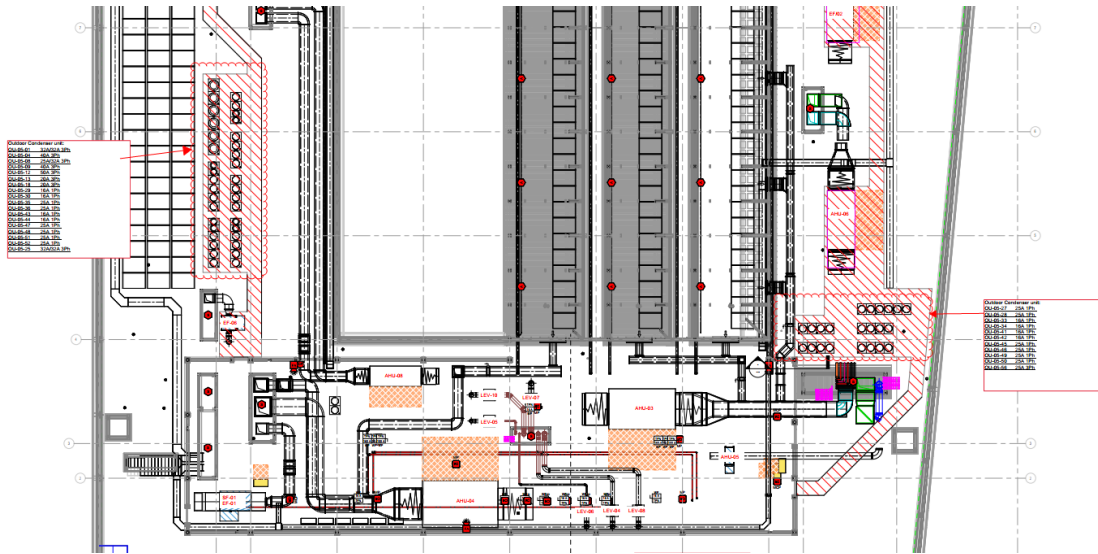
4.2 Proposed Plant

The external noise generating items of building services plant includes the following items. The location of each plant item is shown on B&F drawings:

- 8no Air Handling Units (AHUs)
- 2no. Supply Fans (SFs)
- 6no. Extract Fans (EFs)
- 15no. LEVs;
- 46no. Condenser Units (CUs)

Screenshots of the mechanical services drawings are included in the following figures.





It should be noted that following ongoing design discussions the condensers have been relocated since receipt of the above plant location drawing, and our revised assessment as presented herein is based on the condenser locations indicated on the following drawings:

- CC-BAF-ZZ-RF-DR-M-5520_C01 - Roof Level - VRF & Split Systems Layout Sheet 1 of 4
- CC-BAF-ZZ-RF-DR-M-5521_C01 - Roof Level - VRF & Split Systems Layout Sheet 2 of 4
- CC-BAF-ZZ-RF-DR-M-5522_C01 - Roof Level - VRF & Split Systems Layout Sheet 3 of 4
- CC-BAF-ZZ-RF-DR-M-5523_C01 - Roof Level - VRF & Split Systems Layout Sheet 4 of 4

4.3 Assessment

4.3.1 Assessment to Planning Limits

The sound pressure level at the worst affected noise sensitive receptors have been calculated, accounting for attenuating factors such as distance attenuation, barrier attenuation and attenuators where applicable.

Based on the manufacturers' noise data, and the provision of the proposed attenuators to the AHUs, the cumulative sound pressure levels have been calculated and assessed as below.



Description	Sound Pressure Level (dB L _{Aeq})	
	Travelodge receptor	Residential receptor
AHUs	31	30
SFs/EFs	34	34
LEVs	38	42
Condensers	39	42
Cumulative noise level for rooftop plant	42	45
Plant Noise Limit (daytime)	46	51
+/- dB compared to limits	-4 dB	-6 dB

Our assessment indicates that plant noise levels can fall below the plant noise limits set in-line with the local authority requirements. It should however be noted that this is based on the provision of noise mitigation measures as detailed in the following section.

Noise Mitigation Requirements to Achieve Planning Limits

Based on the above calculations of plant noise egress, the following attenuator specifications for AHUs are considered commensurate with achieving the noise egress criteria set by Hoare Lea.

AHU ref.	Attenuator	Inlet or Exhaust	Parameter	Octave Band Centre Frequency (Hz)						
				63	125	250	500	1k	2k	4k
AHU1	Primary Attenuator	Inlet	Minimum insertion loss (dB)	-5	-6	-10	-15	-25	-19	-13
			Max regen sound power level (dB)	54	65	57	49	43	44	43
		Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	56	68	60	55	43	37	44
AHU2	Primary Attenuator	Inlet	Minimum insertion loss (dB)	-7	-13	-17	-30	-36	-33	-26
			Max regen sound power level (dB)	63	61	65	47	52	53	39
		Exhaust	Minimum insertion loss (dB)	-7	-12	-16	-28	-35	-35	-28
			Max regen sound power level (dB)	64	72	65	52	42	37	40
AHU3	Primary Attenuator	Inlet	Minimum insertion loss (dB)	-7	-13	-17	-30	-36	-33	-26
			Max regen sound power level (dB)	61	58	64	45	50	51	39
		Exhaust	Minimum insertion loss (dB)	-6	-7	-13	-21	-29	-39	-20



AHU ref.	Attenuator	Inlet or Exhaust	Parameter	Octave Band Centre Frequency (Hz)						
				63	125	250	500	1k	2k	4k
			Max regen sound power level (dB)	57	67	58	50	39	32	39
AHU4	Primary Attenuator	Inlet	Minimum insertion loss (dB)	-7	-13	-17	-30	-36	-33	-26
			Max regen sound power level (dB)	62	59	64	45	51	52	40
		Exhaust	Minimum insertion loss (dB)	-7	-12	-16	-28	-35	-35	-28
			Max regen sound power level (dB)	65	65	65	51	41	37	42
AHU5	Primary Attenuator	Inlet	Minimum insertion loss (dB)	-5	-6	-10	-15	-25	-19	-13
			Max regen sound power level (dB)	59	67	58	50	43	44	45
		Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	59	67	59	55	44	39	45
AHU6	Primary Attenuator	Inlet	Minimum insertion loss (dB)	-5	-6	-10	-15	-25	-19	-13
			Max regen sound power level (dB)	52	61	56	46	34	38	41
		Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	56	65	58	53	42	37	43
AHU7	Primary Attenuator	Inlet	Minimum insertion loss (dB)	-5	-6	-10	-15	-25	-19	-13
			Max regen sound power level (dB)	52	61	53	45	33	38	40
		Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	55	64	57	52	41	36	42
AHU8	Primary Attenuator	Inlet	Minimum insertion loss (dB)	-5	-6	-10	-15	-25	-19	-13
			Max regen sound power level (dB)	54	55	57	50	39	40	39
		Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	58	60	63	55	47	43	49

Based on the above calculations of plant noise egress, the following attenuator specifications for SFs and EFs are considered commensurate with achieving the noise egress criteria set by Hoare Lea.



Based on the above calculations of plant noise egress, the following attenuator specifications for LEVs are considered commensurate with achieving the noise egress criteria set by Hoare Lea.

LEV ref.	Attenuator	Inlet or Exhaust	Parameter	Octave Band Centre Frequency (Hz)						
				63	125	250	500	1k	2k	4k
LEV-01	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-8	-13	-18	-28	-40	-47	-26
			Max regen sound power level (dB)	67	66	66	61	53	45	56
LEV-04	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	66	67	60	58	42	41	46
LEV-05	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-2	-5	-10	-17	-17	-13	-10
			Max regen sound power level (dB)	51	51	49	46	37	40	43
LEV-06	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	72	74	71	64	52	46	52
LEV-07	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	TBC						
			Max regen sound power level (dB)							



LEV ref.	Attenuator	Inlet or Exhaust	Parameter	Octave Band Centre Frequency (Hz)						
				63	125	250	500	1k	2k	4k
LEV-08	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-6	-7	-13	-21	-29	-39	-20
			Max regen sound power level (dB)	69	72	73	62	55	44	58
LEV-10	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	66	67	60	58	42	41	46
LEV-11	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	72	74	71	64	52	46	52
LEV-12	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-6	-7	-13	-21	-29	-39	-20
			Max regen sound power level (dB)	69	72	71	68	64	53	62
LEV-14	Primary Attenuator	Exhaust	Minimum insertion loss (dB)	-4	-5	-9	-14	-23	-24	-14
			Max regen sound power level (dB)	58	61	68	63	55	50	55

The acoustic data the manufacturer has provided for the LEV fans is considered to be less than ideal, and consequently, there remains an element of uncertainty in the predictions and guidance presented. The main concern is that for a number of the fans there is no information on inlet, exhaust and casing as separate sources. Without this, it is not possible to determine how much of the total noise level of the fan is made of each noise component, which consequently means it is not possible to reliably recommend attenuation.

For the following fans, the information provided is limited to single values only. There is also noted to be “soundbox’s” available for the fans, however there is limited information available surrounding the acoustic performance of this system, with the exception of a “before and after” noise level with and without the soundbox. For the following fans, it is recommended that the soundbox’s are provided, and further information requested from the manufacturer on t

- LEV-02
- LEV-03
- LEV-09 (whilst there is no soundbox noted in manufacturers’ data sheet, there is a silencer noted. Further information should be requested from the manufacturer)
- LEV-15

Whilst no assessment has been possible for case radiated noise from the majority of the fans, it is the bifurcated fans that will potentially be the most problematic. Whilst we cannot numerically quantify the noise output, at this stage it is recommended that noise mitigation be allowed for on the fan and motor of these fans. This would likely take the form of a small enclosure with sound absorbent inner faces surrounding the fan/motor of the bifurcated fans.



Noise Mitigation Requirements to Achieve Design Limits

Whilst not required for compliance with the planning limits (see above), some of the condensers have been afforded noise mitigation to assist with compliance to the design limits set by Hoare Lea at Stage 4. These limits require sufficient control of plant noise levels on the Level 4 external terrace, as well as incident noise upon roof surfaces directly above Level 4 teaching spaces.

Based on the manufacturers' data for the external condenser units, the following attenuation levels are considered commensurate with the design limits set by Hoare Lea, and are provided for guidance purposes at this stage. These can be achieved with the "top and side kit" package available from ambient acoustics.

Plant ref.	Parameter	Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
PURY CUs	Minimum insertion loss (dB)	1	2	3	4	10	10	8

It is understood that allowance is to be made for an attenuation package that achieves the above minimum losses for the following condenser units:

- OU-05-14, OU-05-19 and OU-05-10;
- OU-05-08 and OU-05-25;
- OU-05-07 and OU-05-06;
- OU-05-14 and OU-05-16.

We trust the above is clear and of assistance.

For and on behalf of
HANN TUCKER ASSOCIATES

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