



Building Services Noise Impact Assessment

Belle Vue Co-op Academy

Manchester

M12 5AL

Stroma Built Environment Ltd.

SBE Ref: OPP-068103 - NC1v2

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I. Revision History

Revision	Date	Description	
NC1v1	01/07/2022	First Issue	
		Compiled By	Authorised By
		Samuel Sumner AMIOA Acoustic Consultant	Tom Chaffer MIOA Principal Acoustic Consultant
NC1v2	04/07/2022	Updated to include the requirements of planning condition 19	
		Compiled By	Authorised By
		Samuel Sumner AMIOA Acoustic Consultant	Tom Chaffer MIOA Principal Acoustic Consultant

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II. Executive Summary

Stroma Built Environment (SBE) has been appointed by Sir Robert McAlpine (the client) to undertake a noise impact assessment for the Belle Vue Co-op development, Manchester (the site). The site is located approximately 3 km south-east of Manchester Piccadilly train station.

The purpose of this assessment is to determine the noise impact of new sources of building services plant equipment associated with the development upon the existing noise climate at the nearest noise sensitive receptors (NSR). The assessment is undertaken in relation to the requirements of the BREEAM 2018 Pol 05 credit.

The nearest NSRs to the site during the day and night-time have been identified as residential dwellings off Hyde Road, Ellen Wilkinson Crescent, and Bracewell Close.

Based on data from a previous noise survey carried out by BDP at the site on the 3rd November 2020 (report ref. *P3001502(REP)U001_Hyde Road_Stage 2 Acoustic Design Strategy*), noise limits have been proposed for fixed plant noise emissions to satisfy the requirements of Pol 05 at the nearest NSRs.

BDP have assumed that the plant associated with the scheme will only be operational during the typical hours of operation (i.e. daytime) and have only proposed daytime (07:00 – 23:00 hours) BS 4142 rating noise limits of 5 dB below the representative background sound level. Therefore, only the day-time period has been assessed. If the proposed development plant were to be operational during the night-time period (23:00 – 07:00 hours), the criteria would need to be revised.

Assessment of the new items of external plant against the proposed noise limits indicates that the cumulative noise level from all items of fixed plant would satisfy the rating noise limit at the nearest noise sensitive receptors without any mitigation.

On this basis, it is considered that the requirements of the BREEAM 2018 Pol 05 credit are met.

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1. Introduction

- 1.1 Stroma Build Environment (SBE) has been appointed by Sir Robert McAlpine to undertake a noise impact assessment. The assessment relates specifically to fixed external plant servicing the new school building of the Belle Vue Co-op development, Manchester for the purposes of achieving the relevant BREEAM UK New Construction 2018 credit for Pol 05 (Reduction of noise pollution) and compliance with Planning Condition 19.
- 1.2 The purpose of this report is to consider the acoustic impact of new fixed building services plant on the existing noise climate at the nearest NSRs. The impact of the fixed building services plant has been assessed against the requirements of Pol 05.
- 1.3 The assessment has been carried out in conjunction with noise emission limits derived from a previous site noise survey carried out by BDP (report ref. *P3001502(REP)U001_Hyde Road_Stage 2 Acoustic Design Strategy*). The survey was undertaken on the 3rd November 2020.
- 1.4 Assessments are based on manufacturer supplied plant equipment data including type, locations, operating hours and noise emissions supplied to SBE.
- 1.5 This document has been prepared for the sole use, benefit and information of the client for the purposes set out in the document or instructions commissioning the works. The liability of SBE in respect of the information contained herein will not extend to any third party.
- 1.6 This report is limited to addressing the specific acoustic issues contained herein and is based on information and drawings provided by the client.
- 1.7 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature. A glossary of terminology is included in Appendix IV.

2. Standards and BREEAM Requirements

Planning Requirements

- 2.1 Planning consent for the development was granted under application 129076/VO/2021, subject to conditions. Condition 19 relates to control of building services noise and is reproduced on Figure 1 below.

19) 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.

b) Prior to occupation of the development 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 nonconformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Figure 1: Planning condition 19

BREEAM New Construction 2018

- 2.2 The development is registered under BREEAM UK New Construction 2018 with the one Pol 05 credit being targeted. All recommendations given in this assessment to achieve the Pol 05 criteria shall need to be taken into consideration for the completed building.

- 2.3 One credit is available under section Pol 05 as below:

1. There are no noise-sensitive areas within the assessed building or within 800 m radius of the assessed site.

OR

2 Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS4142:2014(231) is commissioned. Noise levels must be measured or determined for:

2.a Existing background noise levels:

2.a.i at the nearest or most exposed noise-sensitive development to the proposed assessed site

2.a.ii including existing plant on a building, where the assessed development is an extension to the building

2.b Noise rating level from the assessed building.

3 The noise impact assessment must be carried out by a suitably qualified acoustic consultant.

4 The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise sensitive development, must be at least 5dB lower than the background noise throughout the day and night.

5 If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.

BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'

2.4 BS 4142 describes a method for assessing noise arising from commercial noise sources including external plant, on-site vehicle movements and loading, at residential receptors. The assessment methodology is based upon determining a 'rating level' for the noise sources being assessed, which is the level of noise from the item or items of plant being assessed (measured as an L_{Aeq}). The rating level is then compared with the underlying background noise level (measured as an L_{A90}) in the absence of noise from the item or items of plant being assessed.

2.5 BS 4142 states that a penalty should be added for any plant which gives rise to noise features that may increase disturbance such as tonal, impulsive or intermittent characteristics. With respect to the acoustic feature correction, BS 4142 states:

'Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level.'

2.6 BS 4142 also notes that in instances where more than one acoustic character is present, the individual corrections should be summed. A rating penalty for a sound may be applied based on a subjective assessment of its characteristics.

3. Site Description

- 3.1 The proposed development is located within the Belle Vue area east of the city centre and is situated off Hyde Road A57. The site is bound by a large bingo centre to the east, Belle Vue Speedway stadium to the south, residential dwellings to the west and residential/commercial buildings to the north. The wider area surrounding the site primarily consists of residential/commercial buildings, with the Hope Valley train line approximately 420 m to the west.
- 3.2 The nearest NSRs to the development have been identified as residential dwellings off Hyde Road (north of the site), Ellen Wilkinson Crescent (west of the site), and Bracewell Close (west of the site). The NSRs within the wider site context are indicated by yellow icons on Figure 2 and detailed in Table 1.

Table 1: Nearest identified NSRs

NSR	Description	Approximate Distance to Site Boundary
A	Residential Dwellings – Hyde Road	30 m
B	Residential Dwellings – Ellen Wilkinson Crescent	45 m
C	Residential Dwellings – Bracewell Close	20 m



Figure 2: Site location and nearest identified NSRs

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- 3.3 The development's fixed terminating/external plant comprises numerous heat recovery units (HRU), air handling units (AHU), hybrid ventilation units (HVV) and extract fans.
- 3.4 Drawings presenting the site layout plan including each external plant and their specific locations are presented in Appendix I.

4. Noise Impact Assessment

- 4.1 A baseline noise survey was undertaken by BDP on the 3rd November 2020 in order to determine prevailing background noise levels at the site and nearby NSRs. Relevant extracts from the BDP report detailing the noise survey results used to inform the assessment, as well as measurement positions and the survey methodology, is provided in Appendix III.

Proposed Fixed Plant Noise Limits

- 4.2 Table 2 below gives details of the plant noise limits at the nearest identified NSR locations. Representative background noise levels are based on BDP's statistical analysis of the measured long-term noise survey data (Appendix III).
- 4.3 The rating level described above should be assessed in accordance with BS 4142, including appropriate consideration of any tonal or impulsive characteristics of the proposed mechanical services plant.

Table 2: Fixed building services plant noise limits to meet BREEAM 2018 Pol 05

NSR Location	Approx. distance from site boundary	Daytime (07:00 – 23:00)		Night-time (23:00 – 07:00)	
		Representative background noise level dB $L_{A90,T}$	BREEAM Pol 05 Rating Level dB $L_{Ar,Tr}$	Representative background noise level dB $L_{A90,T}$	BREEAM Pol 05 Rating Level dB $L_{Ar,Tr}$
A	30 m	57	52	(see 4.7)	(see 4.7)
B	45 m	47	42	(see 4.7)	(see 4.7)
C	20 m	47	42	(see 4.7)	(see 4.7)

- 4.4 A desktop noise assessment has been undertaken to assess the rating level at the nearby NSRs using manufacturer's plant noise data provided by the client. Plant noise data for each unit can be viewed in Appendix II. Full plant information is available on request.
- 4.5 The client has provided an attenuator schedule and can be viewed in Appendix II. The relevant insertion loss data for each attenuator has been applied within the calculations.
- 4.6 In order to assess the rating noise level from new items of plant operating cumulatively, calculations have been undertaken assuming all items of fixed plant are operating concurrently and continuously throughout each assessment period.
- 4.7 BDP have assumed that the plant associated with the scheme will only be operational during the typical hours of operation (i.e. daytime) and have only proposed daytime (07:00 – 23:00 hours) BS 4142 rating noise limits. Therefore, only the day-time period has been assessed. If the proposed development plant

were to be operational during the night-time period (23:00 – 07:00 hours), the criteria would need to be revised.

4.8 BS 4142 acoustic feature corrections have not been included in the calculations as based on the type of plant equipment and manufacturer noise data provided, SBE does not expect impulsive or tonal characteristics, or distinctive intermittency to the noise emitted.

4.9 Table 3 below presents a summary of the assessment.

Table 3: Fixed plant noise assessment

NSR Location	Period	BREEAM Pol 05 Rating Level $L_{A,r,Tf}$ (dB)	Calculated rating level at receptor dB $L_{A,r,Tf}$	Rating level difference dB
A	Daytime	52	20	-32
	Night-time	(see 4.7)	-	-
B	Daytime	42	22	-20
	Night-time	(see 4.7)	-	-
C	Daytime	42	26	-16
	Night-time	(see 4.7)	-	-

4.10 The results presented in Table 3 indicate that the rating noise level from fixed plant associated with the units would be more than 5 dB below the existing site representative background sound level for the daytime period. In line with BS 4142 methodology this is an indication of a 'low noise impact'. The calculated noise rating levels therefore satisfy the requirements for the BREEAM Pol 05 credit and the requirements of Planning Condition 19 without mitigation.

Estimate of Calculation Uncertainty

4.11 An assessment of uncertainty in measurement and calculation is undertaken following guidance in University of Salford document 'A good practice guide on the sources and magnitude of uncertainty arising in the practical measurement of environmental noise' (2007).

4.12 Assessment is undertaken against site background sound level measurements. The uncertainty of noise survey measurements is expected to be ± 1 dB based on the allowable uncertainty for a calibrated Class 1 precision integrating sound level meter, quoted by BS 61672-1:2003 as ± 1.1 dB at 1kHz.

4.13 Sound data for plant equipment has been taken from manufacturer quoted noise. In accordance with BS EN ISO 3740:2001 the uncertainty of source measurement is expected to be between 1 dB and 2 dB in each octave band.

-
- 4.14 The uncertainty in a distance attenuation calculation over a distance of <100 m is quoted by ISO 9613-2:1996 as ± 1 dB for rooftop sources (>5 m) and ± 3 dB for sources <5 m from ground level.
- 4.15 It is therefore considered that the maximum uncertainty in measurement and calculation is ± 4 dB.
- 4.16 The calculated rating levels are at least 16 dB below the background sound level, therefore it is not expected that uncertainty in measurement or calculation will affect the outcome of the assessment.

5. Conclusions

- 5.1 SBE has been appointed by Sir Robert McAlpine to undertake a fixed plant noise assessment for the new school building of the Belle Vue Co-op development, Manchester for the purposes of achieving the relevant BREEAM Pol 05 credit.
- 5.2 The assessment has been undertaken using baseline noise survey data obtained by BDP on 3rd November 2020. The baseline data has been used to determine noise limits that satisfy the requirements of Pol 05 at the nearest NSRs.
- 5.3 A desktop noise assessment has been carried out to assess the rating level at the nearby NSRs using screening/distance attenuation calculations and manufacturer's plant noise specification data for the plant serving the building.
- 5.4 Assessment of the plant noise specifications against the stated noise levels rating indicates that building service plant noise emissions are compliant with the requirements of BREEAM 2018 Pol 05 (Reduction of noise pollution) and Planning Condition 19.
- 5.5 On this basis, it is considered that the one credit available under Pol 05 can be awarded.

Appendix I. M&E Services Layout Drawings

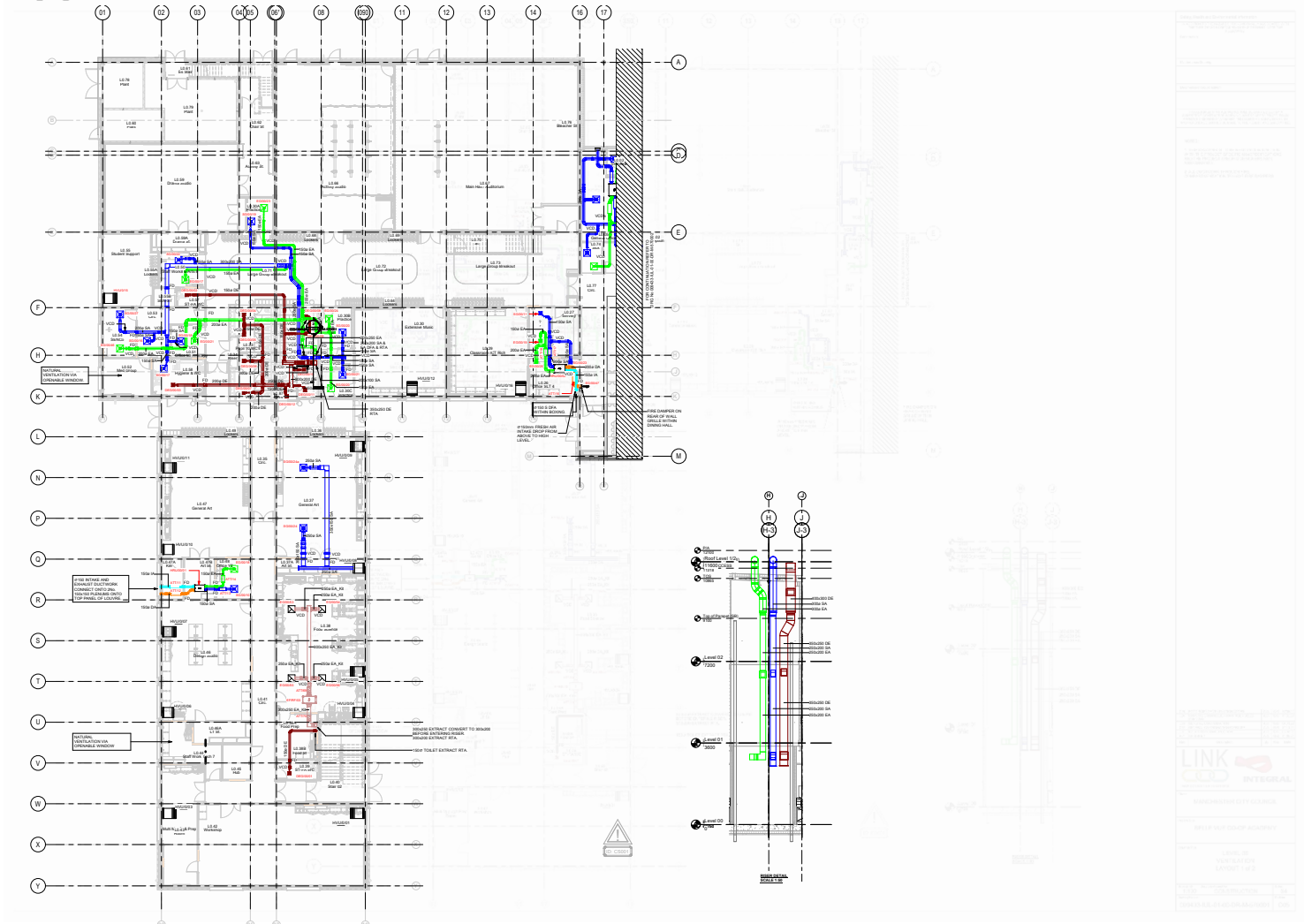


Figure A1: Level 00 ventilation layout 1 of 2



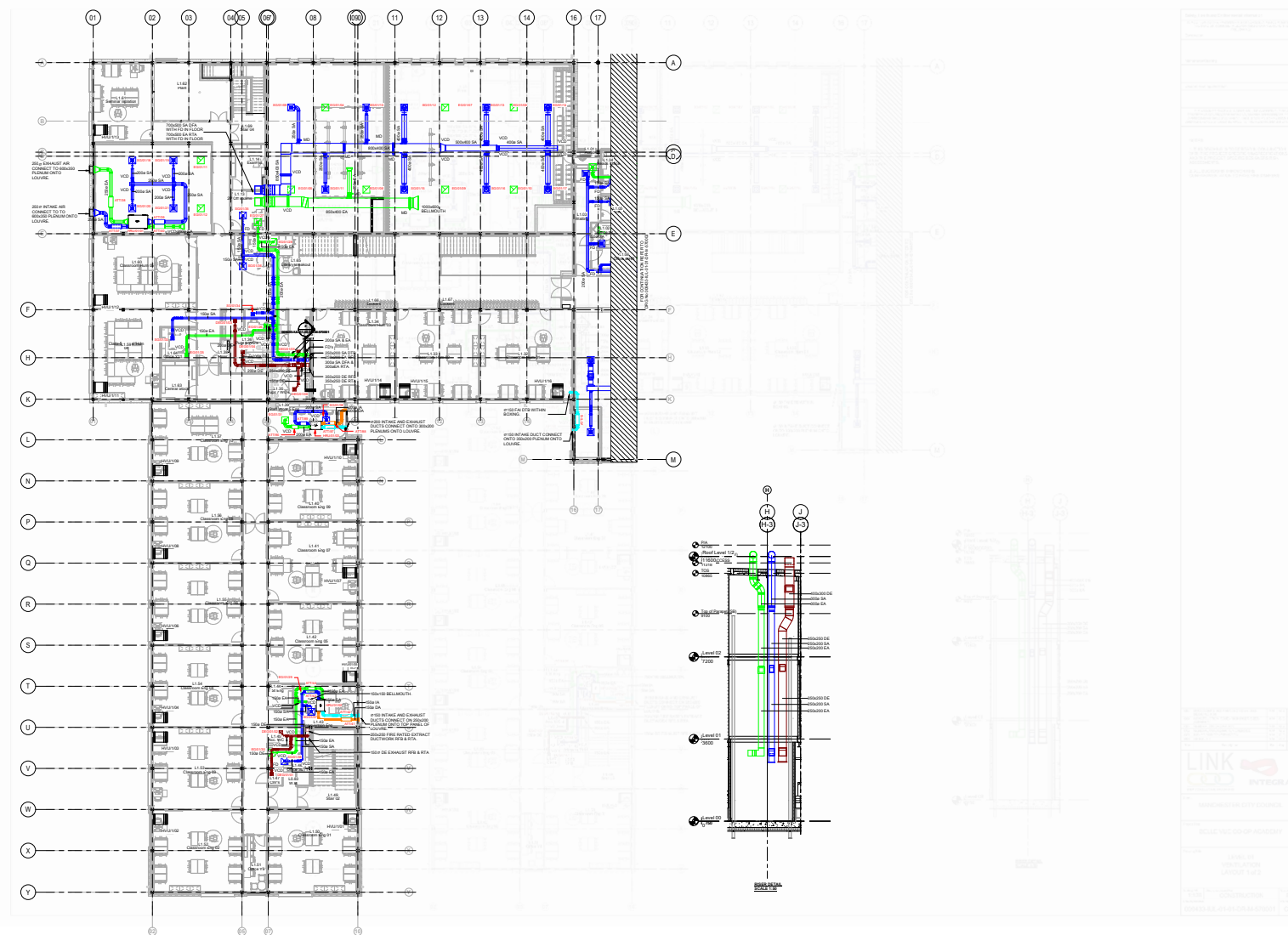


Figure A3: Level 01 ventilation layout 1 of 2

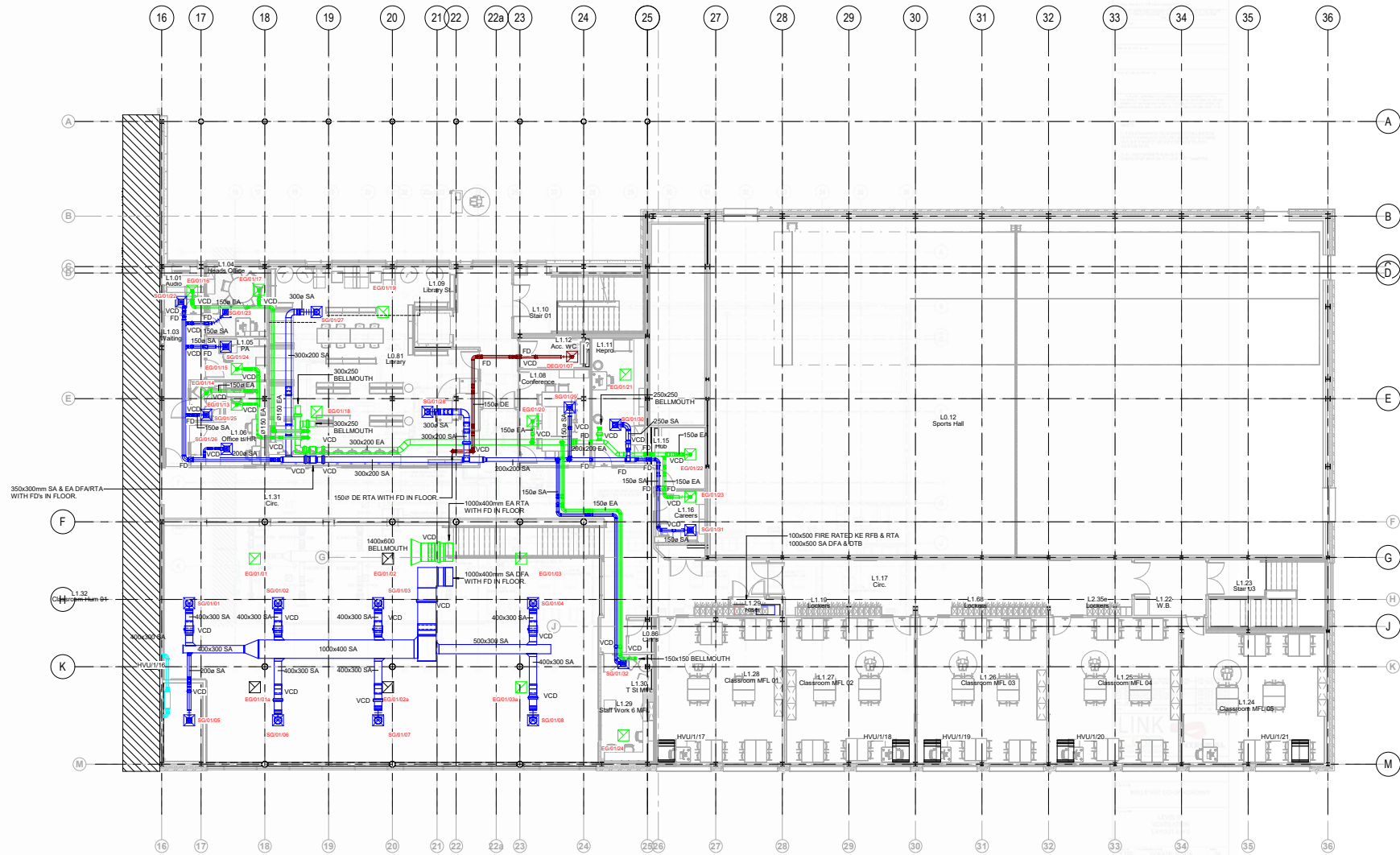


Figure A4: Level 01 ventilation layout 2 of 2

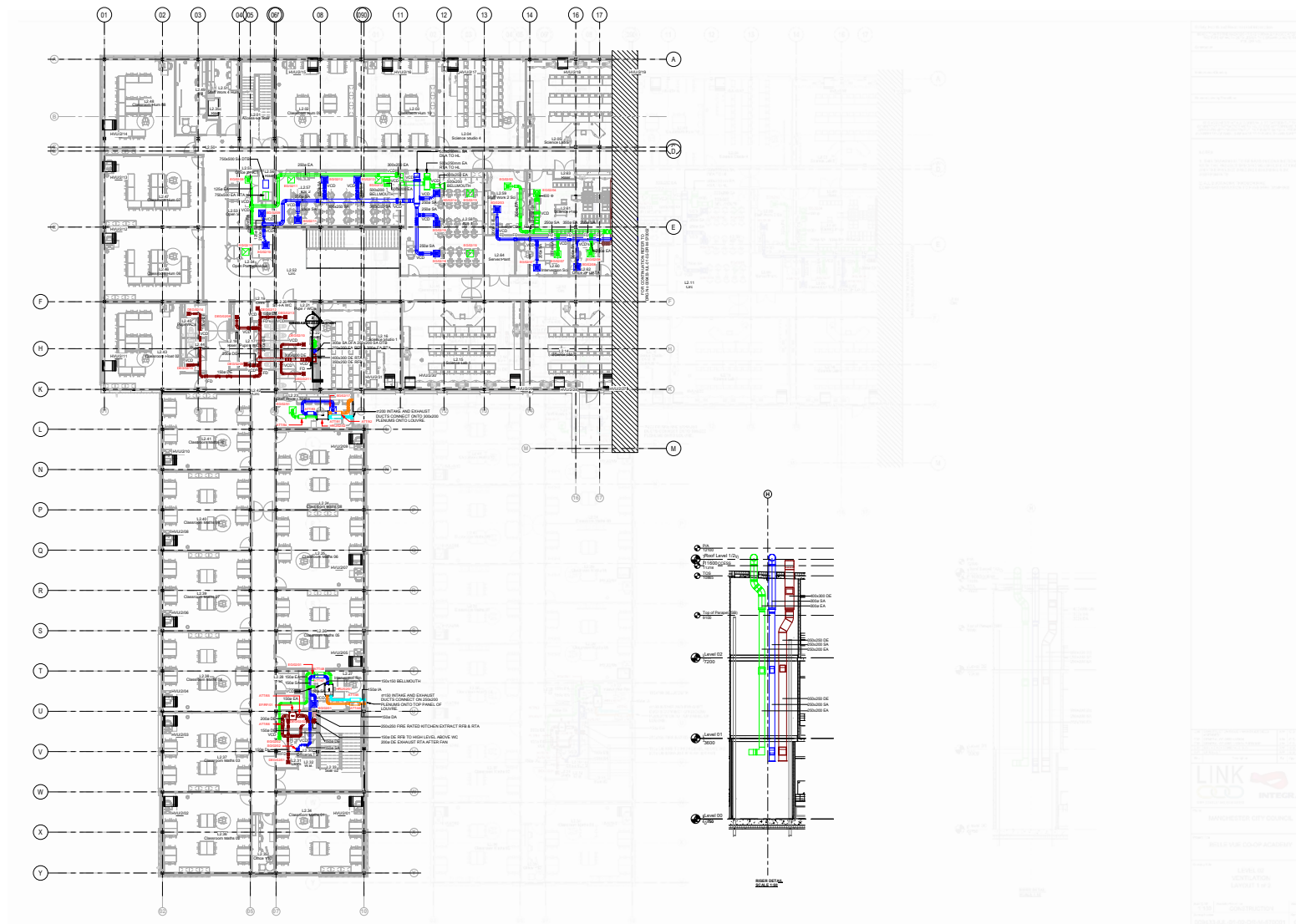


Figure A5: Level 02 ventilation layout 1 of 2

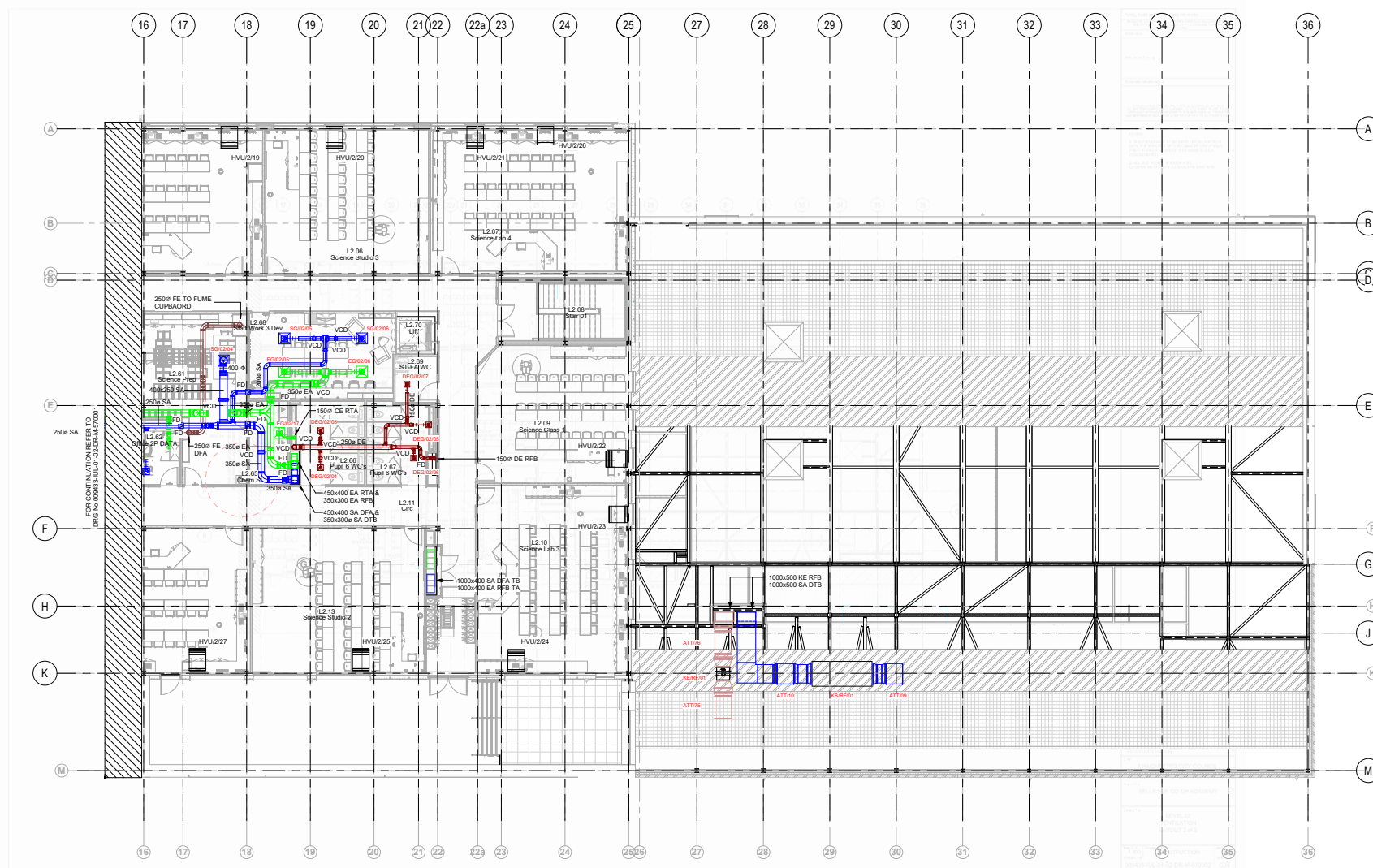


Figure A6: Level 02 ventilation layout 2 of 2

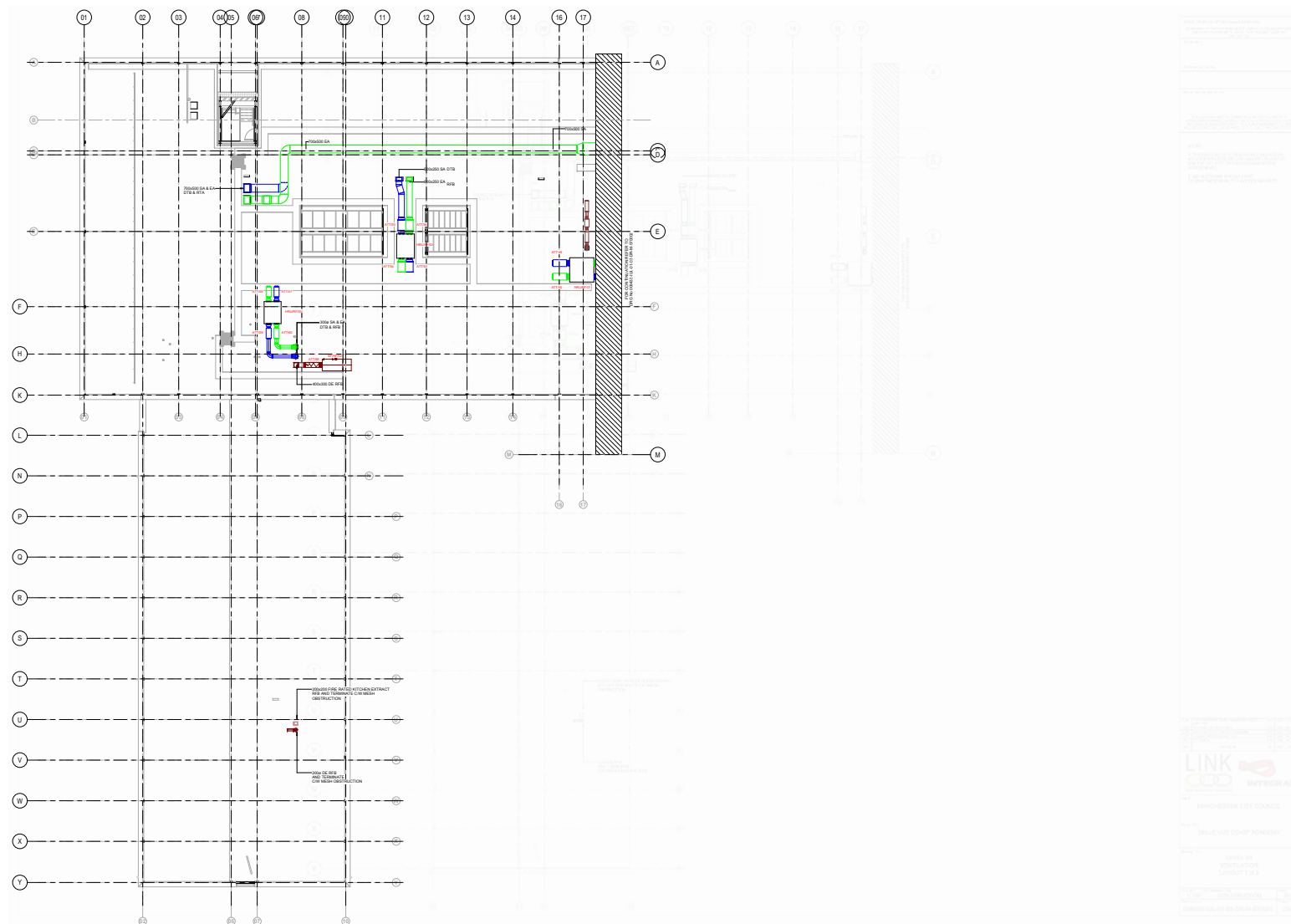


Figure A7: Level 03 ventilation layout 1 of 2

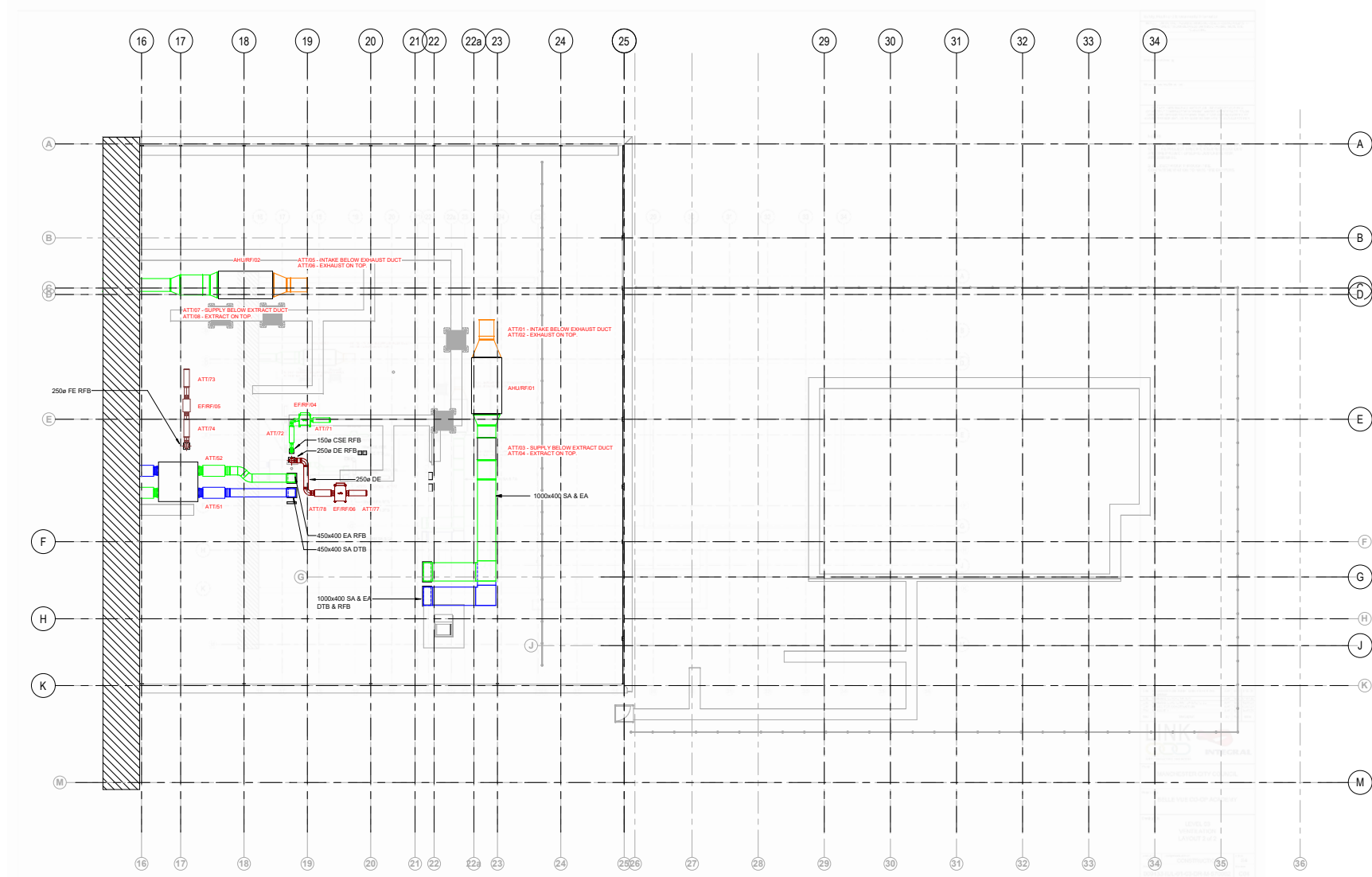


Figure A8: Level 03 ventilation layout 2 of 2

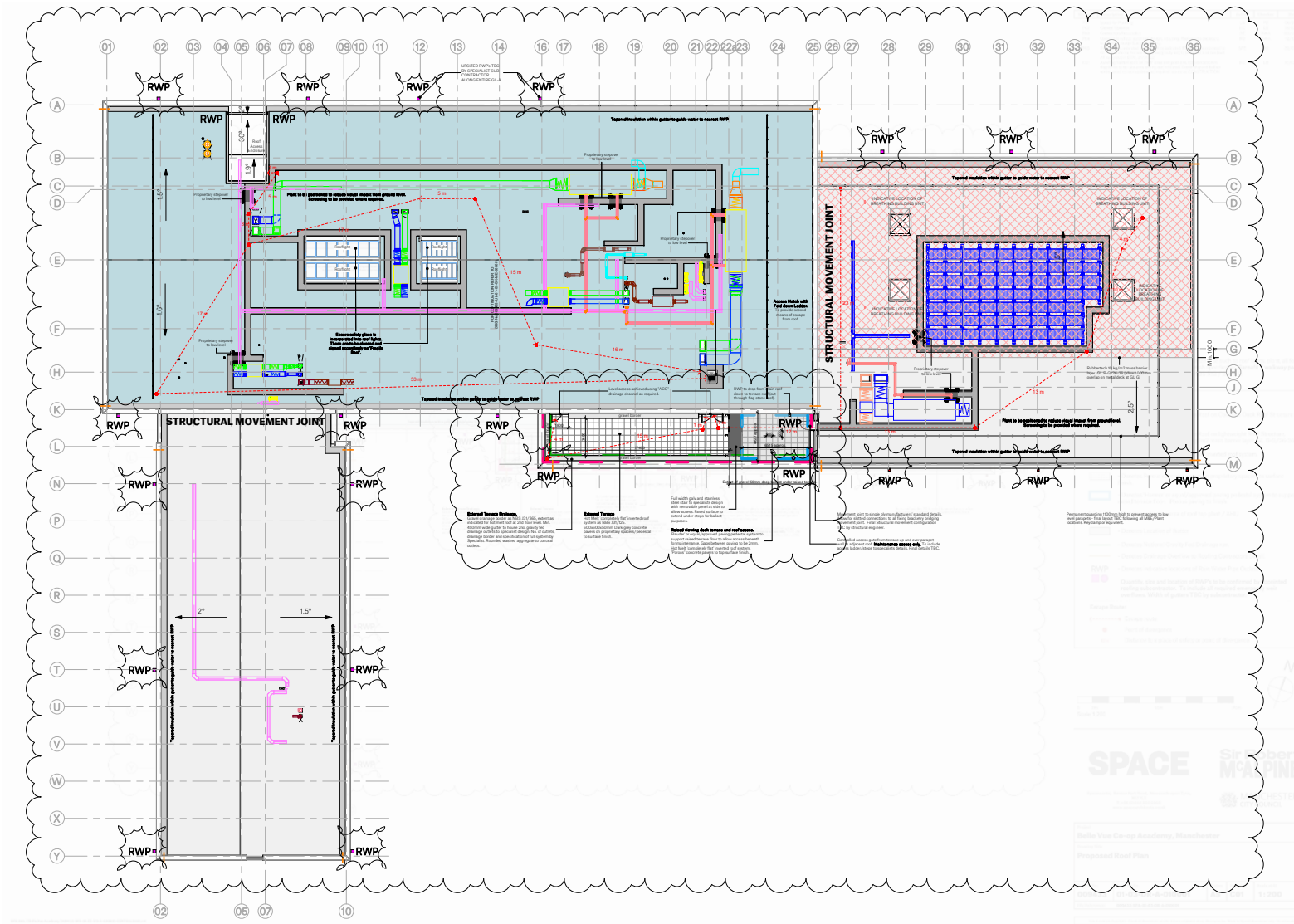


Figure A9: Proposed roof plan

Appendix II. Plant Schedule/Data

Ref	Location	Type
Level 0		
HVU/0/01	Lo.42 Workshop	HTMF-H
HVU/0/02	Lo.42 Workshop	HTMF
HVU/0/03	Lo.43 Multi Mat Prep Room	HTMF-H
HVU/0/04	Lo.38 Food Science	HTMF
HVU/0/05	Lo.38 Food Science	HTMF-H
HVU/0/06	Lo.46 Design Studio	HTMF
HVU/0/07	Lo.46 Design Studio	HTMF-H
HVU/0/08	Lo.37 General Art	HTMF-FT
HVU/0/09	Lo.37 General Art	HTMF-H
HVU/0/10	Lo.47 General Art	HTMF
HVU/0/11	Lo.47 General Art	HTMF-H
HVU/0/12	Lo.30 Extensive Music	HTMF-H
HVU/0/13	Lo.06 Library Community Hub	HTMF-H
HVU/0/14	Lo.06 Library Community Hub	HTMF
Level 1		
HVU/1/01	L1.50 Classroom Eng 01	HTMF-H
HVU/1/02	L1.52 Classroom Eng 02	HTMF-H
HVU/1/03	L1.53 Classroom Eng 03	HTMF-H
HVU/1/04	L1.54 Classroom Eng 04	HTMF-H
HVU/1/05	L1.42 Classroom Eng 05	HTMF-H
HVU/1/06	L1.55 Classroom Eng 06	HTMF-H
HVU/1/07	L1.41 Classroom Eng 07	HTMF-H
HVU/1/08	L1.56 Classroom Eng 08	HTMF-H
HVU/1/09	L1.40 Classroom Eng 09	HTMF-H
HVU/1/10	L1.57 Classroom Eng 10	HTMF-H
HVU/1/11	L1.59 Class Seminar Hum 04	HTMF-H
HVU/1/12	L1.60 Classroom Hum 05	HTMF-H
HVU/1/13	L1.61 Seminar Isolation	HTMF-H
HVU/1/14	L1.34 Classroom Hum 03	HTMF-H
HVU/1/15	L1.33 Classroom Hum 02	HTMF-H
HVU/1/16	L1.32 Classroom Hum 01	HTMF-H
HVU/1/17	L1.28 Classroom MFL 01	HTMF-H
HVU/1/18	L1.27 Classroom MFL 02	HTMF-H
HVU/1/19	L1.26 Classroom MFL 03	HTMF-H
HVU/1/20	L1.25 Classroom MFL 04	HTMF-H
HVU/1/21	L1.24 Classroom MFL 05	HTMF-H
Level 2		
HVU/2/01	L2.34 Classroom Maths 01	HTMF-H
HVU/2/02	L2.36 Classroom Maths 02	HTMF-H
HVU/2/03	L2.37 Classroom Maths 03	HTMF-H
HVU/2/04	L2.38 Classroom Maths 04	HTMF-H
HVU/2/05	L2.26 Classroom Maths 05	HTMF-H
HVU/2/06	L2.39 Classroom Maths 07	HTMF-H
HVU/2/07	L2.25 Classroom Maths 06	HTMF-H
HVU/2/08	L2.40 Classroom Maths 09	HTMF-H
HVU/2/09	L2.24 Classroom Maths 08	HTMF-H
HVU/2/10	L2.41 Classroom Maths 10	HTMF-H
HVU/2/11	L2.43 Classroom Float 02	HTMF-H
HVU/2/12	L2.46 Classroom Hum 06	HTMF-H
HVU/2/13	L2.47 Classroom Hum 07	HTMF-H
HVU/2/14	L2.48 Classroom Hum 08	HTMF-H
HVU/2/15	L2.02 Classroom Hum 09	HTMF-H
HVU/2/16	L2.03 Classroom Hum 10	HTMF-H
HVU/2/17	L2.04 Science Studio 4	HTMF-H
HVU/2/18	L2.05 Science Lab 5	HTMF
HVU/2/19	L2.05 Science Lab 5	HTMF-H
HVU/2/20	L2.06 Science Studio 3	HTMF-H
HVU/2/21	L2.07 Science Lab 4	HTMF-H
HVU/2/22	L2.09 Science Class 1	HTMF-H
HVU/2/23	L2.10 Science Lab 3	HTMF
HVU/2/24	L2.10 Science Lab 3	HTMF-H
HVU/2/25	L2.13 Science Studio 2	HTMF-H
HVU/2/26	L2.13 Science Studio 2	HTMF
HVU/2/27	L2.14 Science Lab 2	HTMF-H
HVU/2/28	L2.14 Science Lab 2	HTMF
HVU/2/29	L2.15 Science Lab 1	HTMF-H
HVU/2/30	L2.15 Science Lab 1	HTMF
HVU/2/31	L2.16 Science Studio 1	HTMF-H

Figure A10: HVU schedule

Project Name	Belle Vue CO-OP Academy, Manchester	Quote No.	AHS 22446
Unit Reference	AHU/RF/01	Revision	2
Unit Model	AIR FLEX 58 F	Date	20 Sep 2021

Project Name	Belle Vue CO-OP Academy, Manchester	Quote No.	AHS 22446
Unit Reference	AHU/RF/02	Revision	2
Unit Model	AIR FLEX 47 F	Date	20 Sep 2021

Project Name	Belle Vue CO-OP Academy, Manchester	Quote No.	AHS 22446
Unit Reference	KSF/RF/01	Revision	3
Unit Model	AIR FLEX 40 F	Date	22 Sep 2021

Figure A11: AHU schedule

Table A1: HRU & Extract Fan schedule

HRU Unit Name	Location	Extract Fan Unit Name	Location
HRU/00/01	Office Y7	EF/00/02	L0.04 ST-VIS WC
HRU/00/02	Office SLT 4	EF/00/03	Kitchen WC & COSHH
HRU/00/03	Level 0 Reception Area	EF/RF/01	ACC WCs / Cleaners
HRU/00/04	Female Changing	EF/RF/02	Pupil WC
HRU/00/05	Male Changing Area	EF/RF/03	Food Science
HRU/00/05(2)	Male Changing Area	EF/RF/04	Chemical Store
HRU/00/06	Dining Area	EF/RF/06	Roof
HRU/00/07	Dining Area	KEF/RF/01	Kitchen
HRU/01/01	Drama Studio	DWE/RF/01	Roof
HRU/01/02	L1 Office SLT1 and Intervention	DEF/00/01	L0.18 Cleaners
HRU/02/01	L1 Office SLT2 and Intervention	-	-
HRU/RF/01	Roof	-	-
HRU/RF/02	Roof	-	-
HRU/RF/03	Roof	-	-

Item	System Reference	Code	Suffix	DWG	L1	L2/ID	W	H/Dia	Vol	PD	Wt	No.		Performance, dB							
					mm	mm	mm	mm	m ³ /s	Pa	kg	Off.		63	125	250	500	1k	2k	4k	8k
1	ATT/01 - AHU/RF/01 FAI *	SL	GJ	A02G	900		1200	500	2.54	20	69	1	IL	5	8	14	20	24	18	14	8
2	ATT/02 - AHU/RF/01 EXHAUST *	SL	GJ	A02G	900		1100	500	2.03	20	68	1	IL	7	10	17	22	27	22	18	10
3	ATT/03 - AHU/RF/01 SUPPLY *	SL	GJ	A02G	1200		1200	500	2.54	20	85	1	IL	6	11	18	25	30	22	18	10
4	ATT/04 - AHU/RF/01 EXTRACT *	SL	GJ	A02G	1200		1100	500	2.03	20	85	1	IL	8	14	21	29	33	27	22	13
5	ATT/05 - AHU/RF/02 FAI	SL	GJ	A02G	900		700	500	1.76	20	46	1	IL	5	8	14	20	24	18	14	8
6	ATT/06 - AHU/RF/02 EXHAUST	SL	GJ	A02G	900		700	500	1.76	20	46	1	IL	5	8	14	20	24	18	14	8
7	ATT/07 - AHU/RF/02 SUPPLY	SL	GJ	A02G	1200		700	500	1.76	20	57	1	IL	6	11	18	25	30	22	18	10
8	ATT/08 - AHU/RF/02 EXTRACT	SL	GJ	A02G	1200		700	500	1.76	20	57	1	IL	6	11	18	25	30	22	18	10
9	ATT/09 - KS/RF/01 FAI	SL	GJ	A02G	900		1000	500	2.45	20	61	1	IL	5	8	14	20	24	18	14	8
10	ATT/10 - KS/RF/01 SUPPLY	SL	GJ	A02G	1200		1000	500	2.45	20	74	1	IL	6	11	18	25	30	22	18	10
11	ATT/11 - HRU/00/01 FAI	PL	G	A13G	600	150			0.024	5	6	1	IL	1	2	6	16	23	19	17	12
12	ATT/12 - HRU/00/01 EXHAUST	PL	G	A13G	600	150			0.024	5	6	1	IL	1	2	6	16	23	19	17	12
13	ATT/13 - HRU/00/01 SUPPLY	SL	GE	A18G	600	150	280	205	0.024	20	15	1	IL	5	9	15	24	37	34	29	23
14	ATT/14 - HRU/00/01 EXTRACT	SL	GE	A18G	600	150	280	205	0.024	20	15	1	IL	5	9	15	24	37	34	29	23
15	ATT/15 - HRU/00/02 FAI	PL	G	A13G	600	200			0.084	5	7	1	IL	1	2	6	16	23	19	17	12
16	ATT/16 - HRU/00/02 EXHAUST	PL	G	A13G	600	200			0.084	5	7	1	IL	1	2	6	16	23	19	17	12
17	ATT/17 - HRU/00/02 SUPPLY	SL	GE	A18G	600	200	340	255	0.084	20	19	1	IL	3	7	12	19	28	23	20	12
18	ATT/18 - HRU/00/02 EXTRACT	SL	GE	A18G	600	200	340	255	0.084	20	19	1	IL	3	7	12	19	28	23	20	12
19	ATT/19 - HRU/00/03 FAI	PL	G	A13G	600	200			0.096	5	7	1	IL	1	2	6	16	23	19	17	12
20	ATT/20 - HRU/00/03 EXHAUST	PL	G	A13G	600	200			0.08	5	7	1	IL	1	2	6	16	23	19	17	12
21	ATT/21 - HRU/00/03 SUPPLY	SL	GE	A18G	900	200	340	255	0.096	20	24	1	IL	5	9	17	27	39	33	28	17
22	ATT/22 - HRU/00/03 EXTRACT	SL	GE	A18G	900	200	340	255	0.08	20	24	1	IL	5	9	17	27	39	33	28	17
23	ATT/23 - HRU/00/04 FAI *	SL	G	A02G	900		350	250	0.315	20	22	1	IL	5	9	16	26	37	30	26	16
24	ATT/24 - HRU/00/04 EXHAUST *	SL	G	A02G	900		450	250	0.404	20	25	1	IL	5	9	16	22	29	23	19	11
25	ATT/25 - HRU/00/04 SUPPLY *	SL	G	A02G	900		350	250	0.315	20	22	1	IL	5	9	16	26	37	30	26	16
26	ATT/26 - HRU/00/04 EXTRACT *	SL	G	A02G	600		450	250	0.404	20	20	1	IL	4	7	11	15	20	16	13	8
27	ATT/27 - HRU/00/05 FAI	SL	G	A02G	900		300	200	0.26	20	18	1	IL	3	7	13	26	37	30	26	16
28	ATT/28 - HRU/00/05 EXHAUST	SL	G	A02G	900		400	200	0.353	20	21	1	IL	4	7	14	22	29	22	19	11
29	ATT/29 - HRU/00/05 SUPPLY	SL	G	A02G	900		300	200	0.26	20	18	1	IL	3	7	13	26	37	30	26	16
30	ATT/30 - HRU/00/05 EXTRACT	SL	G	A02G	900		400	200	0.353	20	21	1	IL	4	7	14	22	29	22	19	11
31	ATT/31 - HRU/00/06 FAI *	SL	G	A02G	900		450	250	0.424	20	25	1	IL	5	9	16	22	29	23	19	11
32	ATT/32 - HRU/00/06 EXHAUST *	SL	G	A02G	900		450	250	0.381	20	25	1	IL	5	9	16	22	29	23	19	11
33	ATT/33 - HRU/00/06 SUPPLY *	SL	G	A02G	900		450	250	0.424	20	25	1	IL	5	9	16	22	29	23	19	11
34	ATT/34 - HRU/00/06 EXTRACT *	SL	G	A02G	900		450	250	0.381	20	25	1	IL	5	9	16	22	29	23	19	11
35	ATT/35 - HRU/00/07 FAI *	SL	G	A02G	900		450	250	0.424	20	25	1	IL	5	9	16	22	29	23	19	11
36	ATT/36 - HRU/00/07 EXHAUST *	SL	G	A02G	900		450	250	0.381	20	25	1	IL	5	9	16	22	29	23	19	11

Item	System Reference	Code	Suffix	DWG	L1	L2/ID	W	H/Dia	Vol	PD	Wt	No.		Performance, dB							
37	ATT/36A - HRU/00/07 SUPPLY *	SL	G	A02G	900		450	250	0.424	20	25	1	IL	5	9	16	22	29	23	19	11
38	ATT/36B - HRU/00/07 EXTRACT *	SL	G	A02G	900		450	250	0.381	20	25	1	IL	5	9	16	22	29	23	19	11
39	ATT/37 - HRU/01/01 FAI	SL	GE	A18G	900	250	400	305	0.256	20	29	1	IL	4	7	14	22	29	22	19	11
40	ATT/38 - HRU/01/01 EXHAUST	SL	GE	A18G	900	250	400	305	0.256	20	29	1	IL	4	7	14	22	29	22	19	11
41	ATT/39 - HRU/01/01 SUPPLY	SL	GE	A18G	900	250	400	305	0.256	20	29	1	IL	4	7	14	22	29	22	19	11
42	ATT/40 - HRU/01/01 EXTRACT	SL	GE	A18G	900	250	400	305	0.256	20	29	1	IL	4	7	14	22	29	22	19	11
43	ATT/41 - HRU/01/02 FAI	PL	G	A13G	600	150			0.06	5	6	1	IL	1	2	6	16	23	19	17	12
44	ATT/42 - HRU/01/02 EXHAUST	PL	G	A13G	600	150			0.06	5	6	1	IL	1	2	6	16	23	19	17	12
45	ATT/43 - HRU/01/02 SUPPLY	SL	GE	A18G	600	150	280	205	0.06	20	15	1	IL	2	6	10	18	28	23	20	12
46	ATT/44 - HRU/01/02 EXTRACT	SL	GE	A18G	600	150	280	205	0.06	20	15	1	IL	2	6	10	18	28	23	20	12
47	ATT/45 - HRU/02/01 FAI	PL	G	A13G	600	150			0.06	5	6	1	IL	1	2	6	16	23	19	17	12
48	ATT/46 - HRU/02/01 EXHAUST	PL	G	A13G	600	150			0.06	5	6	1	IL	1	2	6	16	23	19	17	12
49	ATT/47 - HRU/02/01 SUPPLY	SL	GE	A18G	600	150	280	205	0.06	20	15	1	IL	2	6	10	18	28	23	20	12
50	ATT/48 - HRU/02/01 EXTRACT	SL	GE	A18G	600	150	280	205	0.06	20	15	1	IL	2	6	10	18	28	23	20	12
51	ATT/49 - HRU/RF/01 FAI *	SL	G	A02G	900		550	500	1.042	20	41	1	IL	6	9	16	20	23	18	14	8
52	ATT/50 - HRU/RF/01 EXHAUST *	SL	G	A02G	900		550	500	1.066	20	41	1	IL	6	9	16	20	23	18	14	8
53	ATT/51 - HRU/RF/01 SUPPLY *	SL	G	A02G	1200		550	500	1.042	20	51	1	IL	8	13	20	25	28	22	17	10
54	ATT/52 - HRU/RF/01 EXHAUST *	SL	G	A02G	1200		550	500	1.066	20	51	1	IL	8	13	20	25	28	22	17	10
55	ATT/53 - HRU/RF/02 FAI	SL	G	A02G	900		500	250	0.6	20	28	1	IL	5	8	14	20	24	18	14	8
56	ATT/54 - HRU/RF/02 EXHAUST	SL	G	A02G	900		500	250	0.6	20	28	1	IL	5	8	14	20	24	18	14	8
57	ATT/55 - HRU/RF/02 SUPPLY	SL	G	A02G	900		500	250	0.6	20	28	1	IL	5	8	14	20	24	18	14	8
58	ATT/56 - HRU/RF/02 EXTRACT	SL	G	A02G	900		500	250	0.6	20	28	1	IL	5	8	14	20	24	18	14	8
59	ATT/57 - HRU/RF/03 FAI	SL	GE	A18G	900	300	450	355	0.288	20	34	1	IL	5	9	16	22	29	23	19	11
60	ATT/58 - HRU/RF/03 EXHAUST	SL	GE	A18G	900	300	450	355	0.288	20	34	1	IL	5	9	16	22	29	23	19	11
61	ATT/59 - HRU/RF/03 SUPPLY	SL	GE	A18G	900	300	450	355	0.288	20	34	1	IL	5	9	16	22	29	23	19	11
62	ATT/60 - HRU/RF/03 EXTRACT	SL	GE	A18G	900	300	450	355	0.288	20	34	1	IL	5	9	16	22	29	23	19	11
63	ATT/61 - OMITTED																				
64	ATT/62 - OMITTED																				
65	ATT/63 - OMITTED																				
66	ATT/64 - OMITTED																				
67	ATT/65 - EF/RF/01 EXHAUST	PL	G	A13G	600	200			0.088	5	7	1	IL	1	2	6	16	23	19	17	12
68	ATT/66 - EF/RF/01 EXTRACT	PL	G	A13G	600	200			0.088	5	7	1	IL	1	2	6	16	23	19	17	12
69	ATT/67 - EF/RF/02 EXHAUST *	SL	GJ	A02G	900		550	450	0.81	20	38	1	IL	5	9	16	22	29	23	19	11
70	ATT/68 - EF/RF/02 EXTRACT *	SL	GJ	A02G	900		550	450	0.81	20	38	1	IL	5	9	16	22	29	23	19	11
71	ATT/69 - EF/RF/03 EXHAUST *	SL	G	A02G	900		350	350	0.39	20	25	1	IL	5	9	16	26	37	30	26	16
72	ATT/70 - EF/RF/03 EXTRACT *	SL	G	A02G	900		350	350	0.39	20	25	1	IL	5	9	16	26	37	30	26	16
73	ATT/71 - EF/RF/04 EXHAUST	PL	G	A13G	600	150			0.035	5	6	1	IL	1	2	6	16	23	19	17	12

Item	System Reference	Code	Suffix	DWG	L1	L2/ID	W	H/Dia	Vol	PD	Wt	No.		Performance, dB							
74	ATT/72 - EF/RF/04 EXTRACT	PL	G	A13G	600	150			0.035	5	6	1	IL	1	2	6	16	23	19	17	12
75	ATT/73 - EF/RF/05 EXHAUST	SL	GE	A18G	900	250	400	305	0.227	20	30	1	IL	6	11	18	26	35	30	25	16
76	ATT/74 - EF/RF/05 EXTRACT	SL	GE	A18G	900	250	400	305	0.227	20	30	1	IL	6	11	18	26	35	30	25	16
77	ATT/75 - KEF/RF/01 EXHAUST *	SP	GM	A02G	1200		1100	700	2.9	20	101	1	IL	8	13	16	17	22	12	9	7
78	ATT/76 - KEF/RF/01 EXTRACT *	SP	GM	A02G	1200		1100	700	2.9	20	101	1	IL	8	13	16	17	22	12	9	7
79	ATT/77 - EF/RF/06 EXHAUST	SL	GE	A18G	900	250	400	305	0.192	20	30	1	IL	6	11	18	26	35	30	25	16
80	ATT/78 - EF/RF/06 EXTRACT	SL	GE	A18G	900	250	400	305	0.192	20	30	1	IL	6	11	18	26	35	30	25	16
81	ATT/79 DWE/RF/01 EXHAUST	SL	G	A02G	900		450	450	0.88	20	35	1	IL	5	9	16	22	29	23	19	11
82	ATT/80 DWE/RF/01 EXTRACT	SL	G	A02G	900		450	450	0.88	20	35	1	IL	5	9	16	22	29	23	19	11
83	ATT/81 - DEF/00/01 EXHAUST	PL	G	A13G	600	150			0.01	5	6	1	IL	1	2	6	16	23	19	17	12
84	ATT/82 - DEF/00/01 EXTRACT	PL	G	A13G	600	150			0.01	5	6	1	IL	1	2	6	16	23	19	17	12
85	ATT/83 - EF/00/02 EXHAUST	PL	G	A13G	600	150			0.029	5	6	1	IL	1	2	6	16	23	19	17	12
86	ATT/84 - EF/00/02 EXTRACT	PL	G	A13G	600	150			0.029	5	6	1	IL	1	2	6	16	23	19	17	12
87	ATT/85 - EF/00/03 EXHAUST	PL	G	A13G	600	150			0.039	5	6	1	IL	1	2	6	16	23	19	17	12
88	ATT/86 - EF/00/03 EXTRACT	PL	G	A13G	600	150			0.039	5	6	1	IL	1	2	6	16	23	19	17	12

Figure A12: Attenuator schedule

Sound Power Level at 350 l/s							
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
53.8	56.9	54.8	49	42	33.7	23.3	25.3
Sound Reduction Index R_w (C:Ctr) = 30 dB							

Figure A13: HVU noise data

Supply

Sound Power L_w	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Inlet (dB)	84	82	77	72	69	66	63	63
Fan Outlet (dB)	85	88	80	81	79	76	73	70

Extract

Sound Power L_w	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Inlet (dB)	83	82	76	71	65	64	63	64
Fan Outlet (dB)	83	84	78	78	77	75	72	70

Figure A14: AHU/RF/01 noise data

Supply

Sound Power L_w	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Inlet (dB)	82	78	77	75	69	66	65	67
Fan Outlet (dB)	83	82	83	82	79	75	71	72

Extract

Sound Power L_w	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Inlet (dB)	81	81	76	73	67	65	65	68
Fan Outlet (dB)	81	86	79	80	78	73	70	72

Figure A15: AHU/RF/02 noise data

Supply

Sound Power Lw	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Inlet (dB)	87	84	80	77	70	69	68	72
Fan Outlet (dB)	87	87	84	83	81	81	77	77

Figure A16: KSF/RF/01 noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k
Open Inlet	52	51	56	53	39	38	28	25
Open Outlet	52	47	54	48	41	36	26	20
Breakout	51	50	55	57	32	26	16	<16
For 100% speed:	+4	+6	+8	+11	+16	+16	+16	+16

Figure A17: HRU/00/01 – Office Y7 noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k
Open Inlet	58	51	65	62	49	50	42	39
Open Outlet	57	48	61	61	50	48	39	32
Breakout	52	54	64	62	45	41	33	32
For 100% speed:	+1	+1	+2	+2	+3	+3	+3	+3

Figure A18: HRU/00/02 – Office SLT 4 noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k
Open Inlet	60	58	67	58	49	50	38	33
Open Outlet	55	55	64	56	50	47	37	27
Breakout	64	67	65	60	46	41	32	27
For 100% speed:	+2	+2	+3	+4	+6	+6	+6	+6

Figure A19: HRU/00/03 – Level 0 Reception Area noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Breakout	72	63	60	45	43	42	38	27 34
Induct Intake	81	73	73	62	62	60	52	43 48
Induct Supply	85	78	83	69	70	69	64	60 56
Induct Discharge	86	79	83	69	70	70	64	62 57
Induct Extract	82	73	74	61	62	61	51	42 48
For 100% speed:	+2	+2	+2	+2	+2	+2	+2	+2

Figure A20: HRU/00/04 – Female Changing noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Breakout	70	61	58	43	41	40	36	25 32
Induct Intake	79	71	71	60	60	58	50	41 46
Induct Supply	83	76	81	67	68	67	62	58 54
Induct Discharge	84	77	81	67	68	68	62	60 55
Induct Extract	80	71	72	59	60	59	49	40 46
For 100% speed:	+4	+4	+4	+4	+4	+4	+4	+4

Figure A21: HRU/00/05 – Male Changing Area noise data

Hz	63	125	250	500	1k	2k	4k	8k dBA
Breakout	67	61	54	40	39	36	32	21 29
Induct Intake	76	70	68	56	58	54	45	34 43
Induct Supply	80	76	77	64	66	63	58	54 51
Induct Discharge	81	77	77	64	66	64	58	56 51
Induct Extract	77	71	68	56	58	55	45	36 43
For 100% speed:	+5	+4	+7	+7	+6	+7	+8	+7

Figure A22: HRU/00/05(2) – Male Changing Area noise data

Sound Power Levels re 1 pWatts (Hz):									
Hz	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	72	63	60	45	43	42	38	27	34
Induct Intake	81	73	73	62	62	60	52	43	48
Induct Supply	85	78	83	69	70	69	64	60	56
Induct Discharge	86	79	83	69	70	70	64	62	57
Induct Extract	82	73	74	61	62	61	51	42	48
For 100% speed:	+2	+2	+2	+2	+2	+2	+2	+2	

Figure A23: HRU/00/06 – Dining Area noise data

Sound Power Levels re 1 pWatts (Hz):									
Hz	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	72	63	60	45	43	42	38	27	34
Induct Intake	81	73	73	62	62	60	52	43	48
Induct Supply	85	78	83	69	70	69	64	60	56
Induct Discharge	86	79	83	69	70	70	64	62	57
Induct Extract	82	73	74	61	62	61	51	42	48
For 100% speed:	+2	+2	+2	+2	+2	+2	+2	+2	

Figure A24: HRU/00/07 – Dining Area noise data

Sound Power Levels re 1 pWatts (Hz):									
Hz	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	65	64	51	54	41	40	40	32	33
Induct Intake	73	67	65	67	62	58	50	49	47
Induct Supply	78	79	74	78	68	68	64	66	57
Induct Discharge	79	80	74	77	68	68	66	67	57
Induct Extract	72	66	64	67	61	58	50	50	46
For 100% speed:	+7	+7	+7	+7	+7	+7	+7	+7	

Figure A25 - HRU/01/01 – Drama Studio noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Open Inlet	57	49	63	59	44	45	37	34
Open Outlet	56	46	59	58	45	43	34	27
Breakout	51	52	62	59	40	36	28	27 37
For 100% speed:	+2	+3	+4	+5	+8	+8	+8	+8

Figure A26: HRU/01/02 – L1 Office SLT1 and Intervention noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Open Inlet	57	49	63	59	44	45	37	34
Open Outlet	56	46	59	58	45	43	34	27
Breakout	51	52	62	59	40	36	28	27 37
For 100% speed:	+2	+3	+4	+5	+8	+8	+8	+8

Figure A27: HRU/02/01 – L1 Office SLT2 and Intervention noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Open Inlet	41	39	47	43	30	21	17	<16 22
Breakout								25
For 100% speed:	+4	+5	+7	+9	+14	+14	+14	+14

Figure A28: EF/00/02 – L0.04 ST-VIS WC noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Open Inlet	42	40	48	44	33	24	20	17 23
Breakout								26
For 100% speed:	+3	+4	+6	+8	+11	+11	+11	+11

Figure A29: EF/00/03 – Kitchen WC & COSHH noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Induct Inlet	67	63	56	54	47	45	46	45
Induct Outlet	72	64	62	53	50	51	47	46
Breakout	53	47	43	37	30	29	26	22
For 100% speed:	+2	+3	+4	+5	+7	+7	+7	+7

Figure A30: EF/RF/01 – ACC WCs / Cleaners noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Induct Inlet	79	75	73	72	65	62	59	54
Open Outlet	79	76	77	78	75	71	66	59
For 100% speed:	+1	+2	+2	+3	+4	+4	+4	+4

Figure A31: EF/RF/02 – Pupil WCs noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Induct Inlet	89	85	72	63	60	56	54	47
Induct Outlet	89	85	72	63	60	55	51	44
Breakout	73	65	63	48	47	36	31	25
For 100% speed:	+2	+3	+4	+5	+7	+7	+7	+7

Figure A32: EF/RF/03 – Food Science noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Induct Inlet	68	58	58	47	42	37	36	34
Induct Outlet	70	62	62	55	46	41	41	34
Breakout	49	49	40	36	21	19	16	<16
For 100% speed:	+3	+3	+5	+6	+9	+9	+9	+9

Figure A33: EF/RF/04 – Chemical Store noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Induct Inlet	77	75	62	69	56	55	51	58
Induct Outlet	86	86	68	65	59	57	52	53
Breakout	62	60	49	48	37	33	26	31
For 100% speed:	+4	+5	+7	+9	+13	+13	+13	+13

Figure A34: EF/RF/06 – Roof noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Induct Inlet	88	97	85	82	81	80	79	77
Induct Outlet	86	98	81	79	85	85	80	79
Breakout	82	91	77	74	72	71	64	58
For 100% speed:	+1	+2	+2	+3	+4	+4	+4	+4

Figure A35: KEF/RF/01 – Kitchen noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Induct Inlet	84	90	80	74	70	72	71	63
Induct Outlet	81	91	76	71	74	76	73	65
Breakout	77	84	72	66	61	63	56	51
For 100% speed:	+1	+2	+2	+3	+4	+4	+4	+4

Figure A36: DWE/RF/01 – Roof noise data

Sound Power Levels re 1 pWatts (Hz):								
Hz	63	125	250	500	1k	2k	4k	8k dBA
Induct Inlet	67	56	56	44	38	33	32	30
Induct Outlet	69	60	60	52	42	37	37	30
Breakout	48	47	38	33	17	<16	<16	<16
For 100% speed:	+4	+5	+7	+9	+13	+13	+13	+13

Figure A37: DEF/00/01 – L0.18 Cleaners noise data

ACOUSTICS							
Sound Power Levels (Lw)	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Supply Fan Inlet (dB)	74	74	73	73	72	75	68
Supply Fan Outlet (dB)	75	75	75	78	78	80	73
Extract Fan Inlet (dB)	74	74	73	73	72	75	68
Extract Fan Outlet (dB)	75	75	75	78	78	80	73

Figure A38: HRU/RF/01 – Roof noise data

ACOUSTICS							
Sound Power Levels (Lw)	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Supply Fan Inlet (dB)	69	69	67	65	63	64	62
Supply Fan Outlet (dB)	77	77	74	74	73	68	66
Extract Fan Inlet (dB)	69	69	67	65	63	64	62
Extract Fan Outlet (dB)	77	77	74	74	73	68	66

Figure A39: HRU/RF/02 – Roof noise data

ACOUSTICS							
Sound Power Levels (Lw)	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Supply Fan Inlet (dB)	68	67	65	62	59	57	51
Supply Fan Outlet (dB)	73	72	70	67	64	62	56
Extract Fan Inlet (dB)	68	67	65	62	59	57	51
Extract Fan Outlet (dB)	73	72	70	67	64	62	56

Figure A40: HRU/RF/03 – Roof noise data

Appendix III. Survey Information & Data

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4 Environmental Noise Survey

An environmental noise survey has been undertaken on the 3rd November 2020 at various positions on and in the vicinity of the proposed site.

The data obtained has been used in order to assist in the following:

- Establishing the baseline pre-development noise climate at the site;
- Informing a 3D acoustic noise model of the site for the purposes of assessment of the required sound insulation of the building fabric, including glazing and ventilation; and
- Establishing noise limit criteria for external noise emissions associated with the project from noise associated with the use of the outdoor MUGA pitches as well as noise associated with external plant equipment associated with the development.

4.1 Survey Methodology

A series of manned short-term measurements were undertaken during 'worst-case' daytime and night-time periods. The approximate site boundary & measurement positions are presented in Figure 1 and were selected in order to:

- Measure worst-case, i.e. noisiest, daytime (0800 – 1000 hours) noise levels in order to inform a 3D noise model of the site used to establish the required sound insulation of the building fabric, including glazing and ventilation (Positions 1 – 4);
- Provide data representative of the worst-case, i.e. quietest, daytime (1000 – 1100 hours) noise levels at the nearest or most exposed residential noise sensitive receptors for the purposes of informing external noise emission limits to maintain residential amenity (Positions A – B).

Weather conditions during the survey were dry with low wind speeds varying below 2m/s in a westerly direction, temperatures varying around 6°C and cloud cover of approximately 70%.

The instrumentation used for measurements consisted of 1no. B&K 2260 sound level meter which was calibrated prior to commencing and upon completion of the survey, with no significant drift in sensitivity observed.

At each position octave band and A-weighted fast response levels were recorded for a comprehensive suite of noise level metrics. All readings were taken at a height of 1.5m above local ground level in free-field conditions. Measurements were carried out by Gavin Stevenson MIOA.

Figure 1: Approximate survey measurement positions (red line shows approximate site boundary)



4.1.1 On-Site Noise Climate

The ambient noise climate at the site is dominated by road traffic noise primarily from vehicles travelling on Hyde Road and Kirkmanshulme Lane.

The background noise climate at the site is dominated by distant road traffic noise, primarily from the south-west of the site.

Other noise sources contributing to the ambient noise climate on site included noise from people in the local area, as well as low level noise from the MUGA pitches located to the south of the proposed development site.

It is noted that the speedway stadium to the south of the proposed site does not have the necessary permissions to operate for speedway during typical school opening hours (weekdays); other associated mixed-use external games/sports areas are not expected to cause an increase to the surveyed levels at the proposed development site based on a review of the submitted noise reports associated with the speedway complex's prior planning application.

4.1.2 Results

A summary of the measured results are presented in Table 7 table below.

Table 7: Summary of noise measurement results

Measurement Position	Start Time (hh:mm)	Duration (mm:ss)	L _{Aeq,5mins} Range (dB)	L _{Amax,5mins} Range (dB)	L _{A90,5mins} Range (dB)
1	08:00	10:00	62 - 63	74 - 76	49
1	09:00	10:00	64 - 65	77 - 80	50
2	08:15	10:00	67	76	55 - 56
2	09:15	10:00	66 - 67	75	57
3	08:28	10:00	51 - 52	64 - 66	49
3	09:27	10:00	51	60 - 67	49
4	08:40	10:00	52 - 54	56 - 62	51 - 52
4	09:40	10:00	53 - 54	59 - 60	51 - 52
A	10:05	15:00	70 - 71	81 - 83	57 - 58
B	10:24	15:00	48 - 49	55 - 59	47

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10 Building Services

10.1 Internal building services noise

Building service items and associated attenuation measures should be selected to ensure compliance with the BB93 IANL criteria.

The table below presents recommended building services noise upper limits to allow the BB93 IANL criteria to be achieved when considering the cumulative noise level of building services noise and other external noise sources (e.g. road traffic), and the BB93 mechanical services noise limits.

The upper limits are presented in terms of $L_{Aeq,T}$ dB and NR levels; both criteria should be complied with when operating at duties to satisfy the BB93 defined 'normal' operation. The limits provided are cumulative and any selection should take account of the total number of noise sources within the space (e.g. inlet, outlet, case, number of units, etc.); these limits should be refined in the subsequent design stages as the external envelope build-ups and associated performance are developed.

Table 14: Preliminary room-side building services noise limits

Room Type	Recommended building services noise limits to achieve the IANL criteria, $L_{Aeq, 30min}$ dB	Recommended building services NR limits to achieve the IANL criteria
General Classrooms	35	29
Offices, Staff workrooms, Meeting/Conference room, Interview room	40	34
Student Support	30	24
Intervention spaces	35	29
Kitchen	50	44
Science Labs, Res Materials, Food Tech, Product Design, Art, ICT, Library, resource/breakout areas	40	34
Main Hall, Drama	35	29
Sports Hall, Activity Studio	40	34
Music: Recording, practice, classroom	35	29
Circulation spaces, corridors, stairwells	45	39
Toilets	50	44
Changing Rooms	50	44
Dining Room	45	39

10.2 Equipment noise levels

General comments on equipment selections with regard to noise levels are provided below:

- Primary attenuators should be incorporated into ductwork near to plant. This helps to reduce airborne noise transmission to the building to an acceptable level.
- In-room units located within occupied spaces will need to be carefully selected to ensure internal noise requirements are achieved. As well as in-line attenuation, it is important to recognise that the units may also need acoustic cladding / boxing in order to control the level of break-out noise from the unit casing. The requirement for this will be dependent on final unit selections.

It should be noted that the internal building services noise limits provided in are cumulative room-side limits, i.e. accounting for all sources of building services noise in the space (case radiated/breakout noise, and down-duct inlet & outlet noise).

10.3 External plant noise emission limits

10.3.1 Plant noise limits at nearest noise sensitive receptors

External plant noise emissions associated with the development should be suitably controlled in order to maintain residential amenity at nearby noise sensitive receptors.

It is assumed that the plant associated with the scheme will only be operational during the typical hours of operation (i.e. daytime), therefore only daytime (0700 – 2300 hours) BS4142 rating noise limits have been proposed below. If the proposed development plant were to be operational during the defined BS4142 night-time period (2300 – 0700 hours), the criteria would need to be revised.

On this basis, the following cumulative noise limits are proposed for fixed items of plant associated with the development, in line with the Local Authority's understood criteria.

Table 15: Preliminary external plant noise emission limits

Noise sensitive receptor	Measured representative Background level, $L_{A90,T}$ (dB)	Cumulative Plant Noise Rating Level Limit at façade of NSR property, $L_{Aeq,T}$ (dB)
Residential dwellings to the north-east of the proposed development site off Hyde Road	57	52
Residential dwellings to the west of the proposed development site off Ellen Wilkinson Crescent and Bracewell Close	47	42

It should be noted that the plant noise limits provided are for the cumulative BS 4142 rating level of all items of plant, and allowance should be made for the number and character of the noise sources. Plant noise should also be controlled sufficiently to ensure that the indoor ambient noise level design criteria for the proposed development are not exceeded.

December 2020

Appendix IV. Acoustic Glossary

Sound pressure level and the decibel, dB

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. The decibel is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Frequency and hertz, Hz

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz. The human range of hearing is commonly accepted to be 20 Hz to 20,000 Hz. Additionally, an octave can be used to describe the interval between a frequency in Hz and either half or double that frequency.

Frequency weighting

Different weighting networks can be applied to a given sound level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The most commonly used weighting network is the 'A' weighting, and the letter 'A' will be included within a descriptor to indicate that the value has been 'A' weighted, e.g. $L_{Aeq,T}$ or L_{A90} . An 'A' weighted noise level may also be written as dB(A). Other weightings less commonly used are 'C' and 'D' weighting.

Noise indices

When a noise level varies with time, the measured 'A' weighted dB level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple 'A' weighted dB value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The various indices used are described as below:

$L_{Aeq,T}$	The 'A' weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period, T
L_{Amax}	The maximum 'A' weighted noise level that was recorded during the monitoring period.
L_{A10}	The 'A' weighted noise level that was recorded for at least 10% of the monitoring period.
L_{A90}	The 'A' weighted noise level that was recorded for at least 90% of the monitoring period, usually taken as the underlying 'background' noise level.

Sound level difference, D

The sound level difference between two internal spaces, or between internal and external spaces. The ' D ' value is used to denote the differences at each third octave or octave band, with a single figure 'weighted' value to describe an overall performance. Note that the ' D ' value will always describe an in-situ or on-site acoustic performance. All values are described using the decibel.

D_w	Single figure weighted sound level difference, simply the measured source noise level minus receiver noise level, not adjusted to reference conditions
$D_{nT,w}$	Weighted normalised sound level difference – a single, weighted sound insulation value, normalised to a reference reverberation time using the measured reverberation time in the receive room
$D_{nT,w} + C_{tr}$	As above, with a spectral adaptation term applied to account for the effects of low frequency noise, and based on urban traffic noise
$D_{nf,w}$	Overall flanking normalised level difference - A parameter that defines the flanking transmission of sound from room to room where a dividing partition or floor construction abuts a flanking building element common to both rooms, such as the building façade or ceiling

Sound reduction index, R

This describes the sound transmitted through a material or building element, such as a wall, door or window. It is measured in a laboratory with suppressed flanking transmission. The ' R ' value is used to denote the differences at each third octave or octave band, with a single figure 'weighted' value to describe an overall performance. All values are described using the decibel.

R_w	Weighted single figure sound reduction index
$R_w + C_{tr}$	As above, with a spectral adaptation term applied to account for the effects of low frequency noise, and based on urban traffic noise
R'_w	The 'apparent sound reduction index', a field measurement to obtain the sound reduction index of a material or element, with all effects of site installation accepted.

Standardised impact sound pressure level, $L'_{nT,w}$

$L'_{nT,w}$ is the single figure used to characterise the impact sound pressure level in a receiving room, normalised to a reference reverberation time. Impact noise can be classified as (but is not limited to) the result of footfall impact on a separating floor to a habitable space below. All values are described using the decibel.

Reverberation time, T and T_{mf}

The reverberation time of a space is a measure of the rate at which sound decays, measured in seconds. It is defined as the time taken for the sound pressure level to reduce by 60 dB from its original impulse level.

Reverberation time is commonly quoted in terms of the mid-frequency reverberation time, T_{mf} , the arithmetic average of the reverberation times in the 500 Hz, 1 kHz and 2 kHz octave bands.

Absorption Coefficient

The acoustic absorption provided by a surface is defined as the sound absorption coefficient α , which denotes the fraction of sound energy absorbed between 0 (no absorption) and 1 (no reflection). The absorption coefficient of a material varies with the frequency of incident sound waves, therefore is considered for different frequencies.

Absorption Class

Based on the absorption coefficients, the overall sound absorption of a material is classified from Class A to Class E as defined in BS EN ISO 11654:1997, with Class A providing the highest level of acoustic absorption.

Noise rating, NR

The noise rating or NR system is commonly used in the design of noise emitted by internal building services systems. The system is frequency dependent, and was empirically derived to prevent disturbance to occupants in habitable or working areas from building services noise that exhibits 'tonal' elements, e.g. rumbles, whines, whistles etc. There is no direct relationship between the average 'A' weighted noise level in dB and the NR. However, as a guide, and assuming the absence of strong low frequency content in a given noise, the NR could generally be said to be 6 dB less than the average 'A' weighted dB value.

Privacy

Privacy is the addition of the level of sound insulation between two rooms and the background noise within a receiving room. It can be used to assess the level of privacy afforded in the 'receiving room' for speech from the 'source room'. The 'privacy factor' is a unit-less value that is the combination of the average 'A' weighted background noise level in dB and the weighted sound level difference (D_w) in dB.

Appendix V. SBE Acoustic Credentials

SBE have specialised in providing the UK Construction Industry with a range of acoustics services since 2006. Specialising in Building Acoustics, all SBE acousticians are members of the Institute of Acoustics.

SBE is accredited for on-site acoustic testing by United Kingdom Accreditation Service (UKAS) (Testing Laboratory Number 2731).

SBE meet the relevant acoustic requirements typically required in the UK, including for sound insulation testing as defined in Approved Document E for the purposes of testing for Part E to the Building Regulations 2010.

Appendix VI. Report Conditions

This document has been prepared for the sole use, benefit and information of the Client. The liability of Stroma Built Environment Ltd. in respect of the information contained herein will not extend to any third party unless prior agreement is obtained in writing from Stroma Built Environment Ltd.

This report is limited to addressing the specific acoustic issues contained herein. Advice has been provided for acoustic reasons only and it is recommended that appropriate expert advice be sought on all the ramifications, e.g. safety, fire, structural, CDM etc., associated with any proposals contained herein.

The in-situ performance of acoustic measures is influenced to a large extent by the quality of workmanship and compliance with the specifications on-site during construction, as such, Stroma Built Environment Ltd. accepts no liability for issues with acoustic performance arising from such factors.

Acoustic survey and testing work carried out for the project is representative of the prevailing conditions at the time of the work. Conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

In particular, it should be noted that where calculations are carried out that are based on assumptions regarding certain aspects where information has not been supplied, these are provided for indicative purposes only and should be treated as such.