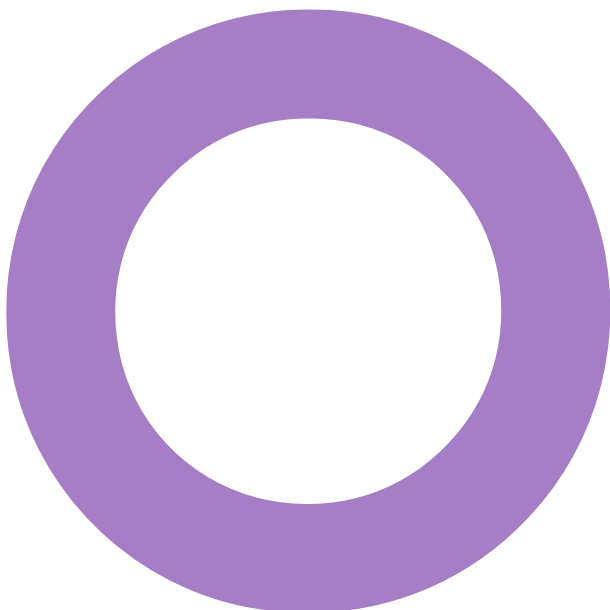


TMC Phase 2. Manchester. **Willmott Dixon Construction.**

ACOUSTICS

ACOUSTIC COMMISSIONING TESTING REPORT

REVISION 00 – 25 FEBRUARY 2025



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	25/02/2025	First issue	AP	PM	PM

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

Project number: 10/14837

Document reference: REP-1014837-5A-AP-20250224-Acoustic commissioning testing report-Rev00 +PM.docx

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1. Introduction.

Hoare Lea has been appointed to carry out pre-completion acoustic testing at The Manchester College City Centre Campus Phase 2 scheme in Manchester.

This report summarises the results of the acoustic measurements with respect to achieving the project criteria, inclusive of the credits being targeted under BREEAM 2018 Hea 05 and Pol 05.

2. Project criteria.

2.1 General.

The acoustic criteria for internal noise levels, sound insulation and reverberation time are presented in Hoare Lea RIBA Stage 4 report *REP-1014659-5A-LR-20230321-Stage 4 acoustic report-Rev01*.

2.2 BREEAM.

2.2.1 Hea 05 - Acoustic performance.

BREEAM 2018 states the following requirements for education buildings:

- **First credit (sound insulation)** - *'Achieve the performance standards set out in Section 1 of Building Bulletin 93: Acoustic design of schools: performance standards, February 2015 (BB93) relating to airborne sound insulation between spaces and impact sound insulation of floors.'*
- **Second credit (internal ambient noise levels)** - *'Achieve the indoor ambient noise level standards set out within Section 1 of BB93 for all room types.'*
- **Third credit (room acoustics)** - *'Achieve the requirements relating to reverberation time for teaching and study spaces set out within Section 1 of BB93.'*

An assessment of the acoustic design set out in Hoare Lea RIBA Stage 4 report against these BREEAM credits is summarised as follows:

- **First credit (sound insulation)** – all sound insulation performance requirements as detailed in Section 5 and Appendix B of the Hoare Lea Stage 4 report are in line with the performance standards set out in BB93.
- **Second credit (indoor ambient noise levels)** – all internal noise level requirements as detailed in Section 4 / Table 1 of the HL Stage 4 report are in line with the performance standards set out in BB93
- **Third credit (room acoustics)** – all reverberation performance requirements as detailed in Section 6 / Table 2 of the HL Stage 4 report are in line with the performance standards set out in BB93.

Based on this, all three of the Hea 05 credits can be targeted.

The specific criteria for each test carried out are reproduced in the results section below.

2.2.2 Pol 05 - noise emissions.

BREEAM Pol 05 requires that plant noise emissions from the scheme must be at least 5 dB below the existing background noise levels at the façade of the nearest noise sensitive buildings.

Based on the results of the noise survey carried out at the site, the overall maximum sound pressure levels for fixed plant, equipment and machinery associated with the development should not exceed the levels presented in Table 1 at the nearby sensitive receptors.

Table 1 Maximum sound pressure level at nearest residential receptor

Time of day	Maximum permissible plant rating level at noise sensitive receptor ($L_{Aeq,15min}$, dB)
Daytime (07:00 to 23:00 hrs)	44
Night-time (23:00 to 07:00 hrs)	37

3. Test details.

3.1 General.

Acoustic measurements were carried out on 29 January and 12 February 2025 by Al Plail. The following assessment was prepared by Al Plail and reviewed by Phil Mann.

The above are all Members of the Institute of Acoustics (MIOA). Hoare Lea acoustics are accredited under the Association of Noise Consultants scheme for site testing – Registration no. 126.

All instrumentation used have valid calibration certificates and the sound level meters comply with BS EN 60804:2001. Further information and certificates for all instrumentation used are held on file.

Full details of the equipment used are presented in Appendix A.

3.2 Site conditions.

During the test visits the internal noise levels were generally driven by building services noise.

It is understood that building services were all balanced and commissioned prior to the acoustic testing visit on 12 February when the building services noise measurements were undertaken.

3.3 Internal ambient noise level measurements.

Internal ambient noise level measurements were carried out in a selection of rooms across all floors as indicated in Appendix B.

Building services noise was the dominant source in all rooms tested. Measurements in each room were carried out over 4x 10 second intervals.

The measurements were carried out with the sound level meter at least 1.2m above the floor and at least 1m from any other reflective surfaces.

3.4 Sound insulation measurements.

Airborne and impact sound insulation measurements were carried out in a selection of rooms across all floors with the partitions measured indicated in Appendix B.

3.5 External plant measurements.

In line with the requirements of BREEAM 2018 Pol 05, attended sample measurements of plant noise emissions have been taken at a number of representative locations at rooftop level. The attended rooftop measurements were carried out in accordance with BS 7445.

4. Internal acoustic testing.

A summary of the acoustic measurements and associated analysis undertaken is provided below, the measurement locations are provided in Appendix B.

4.1 Indoor ambient noise levels.

The results from the indoor ambient noise level measurements are presented in Table 2. The results from the measurement positions in each room have been averaged and are presented against the design requirements.

Building services noise was generally the dominant noise source in all rooms tested.

All building services were understood to be balanced and commissioned with ventilation running at maximum design duty during the measurements.

Table 2 Results of internal ambient noise level measurements

Room	Measured internal noise level, L_{Aeq} (dB)		Pass / Fail
	Measured	Project criteria	
0.05 Workshop	36	≤ 40	Pass
0.14 PC Suite	30	≤ 40	Pass
1.13 Classroom	35	≤ 35	Pass
1.17 Classroom	34	≤ 35	Pass
1.25 Film Classroom	35	≤ 35	Pass
2.01 PC Suite	34	≤ 40	Pass
2.03 PC Suite	39	≤ 40	Pass
2.11 PC Suite	31	≤ 40	Pass
3.01 AAT Room	33	≤ 40	Pass
3.12 Classroom	35	≤ 35	Pass
3.17 Classroom + PC	34	≤ 35	Pass
4.03 Wet Lab	32	≤ 40	Pass
4.16 Dry Lab	33	≤ 40	Pass

4.2 Sound insulation.

The sound insulation performance of a representative sample of walls and floors have been tested in order to assess the sound insulation performance against the design requirements. The results are summarised in Table 3 to Table 5.

Table 3 Results of airborne sound insulation testing of walls

Source room	Receiver room	In-situ sound insulation $D_{nT,w}$ (dB)		Pass / Fail
		Measured	Project criteria	
0.05 Workshop	0.10 Classroom	49	≥ 45	Pass
0.13 PC Suite	0.14 PC Suite	50	≥ 45	Pass
1.13 Classroom	1.12 Classroom	52	≥ 45	Pass
1.13 Classroom	1.15 Classroom	50	≥ 45	Pass
2.02 PC Suite	2.01 PC Suite	50	≥ 45	Pass
2.02 PC Suite	2.03 PC Suite	49	≥ 45	Pass
2.13 Staffroom	2.11 PC Suite	50	≥ 45	Pass
3.12 Classroom	3.11 Classroom (via moveable wall)	40	≥ 40	Pass
3.15 Classroom	3.17 Classroom + PC	54	≥ 45	Pass

Source room	Receiver room	In-situ sound insulation $D_{nT,w}$ (dB)		Pass / Fail
		Measured	Project criteria	
3.11 Classroom	3.06 PC Suite	48	≥ 45	Pass
4.03 Wet Lab	4.02 PC Suite	51	≥ 45	Pass
4.14 Wet Lab	4.16 Dry Lab	49	≥ 45	Pass
4.14 Wet Lab	4.11 Prep	55	≥ 45	Pass

Table 4 Results of airborne sound insulation testing of floors

Source room	Receiver room	In-situ sound insulation $D_{nT,w}$ (dB)		Pass / Fail
		Measured	Project criteria	
1.13 Classroom	0.11 PC Suite	53	≥ 45	Pass
2.02 PC Suite	1.05 PC Suite	53	≥ 45	Pass
4.03 Wet Lab	3.03 PC Suite	57	≥ 45	Pass

Table 5 Results of impact sound insulation testing of floors

Source room	Receiver room	Sound insulation performance $L_{nT,w}$ (dB)		Pass / Fail
		Measured	Project criteria	
2.02 PC Suite	1.05 PC Suite	35	≤ 55	Pass
3.10 PC Suite	2.11 PC Suite	33	≤ 55	Pass
4.03 Wet Lab	3.03 PC Suite	39	≤ 55	Pass

4.3 Reverberation times.

The results of the reverberation time measurements are shown in Table 6. The results from the multiple measurement positions in each room have been averaged. The resultant average reverberation times for each room have been averaged over mid-frequency octave bands: 500Hz, 1kHz, and 2kHz to assess against the design criteria.

Table 6 Results of reverberation testing

Room	Mid frequency reverberation time T_{mf} (s)		Pass / Fail
	Measured	Project criteria	
0.10 Classroom	1.2 ^[1]	≤0.8	Pass ^[1]
0.14 PC Suite	0.8	≤0.8	Pass
1.12 Classroom	1.1 ^[1]	≤0.8	Pass ^[1]
1.15 Classroom	1.1 ^[1]	≤0.8	Pass ^[1]
2.01 PC Suite	0.8	≤0.8	Pass
2.03 PC Suite	0.7	≤0.8	Pass
2.11 PC Suite	0.7	≤0.8	Pass
3.01 AAT Room 01	0.9 ^[1]	≤0.8	Pass ^[1]
3.11 Classroom / 3.12 Classroom (moveable wall open)	1.1 ^[1]	≤0.8	Pass ^[1]
3.17 Classroom + PC	1.1 ^[1]	≤0.8	Pass ^[1]
4.02 PC Suite	0.7	≤0.8	Pass
4.16 Dry Lab	0.7	≤0.8	Pass

^[1] Measurements were affected by flutter echoes (i.e. sound bouncing between parallel surfaces in an empty room) due to these tests being carried out in unfurnished rooms. Once the rooms are furnished, this will provide sound scattering to ensure a diffuse sound field. With fully furnished rooms, the reverberation time is expected to reduce in line with the criteria. It should be noted that the criteria are to apply with fully furnished rooms in line with BB93.

5. BREEAM Pol 05 measurements (noise emissions).

Rooftop plant noise measurements were carried out on the testing visit of 12 February 2025. The following section presents further details on the measurement method applied for the external noise survey and the survey results.

5.1 External survey method.

The measurements at the rooftop area were carried out as set out in Section 3.

Due to the steady, continuous nature of the plant noise, measurements were carried out over 30 second intervals per location. The measurement locations are set out in Appendix C.

5.2 Measured external plant noise levels.

The results of the external attended sample measurements are presented in Table 7. Noise from the nearby external plant was generally the dominant noise source at all measurement positions.

Table 7 Attended sample measurement results from rooftop plant survey

Measurement location / plant item measured	Approx. measurement distance	L _{Aeq,T} (dB)	L _{A90,T} (dB)
Ventilation plant			
AHU/RF/01	1 m	61	60 ^[1]
AHU/RF/02	1 m	59	57 ^[1]
EF/RF/01	1 m	63	62
Condensers / VRF units			
EC/RF/01 & 02	0.5 m	68	68
EC/RF/03a & 03b	0.5 m	68	67
EC/RF/04 & 05	0.5 m	68	68
EC/RF/06 & 07	0.5 m	67	67
EC/RF/08 & 09	0.5 m	65	65
EC/RF/10 & 11	0.5 m	70	70
EC/RF/12 & 13	0.5 m	67	66
EC/RF/14 & 15	0.5 m	70	70
EC/RF/16 & 17	0.5 m	67	66
EC/RF/18 & 19	0.5 m	69	67
EC/RF/20-22	1 m	60 ^[1]	56 ^[1]
EC/RF/23	0.5 m	56 ^[1]	54 ^[1]
EC/RF/24 & 25	0.5 m	62 ^[1]	56 ^[1]
EC/RF/26	0.5 m	57 ^[1]	55 ^[1]
ASHPs			
ASHP/RF/01 & ASHP/RF/02	1 m	65	65
Background – no plant operating / audible			
Background noise measured at various points across the rooftop	N / A	56 – 64	54 - 61

^[1] Measurements were background limited due to general background noise being higher than plant noise being measured. A lower noise level can be expected due to the plant item by itself.

5.3 Pol 05 - External plant noise emissions.

A desktop assessment of the rooftop plant measurements has been carried out to assess cumulative plant noise egress from the proposed development at the nearest noise sensitive receptor. The results of the plant noise assessment are summarised in Table 8.

Table 8 Calculated plant noise levels at nearest noise sensitive premises

Receptor	Plant noise source	Sound pressure level at receptor L _{Aeq} dB	Cumulative plant noise at receptor, L _{Aeq} dB
Future Great Ducie Street site (Great Ducie St side)	Ventilation plant	26	42
	Condensers / VRF	40	
	ASHPs	38	
Future Great Ducie Street site (rear side)	Ventilation plant	26	43
	Condensers / VRF	42	
	ASHPs	32	
Future Old Brewery Gar4dens site	Ventilation plant	18	36
	Condensers / VRF	35	
	ASHPs	28	

It is understood that no plant will be running at night, which will be achieved by time scheduling functionality. The predicted noise levels should therefore be compared to the daytime noise limits only.

The results of the plant noise assessment therefore indicate that the measured building services contributions are compliant with the 44 dB L_{Aeq} daytime plant noise limit set out in Section 2.2.2.

6. BREEAM assessment.

6.1 Hea 05 - Indoor ambient noise levels.

All of the indoor ambient noise level measurements complied with the BB93 and project criteria.

On this basis the available credit under BREEAM Hea 05 can be awarded.

6.2 Hea 05 - Sound insulation tests.

All of the airborne and impact floor tests achieved the BB93 and project criteria.

On this basis the available credit under BREEAM Hea 05 can be awarded.

6.3 Hea 05 - Reverberation time.

All of the reverberation time tests achieved the BB93 and project criteria. Where rooms were empty / unfurnished during the measurements, it should be noted that this considers the anticipated reduction in reverberation time once furniture is included. This is in line with the BB93 requirements with reverberation time criteria applicable to furnished rooms.

On this basis the available credit under BREEAM Hea 05 can be awarded.

6.4 Pol 05 - noise emissions.

The noise measurements and assessment presented in Section 0 demonstrate compliance with the BREEAM Pol 05 criteria.

On this basis the available credit under BREEAM Pol 05 can be awarded.

7. Conclusion.

Acoustic pre-completion tests have been carried out at The Manchester College City Centre Campus Phase 2 scheme to demonstrate compliance against project acoustic criteria and BREEAM 2018 Hea 05 and Pol 05 requirements.

Airborne and impact sound insulation tests, attended sample measurements of indoor and external noise levels and reverberation time measurements have been carried out across the site.

The measured internal ambient noise levels are compliant with the criteria.

The measured sound insulation performances of wall and floors were compliant with the project criteria for all tests carried out.

The measured reverberation times were compliant with the project criteria for all tests carried out. Where rooms were empty / unfurnished during the measurements, it should be noted that this considers the anticipated reduction in reverberation time once furniture is included. This is in line with the BB93 requirements with reverberation time criteria applicable to furnished rooms.

An assessment carried out on the basis of the external plant noise measurements indicates that the cumulative contributions from the installed building services plant are in compliance with the BREEAM Pol 05 requirements.

In relation to the BREEAM commissioning assessment, three credits can be awarded under Hea 05 and one credit under Pol 05.

Appendix A: Testing instrumentation.

The main details of the equipment used during the measurements are given in Table A1. The sound level meter was calibrated before and after the measurements, with no calibration drift.

Table A1 Equipment used during measurements

Instrument description	Type	Manufacturer	Date of last calibration	Calibration certificate number
Sound level meter	2250	Brüel and Kjær	20/11/2023	UCRT23/2498
Microphone	4189	Brüel and Kjær	20/11/2023	UCRT23/2498
Pre-amplifier	ZC0032	Brüel and Kjær	20/11/2023	UCRT23/2498

Appendix B: Acoustic pre-completion test mark-ups.

LEVEL 00

- Business
- Business Adult
- ESOL
- Staff / Meeting / Shared
- Computing - P1
- Back of House / Plant
- Business 16-18
- Access
- Science
- Social / LRC
- Film - P1

COMMERCIAL UNIT
+ 2 9 9 0 0

ION

ION

AREA TO BE DELIVERED BY
ADJACENT DEVELOPMENT

C08 Updated to suit College revised room numbers.	CD	GQ	06.06.24
C07 Amended following incubator hub change instruction 20.03.24.	JMW	GQ	21.03.24
C06 Riser door numbers amended to suit room number.	JMW	GQ	20.02.24
C05 Updated following general design development	JMW	GQ	09.02.24
C04 Blue line sketch information separated	JMW	GQ	23.01.24
C03 Amended following incubator hub change control. As WDC email on 16.01.2024	JMW	GQ	23.01.24
C02 Post Contract Update	EB	GQ	22.09.23
C01 Issued for Contractors Proposals	BS	GQ	18.08.23
P05 Updated to suit revised Fire Strategy	BS	GQ	12.07.23
P04 Updated to suit revised Fire Strategy	BS	GQ	18.05.23
P03 General Coordination Updated	BS	GQ	20.04.23
P02 GA Plans updated to the colleges proposed changes as highlighted. MEP riser sizes amended to suit BOP requirements. Room Occupancies added	BS	GQ	22.03.23
P01 First Issue - For review and comment by Client, M&E and Fire Engineer	RM	JW	09.02.22

City Centre Phase 2
The Manchester College



bba project ref	drawn	checked	date	scale
21187	RM	JW	09/02/22	1:125

description
GROUND FLOOR GA PLAN

project	originator	volume	level	type	role	number	status	revision
CCPH2	- BBA - ZZ	- 00	- DR	- A	- 2101	A5	C08	

B BOND BRYAN



Wall sound insulation test

TB

Floor sound insulation test
(to below)

FA

Floor sound insulation test
(from above)

TA

Floor sound insulation test
(to above)

FB

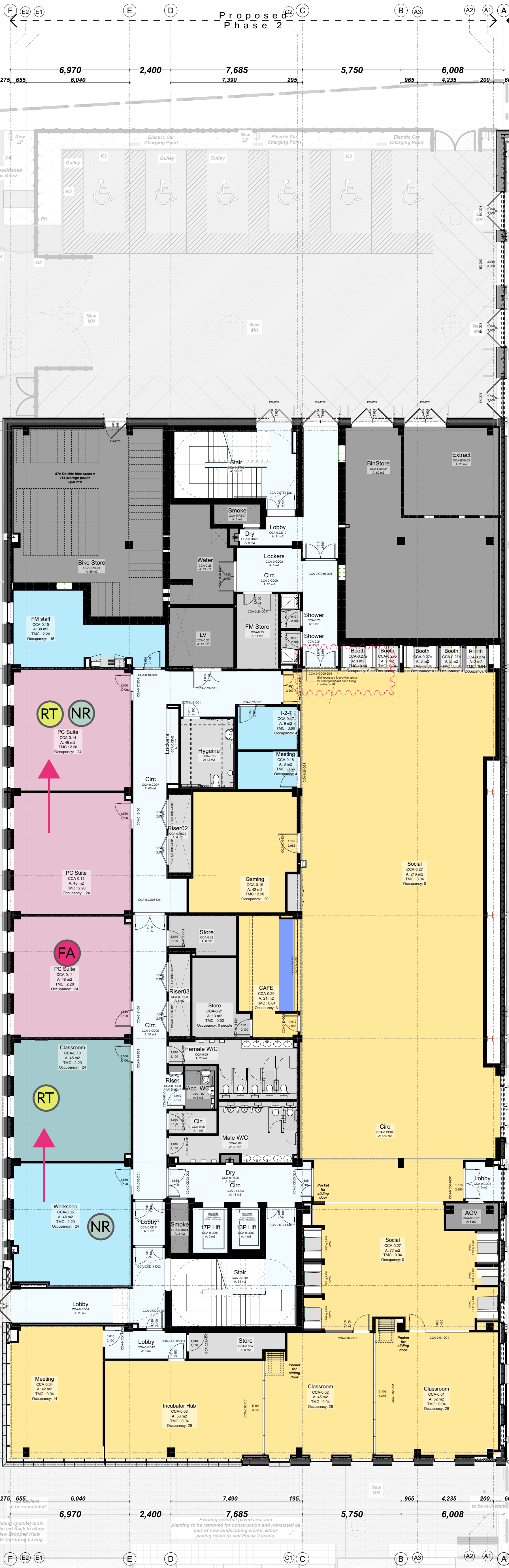
Floor sound insulation test
(from below)

RT

Reverberation test

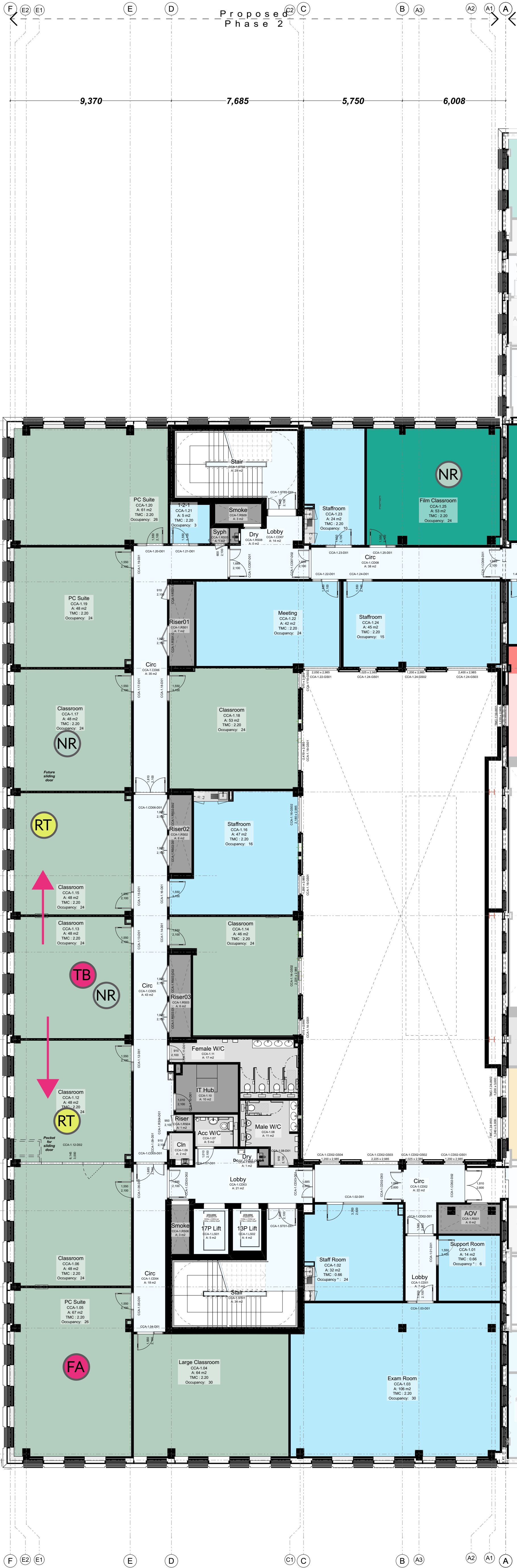
NR

Noise level test



LEVEL 01

- Business
- Business Adult
- ESOL
- Staff / Meeting / Shared
- Computing - P1
- Back of House / Plant
- Business 16-18
- Access
- Science
- Social / LRC
- Film - P1



- Wall sound insulation test
- Floor sound insulation test (to below)
- Floor sound insulation test (from above)
- Floor sound insulation test (to above)
- Floor sound insulation test (from below)
- Reverberation test
- Noise level test

C07 Double swing door amended	JMW	GQ	24.09.24
C06 Riser door numbers amended to suit room number.	JMW	GQ	20.02.24
C05 Updated following general design development	JMW	GQ	09.02.24
C04 Amended corridor following AOV updates	JMW	GQ	22.11.23
C03 Post Contract Update	EB	GQ	22.09.23
C02 Amended following WDC comments	JMW	GQ	19.09.23
C01 Issued for Contractors Proposals	BS	GQ	18.08.23
P04 Updated to suit revised Fire Strategy	BS	GQ	18.05.23
P03 General Coordination Updated	BS	GQ	20.04.23
P02 GA Plans updated to the colleges proposed changes as highlighted. MEP riser sizes amended to suit BOP requirements. Room Occupancies added	BS	GQ	22.03.23
P01 First Issue - For review and comment by Client, M&E and Fire Engineer	RM	JW	09.02.22

City Centre Phase 2
The Manchester College



bba project ref	drawn	checked	date	scale
21187	RM	JW	14/02/22	1:125

description

FIRST FLOOR GA PLAN

project	originator	volume	level	type	role	number	status	revision
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CCPH2 - BBA - ZZ - 01 - DR - A - 2101

A5 C07



BOND BRYAN

LEVEL 02

Business	Business 16-18
Business Adult	Access
ESOL	Science
Staff / Meeting / Shared	Social / LRC
Computing - P1	Film - P1
Back of House / Plant	



Wall sound insulation test

TB

Floor sound insulation test (to below)

FA

Floor sound insulation test (from above)

TA

Floor sound insulation test (to above)

FB

Floor sound insulation test (from below)

RT

Reverberation test

NR

Noise level test



C06 Double swing door amended	JMW	GO	24.09.24
C05 Riser door numbers amended to suit room number.	JMW	GO	20.02.24
C04 Updated following general design development	JMW	GO	09.02.24
C03 Amended AOV setting out	JMW	GO	22.11.23
C02 Post Contract Update	EB	GO	22.09.23
C01 Issued for Contractors Proposals	BS	GO	18.08.23
P04 Updated to suit revised Fire Strategy	BS	GO	18.05.23
P03 General Coordination Updated	BS	GO	20.04.23
P02 GA Plans updated to the colleges proposed changes as highlighted. MEP riser sizes amended to suit BOP requirements. Room Occupancies added	BS	GO	22.03.23
P01 First Issue - For review and comment by Client, M&E and Fire Engineer	RM	JW	09.02.22

City Centre Phase 2
The Manchester College



bba project ref	drawn	checked	date	scale
21187	RM	JW	09/02/22	1:125

description

SECOND FLOOR GA PLAN

project	originator	volume	level	type	role	number	status	revision
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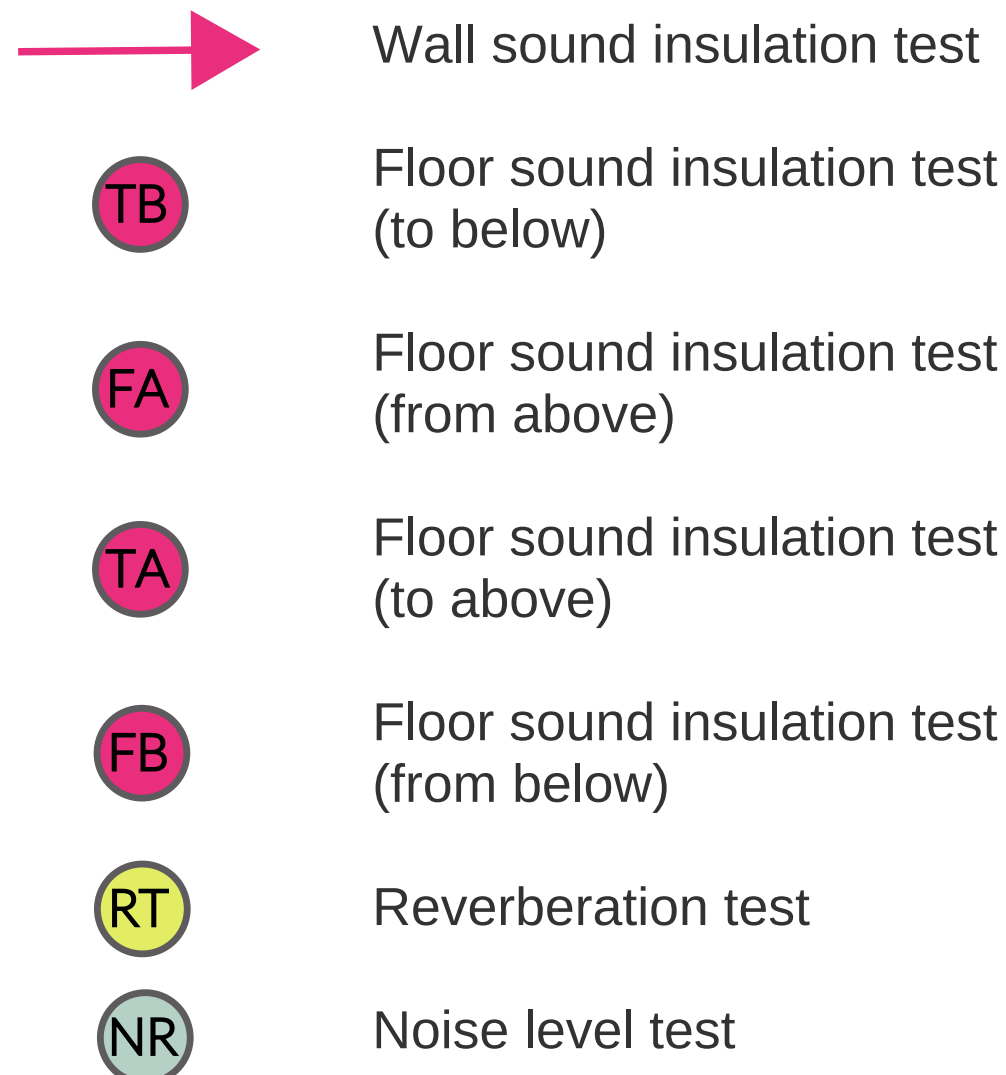
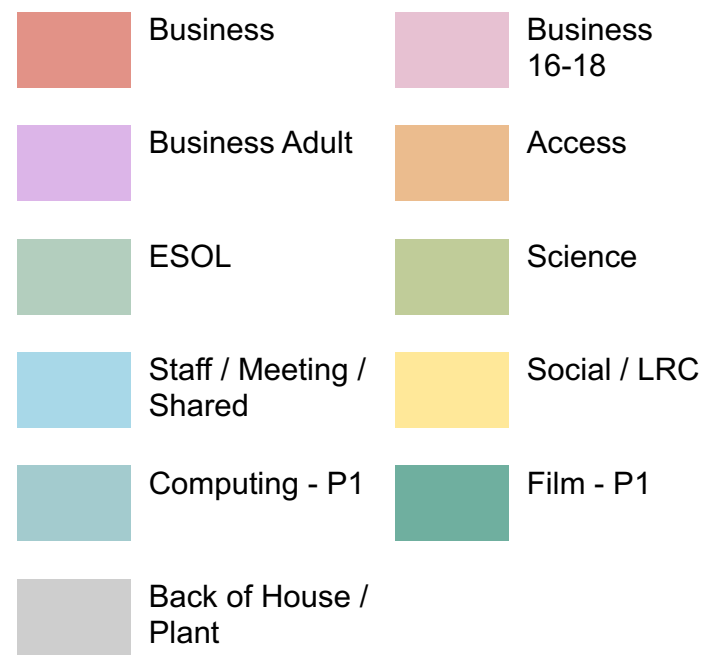
CCPH2 - BBA - ZZ - 02 - DR - A - 2101

A5 C06



BOND BRYAN

LEVEL 03



C05	Double door swing amended	JMW	GQ	24.09.24
C04	Riser door numbers amended to suit room number.	JMW	GQ	20.02.24
C03	Updated following general design development	JMW	GQ	09.02.24
C02	Post Contract Update	EB	GQ	22.09.23
C01	Issued for Contractors Proposals	BS	GQ	18.08.23
P05	Rooms 3, 10&3.11 swapped following college comments	JMW	GQ	15.06.23
P04	Updated to suit revised Fire Strategy	BS	GQ	18.05.23
P03	General Coordination Updated	BS	GQ	20.04.23
P02	GA Plans updated to the colleges	BS	GQ	22.03.23

P01	First Issue - For review and comment by Client, M&E and Fire Engineer	RM	JW	09.02.22
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LEVEL 04

- Business
- Business Adult
- ESOL
- Staff / Meeting / Shared
- Computing - P1
- Back of House / Plant
- Business 16-18
- Access
- Science
- Social / LRC
- Film - P1

Proposed Phase 2

9,370 7,685 5,750 6,008



Wall sound insulation test

TB

Floor sound insulation test (to below)

FA

Floor sound insulation test (from above)

TA

Floor sound insulation test (to above)

FB

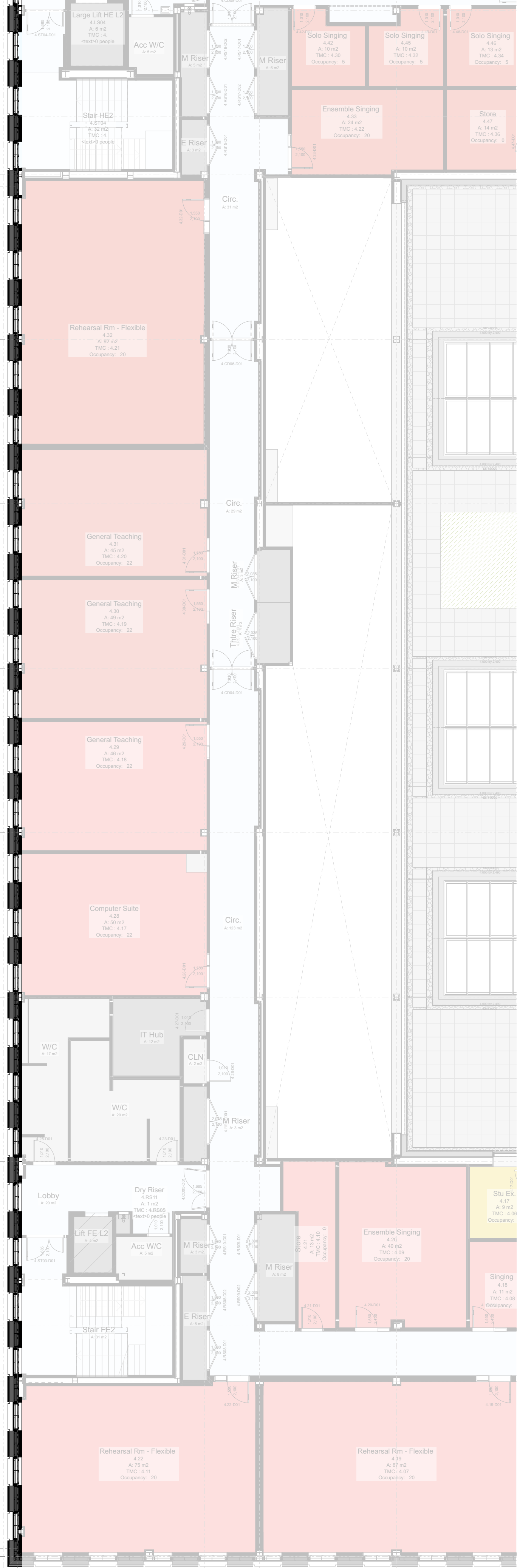
Floor sound insulation test (from below)

RT

Reverberation test

NR

Noise level test



C05 Double door swing amended	JMW	GO	24.09.24
C04 Riser door numbers amended to suit room number.	JMW	GO	20.02.24
C03 Updated following general design development	JMW	GO	09.02.24
C02 Post Contract Comments	JMW	GO	22.09.23
C01 Issued for Contractors Proposals	BS	GO	18.08.23
P04 Updated to suit revised Fire Strategy	BS	GO	18.05.23
P03 General Coordination Updated	BS	GO	20.04.23
P02 GA Plans updated to the colleges proposed changes as highlighted. MEP riser sizes amended to suit BOP requirements. Room Occupancies added	BS	GO	22.03.23
P01 First Issue - For review and comment by Client, M&E and Fire Engineer	RM	JW	09.02.22

City Centre Phase 2
The Manchester College



bba project ref	drawn	checked	date	scale
21187	RM	JW	09/02/22	1:125

description
FOURTH FLOOR GA PLAN

project	originator	volume	level	type	role	number	status	revision
CCPH2	- BBA	- ZZ	- 04	- DR	- A	- 2101	A5	C05





AL PLAIL
ASSOCIATE

+44 161 672 7207
alplail@hoarelealea.com

HOARELEA.COM

Royal Exchange
Manchester
M2 7FL
England

