KP Acoustics Ltd.
info@kpacoustics.com
1 Galena Road, W6 0LT London, UK
+44 (0) 208 222 8778
www.kpacoustics.com

101 Bayham Street
London NW1 0AG

Acoustic Design Review
Report 27909.ADR.01.RevA

QOB Interiors

Report 27909.ADR.01 Revision History			
First Issue Date: 17/04/2024			
A	**22/04/24** Rooftop plant assessment revised – two ASHPs removed, reduced duty during night time considered.	D	
B		E	
C		F	

Written by:	Checked by:	Approved by:
Steven Leslie MIOA Consultancy Manager	**Daniel Stuart MIOA** Senior Consultant	**Oliver Packman MIOA** Principal Consultant

KP acoustics

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1.0 INTRODUCTION

The aim of this report is to define the acoustic requirements for the proposed future offices at 101 Bayham Street, London. Performance specifications will be established, reflecting a pragmatic approach without compromising on the building's intended use.

The following sections describe the required acoustic criteria for the different areas of the building and the findings of our review of the current design.

2.0 GUIDANCE

KP Acoustics have been issued with the BREEAM and WELL trackers for this development. It is also necessary that the planning policies of the Local Authority are adhered to. We have therefore based our acoustic design on the criteria contained within these documents are listed in the following sections.

2.1 BREEAM UK Refurbishment & Fitout 2014

It is understood that compliance with BREEAM UK Refurbishment and Fitout 2014 is targeted. There are up to four 4No. credits available as per the following:

HEA 05 *ACOUSTIC PERFORMANCE*

We understand that the three (3No.) credits within Hea 05 have been targeted for this office development. The available credits may be achieved by compliance with the following assessment criteria, as outlined in the following paragraphs.

First Credit – Sound Insulation

- *Criteria: The sound insulation between acoustically sensitive rooms and other occupied areas complies with the performance criteria given in Section 7 of BS8233:2014.*
- *Testing requirement: A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Additional information section of this BREEAM issue.*
- *Notes: If testing is to be carried out where the office is not yet furnished, then section 7.5 of BS 8233:2014 should be referred to when determining the performance criteria. Where the office is to be furnished at the time testing is carried out, then refer to section 7.7.6 of BS8233:2014 for the relevant performance criteria.*

Second credit – Indoor ambient noise levels

- *Criteria: Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014.*
- *Testing requirement: A programme of acoustic measurements is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlines in the Additional information section of this BREEAM issue.*

Third credit – Room acoustics

- *Criteria: Acoustic environment (control of reverberation, sound absorption and speech transmission index) – Achieve the requirements relating to sound absorption and reverberation times, where applicable, set out in Section 7 of BS8233:2014.*
- *Testing Requirement: A programme of acoustic measurements is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Additional information section of this BREEAM issue.*

POL 05 *REDUCTION OF NOISE POLLUTION*

We understand that the credit detailed within Pol 05 has been targeted for this development.

The available credit (1No.) may be achieved through compliance with the following:

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 BS 4142:2014 is commissioned. Noise levels must be measured or determined for:*
   2a. Existing background noise levels:
   2ai. At the nearest or most exposed noise-sensitive development to the proposed assessed site
   2aii. Including existing plant on a building, where the assessed development is an extension to the building
   2b. 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.*
   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."

2.2 WELL Standard

It is understood that compliance with the requirements of WELL have been targeted. There are up to 6No. 'features' that are proposed to be achieved, outlined as follows:

- S01 Sound Mapping
  - S01.1 Label acoustic zones
  - S01.2 Provide acoustic design plan
  - S01.3 Label acoustic zones
- S02 Maximum Noise Levels
  - S02.1 Limit background noise levels (1.5 points)
- S03 Sound Barriers
  - S03.1 Design for sound isolation at walls and doors (1 point)
  - S03.2 Achieve sound insulation at walls (2 points)

- S04 Reverberation Time
  - S04.1 Achieve reverberation time thresholds (1 point)
  - S04.3 Implement sound reducing vertical surfaces (1 point)
- S05 Sound Reducing Surfaces
  - S05.1 Implement sound reducing surfaces (1 point)
- S07 Impact Noise Management
  - S07.2 Meet thresholds for impact noise rating

S01.1 Label Acoustic Zones

For All Spaces
The project meets following requirements:

a. A floor plan or other design document is made available to occupants showing the following acoustic zones throughout the project:
   1. Loud zone: includes areas intended for loud equipment or activities (e.g., mechanical rooms, kitchens, fitness rooms, social spaces, recreational rooms, music rooms).
   2. Quiet zone: includes areas intended for concentration, wellness, rest, study and/or privacy (e.g., restorative spaces, lactation rooms, nap rooms).
   3. Mixed zone: includes areas intended for learning, collaboration and/or presentation (e.g., auditoriums, classrooms, breakout spaces).
   4. Circulation zone: includes occupiable areas not intended for regular occupancy (e.g., hallways, egress, atria, stairs, lobbies).

b. A plan for reprogramming or mitigating sound transmission between loud zones that border quiet zones (if any).

S01.2 Provide Acoustic Design Plan

For All Spaces
The project provides one of the following:

- A plan developed by the project team and/or project owner that outlines acoustical solutions and a timeline for implementation with a focus on managing acoustical comfort, background noise, speech privacy, reverberation time and/or impact noise within the project boundary.
- A detailed report from a professional in acoustics that describes existing conditions, recommended solutions and measurement results with a focus on managing background noise, speech privacy, reverberation time and/or impact noise within the project boundary. These measurements are not required to adhere to the Performance Verification Guidebook requirements for on-site testing.

S01.3 Label Acoustic Zones

For All Spaces
The following zones are identified and labelled on the project floor plans:

a) Loud zones: includes areas intended for appliances, mechanical equipment or amenities
(e.g., kitchens, fitness rooms, social spaces, recreational rooms).

b) Quiet zones: includes areas intended for focused work, wellness, rest, study and/or privacy.

c) Mixed zones: includes areas intended for learning, collaboration and/or presentation.

S02.1 Limit Background Noise Levels (1.5 points)

For All Spaces
The Contractor to ensure on-site performance test for background noise levels. These should not exceed the levels shown on the table below.

Tier	Sound Pressure Level (SPL)		Category 4 Areas with machinery and appliances used by occupants (e.g., baggage handling areas, security commercial kitchens, labs where spoken lectures do not take place).	Category 3 Open areas for concentration, areas with regularly used PA systems, and areas for dining	Category 2 Enclosed areas for concentration	Category 1 Areas for conferencing, learning or speaking
2	L_{eq}	dBA	50	45	40	35
		dBC	70	65	60	55
	L_{max}	dBA	60	55	50	45
		dBC	80	75	70	65

Table 2.1 S02.1 Criteria

S03.1 Design for Sound Isolation at Walls and Doors (1 point)

For All Spaces
The following requirements are met:

a. Interior walls meet the following sound transmission class (STC) or weighted sound reduction (Rw) values. If an interior wall meets multiple categories listed, use the highest (i.e., more stringent) STC/R_w value listed.

Interior Wall Types	Minimum R_w
Between loud zones and other occupiable spaces	60
Between areas for conferencing, learning or sleeping and other regularly occupied spaces	55
Between adjacent quiet zones	50
Between rooms for concentration and other regularly occupied spaces	45
Between circulations zones and regularly occupied spaces	40

Table 2.2 S03.1 Criteria

b. Doors that connect two occupiable rooms and doors to mechanical equipment rooms have a non-hollow core, minimum STC/R_w of 30 and seals at the head, jamb and base.

S03.2 Achieve Sound Isolation at Walls (2 points)

Option 2: Speech privacy

For walls that separate regularly occupied spaces the following requirements are met:

- The sum of the measured Noise Isolation Class (NIC) or Weighted Difference Level (D_w) combined with the Noise Criteria Rating (NC) or A-weighted Sound Pressure Level (L_{Aeq}) within a room achieves the following minimum values, as applicable. If an interior wall meets multiple categories listed, use the highest value listed.

Source Room	Receiver Room	$D_w + L_{Aeq}$
Enclosed loud zones	Open areas for concentration Circulation zones	80
	All other occupiable areas	85
Enclosed areas for conferencing Enclosed areas for learning Enclosed areas for sleeping	Open areas for concetration Circulation zones	75
	Enclosed quiet zones	80
	Enclosed areas for conferencing Enclosed areas for learning Enclosed areas for sleeping	85
Enclosed quiet zones	Open areas for concentration Circulation zone	70
	Enclosed quiet zones	75
	Enclosed areas for conferencing Enclosed areas for learning Enclosed areas for sleeping	80

Table 2.3 S03.2 Option 2 Criteria

S04.1 Achieve Reverberation Time Thresholds (1 point)

For projects in which the room types listed in the table cumulatively make up at least 10% of occupiable project area, the following requirements are met:

Reverberation time is within the ranges shown in the following table:

Room Type	Room Volume, v	Reverberation Time, t (s)
Areas for learning Areas for lectures Areas for conferencing	V < 10,000 ft^3 V < 283 m^3	t ≤ 0.6
	10,000 ft^3 ≤ v ≤ 20,000 ft^3 283 m^3 ≤ v ≤ 566 m^3	0.5 ≤ t ≤ 0.8
	v > 20,000 ft^3 v > 566m^3	0.6 ≤ t ≤ 1.0
Areas for dining	N/A	t ≤ 1.0

Table 2.4 S04.1 Criteria

S04.3 Implement Sound Reducing Vertical Surfaces (1 point)

Spaces have wall finishes that meet following requirement:

a. Wall treatments meet the specifications described:

Space Type	Minimum NRC/ α_w
Open workspaces Enclosed offices Dining spaces	0.7 for at least 25% of at least one wall
Conference rooms Classrooms	0.7 for at least 25% of at least two (preferably adjacent) walls

Table 2.5 S04.3 Criteria

S05.1 Implement Sound Reducing Surfaces (1 point)

For All Spaces except Dwelling Units

For projects in which the room types listed in the table cumulatively make up at least 10% of occupiable project area, the following requirements are met:

a. Acoustical furnishings meet the criteria shown in the following table:

Room Type	Metric	Tier 1
Open workspaces	Minimum NRC or Alpha-w	0.75 for at least 75% of available ceiling area
	Minimum furniture height and NRC OR Alpha-w	N/A
Areas for conferencing and learning	Minimum NRC or Alpha-w at ceilings	0.75 for at least 75% of available ceiling area
	Minimum NRC or Alpha-w at walls	0.75 for at least 25% of one wall
Areas for dining	Minimum NRC or Alpha-w at ceiling	0.75 for at least 50% of available ceiling area

Table 2.6 S05.1 Criteria

S07.2 Meet Thresholds for Impact Noise Rating (1-2 points)

For All Spaces
The following requirements are met:

For the following room types within the project boundary the floor-ceiling construction achieves the following Normalized Impact Sound Ratings (NISR), as measured by a professional in acoustics, in accordance with ASTM E1007-19, ISO 16283 or equivalent (L_{nTw} may be used as an equivalent metric and may be determined by subtracting the NISR values listed below from 110):

Room Type	Location of Applicable Floor-Ceiling Assembly	Tier 1 1 point Minimum NISR[1]	Tier 2 2 points Minimum NISR[1]
Quiet zones (except areas for concentration)	Above	52	57
Areas for Fitness (If space is within the project boundary)	Below	47	52
Enclosed Areas for Concentration and Conferencing	Above	47	52
Open Areas for Concentration	Above	42	47
Areas for Retail and Dining (If space is within the project boundary)	Below	42	47

Figure 2.6 S07.2 Criteria

2.3 BS8233:2014

Sound Insulation

BREEAM states that, *"the sound insulation between acoustically sensitive rooms and other occupied areas complies with the performance criteria given in Section 7 of BS 8233:2014."*

Section 7 of BS8233:2014 provides an example matrix that can be used to determine the sound insulation requirement of separating partitions once the noise activity, noise sensitivity and privacy requirements for each room and space are established. The example matrix is shown in the following table.

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms		
		Low sensitivity	Medium sensitivity	Sensitive
Confidential	Very high	47	52	57
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

Table 2.4 BS8233 example on-site sound insulation matrix (dB $D_{nT,w}$)

Based on the BS8233 on-site sound insulation matrix shown in Table 2.4, the following room types and sound insulation characteristics have been determined within this development, as shown in Table 2.5.

Room Type	Privacy Requirement	Activity noise of room as a source	Noise sensitivity of room as a receiver
Cellular Office	Moderate	Typical	Medium Sensitivity
Meeting Room			
Open Plan Office	Not private	Typical	Low Sensitivity
Lobby/Reception			
Stairwell			
Toilets/Showers	Moderate	High	Low Sensitivity
Plantroom	Not private	High	Low Sensitivity

Table 2.5 Room types and sound insulation characteristics

If confidentiality is required for any spaces, the proposed sound insulation criteria will need to be revised.

Internal Ambient Noise Levels

BREEAM states, *"Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014."*

Section 7 of BS8233 states that internal noise levels in offices should reside within the following design ranges:

Location Description	Internal Ambient dB $L_{Aeq,T}$ Noise Level (External noise intrusion + internal building services)
Open plan office	45-50
Meeting room	35-45
Executive office	35-40

Table 2.6 BS8233:2014 Internal ambient noise level criteria

Room Acoustics (Reverberation)

In terms of room acoustics and reverberation time (3rd credit), Section 7 of BS8233 references the British Council for Offices specification document, which recommends that a Class A sound absorptive ceiling is installed. It should be noted that the document does not outline specific criteria for various rooms within the development.

Based on previous projects with office spaces where speech intelligibility is paramount, we recommend that the reverberation time criteria outlined in Table 2.7 are achieved within the various office spaces.

Room Type	Example	Reverberation Time Target (s)
Cellular Office	Private offices, interview rooms, meeting rooms	≤ 0.8
Open Place Office	Open plan office spaces	≤ 1.0
Circulation Spaces	Lobbies, entrance halls, receptions, atriums	≤ 1.5

Table 2.7 Recommended reverberation time targets within office spaces

2.4 Local Authority Requirements for External Plant Installations

The guidance provided by The London Borough of Camden for noise emissions of new plant in this instance is as follows:

"The noise criteria, as per the Local Plan 2017 of London Borough of Camden, British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' should be considered as the main reference document for the assessment. The resultant 'Rating Level' would be considered as follows:"

Period	Assessment Location	Rating Level Acceptability Range		
		Green: noise is considered to be at an acceptable level	**Amber:** noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development	**Red:** noise is observed to have a significant adverse effect.
Daytime (07:00-23:00)	Garden used for main amenity (free field) and Outside living or dining or Bedroom window (façade)	10dB below background	9 dB below and 5dB above background	5dB above background
Night-time (23:00-7:00)	Outside bedroom window (façade)	10dB below background and no events exceeding 57dB L_{Amax}	9db below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	5dB above background and/or events exceeding 88dB L_{Amax}

Table 2.8 Camden noise criteria for plant and machinery

2.5 British Council for Offices Guide to Specification

SOUND INSULATION

British Council for Offices *Guide to Specification 2019* (BCO) provides the following acoustic targets for airborne and impact sound insulation across floors.

> *"Vertical sound difference between individual office floors should be at least $D_{nT,w}$ 45dB at shell and core stage or at least $D_{nT,w}$ 48dB if fitted to Cat A standards…*
>
> *Where it is envisaged that the fit out may not include a ceiling, the shell and core shall achieve $D_{nT,w}$ 48dB without the need for further enhancement later…*
>
> *A weighted standardised impact sound pressure level ($L_{nT,w}$) of 60dB is consider to be a reasonable maximum value for floors over office areas…"*

BCO states the following criteria for demise walls that separate different office occupiers:

> *"Demise walls, separating different office occupiers, should give a sound level difference of at least $D_{nT,w}$ 48dB…"*

Additionally, BCO states the following regarding mullions within occupier spaces:

"Flanking transmission horizontally across cladding mullions at potential partitions locations should achieve a weighted normalised flanking level difference of at least $D_{nf,w}$ 45dB…"

INTERNAL AMBIENT NOISE LEVELS

External noise intrusion should be controlled to avoid exceeding the following Noise Rating levels:

Room type	Noise rating (NR)
Cellular offices	NR35
Speculative offices	NR38
Open-plan offices	NR40

Table 2.1 Acoustic design criteria for external noise intrusion

Building services systems will be designed to meet the following internal noise criteria which are presented in the following table. Please note that the following Noise Ratings are the noise limits proposed for building services noise in isolation:

Room type	Noise rating (NR)
Cellular offices	NR35
Speculative offices*	NR38
Open-plan offices, Reception Areas, Lift Lobbies, Circulation Spaces	NR40
Toilets	NR45
Loading Bays, Underground Car Parks	NR55

Table 2.2 Acoustic design criteria for building services noise

The criteria above are based upon building services noise being constant. For variable air volume (VAV) systems, a relaxation up to +5dB may be appropriate at maximum design duty, provided that these criteria are achieved under typical conditions.

Please note that the speculative office criteria are a compromise between open plan and cellular offices, to be used in situations where the final layout of such areas is not known.

3.0 INTERNAL BUILDING FABRIC

3.1 Target Criteria

Sound insulation targets for the development are enclosed within the Appendix B *Sound Insulation Criteria* in order to achieve the requirements presented within the following:

- BREEAM Hea05 *Sound Insulation*
- WELL S03.1 *Design for Sound Insulation at Walls and Doors*
- WELL S03.2 *Achieve Sound Isolation at Walls*
- WELL S07.2 *Meet Thresholds for Impact Noise Rating*

Walls

There are 3no. main airborne sound insulation targets that need to be achieved in order to achieve the requirements of BREEAM. The locations of the partitions where each target is required are shown in Appendix B.

1) **Plantroom walls – Min. Lab Rating 55dB R_w**

   (Note that this will need to be assessed in more detail once plant proposals have been finalised to ensure that the level of sound insulation would be sufficient).

2) **In-situ rating 37dB $D_{nT,w}$**

   (Note that the above rating could be achieved by installing a wall with a laboratory rating of 47dB R_w).

3) **In-situ rating 42dB $D_{nT,w}$**

   (Note that the above rating could be achieved by installing a wall with a laboratory rating of 52dB R_w).

4) **Where there is no specific requirement (min. lab rating 40dB R_w)**

   Whilst there is no specific requirement for compliance with BREEAM for these walls, we would recommend a minimum lab rating of 40dB R_w to be achieved.

Floors

Floors should be designed to achieve a minimum in-situ airborne performance of:-

1) 45dB $D_{nT,w}$ at shell and core stage

2) 48dB $D_{nT,w}$ at Cat A

Floors should be designed to achieve a maximum in-situ impact performance of 60dB $L_{nT,w}$.

3.2 Proposed Walls

We have reviewed the wall types shown in 101BS-SGH-PR-ZZ-DR-A-607 P2 issued on 27th March 2024, and recommend upgrades where required:

1) Plantroom walls – Min. Lab Rating 55dB R_w

It is expected that none of the currently proposed wall types will achieve this acoustic rating. Wall Type 24, which is understood to be proposed to the plant rooms, would miss the target by only 1 dB, which is considered to be a marginal and not noticeable difference and therefore may be considered acceptable; however, it must be noted that this will need to be assessed in more detail once plant proposals have been finalised, to ensure that the level of sound insulation will be sufficient.

Wall Type 20 could be adapted to achieve the rating by adding a plaster finish to both sides, provided the blockwork is at least 1850 kg/m^3.

The required laboratory rating could be achieved by the constructions suggested below. We would be happy to discuss alternative proposals.

- 215mm single leaf blockwork wall (min. density 1,850kg/m^3) and plastered on both sides; OR
- 140mm single leaf blockwork wall (min. density 1,850kg/m^3) and an independent 10mm plasterboard lining; OR
- Independent twin leaf lightweight blockwork wall. Each blockwork leaf should be at least 100mm thick and a minimum density of 1,300kg/m^3.

(Note that this will need to be assessed in more detail once plant proposals have been finalised to ensure that the level of sound insulation would be sufficient).

2) In-situ rating 37dB $D_{nT,w.}$ (approx. lab rating 47dB R_w)

This could be achieved by Wall Type 22, provided the blockwork is at least 1880 kg/m^3, or by Wall Type 20 provided the blockwork is at least 1300 kg/m^3. Plasterboard Wall Types 23 and 24 would be expected to achieve the rating.

It is understood that Wall Type 21p (100mm block) is proposed to be used between toilet cubicles. This wall construction is expected to achieve up to 45 dB R_w for full-density blockwork (min. 1850 kg/m^3) or up to 39 dB R_w for medium density blockwork (1450 kg/m^3), both of which fall short of the required minimum rating. To meet the acoustic rating, the wall should be uprated as per the below recommendations.

- Criteria could be achieved with a single leaf dense 140mm concrete blockwork wall (min. density 1,880kg/m^3); OR
- Criteria could be achieved with a lightweight 100mm concrete blockwork wall (min. density 1,300kg/m^3) and 1no. 12.5mm Soundbloc on RB1 resilient bars and a minimum cavity of 65mm.

3) In-situ rating 42dB $D_{nT,w}$ (approx. lab rating 52dB R_w)

This could be achieved by Wall Type 24, or by Wall Type 20 if the blockwork is at least 1850 kg/$m^3$and a plaster finish is added to both sides,

Alternative recommendations are given below.

- Criteria could be achieved with a single layer of 100mm lightweight blockwork (min. density 1,300kg/m^3), a 90mm cavity, independent timber/metal stud wall lining and 1no. 12.5mm Soundbloc on an RB1 resilient bar; OR
- Criteria could be achieved with a single layer of 100mm blockwork (min. density 1,880kg/m^3), a 65mm cavity, independent timber/metal stud wall lining and 1no. 12.5mm Soundbloc on an RB1 resilient bar.

4) Where there is no specific requirement (min. lab rating 40dB R_w)

- This would require min. 100mm medium dense blockwork (min. 1450 kg/m^3), masonry paint or plaster to one side.

3.3 Proposed Floors

Floor Separating Open Plan Office Levels

The separating floor construction is proposed to be an in-situ concrete slab with a thickness of no less than 200 mm and a raised access floor above, which should be capable of comfortably achieving fit-out the airborne sound insulation requirements.

To satisfy the impact sound insulation requirements above noise sensitive areas, floor coverings should satisfy the following:

- A resilient floor finish with an overall uncompressed thickness of at least 4.5mm (e.g. carpet tiles); **or**
- Any hard finish with resilient element achieving with a laboratory weighted reduction in impact sound pressure level (Δ Lw) of not less than 17 dB when measured in accordance with BS EN ISO 10140-3:2021 and calculated in accordance with BS EN ISO 717-2: 2020.

The above specification may also be achieved by a proprietary raised access floor system, thereby permitting any hard floor finish above.

It shall be the structural engineer's responsibility to ensure that structural vibration due to footfall impacts, plant items, lifts and escalators is reviewed to ensure mid-span excitation is such that 'adverse comment is not expected' when assessed in accordance with BS 6472-1 Table 1, based on heavy trafficked floors with nominal live loads (i.e. as in electronic/paperless offices).

Floor Separating Ground to Plantroom

We would propose a ceiling construction of:-

- 2No. layers of 12.5mm plasterboard on resilient hangers
- 100mm cavity containing 50mm mineral wool.

This specification will need further review upon receipt of the full basement plantroom items proposals.

4.0 EXTERNAL BUILDING FABRIC

4.1 Target Criteria

The following internal ambient noise level requirements are to be adhered to and have been enclosed within KPA Appendix A *Key Criteria*:

- BREEAM Hea05 Internal Ambient Noise Levels – 45-50dBA $L_{eq,T}$
- WELL S02.1 Limit Background Noise Levels – 45dBA $L_{eq,T}$

4.2 Internal Noise Survey

Internal noise levels have been measured by Max Fordham (MXF Noise Impact Assessment Report, Issue 01, 15-09-2023). The measured internal noise levels are as follows:

- 34dBA $L_{eq,T}$ ambient noise level
- 30dBA L_{90} background noise level.

Whilst the noise levels are significantly lower than the provided design range, the results indicate that the external building fabric is suitable to control external noise intrusion.

The low noise levels could lead to reduced privacy issues within the office, particularly in open plan areas. Therefore, the internal noise level would need to be increased to achieve the design range presented in Section 4.1. Provided that the internal building services are assessed

in detail and internal plant noise emissions are controlled, the design range above should be achievable. Our assessment of internal plant noise is presented in Section 5.

Following on from a detailed internal plant noise assessment, and provided our subsequent advice is adhered to, we would expect that internal noise levels would achieve the target range of BREEAM and WELL.

5.0 BUILDING SERVICES

5.1 Internal Building Services Plant Target Criteria

Internal plant noise criteria are enclosed within KPA Appendix A *Key Criteria* and will be assessed to achieve the following minimum requirements of:-

- BREEAM Hea05 *Internal Ambient Noise Levels*
- WELL S02.1 *Limit Background Noise Levels.*

5.2 External Building Services Plant Target Criteria

External plant noise criteria have been set to achieve the minimum requirements of BREEAM Pol05 *Reduction of Noise Pollution* and the Camden Local Plan.

In order to determine suitable external plant noise emissions criteria, MXF have undertaken an environmental noise survey in the area (MXF Noise Impact Assessment Report, Issue 01, 15-09-2023). The measured environmental noise levels are presented within the following table:

Location	Period	Measured Background L_{90} Noise Levels	
		Minimum (dBA)	Representative (dBA)
LT1	Daytime (07:00-23:00)	44	52
	Night-time (23:00-07:00)	40	45
LT2	Daytime (07:00-23:00)	48	57
	Night-time (23:00-07:00)	45	46

Table 5.1 MXF survey results

Based upon the results of MXF's environmental noise survey, the requirements of Camden Local Plan and BREEAM Pol 05, we would propose the following external plant noise emissions criteria to be achieved at the nearest noise sensitive receptor (with all plant, excluding emergency, running simultaneously), as summarised in Table 5.2.

Noise Sensitive Receptor	Period	Maximum External Plant Noise Emission Limit (dBA) at the Nearest Noise Sensitive Receptor
NSR1	Daytime (07:00-23:00)	42
	Night-time (23:00-07:00)	35
NSR2	Daytime (07:00-23:00)	47
	Night-time (23:00-07:00)	36

Table 5.2 Plant noise emissions criteria

Please note that the Local Authority (LA) requirements do not need to be met in order to achieve the BREEAM Pol 05 criteria, however, it should be noted that the requirements of the LA are more onerous than the requirements of BREEAM Pol 05. Therefore, compliance with Camden requirements will also result in compliance with the requirements of BREEAM Pol 05.

The survey measurement positions and locations of nearest noise sensitive receptors (NSRs) are presented within the following figure:

Figure 5.1 Location of NSRs and measurement positions

5.3 Plant Noise Data

The noise data which is available for the proposed plant is shown in Tables 5.3 and 5.4 below.

Source Ref.	Description	Manufacturer	Model
1	Basement ASHP	Daikin	REYA8A
2	Ground Floor ASHP	Daikin	REYA16A
3	First Floor ASHP	Daikin	REYA20A
4	Second Floor ASHP	Daikin	REYA20A
5	Third Floor ASHP	Daikin	REYA20A
6	Fourth Floor ASHP	Daikin	REYA14A
7	UPS VRF	Daikin	RZAG60A
8	UPS VRF	Daikin	RZAG60A
9	Air Handling Unit	Swegon	AD-10001682606
10	FCUs	Daikin	Various

Table 5.3 Proposed plant for which noise data is available

Plant Item	Sound Power Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	1k	4k	8k	
1	81	81	81	79	71	70	65	60	80
2 – Full Duty	84	84	82	84	77	73	71	67	84
2 – Low Noise 4	77	77	75	77	70	66	64	60	77
3, 4, 5 – Full Duty	86	86	87	87	82	78	75	68	88
3, 4, 5 – Low Noise 4	77	77	78	78	73	69	66	59	79
6 – Full Duty	78	78	77	78	71	70	67	64	79
6 – Low Noise 4	71	71	70	71	64	63	60	57	72
7, 8	68	68	65	65	61	51	47	41	66
9 - Fresh Air	86	81	83	85	82	81	79	79	88
9 - Exhaust	87	82	84	86	83	82	80	80	89
9 – Supply	86	81	83	85	82	81	79	79	88
9 - Extract	86	84	88	77	71	69	69	71	82
9 - Casing	79	71	64	68	53	52	49	52	67
10 – FXDA20A	50	47	50	46	48	41	35	28	51
10 – FXDA32A	50	47	50	46	48	41	35	28	51
10 – FXDA40A	50	48	51	47	49	42	36	29	52
10 – FXDA50A	50	49	52	48	50	43	37	30	53
10 – FXDA63A	50	50	53	49	52	44	38	32	54
10 – FXSA80A	44	44	45	54	57	55	50	42	61
10 – FBA50	45	45	43	53	55	55	51	45	60

Table 5.4 Plant noise data

5.4 Internal Plant Noise Assessment

Office Floors - Ventilation

The proposed AHU (item 10) produces high noise levels in the upper frequency bands, which it may not be possible to adequately mitigate using only in-duct attenuators. It is therefore recommended that where the supply ducts at roof level bend to drop down into the building, the bends are internally lined to provide additional high-frequency attenuation of at least 10 dB in the 8kHz octave band. Alternatively, the attenuator selection could be revised for a unit with lower noise output at high frequencies. A specification for the internal lining can be provided in the next design stage if this is adopted.

In-duct attenuator specifications for the supply and extract ductwork connections to the roof AHU are given below. These assume that the ductwork incorporates lined bends as noted above, or that an alternative noise control strategy has been adopted which can provide this.

Attenuator Location	Minimum Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	1k	4k	8k
AHU Supply	7	12	20	33	39	40	35	28
AHU Extract	8	15	25	40	46	47	43	32

Table 5.5 Roof AHU attenuator requirements for internal noise control

We would expect that the above specifications could be achieved with 1500mm long, 30-35% free area attenuators.

Office Floors – Fan Coil Units

We have assessed the noise from fan coil units based on the FCU schedule P23-092/SH-M-5002/R01 dated 2nd April 2024 and the data provided to us. Our calculations indicate that the proposed fan coil unit selections will result in exceedances of the noise criteria on the office floors. It is therefore recommended that the use of quieter units is investigated. Noise levels from the currently proposed units could be reduced via the application of in-line attenuators on the intake and discharge of each unit, however the exact specifications will require further assessment as the available noise data is not supplied in a format which can be used to calculate these accurately.

Crosstalk

Our calculations indicate that common ductwork runs between office floors and between toilet cubicles could undermine the sound insulation provided by the separating partitions. It

is recommended that an allowance is made for 500 mm of acoustic flexible ductwork to the final run to each of these areas in order to control crosstalk.

These specifications can be developed further in the next design stage.

Basement Plant

An AHU will be located in the basement plant room, serving basement and ground floor areas.

Data for this unit is not currently available. It is recommended that allowance is made for attenuators to every branch of AHU ductwork; specifications can be advised in the next stage.

FCUs will be located in the changing rooms and the shared lobby leading to them. Our calculations indicate that these units may exceed the noise criteria slightly when in low fan speed mode and exceed the criteria significantly in medium and high fan speed mode. IT is recommended that alternative selections are sought.

Toilet Ventilation

AHUs are proposed at each floor level to provide ventilation to toilets.

Noise data for these units is not available at this stage. It is recommended that allowance is made for attenuators to every branch of the AHU ductwork; specifications can be advised in the next stage.

5.5 External Building Services Assessment

The proposed roof plant layout is shown on Figure 5.2 below.

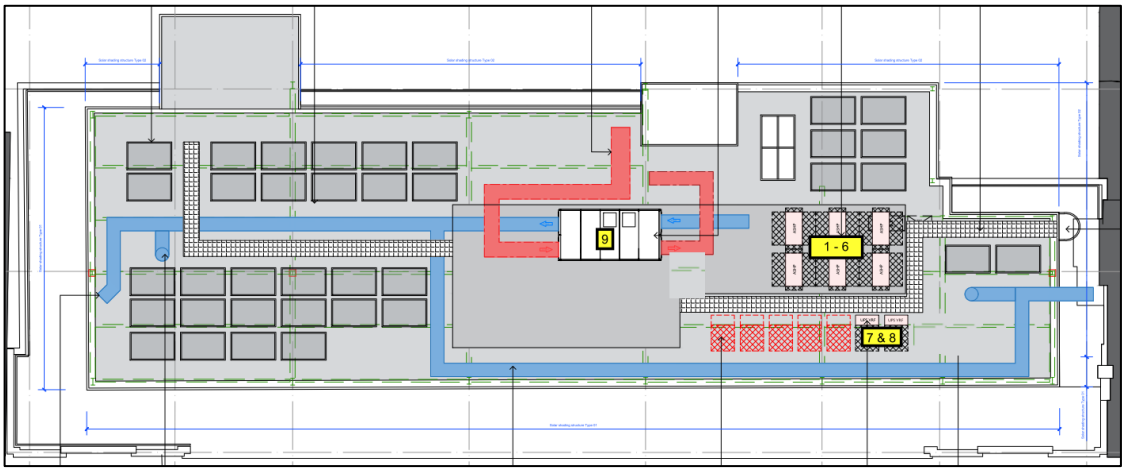


Figure 5.2 Proposed roof plant layout

It is understood that during nighttime hours, the Basement Condenser (item 1) will be off and the remaining condensers (items 2 – 6) will be running in Low Noise Mode 4. The AHU and VRFs will continue to operate at full duty.

Based on the plant layout and the noise data provided, we have calculated the noise emissions to the noise sensitive receptors. Noise mitigation measures will be required in order to meet the required noise criteria.

In-duct attenuators should be provided to the fresh air and exhaust ductwork serving the AHU; the required minimum insertion losses are given in table 5.6 below.

Attenuator Location	Minimum Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	1k	4k	8k
AHU Fresh Air	2	4	9	15	17	14	10	8
AHU Exhaust	2	4	9	15	17	14	10	8

Table 5.6 Roof AHU attenuator requirements for external noise control

We would expect that the above specifications could be achieved with a 500mm long, 50% free area attenuator.

An acoustic enclosure should be provided to the ASHPs (items 1 - 6) meeting the minimum insertion losses specified in table 5.7 below.

Minimum Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	1k	4k	8k
4	3	4	6	11	13	12	10

Table 5.7 ASHP enclosure requirements

The ASHP enclosure should provide the above minimum levels of attenuation to all sides of the plant and over the top. We would expect that the above specification could be achieved with an enclosure formed from 100 - 1500mm deep louvres or a bespoke enclosure design.

It is acknowledged that an alternative noise control strategy may be sufficient to achieve the external noise emission criteria, however any alternative proposals should be assessed by KP Acoustics.

It is understood that there was no requirement noted in the RIBA Stage 2 architectural design for any form of mitigation to the ASHPs. However, it is also noted that the RIBA Stage 2 acoustic design documents issued by MXF did state a requirement for a solid acoustic screen up to 2.2m in height and recommended allowance be made for such in the RIBA Stage 2 cost plan; it is considered likely that the design was not coordinated.

5.6 Vibration Control

In the case of all plant units, appropriate anti-vibration mounts should be installed to ensure that vibrations do not give rise to structure-borne noise. Appendix C outlines advice to ensure that the system installer selects the appropriate anti-vibration mount for the installation.

It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail.

6.0 REVERBERATION CONTROL

6.1 Target Criteria

Reverberation times have been assessed to achieve the following requirements:

- BREEAM Hea05 *Room Acoustics*
- WELL S04.1 *Achieve Reverberation Time Thresholds*
- WELL S04.3 *Implement Sound Reducing Vertical Surfaces.*

6.2 Assessment of Reverberation

Provided that the following recommendations are adhered to, we would expect that the reverberation would comply with the requirements of BREEAM and WELL.

Open Plan Offices

In order to reduce excess reverberation times in open plan offices to be in line with the aforementioned requirements, the following should be implemented:

- Class B absorbent material or more to cover at least 75% of the walls; and
- Class B acoustic ceiling to cover at least 75% of the ceiling area.

The acoustic ceiling requirement could be achieved with hanging baffles. The baffles should be specified to achieve the equivalent absorption area as specified above, with even coverage. Further, it is strongly recommended that the floor finish to the circulation areas of the open plan office be changed to a carpet finish, to further reduce the risk of noise disturbance either between teams or from the atrium to the open plan office areas.

Ground Floor Amenity Space

In order to reduce excess reverberation times in open plan offices to be in line with the aforementioned requirements, the following should be implemented:

- Class B acoustic ceiling to cover at least 50% of the ceiling area.

Assessment of Basement Plantroom

In order to prevent excessive buildup of reverberation within the plantroom which could increase plant noise transfer to the office above, we would recommend allowance for 10-15m^2 of a Class A acoustically absorbent finish within the plantroom. This could be achieved by installing a proprietary acoustic perforated metal panel.

The final requirements for the acoustic finishes in the plant room will be specified once the plant selections are known.

7.0 CONCLUSION

An initial appraisal of the drawings for the proposed office has been undertaken and suitable acoustic specifications have been determined.

Acoustic design criteria have been outlined within the report in order to achieve a suitable acoustic environment within offices.

Recommendations for the internal building fabric, with particular respect to sound insulation have been presented within the report.

The external building fabric has been determined to be sufficient to control external noise break-in. Should a suitable building services design strategy be implemented, internal noise levels would comply with the project requirements.

External building services noise levels have been assessed and mitigation advice given where required.

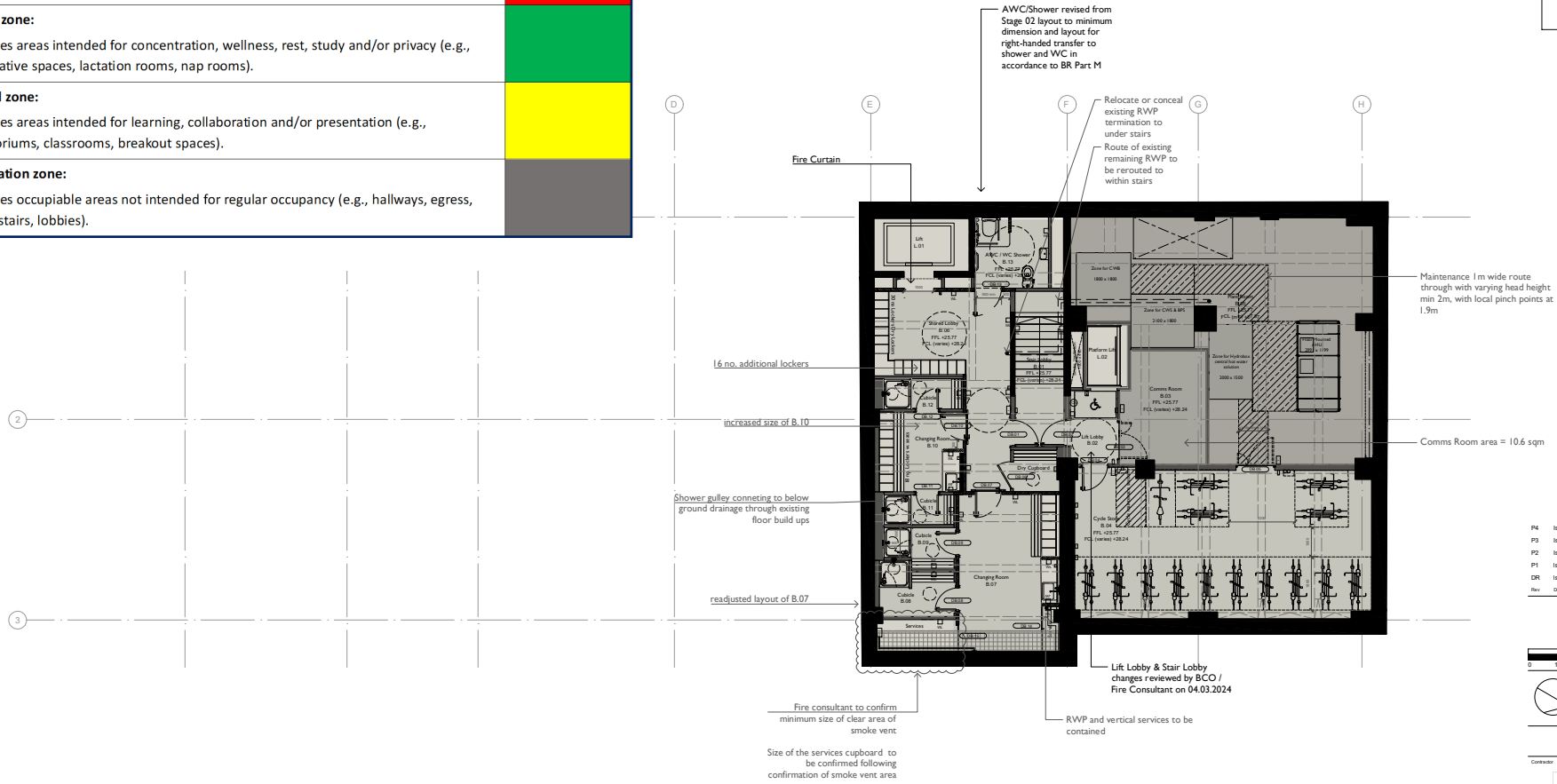
A reverberation control strategy has been recommended for development.

KPA Appendix A - Key Criteria

Acoustic Zone	Colour Key
Loud zone: includes areas intended for loud equipment or activities (e.g., mechanical rooms, kitchens, fitness rooms, social spaces, recreational rooms, music rooms).	
Quiet zone: includes areas intended for concentration, wellness, rest, study and/or privacy (e.g., restorative spaces, lactation rooms, nap rooms).	
Mixed zone: includes areas intended for learning, collaboration and/or presentation (e.g., auditoriums, classrooms, breakout spaces).	
Circulation zone: includes occupiable areas not intended for regular occupancy (e.g., hallways, egress, atria, stairs, lobbies).	

NOTES

- Drawings to be read together with Design Intent information and technical drawings
- All drawings shall be read in conjunction with the fire strategy
- All layouts are subject to compliance review by Building Control
- Drawings are based on survey data and review survey data for further details.
- Do not scale from this drawing. All dimensions are to be verified on site before proceeding with the work.
- Architect shall be notified in writing of any discrepancies.



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P3	Issued for Coordination	DF	OG	25.03.2024
P2	Issued for Coordination	DF	OG	19.03.2024
P1	Issue for Review	DF	OG	14.03.2024
DR	Issue for Review	DF	OG	01.03.2024
Rev	Description	By	Check	Date

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01 | General Arrangement Basement Floor
B-100 | 1:75

STUDIO GHAZAL

Contractor
QOB Interiors
3 Marshalsea Road
London
SE1 1EP

Client
RAILPEN

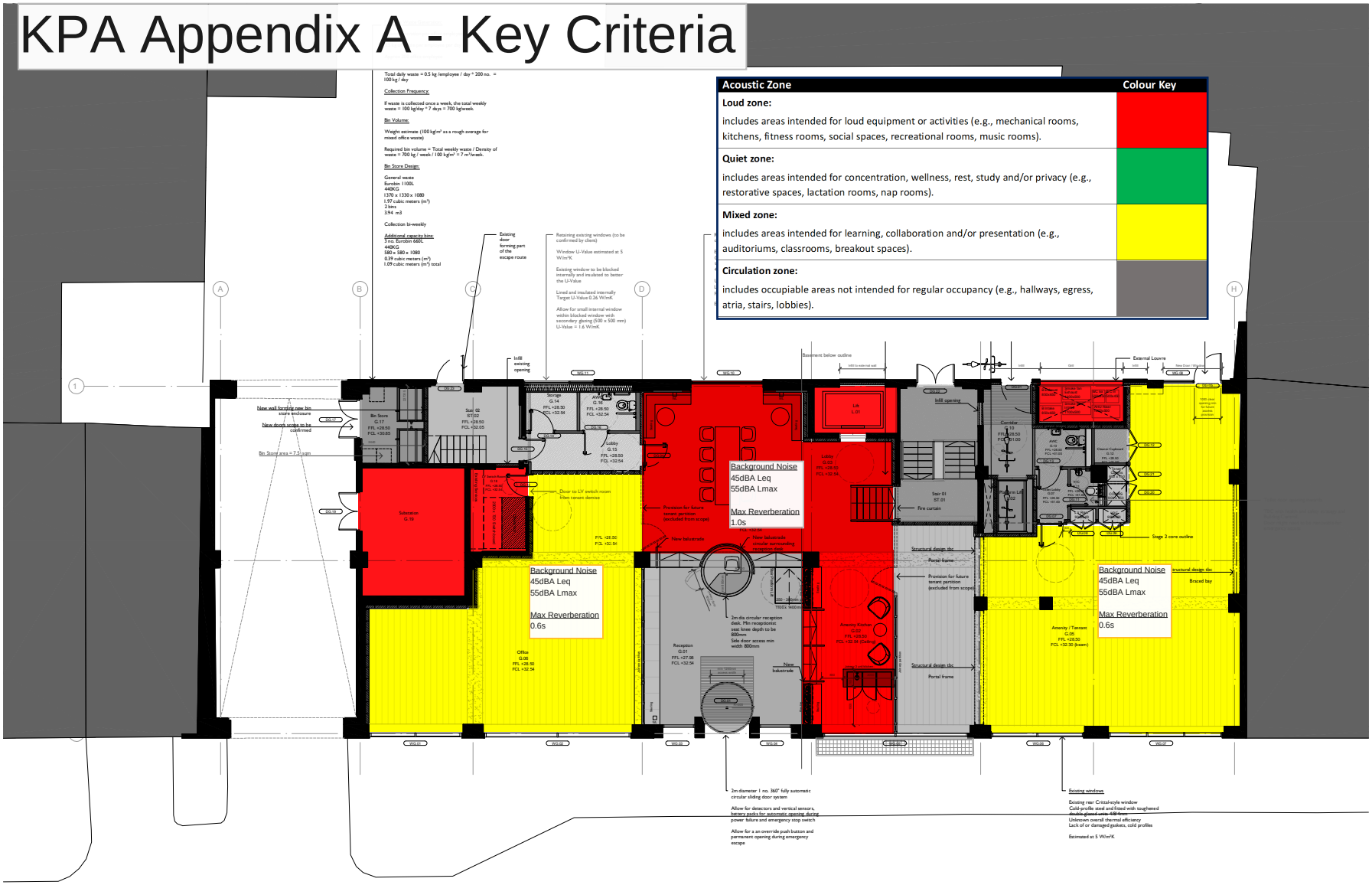
Project
101 Bayham Street,
Greater London, NW1 0AG

Drawing
Proposed Basement Floor GA

Scale	Date	Drawn	Approved
1:75 @ A1	27.03.2024	DF	OG

Drawing No. 101BS-SGH-PR-B-DR-A-100
Revision P4

KPA Appendix A - Key Criteria



01 | General Arrangement Ground Floor

100 | 1:75

NOTES

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P4	Issued for Stage 03	DF	OG	27.03.2024
P3	Issue for coordination	DF	OG	25.03.2024
P2	Issue for coordination	DF	OG	18.03.2024
P1	Issued for review	MT	OG	23.02.2024

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3 Marshalsea Road
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Revision P4

KPA Appendix A - Key Criteria

Acoustic Zone	Colour Key
Loud zone: includes areas intended for loud equipment or activities (e.g., mechanical rooms, kitchens, fitness rooms, social spaces, recreational rooms, music rooms).	
Quiet zone: includes areas intended for concentration, wellness, rest, study and/or privacy (e.g., restorative spaces, lactation rooms, nap rooms).	
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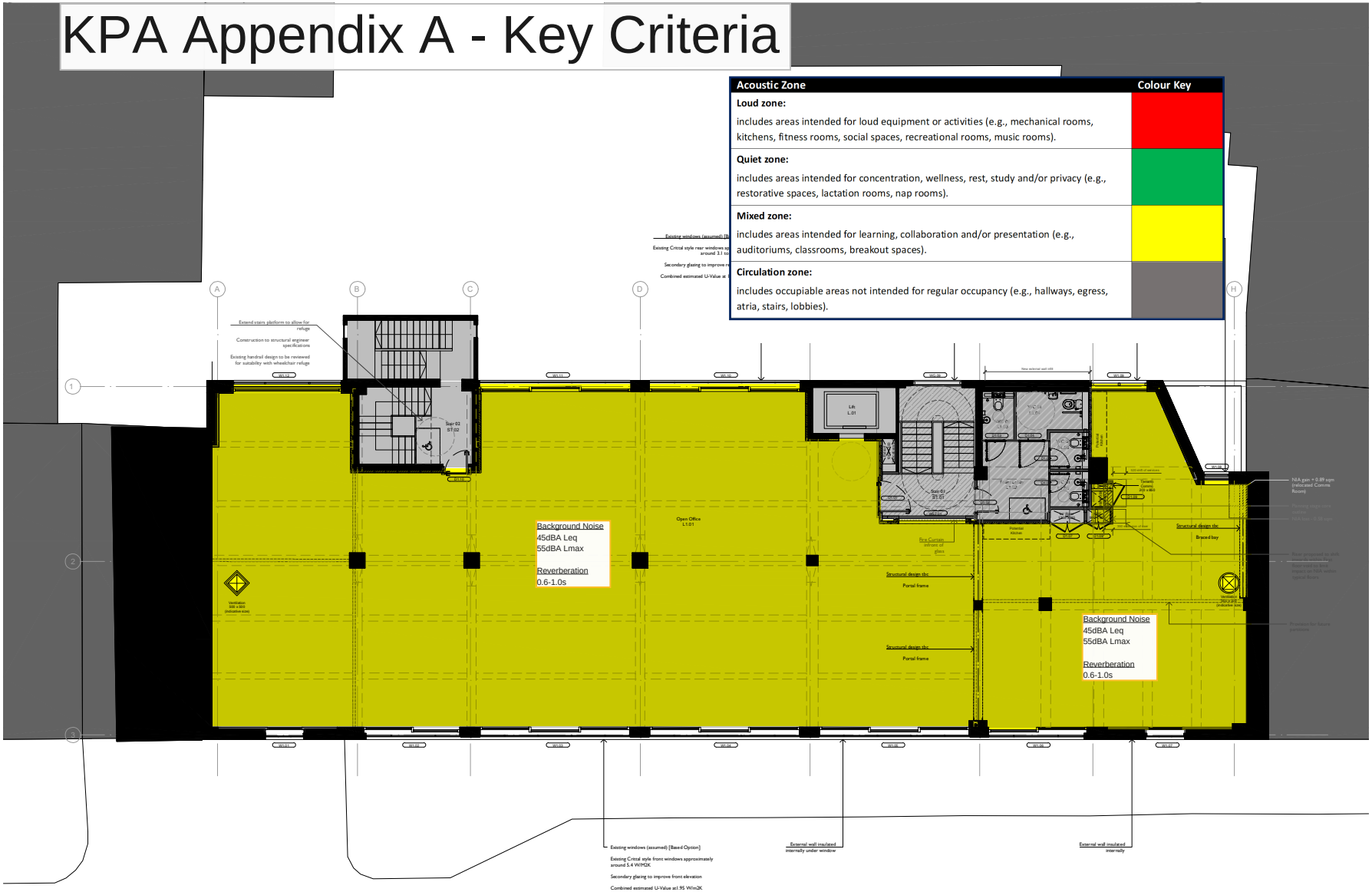
Circulation zone: includes occupiable areas not intended for regular occupancy (e.g., hallways, egress, atria, stairs, lobbies).	



01 | General Arrangement First Floor

01-100 | 1:75

NOTES

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Rev	Description	By	Check	Date
P3	Issued for Stage 03	DF	OG	27.03.2024
P2	Issued for Coordination	DF	OG	25.03.2024
P1	Issue for Review	DF	OG	01.03.2024
DR	Issued for coordination	DF	OG	26.02.2024

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3 Marshalsea Road
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1:75 @ A1	27.03.2024	DF	OG

Drawing No. 101BS-SGH-PR-01-DR-A-100

Revision P3

KPA Appendix A - Key Criteria

Acoustic Zone	Colour Key
Loud zone: includes areas intended for loud equipment or activities (e.g., mechanical rooms, kitchens, fitness rooms, social spaces, recreational rooms, music rooms).	
Quiet zone: includes areas intended for concentration, wellness, rest, study and/or privacy (e.g., restorative spaces, lactation rooms, nap rooms).	
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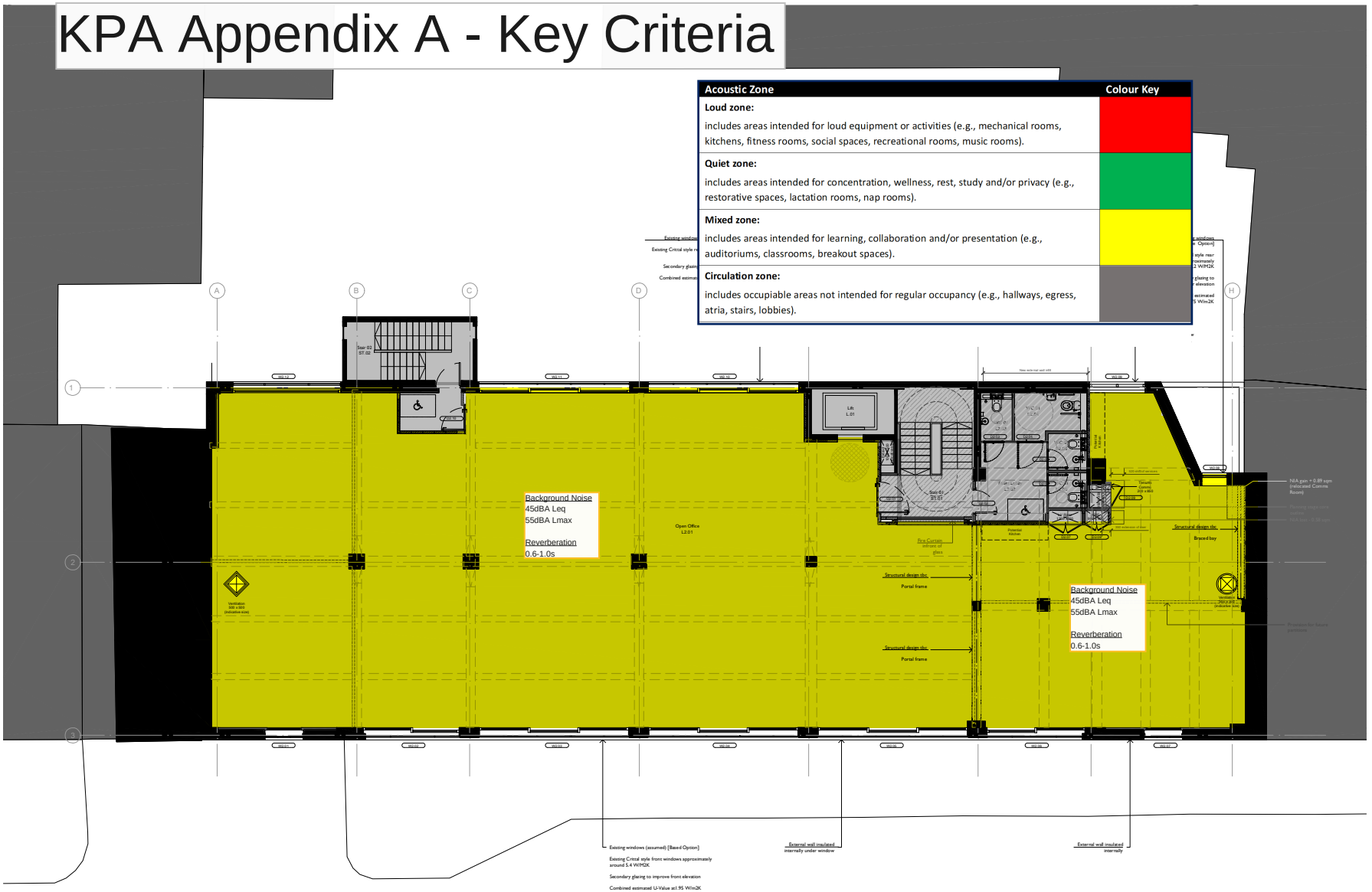
Circulation zone: includes occupiable areas not intended for regular occupancy (e.g., hallways, egress, atria, stairs, lobbies).	



NOTES

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P2	Issued for Stage 03	DF	OG	27.03.2024
P1	Issued for Coordination	FK	OG	25.03.2024
DR	Issue for Review	DF	OG	01.03.2024

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01 | General Arrangement Second Floor

02-100 | 1:75

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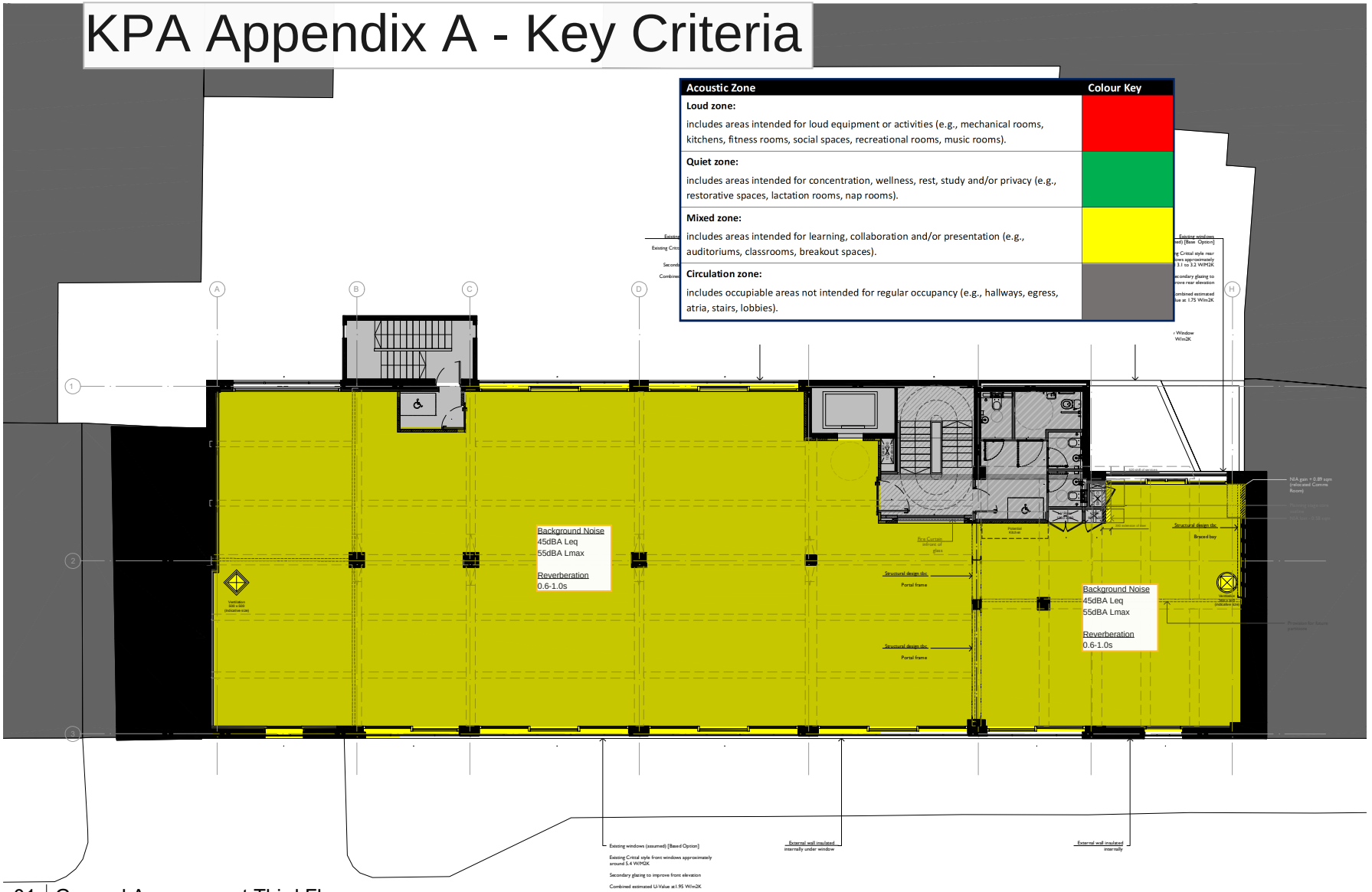
Drawing No. 101BS-SGH-PR-02-DR-A-100

Revision P2

KPA Appendix A - Key Criteria

Acoustic Zone	Colour Key
Loud zone: includes areas intended for loud equipment or activities (e.g., mechanical rooms, kitchens, fitness rooms, social spaces, recreational rooms, music rooms).	
Quiet zone: includes areas intended for concentration, wellness, rest, study and/or privacy (e.g., restorative spaces, lactation rooms, nap rooms).	
Mixed zone: includes areas intended for learning, collaboration and/or presentation (e.g., auditoriums, classrooms, breakout spaces).	
Circulation zone: includes occupiable areas not intended for regular occupancy (e.g., hallways, egress, atria, stairs, lobbies).	



01 | General Arrangement Third Floor

03-100 | 1:75

NOTES

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Rev	Description	By	Check	Date
P2	Issued for Stage 03	DF	OG	27.03.2024
P1	Issued for Coordination	FK	OG	25.03.2024
DR	Issue for Review	DF	OG	01.03.2024

0 1m 2m 3.75m 5m 7.5m

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1:75 @ A1	27.03.2024	FK	OG

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Revision P2

KPA Appendix A - Key Criteria

Acoustic Zone	Colour Key
Loud zone: includes areas intended for loud equipment or activities (e.g., mechanical rooms, kitchens, fitness rooms, social spaces, recreational rooms, music rooms).	
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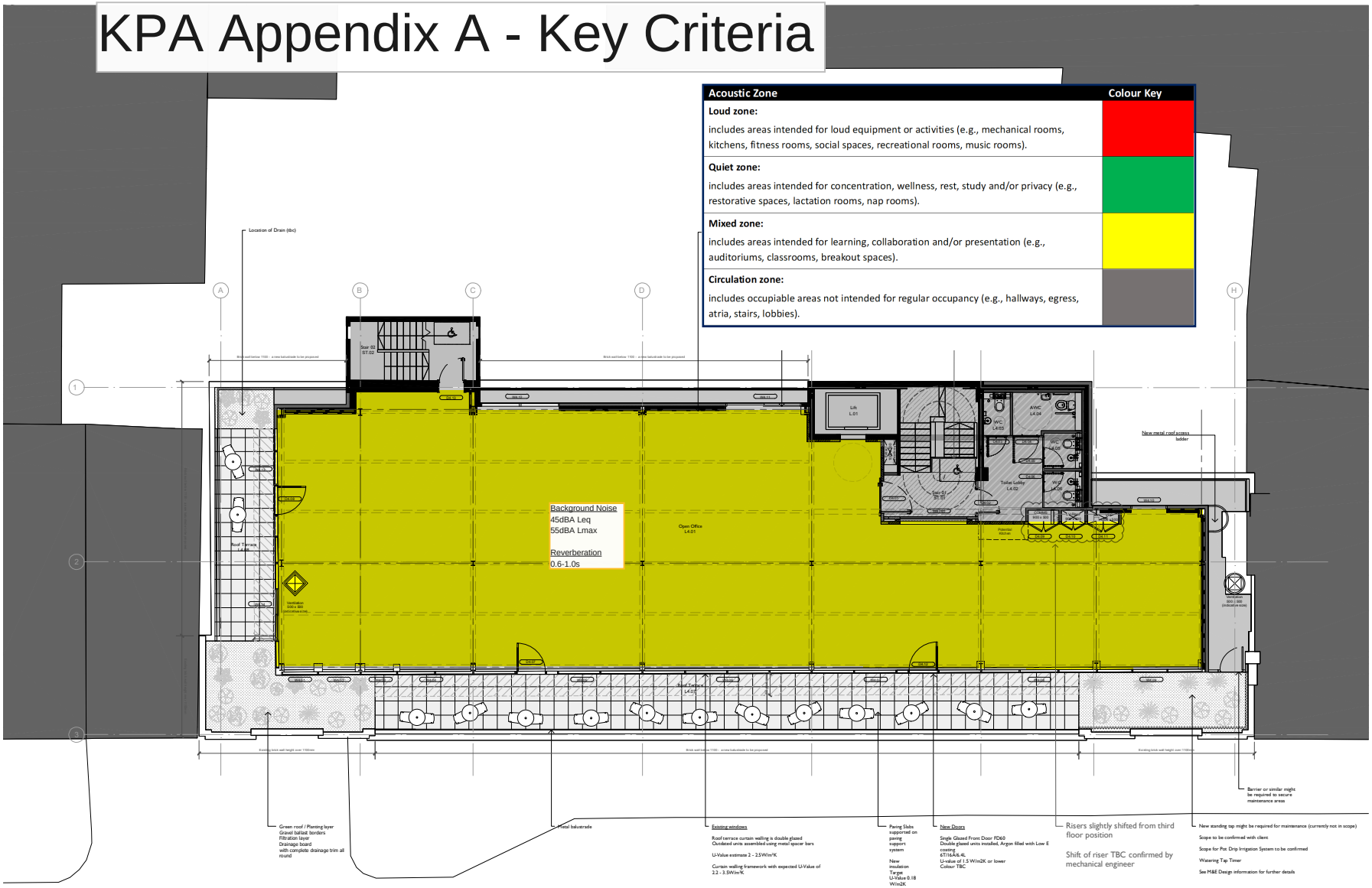

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Rev	Description	By	Check	Date
P2	Issue for Stage 03	FK	OG	27.03.2024
P1	Issue for coordination	FK	OG	25.03.2024
DR	Issue for review	DF	OG	01.03.2024

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01 | General Arrangement Fourth Floor

04-100 | 1:75

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Proposed Fourth Floor GA

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1:75 @ A1	27.03.2024	FK	OG

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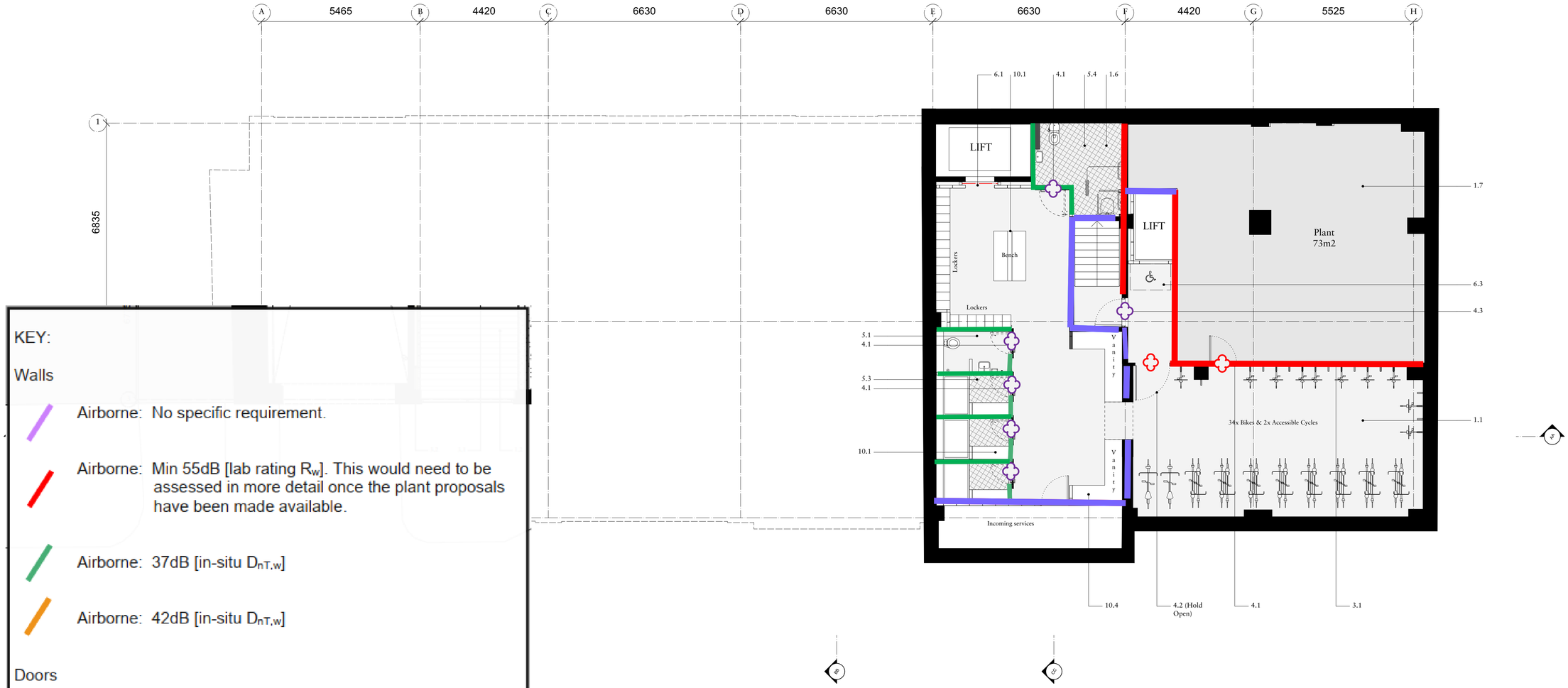
Revision P2

KPA APPENDIX B - SOUND INSULATION CRITERIA

BASEMENT

21-02-2024



General notes

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2. All dimensions are in millimeters unless noted otherwise.
3. This drawing remains copyright of HHbR Ltd.
4. This drawing is based on dimensional survey information provided by others. HHbR cannot accept responsibility for the accuracy of this survey information.
5. All dimensions shall be verified on site before proceeding with work.
6. HHbR shall be notified in writing of any discrepancies.

Specific notes

1.0 Floor Finishes
1.1 Screed - Polished
1.2 Timber Floor - New
1.3 Raised Floor Retained - tba
1.4 Masonry Pavers
1.5 Entrance Mat
1.6 Slip Resistant Tiles
1.7 Screed
1.8 Portland Limestone
1.9 PPC treads

2.0 Windows & Rooflights
2.1 Composite Windows - New
2.2 Existing Glazing - Retained
2.3 Curtain Wall Glazing - New
2.4 Composite Window - New Clear Opening
2.5 Roof Light - & Stairwell AOV - New
2.6 Internal Glazing - non fire rated

3.0 Walls
3.1 Blockwork Wall - Fairface
3.2 Insulated wall lining
3.3 Exposed concrete - sand blasted finish & sealed
3.4 Timber Wall Linings

4.0 Door Types
4.1 Door Leaf - Solid
4.2 Door Leaf - glazed - see fire report
4.3 Door Leaf - glazed
4.4 Glazed Pass Door
4.5 Revolving Door with Nightshield
4.6 Steel Doors
5.0 WC's & Showers
5.1 WC
5.2 Accessible WC
5.3 Shower
5.4 Accessible Shower & WC

6.0 Misc.
6.1 Fire Curtain
6.2 Fire Rated Glazing FD60
6.3 Wheelchair Refuge & Callpoint
6.4 New roof coverings

7.0 Fourth Floor Extension
7.1 Curtain Wall Glazing - Retained
7.2 Existing cladding Panel - replaced to meet 0.3 W/m2K - ppc. finish
7.3 New glazed doors to match curtain walling
7.4 Existing curtain walling capped externally
7.5 Metal balustrade - ppc. finish
7.6 New Planting
7.7 New Glazing - To replace non-DDA compliant door
7.8 Solar shading - 50mm bent circular metal tubes fixed to sub str.

8.0 Plant & MEP
8.3 External Air Handling Ductwork
8.4 Air Handling Duct - Input - special ppc. finish
8.5 Air Handling Duct - Extract special ppc. finish

9.0 Access & Protection from Falling
9.1 New access Ladder - With Block & Tackle hoist
9.2 New metal guarding

10.0 FF&E
10.1 Timber bench - bespoke
10.2 New column
10.3 Timber Reception desk
10.4 Vanity Units -bespoke
10.5 Speed Gates (Provision for future use)
10.6 Kitchenette - details tbc
10.7 Bespoke Timber Screens
11.0 Structural Steelwork - see P&M report

Rev.	Date	Reason for issue	Check

Key

0 2 5 M

Title
Proposed
Basement Plan

Project No.	Drawn	@A3	@A1	Status
9_2208	JS	1:150	1:75	I

Drawing No. 9_2208-SK-1100 **Rev.**

DRAFT

Client
Railpen

Project
101 Bayham Street

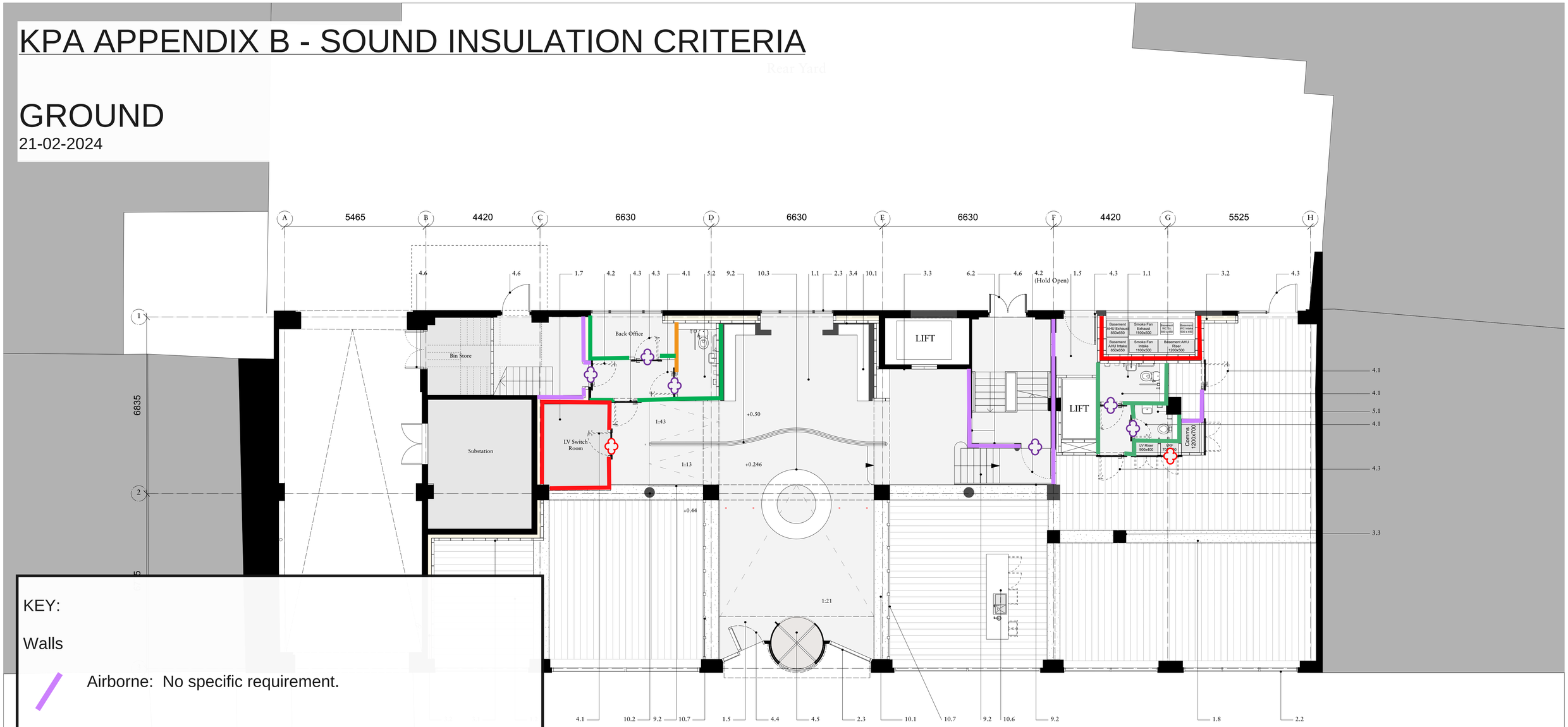
21 Perserverance Works
38 Kingsland Road
London E2 8DD
+44 (0)20 7033 9700
studio@HHbR.co.uk

architects
Henley Halebrown

KPA APPENDIX B - SOUND INSULATION CRITERIA

GROUND

21-02-2024



KEY:

Walls

Airborne: No specific requirement.

Airborne: Min 55dB [lab rating R_w]. This would need to be assessed in more detail once the plant proposals have been made available.

Airborne: 37dB [in-situ $D_{nT,w}$]

Airborne: 42dB [in-situ $D_{nT,w}$]

Doors

≥ 30dB [lab rating R_w]

≥ 35dB [lab rating R_w]

All other doors ≥ 20dB [lab rating R_w]

8.0 Plant & MEP
8.3 External Air Handling Ductwork
8.4 Air Handling Duct - Input - special ppc. finish
8.5 Air Handling Duct - Extract special ppc. finish

9.0 Access & Protection from Falling
9.1 New access Ladder - With Block & Tackle hoist
9.2 New metal guarding

10.0 FF&E
10.1 Timber bench - bespoke
10.2 New column
10.3 Timber Reception desk
10.4 Vanity Units -bespoke
10.5 Speed Gates (Provision for future use)
10.6 Kichenette - details tbc
10.7 Bespoke Timber Screens
11.0 Structural Steelwork - see P&M report

Rev. Date Reason for issue Check

Key

0 2 5 M

Title
Proposed
Ground Floor Plan

Project No. 9_2208 | Drawn JS | @A3 1:150 | @A1 1:75 | Status I

Drawing No. 9_2208-SK-1101 | Rev.

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Project
101 Bayham Street

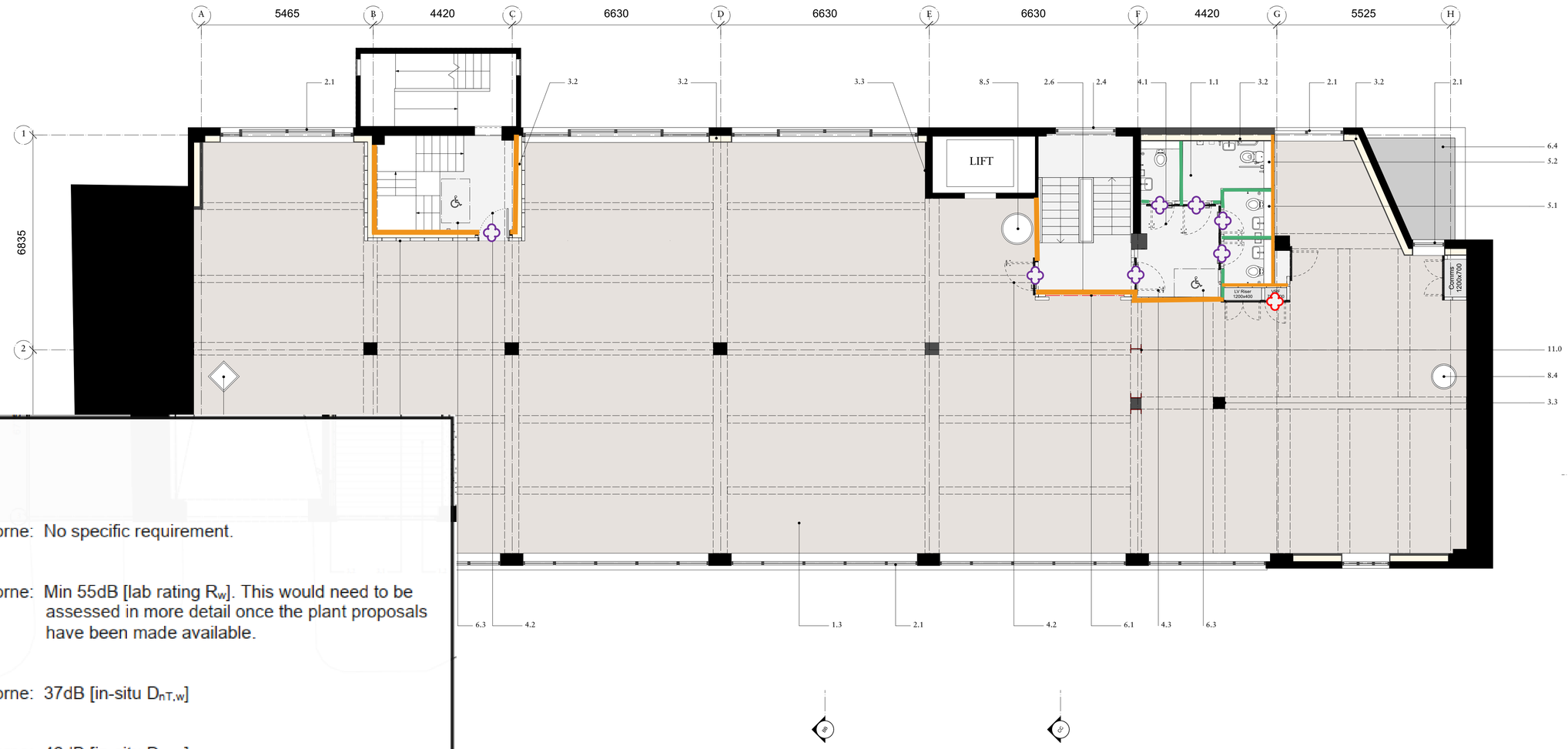
21 Perserverance Works
38 Kingsland Road
London E2 8DD
+44 (0)20 7033 9700
studio@HHbR.co.uk

architects
Henley Halebrown

KPA APPENDIX B - SOUND INSULATION CRITERIA

TYPICAL FLOOR

21-02-2024



KEY:

Walls

Airborne: No specific requirement.

Airborne: Min 55dB [lab rating R_w]. This would need to be assessed in more detail once the plant proposals have been made available.

Airborne: 37dB [in-situ $D_{nT,w}$]

Airborne: 42dB [in-situ $D_{nT,w}$]

Doors

≥ 30dB [lab rating R_w]

≥ 35dB [lab rating R_w]

All other doors ≥ 20dB [lab rating R_w]

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for the accuracy of this survey information.
5. All dimensions shall be verified on site before proceeding with work.
6. HHbR shall be notified in writing of any discrepancies.

1.6 Slip Resistant Tiles
1.7 Screed
1.8 Portland Limestone
1.9 PPC treads

2.0 Windows & Rooflights
2.1 Composite Windows - New
2.2 Existing Glazing - Retained
2.3 Curtain Wall Glazing - New
2.4 Composite Window - New Clear Opening
2.5 Roof Light - & Stairwell AOV - New

4.0 Door Types
4.1 Door Leaf - Solid
4.2 Door Leaf - glazed - see fire report
4.3 Door Leaf - glazed
4.4 Glazed Pass Door
4.5 Revolving Door with Nightshield
4.6 Steel Doors
5.0 WC's & Showers
5.1 WC
5.2 Accessible WC

ver
ssible Shower & WC
.
Curtain
Rated Glazing FD60
elchair Refuge & Callpoint
6.4 New roof coverings

7.0 Fourth Floor Extension
7.1 Curtain Wall Glazing - Retained
7.2 Existing cladding Panel - replaced to meet 0.3 W/m2K - ppc. finish
7.3 New glazed doors to match curtain walling
7.4 Existing curtain walling capped externally
7.5 Metal balustrade - ppc. finish
7.6 New Planting
7.7 New Glazing - To replace non-DDA compliant door
7.8 Solar shading - 50mm bent circular metal tubes fixed to sub str.

8.0 Plant & MEP
8.3 External Air Handling Ductwork
8.4 Air Handling Duct - Input - special ppc. finish
8.5 Air Handling Duct - Extract special ppc. finish

9.0 Access & Protection from Falling
9.1 New access Ladder - With Block & Tackle hoist
9.2 New metal guarding

10.0 FF&E
10.1 Timber bench - bespoke
10.2 New column
10.3 Timber Reception desk
10.4 Vanity Units -bespoke
10.5 Speed Gates (Provision for future use)
10.6 Kitchenette - details tbc
10.7 Bespoke Timber Screens
11.0 Structural Steelwork - see P&M report

Rev. Date Reason for issue Check

Key

0 2 5 M

Title
Proposed
First Floor Plan

Client
Railpen

Project
101 Bayham Street

Project No.	Drawn	@A3	@A1	Status
9_2208	JS	1:150	1:75	I

Drawing No. 9_2208-SK-1102 **Rev.**

DRAFT

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38 Kingsland Road
London E2 8DD
+44 (0)20 7033 9700
studio@HHbR.co.uk

architects
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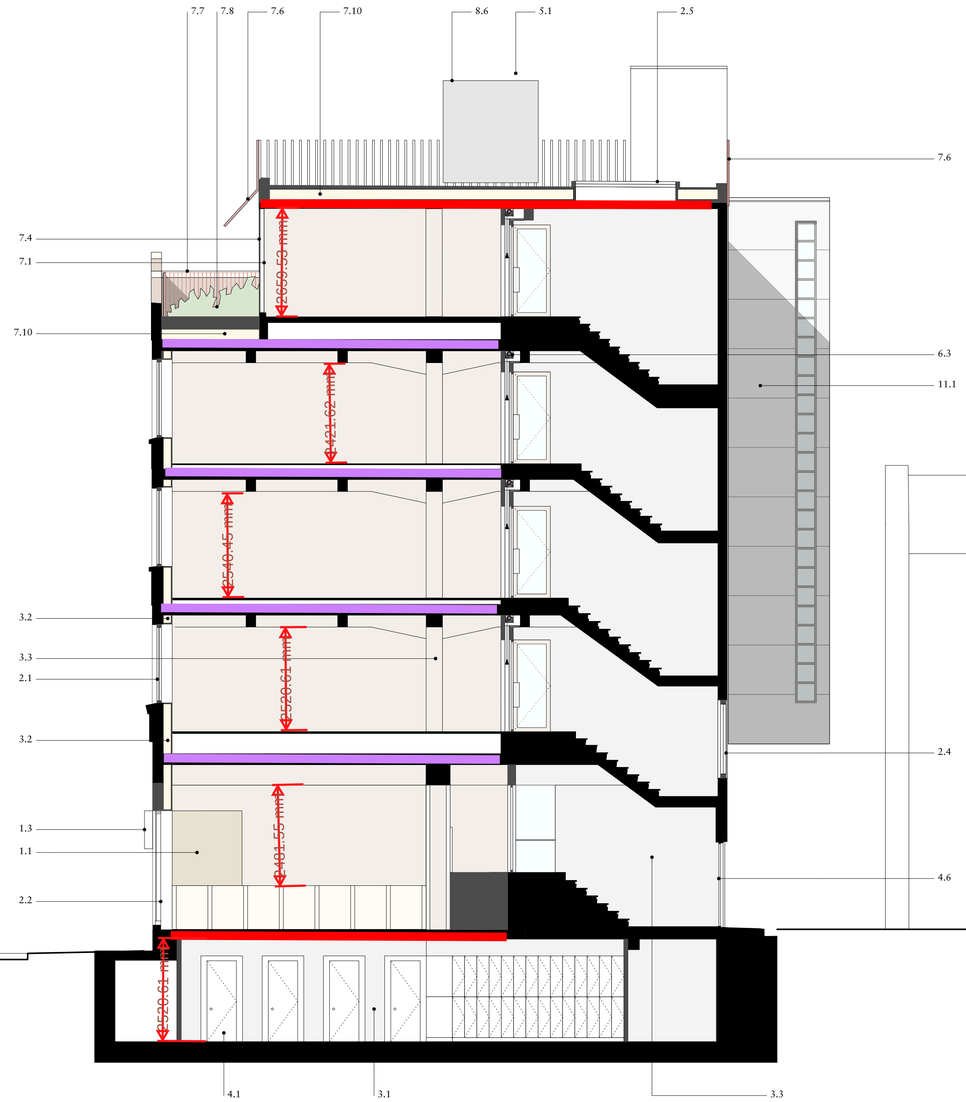
KPA APPENDIX B - SOUND INSULATION CRITERIA

21-02-2024



KEY:

Airborne: ≥45dB (shell & core), ≥48dB (CatA) [in-situ $D_{nT,w}$]
Impact: ≤60dB [$L_{nT,w}$]

Airborne: TBC depending upon plant within the plantroom.
To be assessed once this information is available.
Impact: N/A

General notes

1. Do not scale drawings. Dimensions govern.
2. All dimensions are in millimeters unless noted otherwise.
3. This drawing remains copyright of HHbR Ltd.
4. This drawing is based on dimensional survey information provided by others. HHbR cannot accept responsibility for the accuracy of this survey information.
5. All dimensions shall be verified on site before proceeding with work.
6. HHbR shall be notified in writing of any discrepancies.

Specific notes

1.0 Entrances
1.1 Revolving Door - Four Leaf incl. nightshield - ppc. finish
1.2 Pass Door - installed within curtain glazing system
1.3 Metal canopy - ppc. finish
1.4 Glazed Cycle Entrance

2.0 Windows & Rooflights
2.1 Composite Windows
2.2 Existing Glazing - Retained
2.3 Curtain Wall Glazing - New
2.4 Composite Window - New Clear Opening
2.5 New Roof Light - & Stairwell AOV
2.6 Internal Glazing - non fire rated

3.0 Finishes & Linings
3.1 Fairfaced Blockwork Wall
3.2 Rockwool Insulation - with lining
3.3 Exposed concrete - sand blasted & sealed
3.4 Timber Lining
3.5 Portland Limestone

4.0 Door Types
4.1 Door Leaf - Solid
4.2 Door Leaf - glazed - see fire report
4.3 Door Leaf - glazed
4.4 Pass Door
4.5 Revolving Door with Nightshield
4.6 Steel Door

6.0 Misc.
6.2 Fire Rated Glazing FD60
6.3 Fire Curtain

7.0 Fourth Floor Extension
7.1 Curtain Wall Glazing - Retained
7.2 Cladding Panel - Replaced to meet 0.3 W/m2K - ppc. finish
7.3 External Doors - Replaced to meet DDA compliance
7.4 Window Mullions - Recapped - ppc. finish
7.5 Metal Fascia - Fixed to Substructure - ppc. finish
7.6 Solar shading - 50mm bent circular metal tubes fixed to sub str.
7.7 Metal balustrade - ppc. finish
7.8 Planting - Extent tbc by ecologist
7.9 New Glazing - To replace non-DDA compliant door
7.10 Roof buildup removed and reinsulated

8.0 Plant & MEP
8.3 External Air Handling Ductwork - special ppc. finish
8.4 Air Handling Duct - Input - special ppc. finish
8.5 Air Handling Duct - Extract special ppc. finish
8.6 Air Handling Unit
8.7 Air Source Heat Pumps

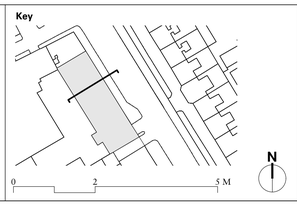
9.0 Access & Protection from Falling
9.1 New access Ladder - With Block & Tackle hoist
9.2 Metal balustrade

10.0 FF&E
10.1 Timber bench - bespoke
10.2 Timber column
10.3 Timber Reception desk
10.4 - Bespoke timber screens

11.0 Secondary Stairwell
11.1 Cladding Panels - Must meet FD60
11.2 Glazing - Must meet FD60
11.3 Cladding Panels - To be retained

Rev. Date Reason for issue Check

Key



Title
Proposed
Section CC

Client
Railpen

Project
101 Bayham Street

Project No.	Drawn	@A3	@A1	Status
9_2208	JJ	1:150	1:75	I

Drawing No. 9_2208-SK-1302 **Rev.**

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studio@HHbR.co.uk

architects
Henley Halebrown

APPENDIX C

ANTI-VIBRATION MOUNTING SPECIFICATION REFERENCE DOCUMENT

1.0 General

1.1 All mountings shall provide the static deflection, under the equipment weight, shown in the schedules. Mounting selection should allow for any eccentric load distribution or torque reaction, so that the design deflection is achieved on all mountings under the equipment, under operating conditions.

1.2 It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail. Particular attention should be paid to mountings which will be exposed to atmospheric conditions to prevent corrosion.

1.3 All mountings shall be colour coded, or otherwise marked, to indicate their load capacity, to facilitate identification during installation.

Where use of resilient supports allows omission of pipe flexible connections for vibration/noise isolation, it shall be the Mechanical Service Consultant's or Contractor's responsibility to decide whether such devices are required to compensate for misalignment or thermal strain.

2.1 Type A Mounting (Caged Spring Type)

2.1.1 Each mounting shall consist of cast or fabricated telescopic top and bottom housings enclosing one or more helical steel springs as the principle isolation elements, and shall incorporate a built-in levelling device. The housing should be designed to permit visual inspection of the springs after installation, i.e. the spring must not be totally enclosed.

2.1.2 The springs shall have an outside diameter of not less than 75% of the operating height, and be selected to have at least 50% overload capacity before becoming coil-bound.

2.1.3 The bottom plate of each mounting shall have bonded to it a rubber/neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.1.4 Mountings incorporating snubbers or restraining devices shall be designed so that the snubbing, damping or restraining mechanism is capable of being adjusted to have no significant effect during the normal running of the isolated machine.

2.1.5 All nuts, bolts or other elements used for adjustment of a mounting shall incorporate locking mechanisms to prevent the isolator going out of adjustment as a result of vibration or accidental or unauthorised tampering.

2.2 Type B Mounting (Open Spring Type)

2.2.1 Each mounting shall consist of one or more helical steel springs as the principal isolation elements, and shall incorporate a built-in levelling device.

2.2.2 The springs shall be fixed or otherwise securely located to cast or fabricated top and bottom plates, shall have an outside diameter of not less than 75% of the operating height, and shall be selected to have at least 50% overload capacity before becoming coil-bound.

2.2.3 The bottom plate shall have bonded to it a rubber/ neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

APPENDIX C

2.3 Type C Mounting (Rubber/Neoprene Type)

Each mounting shall consist of a steel top plate and base plate completely embedded in oil resistant rubber/neoprene. Each mounting shall be capable of being fitted with a levelling device, and should have bolt holes in the base plate and a threaded metal insert in the top plate so that they can be bolted to the floor and equipment where required.

3.0 Plant Bases

3.1 **Type A Bases (A.V. Rails)**

An A.V. Rail shall comprise a steel beam with two or more height-saving brackets. The steel sections must be sufficiently rigid to prevent undue strain in the equipment and if necessary should be checked by the Structural Engineer.

3.2 **Type B Bases (Steel Plant Bases)**

Steel plant bases shall comprise an all-welded steel framework of sufficient rigidity to provide adequate support for the equipment, and fitted with isolator height saving brackets. The frame depth shall be approximately 1/10 of the longest dimension of the equipment with a minimum of 150 mm. This form of base may be used as a composite A.V. rail system.

3.3 **Type C Bases (Concrete Inertia Base: for use with steel springs)**

These shall consist of an all-welded steel pouring frame-work with height saving brackets, and a frame depth of approximately 1/12 of the longest dimension of the equipment, with a minimum of 100 mm. The bottom of the pouring frame should be blanked off, and concrete (2300 kg/m^3) poured in over steel reinforcing rods positioned 35 mm above the bottom. The inertia base should be sufficiently large to provide support for all parts of the equipment, including any components which over-hang the equipment base, such as suction and discharge elbows on centrifugal pumps.