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Renold Building
ID Manchester

“Meanwhile” Office & Commercial Fit-Out Acoustics M&E Design Review

P2416-REP02-R0-JLS
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1 INTRODUCTION

Sol Acoustics Ltd (“Sol”) has been commissioned by Bruntwood Limited (“Bruntwood”) to undertake an acoustic design review of the Stage 4 M&E design information for the proposed “meanwhile” office and commercial refurbishment and fit-out of lower and upper ground floors of the Renold Building on the University of Manchester’s former North Campus.

The proposals for the “meanwhile” use of the Renolds Building are for the “light-touch” reactivation of the building ensuring its meanwhile use will halt any further deterioration, with minimal interventions to ensure the building’s safe use. The proposals generally comprise refurbishment of the lower ground to form flexible public space allowing for pop-up events and exhibitions, as well as an office suite and various meeting rooms. The upper ground floor is to form a co-working space, as well as a large flexible event space, a small community café, and a commercial finishing kitchen to facilitate event catering.

This document presents a review of the Stage 4 M&E design information and identifies any acoustic issues to be addressed with reference to the recommended acoustic design performance standards for the scheme including:

- Internal Ambient Noise Levels
- Building Services Noise Levels

2 BASELINE NOISE SURVEY

2.1 Basis of Assessment

In order to establish the prevailing noise climate at the site, primarily for the setting of plant noise limits in line with the Local Planning Authority guidance, a noise survey has been undertaken.

It should be noted that environmental noise intrusion or operational noise egress (excluding fixed building services plant) are beyond the scope of the acoustic assessment and as such the survey results will only be used to set plant noise limits at this time.

2.2 Noise Survey Methodology

2.2.1 Procedure

Unattended noise level measurements were undertaken at 1no. location at the site from approximately 13:00 hours on Thursday 27 June 2024 to 13:00 hours on Friday 28 June 2024 to establish typical incident noise levels across the extent of the site.

All measurements were taken of the A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{Fmax} sound pressure levels over discrete 15 minute periods. Measurements were undertaken in general accordance with BS 7445-1:2003 Description and Measurement of Environmental Noise.

2.2.2 Measurement Positions

The unattended and attended measurement positions at the development site as shown on Figure 1 and described in Table 1:

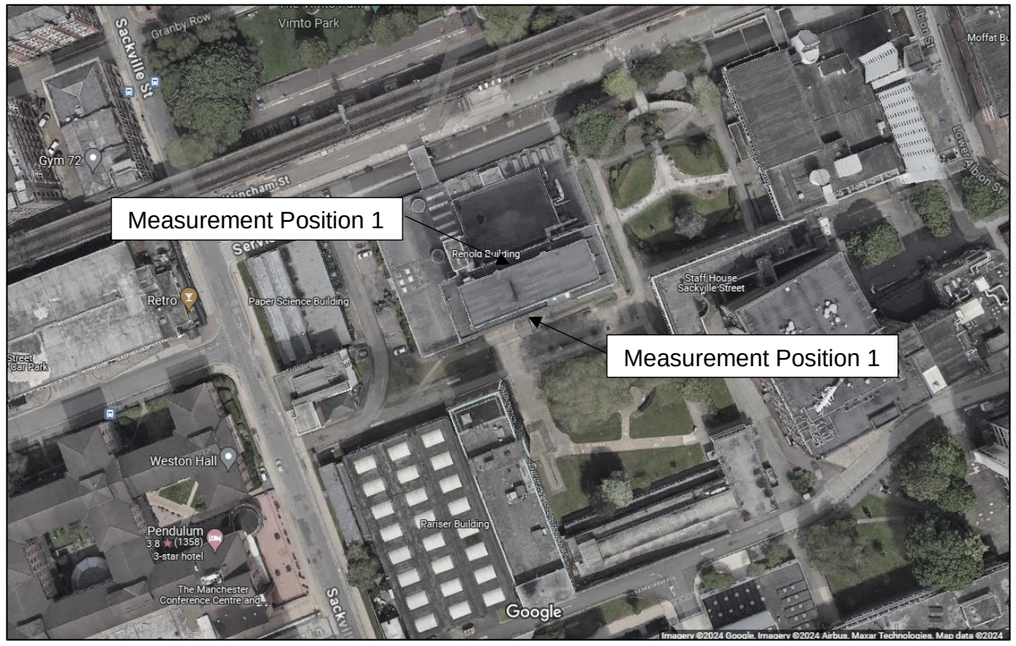


Figure 1: Plan Showing Measurement Positions

Measurement Position	Description
MP1 (Unattended)	Microphone attached to a pole and protruding from a fourth floor window, approximately 1m from the northern tower facade. The soundscape at this position was dominated by rail and road traffic noise from the local road network.
MP2 (Attended)	Microphone attached to a pole and protruding from a fourth floor window, approximately 1m from the southern tower facade. The soundscape at this position was dominated by road traffic noise from the A57(M) to the south.

Table 1: Noise monitoring measurement positions summary

The prevailing weather conditions were generally suitable for the purposes of environmental noise measurements throughout the noise survey. Average rainfall remained below 1mm/h for the entirety of the survey period and for the majority of the survey wind speeds did not exceed 5m/s. Where some exceedances did occur on Thursday 27 June 2024, measured noise levels during these periods have been excluded from further analysis.

Notwithstanding the weather conditions, the microphone systems were entirely weatherproofed and fitted with all-weather environmental windshields, each with a bird spike.

Type 1 Precision Grade sound measuring instrumentation was exclusively used for all surveys. Full details of all the instrumentation used, and corresponding traceable calibration records, are retained on file by Sol and available for inspection if required.

2.3 Environmental Noise Survey Results

Appendix B provides full detailed time history for the environmental noise levels as recorded at Measurement Positions 1 and 2 for the duration of the environmental noise survey.

Table 2 provides a basic summary of the typical overall, A-weighted noise levels measured at the various noise monitoring locations, in $L_{Aeq,T}$ and $L_{A90,15min}$ terms. The specific, measured noise levels pertinent to the required BS4142 environmental noise assessment are highlighted in ***bold, italic*** text:

Date	Measurement Position	Daytime (07:00 – 23:00 Hours)		Night Time (23:00 – 07:00 Hours)	
		dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)
Thursday 25 April 2024	1	56*	50	55	45
	2	60*	57	58	50
Friday 26 April 2024	1	61*	55	-	-
	2	62	59	-	-
** Measurement not conducted for the full assessment period*					

Table 2: Summary of the typical overall, A-weighted noise levels as measured at Positions 1 & 2

3 STANDARDS AND GUIDANCE

3.1 Acoustic Design Standards

The Acoustic Design Standards within this document are based on the following current UK Standards and guidance:

- BS 8233:2014 *Guidance on Sound Insulation and noise reduction for buildings*
- British Council of Offices *Guide to Specifications 2014*
- Finishes and Interiors Sector *Guide to Office Acoustics 2015*

It should be noted that the above documents form best practice guidance only and do not form any statutory requirements.

Please Note: Sol has not received any specific Employer’s Requirements pertaining to the acoustics of the commercial fit-out areas at basement and ground floor.

3.2 Planning Conditions

Planning Permission for the scheme has been granted subject to conditions (ref 139124/FO/2024). Conditions 7 and 9 pertain to acoustics and state the following:

Condition 7

“7)a) Prior to the first use of the development hereby approved, the scheme to acoustically insulate the internal areas of the premises shall be implemented fully and only in accordance with the Technical note: Renolds Building, ID Manchester prepared by BWB received by the City Council as local planning authority on 16 February 2024.

b) Upon completion of the development and before the use hereby approved becomes operational, a verification report shall be undertaken to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that above criteria is met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the noise criteria. This report shall be submitted to and approved in writing by the City Council as local planning authority before the use becomes operational along with a timescale that confirms when any necessary changes will be implemented.

Reason - To ensure an acceptable development in the interests of residential amenity, pursuant to policies DM1 and SP1 of the Core Strategy and saved policy DC26 of the Unitary Development Plan.”

Condition 9

“9)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 the installation of the equipment hereby approved the scheme included the above and the locations on the roof 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) Within 1 month of the equipment hereby approved becoming operational, 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 works 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 non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - To safeguard the amenities of the occupiers of nearby accommodation, pursuant to saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1 and DM1 of the Core Strategy

3.3 BS 4142:2014+A1:2019: *'Method for Rating and Assessing Industrial and Commercial Sound'*

BS 4142:2014+A1:2019 '*Method for rating and assessing industrial and commercial sound'* ("BS 4142") is intended to be used to assess noise of an industrial and commercial nature, which includes sound from fixed installations comprising mechanical and electrical plant and equipment.

The procedure contained in BS 4142: 2014+A1: 2019 for assessing environmental noise impact is to compare the measured or predicted noise level from the source in question, the "Specific Sound Level" immediately outside the noise sensitive premises, with the corresponding "Background Sound Level". Where the noise contains attention attracting characteristics such as tonal, impulsive, and/or intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level to obtain the "Rating Level".

BS 4142: 2014+A1: 2019 states that the significance of sound arising from an industrial and/or commercial nature depends upon both the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, and also the context in which the sound occurs:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.

For the daytime, the assessment is carried out over a one-hour period, and over a 15-minute period at night. The daytime and night-time periods are defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively.

4 INTERNAL NOISE LEVELS

4.1 Internal Ambient Noise Levels

It is commonly accepted that if the background noise of an office is too high, productivity is likely to suffer. Fluctuating noise, such as phones ringing, laughter, and loud speech, affect concentration. Conversely, if background noise levels are too low, privacy can suffer.

Section 7 of BS 8233:2014 includes ambient noise criteria for a variety of spaces used for work and speech, which is reflected in both the British Council of Offices ("BCO") and Finishes and Interiors Sector ("FIS") guidance. Target ambient noise levels should not normally exceed the design ranges given in Table 3 below:

Room Function	Internal Ambient Noise Level Design Range $L_{Aeq,T}$ (dB)
Meeting Rooms	35 – 45
Executive Office / Boardroom / Phone Booth	35 – 40
Cellular Offices	40 – 50
Open Plan Offices	45 – 50
Gallery/Entrance	40 – 45
Circulation Spaces, Toilets	45 – 55
Lounge Areas	50 – 55

Table 3: Internal Ambient Noise Level design range

In areas where acoustic privacy is important, it is recommended that the minimum design range level is achieved to ensure a level of 'masking noise' is present in the space.

In addition, BCO recommends that rain noise should be controlled to 60 dB $L_{Aeq,T}$ during heavy rainfall (as defined within BS EN ISO 140-18:2006). The maximum internal noise limits for building services noise are shown in Table 3, the table shows the criteria in terms of maximum Noise Rating level (*NR*).

4.2 Internal Noise from Building Services

Room Function	Maximum Building Services Noise Limits (NR)
Meeting Rooms/Boardroom	35
Phone Booth	35
Open Plan Offices	40
Gallery/Entrance	40
Circulation Spaces, Toilets	45
Lounge Areas	45

Table 3: Building services Noise Rating limits

For plant rooms, and other occupied spaces not listed above, noise levels should be designed to suit the acoustic requirements of adjacent noise sensitive spaces and shall be reviewed as the M&E design progresses.

5 BUILDING SERVICES

5.1 Proposed External Plant Noise Limits

On the basis of the results of the noise survey and the requirements of MCC, Table 4 sets out the maximum permissible Rating Level to be achieved by the proposed M&E plant associates with the development at the nearest noise sensitive premises:

Location	Maximum Permissible Rating Level, dB $L_{A,Tr}$	
	Daytime (07:00-23:00hrs)	Night-time (23:00-07:00hrs)
Any noise sensitive façade	45	40

Table 4: Plant Rating Limits

The above noise level limits are specified as Rating Levels and as such it will be necessary to consider the acoustic character associated with any of the proposed M&E plant associated with the scheme when predicting the noise impact expected.

5.2 Proposed External Plant Items

Based on the Stage 4 M&E information it is proposed to install the following items of external building services plant on either the second or eighth floor roof as set out in Table 5 below.

Plant Item	Manufacturer	Model	Location
AHU01	AirSource	N/A	2nd Floor Roof
AHU04	AirSource	N/A	2nd Floor Roof
OU01	Mitsubishi	PURY-P350YNW-A	2nd Floor Roof
OU02	Mitsubishi	PURY-P250YNW-A	2nd Floor Roof
OU03	Mitsubishi	PURY-P850YSNW-A2	2nd Floor Roof
OU04	Mitsubishi	PUZ-ZM250YKA2	2nd Floor Roof
OU05	Mitsubishi	PUZ-ZM250YKA2	2nd Floor Roof
OU06	Mitsubishi	PUZ-ZM250YKA2	2nd Floor Roof
OU07	Mitsubishi	PUZ-ZM250YKA2	2nd Floor Roof
OU08	Mitsubishi	PUZ-ZM125YDA	2nd Floor Roof
OU12	Mitsubishi	PURY-P350YNW	8th Floor Roof
OU13	Mitsubishi	PURY-P350YNW	8th Floor Roof
OU14	Mitsubishi	PURY-P350YNW	8th Floor Roof
OU15	Mitsubishi	PURY-P350YNW	8th Floor Roof
OU16	Mitsubishi	PURY-P350YNW	8th Floor Roof
OU17	Mitsubishi	PURY-P450YNW	8th Floor Roof

Table 5: Proposed Plant Items

5.3 Proposed Plant Locations

It is proposed to locate the plant on either the second or eighth floor roof.

Figure 9 shows the proposed locations of the plant:

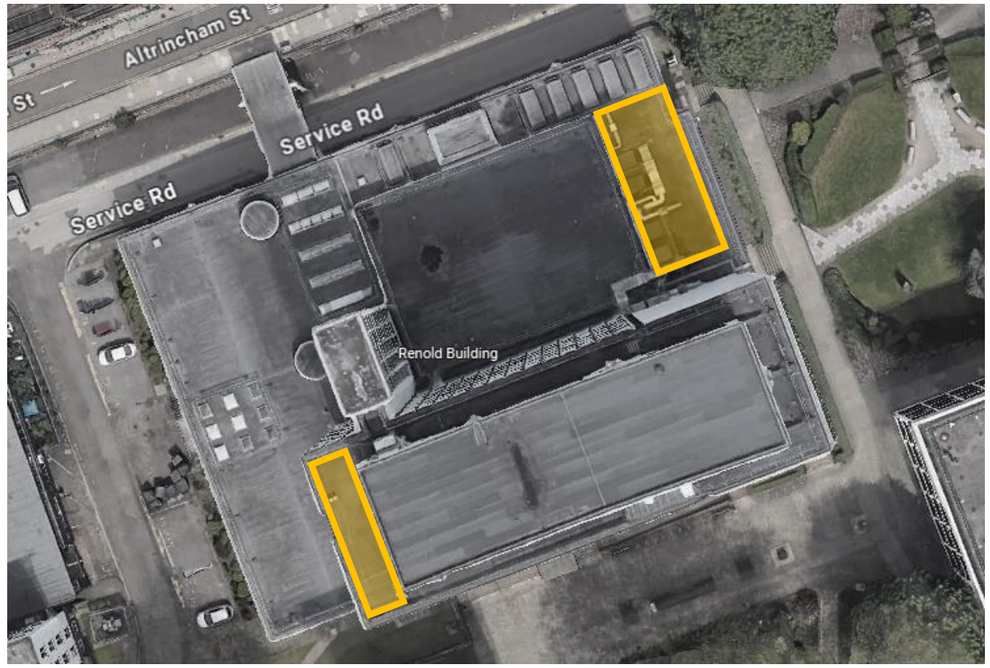


Figure 2: Plan Showing Proposed Plant Locations (maps.google.com)

5.4 External Plant Operational Hours

It is understood that the proposed plant could operate at all hours during both the daytime (07:00-23:00) and the night-time (23:00-07:00).

5.5 External Plant Noise Levels

Table below sets out the manufacturers sound pressure levels at 1 metre from each of the new condenser units:

Manufacturer	Model	Sound Pressure Level @ 1m, dB per Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	dB(A)
Mitsubishi	PURY-P250YNW-A	77	61	61	58	51	49	44	59
Mitsubishi	PURY-P350YNW-A	69	64	64	62	57	52	47	63
Mitsubishi	PURY-P450YNW-A	74	64	67	65	60	55	50	66
Mitsubishi	PURY-P850YNW-A	77	67	70	68	63	58	53	69
Mitsubishi	PUZ-ZM250YKA2	71	61	61	61	56	53	48	62
Mitsubishi	PUZ-ZM125YDA	59	53	51	49	43	40	35	50

Table 7: Condenser Noise Data

Table below sets out the manufacturers in-duct sound power levels for each of the proposed AHU terminals:

AHU	Terminal	Sound Pressure Level @ 1m, dB per Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
01	Fresh Air	59	73	64	64	54	47	39	31
	Supply	65	78	72	71	70	64	58	51
	Extract	60	69	63	62	55	49	44	38
	Exhaust	65	77	70	72	72	69	64	61
04	Fresh Air	62	82	69	65	58	51	43	37
	Supply	72	85	76	76	73	67	61	53
	Extract	64	75	67	63	57	52	46	44
	Exhaust	65	75	54	53	51	46	40	24

Table 8: AHU Noise Data

Table 9 below sets out the proposed attenuators for the atmospheric terminals of the AHU units:

AHU	Terminal	Dynamic Insertion Loss, dB per Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
01	Fresh Air	6	11	21	27	28	22	20	18
	Supply	8	14	25	35	34	27	23	20
	Extract	8	14	25	35	34	27	23	20
	Exhaust	6	11	21	27	28	22	20	18
04	Fresh Air	5	11	19	25	24	19	18	16
	Supply	8	13	23	33	31	24	20	18
	Extract	8	13	23	33	31	24	20	18
	Exhaust	5	11	19	25	24	19	18	16

Table 9: AHU Attenuator Data

5.6 External Plant Noise Assessment

In order to predict the likely resultant plant noise levels at the identified noise sensitive receptors, a 3D computer based environmental noise model has been created using the proprietary DataKustik “CadnaA” Noise Mapping software. The following assumptions have been made in the generation of the noise model:

- The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: ‘*Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation’;*
- The model was set to include up to second-order reflected noise from solid structures;
- Acoustic screening and reflections afforded by nearby buildings and solid structures.

The model predicts the resultant plant noise Specific Level at the noise sensitive receptors with all plant running simultaneously.

A visualisation of the noise model is presented in Figure 3 overleaf.

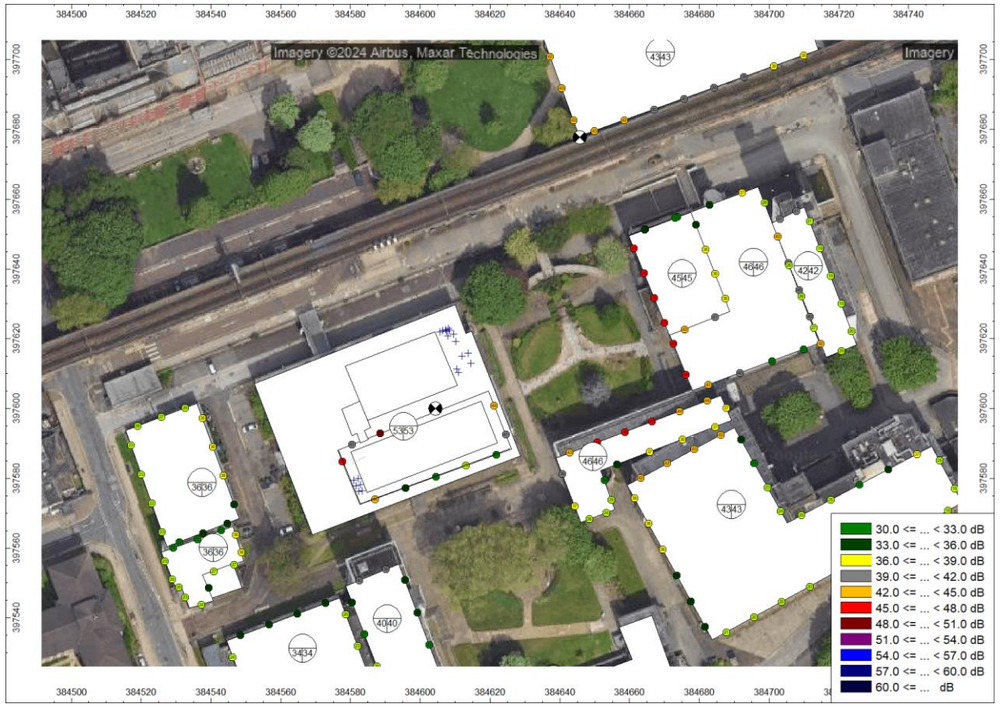


Figure 3: Visualisation of 3D plant noise model (without mitigation), Specific Sound level, dB, L_{Aeq}

5.6.1 BS 4142 Rating Penalty

As the condensers are fan-driven there is a significant probability that the noise generated have a “clearly perceptible” tone at the noise-sensitive receptors. Therefore, a +4dB rating penalty is deemed to be applicable in line with current BS 4142 guidance.

5.6.2 Context

In full accordance with BS 4142 methodology, the context in which the sound occurs must be taken into consideration when demining the magnitude of the noise impact. In this case, the background noise level at site is dominated by transportation noise and other noise sources typical of an urban location. As such, the context of the site is not expected to affect the BS 4142 predicted magnitude of the noise impact generated.

5.6.3 Summary

Table 6 below summarises the results of the plant noise impact assessment:

Receptor	Specific Noise Level, dB, $L_{Aeq,T}$	Acoustic Characted Correction, dB	Rating Level, dB, $L_{Ar,Tr}$	Maximum Permissible Rating Level, dB $L_{A,Tr}$	Exceedance, dB
Renold Building	53	**+4**	57	45	+12
Barnes Wallis Building	45	**+4**	49	45	+4
Proposed Student Resi	43	**+4**	47	40	+17

Table 6: Summary of Plant Noise Assessment

The above assessment indicates that without mitigation the proposed plant is predicted to exceed the relevant LPA plant noise emission limits by up to 17dB which is non-compliant with Condition 9.

5.7 Plant Noise Mitigation

Based on the assessment of the external plant items, in order to comply with the proposed plant noise limits at the worst affected residential windows it will be necessary to reduce the overall noise emissions by a minimum of 17 dBA.

Using the 3D acoustic model the following individual attenuation values presented in Table 15 have been prescribed to the relevant items of plant that are driving the resultant exceedances.

Plant Item	Attenuation Required, dB
OU02	10
OU03	18
OU04	5
OU05	5
OU06	5
OU07	5
OU08	5
OU12	4
OU13	4
OU14	4
OU15	4
OU16	4
OU17	4

Table 15: Summary of Required Mitigation

This can likely be achieved by individual enclosure of the condenser units, or by constructing a louvred covering to the plant compound which would be subject to design by a specialist supplier/manufacturer.

The following companies can be contacted to develop a specific solution to achieve the required attenuation:

- Noico Ltd, (Noico | Noise Control Engineers | Industrial Noise Reduction | Hampshire);
- Caice, (Market Leader in Acoustics and Air Movement Products | Caice);
- Wakefield Acoustics, (Industrial Noise Control Solutions | Wakefield Acoustics)

A visualisation of the noise model with the above reductions in noise levels implemented is presented in Figure 4 below.

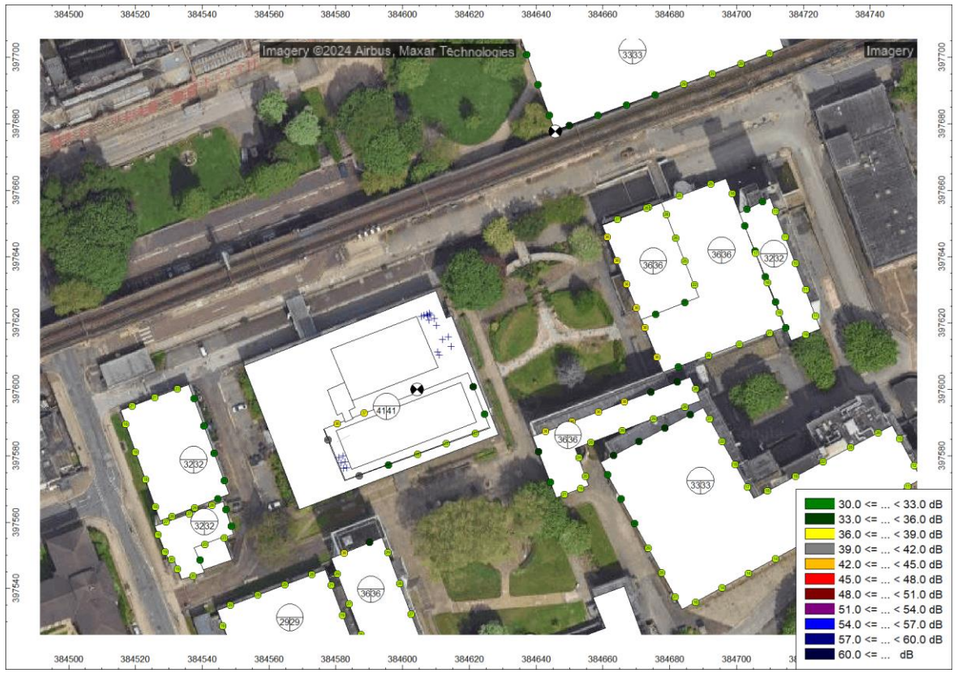


Figure 4: Visualisation of 3D plant noise model (with mitigation), Specific Sound level, dB, L_{Aeq}

5.8 Proposed Internal Plant Items

5.8.1 Variable Refrigerant Flow Units (VRF)

Table 16 below summarises the manufacturers noise data for the various proposed variable refrigerant flow units running at medium fan speed at 50Pa (design duty).

Unit	Description	Type	Sound Level, dB per Octave Band Centre Frequency (Hz)							
			63	125	250	500	1k	2k	4k	8k
PEFY-M50VMA	Ducted Inlet/Outlet	SWL	-	49	48	44	39	35	27	21
	Casing Radiated	SWL	-	49	45	37	32	23	12	7
PEFY-M63VMA	Ducted Inlet/Outlet	SWL	-	52	51	46	41	36	30	23
	Casing Radiated	SWL	-	70	58	48	46	41	32	21
PLFY-M50VEM6-E	Cassette	SPL@1.5m	41	36	33	26	23	14	11	11
PLFY-M80VEM6-E	Cassette	SPL@1.5m	40	39	38	31	29	20	12	11
PLFY-M125VEM6-E	Cassette	SPL@1.5m	45	44	43	40	38	31	27	16
PLFY-P50VFM-E	Cassette	SPL@1.5m	40	41	41	38	33	29	14	13
PFFY-P40VEM-E	Floor Mounted	SPL@1.5m	34	30	32	32	28	23	15	14

Table 16: Table Summarising Manufacturer’s Noise Data for Proposed VCF units.

5.9 Internal Plant Noise Levels

5.9.1 AHU

As the VRF units are not as easily attenuated due to being directly exposed within many of the proposed spaces it is prudent to expect the VRF units will dominate the available “headroom” for services. As such, roomside attenuator performances for the proposed AHU units should target a roomside noise level approximately 5-10dB below the total NR limit of the room/space being served such that the total when combined with the local VRF units should not exceed the overall NR limits proposed.

Drawings of the exact ductwork arrangements are not available due to the reuse of existing ductwork to accommodate the 2No. new AHU units. As such the below calculations assume minimal losses due to propagation through the ductwork with primary losses as per the proposed attenuators set out in Table 16 above.

Table 17 overleaf sets out the predicted AHU noise levels within the 2No. spaces served by the new AHU units.

Room	Predicted AHU Noise Level	Target NR
Co Working (AHU01)	NR 35 (39 dBA)	NR 40
Open Plan Collaboration	NR 36 (40 dBA)	NR 45

Table 17: Predicted AHU Noise Levels

5.9.2 VRF

Table 18 overleaf summarises the predicted noise levels within the various rooms and spaces from the proposed VRF systems.

Floor	Room/Space	Criteria (NR)	Calculated (NR)	Exceedance
Lower Ground	30 Person Training Room	40	50	+10
	MITH Suite	45	47	+2
	Meeting Room 4	35	39	+4
	Meeting Room 5	35	38	+3
	Meeting Room 6	35	52	+17
	Meeting Room 8	35	37	+2
Upper Ground	Co-Working Space	40	42	+2
	Meeting Room 4	35	41	+6

Table 18: Predicted Internal VRF Noise Levels

It can be seen in Table 17 that the proposed VRF units throughout the lower and upper ground spaces are predicted to exceed the ideal NR level target when running at the proposed design duty (Medium). It is likely that where exceedances are in the range of 1-3dB the exceedance is unlikely to significantly impact the use of the space, however more significant exceedances such as those predicted in the 30 Person Training Room and Meeting Room 6 may well impact the usability of the space.

It would be prudent to review all selections and evaluate if running at a lower duty or selection of quieter units would be feasible. It should also be noted that the predicted noise levels in the Co-working Space and MITH suite are elevated by the reduced level of reverberation treatment proposed.

5.10 Crosstalk

“Crosstalk” describes the level of sound transmission between separate rooms via common ductwork connections. The use of crosstalk attenuators are required in order to control sound transmission between spaces in order to maintain the sound insulation performance.

A single crosstalk attenuator is currently shown on the project mechanical services drawings acting as a return air passage through above the door of the Boardroom on upper ground floor. Table 19 below presents a suitable insertion loss performance for the proposed crosstalk attenuator specification indicated on the drawings:

Location	Minimum Dynamic Insertion Loss Performance, dB ΔL_w, @ Octave Frequency Band Centre Frequency, Hz							Proposed Attenuator Arrangement
	63	125	250	500	1k	2k	4k	
Boardroom Room Front	2	2	4	6	16	28	25	Single 600mm long circular attenuator located above partition.

Table 19: Minimum insertion loss performance for crosstalk attenuators

5.10.1.1. BC Boxes

It is recommended that BC boxes be located in non-sensitive rooms/areas such as storerooms or corridors. Where it is not possible to do so, it is recommended that BC boxes are boxed out with 2No. layers of 15mm SoundBloc with penetrations kept to a minimum size, packed with mineral wool, and sealed with non-setting mastic.

5.10.1.2. SVP Encasements

It is recommended that all pipework that passes through offices are separated from noise sensitive spaces by boards that have a minimum mass of 15kg/m^2 and either the pipe/duct or the enclosure is to be lagged with 25mm thick unfaced mineral fibre.

It is important to ensure the stud framework supporting the plasterboard is not in direct contact with the pipework (nor any boards touching pipework).

Where pipework penetrates floor slabs, the penetrations should be suitably detailed to minimise noise transfer through the SVP encasement, additionally, there should be no rigid contact between the pipe and the floor slab. An example detail is shown in in Figure 5.

5.10.2 *Horizontal SVP Runs*

Where horizontal transfer sections are required there is a significant risk that noise from associated fluid flow through these sections will be audible in the spaces beneath. It is recommended that two 45° bends, each of maximum practicable radius, are used rather than a single 90° bend to connect sections of pipework.

All horizontal transfer pipes should be lagged with a minimum of 25mm thick proprietary, mass-loaded acoustic lagging such as “MuftiLag SP”. This must include a mass layer with a minimum density of 5kg/m^2, in addition to two layers of 12.5mm thick acoustic plasterboard encasement layers.

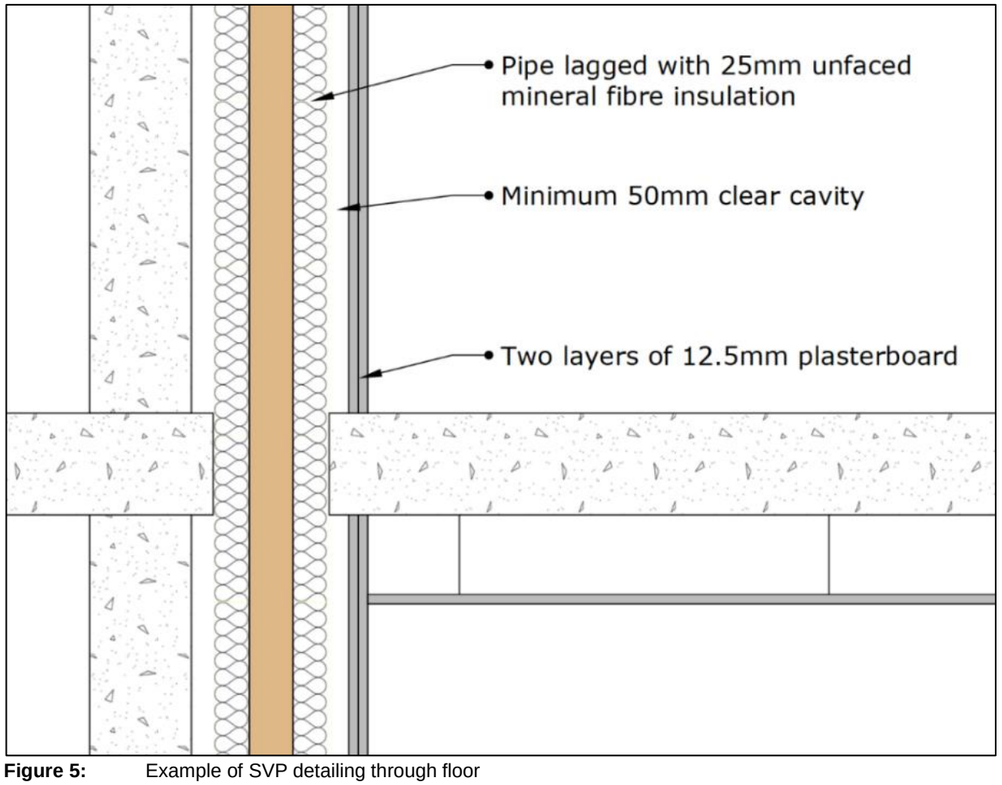


Figure 5: Example of SVP detailing through floor

5.11 Service Penetrations

Service penetrations through wall and floor constructions can significantly reduce the acoustic performance, however the sound insulation performance requirements between cellular office spaces and other areas can be achievable with well detailed penetrations.

Figure 6 and Figure 7 provide standard generic penetration details for pipework and cables which can be adopted into the drylining design package. Services should not penetrate or pass through walls separating meeting rooms or high-privacy requirement cellular offices.

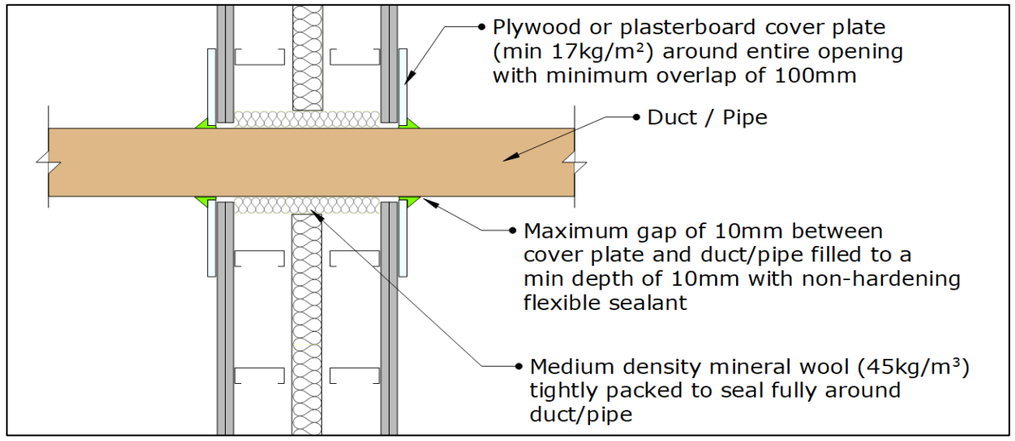


Figure 6: Example generic pipework penetration detailing

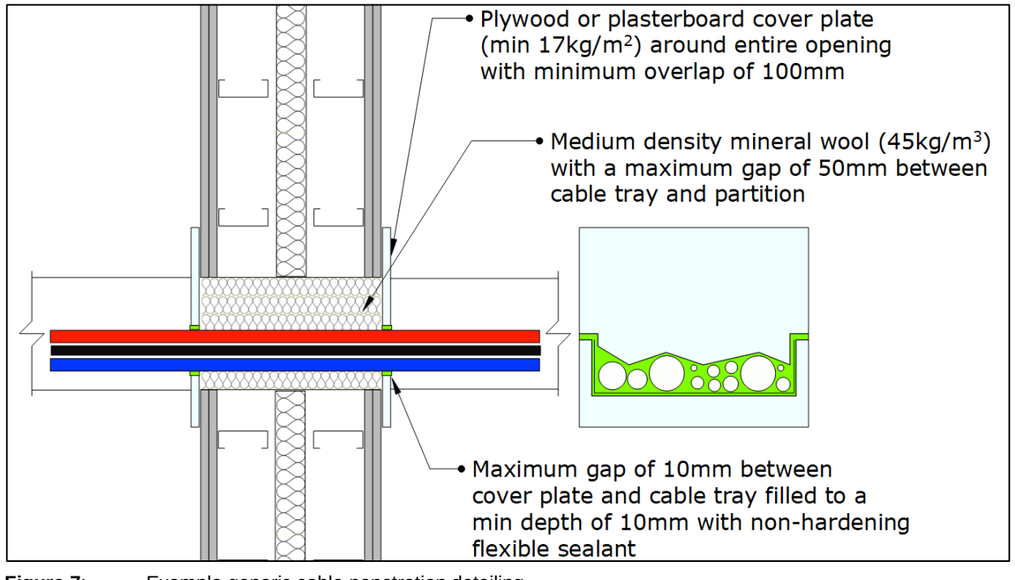


Figure 7: Example generic cable penetration detailing