

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Mindel House & 11 Bloom Street, Manchester

*Planning condition 5 discharge report –
Internal noise assessment*

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Version	Date	Comments	Author	Reviewer
A	22 Jul 21		Thomas Dent	Matthew Robinson
B	26 Jul 21	Minor clarifications	Thomas Dent	Matthew Robinson
C	26 Jul 21	Corrected minor typo	Thomas Dent	Matthew Robinson
D	24 Mar 22	Updated example glazing options (Table 4)	Thomas Dent	Matthew Robinson
E	28 Mar 22	Minor formatting updates	Thomas Dent	Matthew Robinson
F	28 Apr 22	Updates based on latest received AHU info	Thomas Dent	Matthew Robinson
G	2 Feb 23	Updates based on in-situ facade testing carried out (by others)	Thomas Dent	Matthew Robinson
H	6 April 23	Updates to Table 4 based on received comments	Thomas Dent	Matthew Robinson

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Summary

Sandy Brown have been commissioned by Beech Holdings Ltd to provide acoustic consultancy services in relation to the development at Mindell House and 11 Bloom Street, Manchester.

The development comprises 80 apartments formed from a material change of use. Planning condition 5 relates to noise ingress and building services noise to the residential apartments.

Example glazing configurations that could achieve the required sound insulation performances have been provided within this report, including secondary glazing options.

In-situ sound insulation testing of a secondary glazing system comprising 6.4 mm acoustic laminate with approx. 150-200 mm cavity has been carried out (by others). This arrangement is expected to be suitable for windows with sound insulation performance requirement $R'_w + C_{tr}$ 36 dB or less. However, the in-situ test was limited by flanking noise transfer. The installed arrangement may be capable of higher sound insulation performances in practice than the results of the mock-up test.

Based on the information available, it is expected that additional attenuation will be required to the proposed AHU unit. The following options should be considered:

- In-duct attenuators (allowance should be made for 3000 mm attenuator to supply and 1500 mm attenuator to extract)
- Unit reselection to lower sound power levels
- Several smaller AHU units (with lower sound power levels) instead of a single unit.

Existing ventilation opening which within the facade to the proposed dwellings will need to connect to sound attenuated ducted ventilation systems or be removed and filled to the full depth with a material that is at least the same density as the wall.

The recommendations set out in this report to allow Planning Condition 5 to be discharged are expected to be practicable.

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1 Introduction

Sandy Brown have been commissioned by Beech Holdings Ltd to provide acoustic consultancy services in relation to the development at Mindell House and 11 Bloom Street, Manchester.

The development comprises 80 apartments formed from a material change of use. Planning condition 5 relates to noise ingress to the residential apartments.

This report presents an assessment of facade noise ingress and building services noise, to allow discharge of Planning Condition 5.

2 Planning Condition 5

Planning Condition 5 is set out below:

'5) Before the development commences a scheme for acoustically insulating and mechanically ventilating the residential accommodation against noise from adjacent roads shall be submitted to and approved in writing by the City Council as local planning authority.

The approved noise insulation scheme shall be completed before any of the dwelling units are occupied. Prior to occupation a post completion report to verify that all of the recommended mitigation measures have been installed and effectively mitigate any potential adverse noise impacts in the residential accommodation shall be submitted and agreed in writing by the City Council as local planning authority. Prior to occupation any non compliance shall be suitably mitigated in accordance with an agreed scheme.

Reason - To secure a reduction in noise in order to protect future residents from noise nuisance, pursuant to policies SP1, H1 and DM1 of the Core Strategy.'

3 Basis of review

The review has been based on the following:

- Various email correspondences received
- 16044-R01-B *Planning noise report* issued 18 January 2018
- Architectural drawing package received 7 June 2021
- Glazing package received 7 July 2021
- Architectural tender issue received 7 June 2021, including section drawings:
 - 013-MDB-MH-XX-EL-A-2000
 - 013-MDB-MH-XX-EL-A-2001
 - 013-MDB-MH-XX-EL-A-2002
 - 013-MDB-MH-XX-EL-A-2003
 - 013-MDB-BS-XX-EL-A-2000
 - 013-MDB-BS-XX-EL-A-2001
 - 013-MDB-BS-XX-EL-A-2002
 - 013-MDB-BS-XX-EL-A-2003.
- Roof details drawing 061_501B received 7 June 2021
- 24936.SII.01 *Sound Insulation Test Report* received 23 January 2023.

4 Acoustic criteria

4.1 Internal noise levels – noise ingress

Internal noise level criteria for the residential apartments were provided in 16044-R01-B *Planning noise report* issued 18 January 2018, as summarised in Table 1. These criteria were determined in line with Manchester City Council (MCC) guidance.

Table 1 Manchester City Council internal noise criteria for residential developments

Internal space	Internal noise limit, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Living rooms	35	-
Bedrooms	-	30 ^[1]

^[1] Individual noise events in bedrooms should not exceed L_{Amax} 45 dB by more than 15 times.

The levels in Table 1 above are the cumulative noise levels to be achieved by:

- external noise ingress via the facade
- Noise from mechanical ventilation systems.

4.1.1 Entertainment noise ingress

Where noise from entertainment venues is the dominant noise source, the facade sound insulation should be sufficient such that internal noise levels in bedrooms at night do not exceed 42 dB and 36 dB at 63 Hz and 125 Hz respectively.

4.1.2 Building services noise criteria

Building services should be designed to achieve internal noise levels at least 3 dB below the overall internal noise criteria set out in Table 1.

5 External noise levels

The external noise levels predicted at the facades of the development are set out in 16044-R01-B *Planning noise report*. These are summarised below.

Unattended noise monitoring was undertaken at the site between 23 April and 16 July 2015.

Attended noise measurements were carried out during the daytime and on a weekend night, on 6 June 2014 and 5 February 2016 respectively.

5.1 Maximum noise levels

Based on the results from the noise survey, the maximum noise levels not exceeded more than 15 times at the various facades are as follows:

- Minshull Street - L_{AFmax} 86 dB
- Bloom Street - L_{AFmax} 92 dB
- Richmond Street - L_{AFmax} 86 dB
- Car park (south west) - L_{AFmax} 89 dB.

5.2 Ambient noise levels

Predicted external ambient noise levels for the various facades of the proposed development are summarised in Figure 1 and Figure 2.

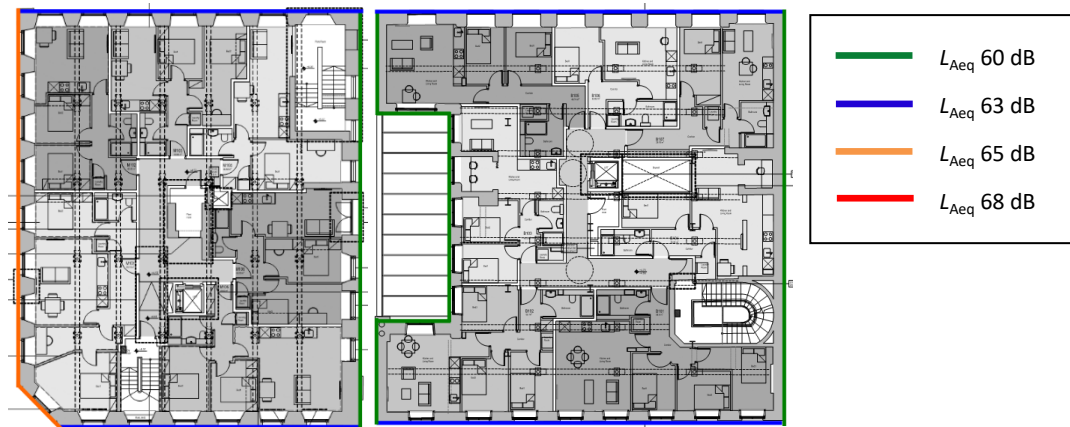


Figure 1 Predicted external noise levels during the daytime (07:00 - 23:00)

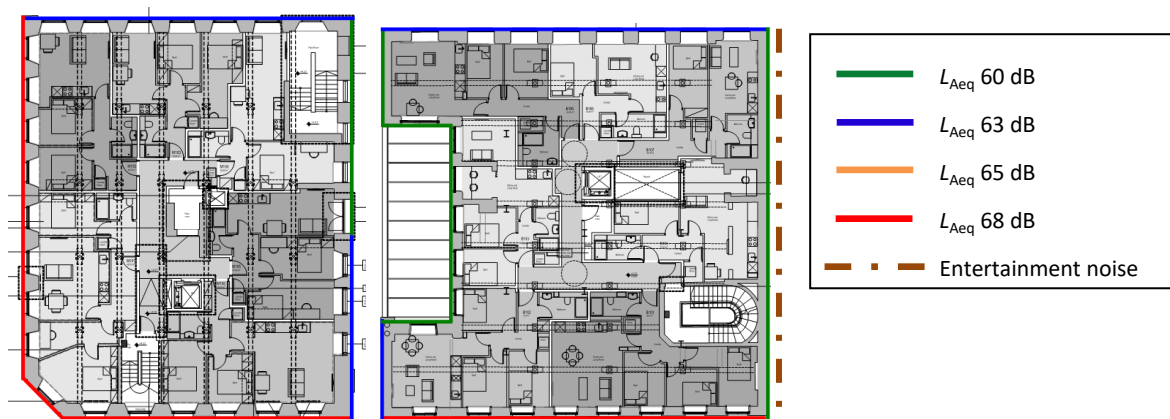


Figure 2 Predicted external noise levels during the night (23:00 - 07:00)

Amplified music egress from the night club Kiki was a dominant noise source at the south west facade adjacent to the car park, as indicated in Figure 2. The internal noise limits set out in Section 4.1.1 at 63 Hz and 125 Hz must be met in bedrooms on this facade.

6 Facade sound insulation

6.1 Overall facade sound insulation performance requirements

Minimum overall facade sound insulation performance requirements are set out in 16044-R01-B *Planning noise report*, as summarised in Table 2.

These have been determined to allow the internal noise criteria (detailed in Section 4) to be achieved, based on the external noise levels at each facade (detailed in Section 5).

Table 2 Overall facade sound insulation performance requirements

Facade zone	Minimum overall sound insulation performance			
	Living areas	Bedrooms		
	Overall, R'_w+C_{tr} (dB) ¹	Overall, R'_w+C_{tr} (dB)	Low frequency, R'_{63Hz} (dB)	Low frequency, R'_{125Hz} (dB)
Minshull Street	33	36	-	-
Bloom Street	31	41 ^[2]	-	-
Richmond Street	31	36	-	-
Alley (central)	28	33	-	-
Car park (south west)	28	38	30	29

^[1] Where living rooms are located on corners of the building (ie, dual aspect), the overall facade sound insulation is required to be 3 dB greater than the value given on both facades.

^[2] Performance driven by maximum not exceeded more than 15 times.

6.1.1 Roof sound insulation

The roof should provide a minimum sound insulation performance equivalent to the facade sound insulation performance for that space, in line with Table 2.

6.2 Facade construction, glazing and ventilation strategy

6.2.1 Non-glazed construction

The existing non-glazed facade is understood to be masonry with a depth of at least 400 mm.

Specifically, it is understood that the wall construction comprises four brick leaves, based on email correspondence received from Beech Design and Build on 8 June 2021.

The masonry wall is expected to be capable of at least R'_w+C_{tr} 55 dB, with low frequency performances of R'_{63Hz} 40 dB and R'_{125Hz} 42 dB, based on the above construction. This is at least 10 dB above the minimum overall facade sound insulation performances detailed in Table 2. Therefore, overall facade sound insulation performance is expected to be dominated by the glazing sound insulation performance.

6.2.2 Glazed construction

Assessment of glazing sound insulation performance requirements has been carried out based on the following assumptions:

- The non-glazed facade elements provide sound insulation performance at least 10 dB greater than the glazing (as per Section 6.2.1)
- A mechanical ventilation strategy (as per Section 6.2.5))
- Assumed reverberation times within apartments as follows:
 - Bedrooms: 0.5 s
 - Living rooms: 1.0 s.
- Typical percentage of facade is glazed:
 - Mindel House north west facade (Bloom Street): 30% (based on drawing 013-MDB-MH-XX-EL-A-2000)
 - Mindel House north east facade (Minshull Street): 30% (based on drawing 013-MDB-MH-XX-EL-A-2001)
 - Mindel House south east facade (Richmond Street): 35% (based on drawing 013-MDB-MH-XX-EL-A-2002)
 - Mindel House south west facade (alley): 35% (based on drawing 013-MDB-MH-XX-EL-A-2003)
 - 11 Bloom Street north west facade (Bloom Street) - ground floor: 55% (based on drawing 013-MDB-BS-XX-EL-A-2000)
 - 11 Bloom Street north west facade (Bloom Street) – first floor to fourth floor: 30% (based on drawing 013-MDB-BS-XX-EL-A-2000)
 - 11 Bloom Street north west facade (Bloom Street) – fifth floor: 85% (based on drawing 013-MDB-BS-XX-EL-A-2000)
 - 11 Bloom Street north east facade (Alley) – ground to fourth floor: 35% (based on drawing 013-MDB-BS-XX-EL-A-2001)
 - 11 Bloom Street north east facade (Alley) – fifth floor: 85% (based on drawing 013-MDB-BS-XX-EL-A-2001)
 - 11 Bloom Street south east facade (Richmond Street) – ground to fourth floor: 30% (based on drawing 013-MDB-BS-XX-EL-A-2002)
 - 11 Bloom Street south east facade (Richmond Street) – fifth floor: 85% (based on drawing 013-MDB-BS-XX-EL-A-2002)
 - 11 Bloom Street south west facade (car park): no glazing (based on drawing 013-MDB-BS-XX-EL-A-2003).

Based on the overall facade sound insulation performance requirements set out in Table 2 and the assumptions above, glazing sound insulation requirements are set out in Table 3.

Table 3 Glazing sound insulation performance requirements

Facade	Minimum glazing sound insulation performance, $R'_w + C_{tr}$ (dB)	
	Living areas	Bedrooms
<i>Mindel House</i>		
North east (Minshull Street)	33	34
North west (Bloom Street)	30	38
South east (Richmond Street)	33	34
South west (alley)	28	31
<i>11 Bloom Street</i>		
North east (Alley) – ground to fourth floor	25	31
North east (Alley) – fifth floor	34	38
North west (Bloom Street) – ground floor	36	40
North west (Bloom Street) – first floor to fourth floor	31	37
North west (Bloom Street) – fifth floor	35	41
South east (Richmond Street) – ground to fourth floor	31	33
South east (Richmond Street) – fifth floor	35	41
South west (car park)	N/A ^[2]	N/A ^[2]

^[1] Where living rooms are located on corners of the building (ie, dual aspect), the overall facade sound insulation is required to be 3 dB greater than the value given on both facades.

^[2] There are no windows located on this facade.

Example glazing configurations that could achieve the required glazing sound insulation performances set out in Table 3 are provided in Table 4.

It is understood that secondary glazing will be provided to the majority of the proposed development. It is understood that existing primary glazing comprises historic single pane glazed timber framed sash windows, based on email correspondence received from Beech Design and Build on 8 July 2021. Existing glass is understood to be 4 mm thick.

Table 4 Example glazing configurations

Glazing sound insulation, R'_w+C_{tr} (dB)	Example glazing configuration
25	A) Existing 4 mm glazing/50 mm cavity/6 mm secondary glazing
28	B) Existing 4 mm glazing/100 mm cavity/6 mm secondary glazing
30-31	C) Existing 4 mm glazing/150 mm cavity/6 mm secondary glazing
33	C) Existing 4 mm glazing/150 mm cavity/6 mm secondary glazing
34-35	D) Existing 4 mm glazing/150 mm cavity/8 mm secondary glazing OR E) Existing 4 mm glazing/200 mm cavity/6 mm secondary glazing
36-37	F) Existing 4 mm glazing/150 mm cavity/10 mm secondary glazing OR G) Existing 4 mm glazing/200 mm cavity/6.4 mm secondary glazing
38	H) Existing 4 mm glazing/200 mm cavity/10 mm secondary glazing
40-41	I) Existing 4 mm glazing/200 mm cavity with sound absorbent reveals/10 mm secondary glazing

Sound absorbent reveals to secondary glazing are provided as a liner between the glass panes (within the cavity introduced). This would not require any changes to the existing building fabric.

The sound absorbent reveals should typically achieve at least sound absorption Class C (α_w 0.6-0.75). This can typically be achieved via a 25-50 mm thick fabric wrapped insulation product.

6.2.3 In-situ facade sound insulation testing

A mock-up secondary glazing system has been constructed on-site. It is understood this comprises 6.4 acoustic laminate with 150-200 mm cavity.

The secondary glazing is installed to a mock-up bedroom at ground floor, 11 Bloom Street. This bedroom will form part of apartment 103.

The mock-up room is shown in Figure 3. The overall facade sound insulation performance to this bedroom is R'_w+C_{tr} 36 dB. The minimum glazing only performance is R'_w+C_{tr} 31 dB.

The highest overall facade insulation performance across the scheme is R'_w+C_{tr} 41 dB (to bedrooms facing Bloom Street). The highest glazing sound insulation performance across the scheme is R'_w+C_{tr} 41 dB (to fifth floor bedrooms facing Bloom Street). It is understood that curtain walling is proposed to the fifth floor, therefore the highest glazing sound insulation

performance where secondary glazing is proposed is $R'_w + C_{tr}$ 40 dB (to ground floor 11 Bloom Street bedrooms facing Bloom Street).

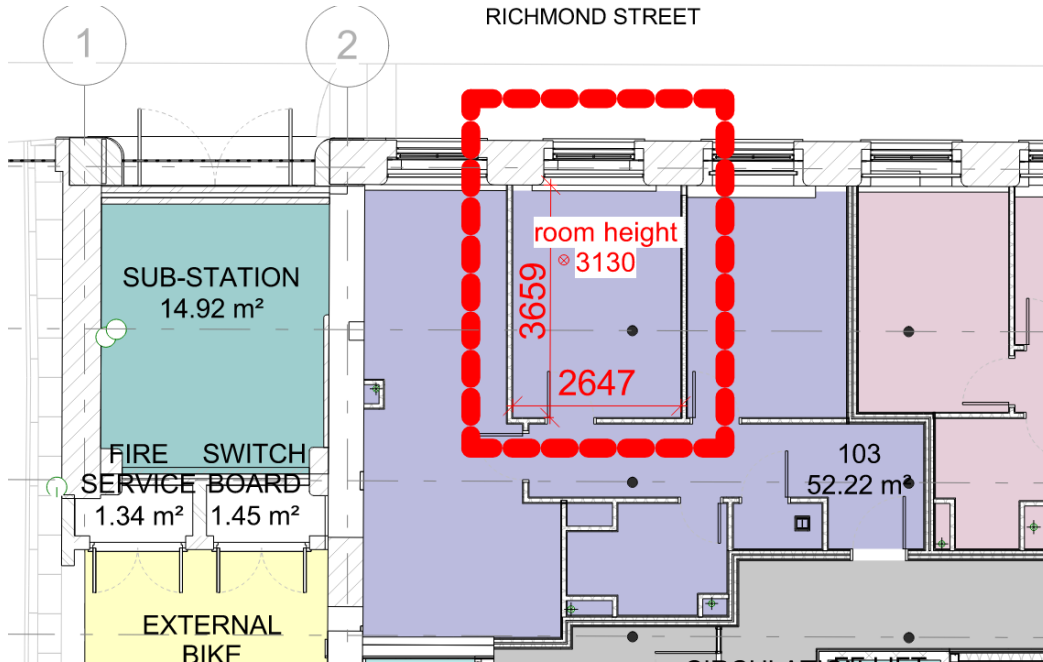


Figure 3 In-situ facade sound insulation test room

The in-situ testing was carried out with the existing primary glazing and secondary glazing installed.

The received facade sound insulation test results are presented in terms of:

- $R'_{45} + C_{tr}$ parameter (Representative of the glazing performance, as per the element method set out in BS EN ISO 16283-3 with outdoor microphone positioned on the façade)
- $D_{2m,nT} + C_{tr}$ (Representative of the overall facade performance, as per the global method in BS EN ISO 16283-3 with outdoor microphone positioned 2 m in front of the facade).

The results of the in-situ testing (by others) are summarised below:

- $R'_{45} + C_{tr}$ 36 dB
- $D_{2m,nT} + C_{tr}$ 41 dB.

The $R'_{45} + C_{tr}$ parameter is considered equivalent to the $R'_w + C_{tr}$ glazing sound insulation criteria, and the $D_{2m,nT} + C_{tr}$ approximately equivalent to the $R'_w + C_{tr}$ overall facade sound insulation criteria.

The $D_{2m,nT}+C_{tr}$ result is in line with the worst-case overall facade sound insulation requirements across the scheme. However, the $R'_{45}+C_{tr}$ result falls short of the worst-case glazing sound insulation performances by 4 dB.

The test room is not worst-case in terms of relative glazing areas (some spaces have larger relative glazing areas, such as ground floor rooms facing Bloom Street). As such, there is a risk that the overall facade sound insulation performances may not be met to these spaces with larger glazing areas.

A secondary glazing system equivalent to that constructed to the mock-up room is expected to be suitable for windows with glazing sound insulation performance requirement R'_w+C_{tr} 36 dB or less (see Table 3).

For windows with higher glazing sound insulation performance requirements, enhancements should be considered as per Table 4, such as thicker glazing, greater cavity depth and sound absorbent reveals.

During the test, there was some influence of flanking noise transfer at high level (above the window). This could potentially be due to noise transfer via the first floor interface with the facade (there was some damage to existing upper floor windows which may have resulted in a flanking noise ingress route). Noise transfer may have also occurred at the mock-up room partition head detail. The mock-up bedroom walls were not fully sealed up against the soffit and there was some flanking noise ingress via a nearby external door.

Once the development is completed, these flanking routes are expected to be controlled and therefore there may be some improvement in overall facade sound insulation performance. Further testing could potentially be carried out to the worst-case rooms once the scheme is progressed to validate the facade sound insulation performances.

6.2.4 Roof construction

A new lath and plaster ceiling (to match existing) is proposed beneath the existing slate roof, as per the received drawing *061_501B*. The overall roof build-up is understood to comprise:

- Existing slate roof
- Approx. 190 mm cavity containing 2 layers of wool insulation
- 2 layers of fireboard (assumed ≥ 12.5 mm thick, with density ≥ 640 kg/m³)
- Approx 70 mm cavity
- Lath and plaster ceiling.

Timber joists are also proposed.

The overall roof construction is expected to provide performance at least equivalent to the most onerous facade sound insulation performance requirement of R_w+C_{tr} 41 dB (as per Table 2), therefore roof sound insulation performance is suitable.

6.2.5 Ventilation strategy

It is understood that mechanical ventilation is proposed throughout. Opening windows will not be relied upon for ventilation.

Existing ventilation opening which within the facade to the proposed dwellings will need to connect to sound attenuated ducted ventilation systems or be removed and filled to the full depth with a material that is at least the same density as the wall.

Octave band sound power level noise data for the proposed AHU unit has been provided via email from Park Wilson on 14 April 2022, as summarised in Table 5.

Table 5 Received AHU sound power level data

	Sound power level (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
<i>Exhaust</i>								
Suction side (extract)	67	71	72	66	61	59	55	53
Pressure side (exhaust)	72	82	82	78	76	72	68	66
Outside at unit (case breakout)	58	64	58	47	48	48	37	30
<i>Supply</i>								
Suction side (fresh air intake)	67	71	72	66	61	59	55	53
Pressure side (supply)	72	82	82	78	76	72	68	66
Outside at unit (case breakout)	58	64	58	47	48	48	37	30

Based on a Revit model screenshot received which indicates proposed ductwork layouts for each floor, the following lengths of duct have been assumed between the proposed AHU and the room-side termination within the worst-affected apartment:

- 11m duct at 0.5 x 0.35 m
- 5 bends with radius 0.5m
- 2 50-50 splits
- End reflection loss for duct size 0.5 x 0.35m.

These are considered conservative assumptions. If ductwork has shorter or simpler (i.e. less bends or splits) routing between the AHU and worst-affected apartment, this will require re-assessment.

Based on the above, it is expected that additional attenuation will be required to the AHU supply and extract to allow building services noise criteria (as per Section 4.1.2) to be achieved. Attenuation requirements are set out in Table 6.

Table 6 Additional attenuation requirements

	Insertion loss (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
AHU supply attenuation required	3	26	34	35	37	34	30	26
AHU extract attenuation required	-	15	24	23	22	21	17	13

These insertion loss requirements could be achieved by one of the following options (or several in combination):

- In-duct attenuators (allowance should be made for 3000 mm attenuator to supply and 1500 mm attenuator to extract)
- Unit reselection to lower sound power levels
- Several smaller AHU units (with lower sound power levels) instead of a single unit.