Technical Note

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To
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From
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Subject
Progression of Acoustic Assessments for Conditions 5 & 6

1.0 PURPOSE AND SCOPE

Clement Acoustics has previously provided Noise Impact Assessment 17578-NIA-01 RevA in support of proposed extension works at Al Falah Masjid, Cheetham Hill, Manchester to form new teaching and office spaces.

Updated assessment has been undertaken, considering the latest proposals and Local Authority requirements.

2.0 SUMMARY OF REQUIREMENTS – DESIGN STAGE

This assessment considers the requirements of Planning Conditions 5 and 6, which are stated on Decision Notice 134400/FO/2022. The design stage requirements for each condition are summarised as follows:

"5. (a) The premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.

Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 5dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63HZ and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (Leq,5min), respectively."

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"6. (a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority."

The requirements of the above conditions have been considered when undertaking design stage assessments of the proposals.

3.0 ESTABLISHED BACKGROUND NOISE LEVELS

In order to determine site-specific criteria, a background noise survey was undertaken on the site, prior to the commencement of development works. Full details of the survey methodologies and results can be found in Clement Acoustics report 17578-NIA-01 RevA, which was issued in September 2022.

As the school will be providing after-school classes, it is understood that the school will operate between the hours of 17:00 and 19:00 on weekdays only.

It should be noted that the guidance of the latest revision of British Standard 4142: 2014 +A1 2019 '*Methods for rating and assessing industrial and commercial sound*' [BS 4142], as detailed in Section 8.1 of the standard is as follows:

"The objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."

Based on the results of the environmental noise survey, Table 3.1 presents the determined typical background noise levels during different time periods.

Period	Plant Noise Emission Limit $L_{Aeq:T}$, dB
Daytime (07:00 - 23:00)	40
Night-time (23:00 - 07:00)	28
Proposed Operating Hours (17:00 - 19:00)	39

Table 3.1 Measured background noise levels

4.0 DESIGN STAGE IMPACT ASSESSMENT: PLANNING CONDITION 5

Planning Condition 5 requires an assessment of noise breakout of internal activities, where entertainment noise is proposed. It is noted that proposed operations comprise education and office-type activities, which would not be considered to be entertainment sources of noise. However, the requirements of Planning Condition 5 have been adopted, in order to present a robust assessment.

4.1 Established Criteria

Based on the requirements of Condition 5 (a) and the measured overall and spectral background noise levels, criteria have been established as shown in Table 4.1. External noise criteria have been derived by subtracting 5 dB from the measured background noise levels, while internal criteria are fixed limits based on the requirements of the planning condition.

Location	Criterion (dB) in Each Frequency Band								Overall Criterion
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Outside Window	41	42	35	32	33	27	18	11	34
Inside Window	47	41	-	-	-	-	-	-	-

Table 4.1 Established criteria for breakout noise emissions

4.2 Anticipated Internal Noise Levels

The proposed school spaces will consist of two classrooms, a library space, a meeting room and an office. It has been confirmed by the Client that there will be no amplified music within the new spaces.

In order to present a worst-case scenario, previous measurements of children playing in a playground on a school site have been used in order to predict noise emissions from classroom and library spaces. The measurements used were the loudest 5 minute period in a half hour playtime for a similar number of children (30).

Measurements taken during a meeting of a mixed in-person and remote staff members has been used in order to predict noise emissions from meeting room and office spaces. The measurements used were the loudest 5 minute period in a 15 minute meeting of 8 people.

These source noise levels are shown in Table 3.1.

Source Noise Profile	Sound Pressure Level (dB) in each Frequency Band, at source								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Children Playing	63	57	56	61	64	68	62	51	71
Meeting	45	57	63	66	59	58	53	44	66

Table 4.2 Source noise profiles used in calculations

These levels have been assumed as the source noise for the following spaces:

- Proposed Classrooms 1 & 2: Children Playing
- Proposed Library: Children Playing
- Proposed Office: Meeting
- Proposed Meeting Room: Meeting

The proposed layout of the site is shown in Figure 4.1.



Figure 4.1 Plan view of proposed rooms at first floor

4.3 Proposed External Building Fabric

In report 17578-NIA-01 RevA, it had been assumed that open windows could be used to ventilate and cool internal spaces. However, it has now been confirmed that mechanical cooling is proposed, and windows would only be open in an emergency for purge ventilation. Background ventilation will be provided through trickle vents, installed in new window frames.

Proposed external building fabric elements have therefore been considered in terms of their sound reduction performance against internally generated noise.

4.3.1 Proposed External Wall

The proposed external wall build up at first floor level comprises the following, from external side to internal:

- 102.5 mm brickwork facing
- 100 mm cavity
  - 50 mm Kingspan or Celotex insulation board in cavity
- 100 mm medium density blockwork inner leaf

The above construction has been modelled using proprietary sound insulation software INSUL, using acoustic butterfly wall ties as proposed (Ancon Cavity Wall Ties HRT4). A 3D view of the modelled construction is shown in Figure 4.2.

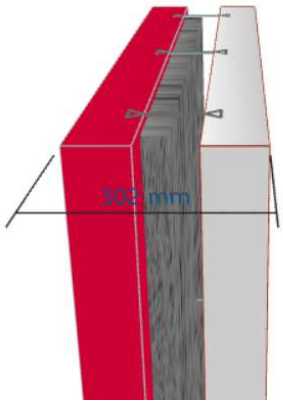


Figure 4.2 3D view of modelled external wall construction

The interrogated calculated sound reduction of the proposed external wall is shown in Table 4.3.

Element	Sound Reduction Index (dB) in each Frequency Band						R_w dB
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
External Wall	47	47	49	59	69	79	56

Table 4.3 Calculated sound reduction performance of external wall

4.3.2 Proposed Glazing and Trickle Ventilators

Proposals are to install double glazed units with trickle vents in the frame of each window. In order to present robust calculations, it has been assumed that glazing would be nominal thermal double glazing and trickle vents would be generic (non-acoustic).

The assumed sound reduction indices for nominal glazing and trickle ventilators are shown in Table 4.4.

Element	Sound Reduction Index (dB) in each Frequency Band						Overall
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
Double Glazing [4 mm glass / 12 mm air / 4 mm glass]	24	20	25	34	37	35	R_w 31 dB
Generic Trickle Ventilator	29	22	32	30	29	23	$D_{n,e,w}$ 23 dB

Table 4.4 Assumed sound reduction performance of glazing and trickle vents

4.4 3D Noise Model

In order to assess the noise impact of proposed activities, noise emissions have been assessed by developing a noise map.

The noise model was constructed using the proprietary noise modelling software package CadnaA. The noise model was constructed utilising the following assumptions and parameters:

- Internal noise sources are as described in Section 4.2
- Façade reduction based on composite performance of elements discussed in Sections 4.3.1 and 4.3.2
- Presence of reflecting surfaces – buildings assumed to be reflective
- Hardness of the ground between the sources and receivers – ground assumed to be reflective

- Attenuation due to atmospheric absorption
- Calculations are performed in spectral frequency bands between 63 Hz and 8 kHz.

The noise map allows the cumulative impact of all proposed spaces operating simultaneously to be assessed at all surrounding receptors.

It should be noted that all calculations in the CadnaA model, including those for distance and screening of intermediate building envelopes are undertaken according to International Standard ISO 9613-2:1996 '*Acoustics – Attenuation of sound during propagation outdoors. Part 2: General method of calculation*'. This standard is the preferred method stated in BS 4142 to minimise uncertainty.

Figure 4.3 visually represents the modelled development and noise propagation from the identified breakout noise sources.

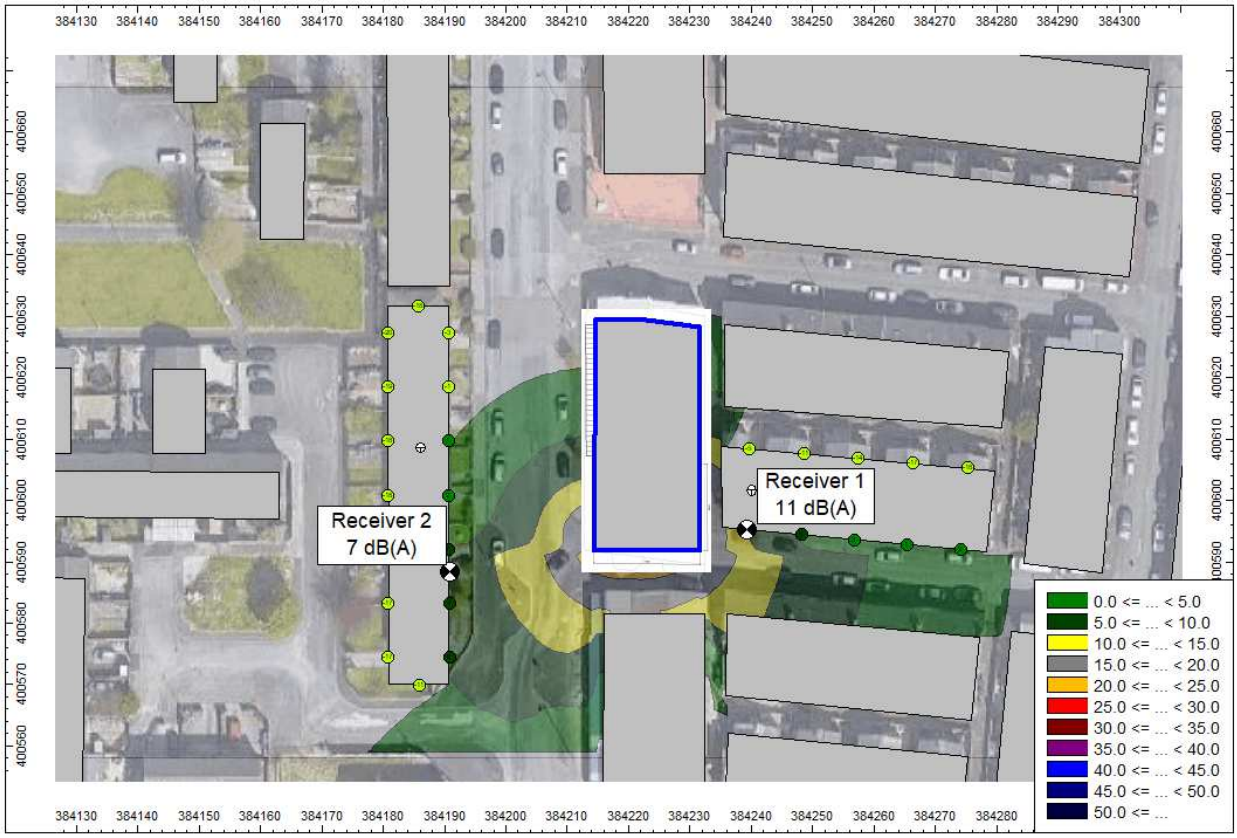


Figure 4.3 Plan view of modelled breakout noise emissions

4.5 Noise Impact Assessment

Receiver levels for the closest identified receivers to the east and west of the proposed development have been interrogated from the created noise model. The calculated spectral noise emissions at each residential façade are summarised in Table 4.5, where they are compared with the established criteria.

Location	Noise Level (dB) in Each Frequency Band								Overall Level
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Receiver 1	8	4	14	11	0	0	0	0	11 dB(A)
Receiver 2	10	0	5	5	0	1	0	0	7 dB(A)
Criteria	**41**	**42**	**35**	**32**	**33**	**27**	**18**	**11**	**34**

Table 4.5 Calculated noise emissions levels at assessed receivers

As shown in Table 4.5 full compliance is expected at both receivers with activities and external facades as proposed.

It is further noted that external noise levels comply with the established internal criteria shown in Table 4.1. Full compliance with internal criteria would therefore also be expected, particularly once the reduction of the residential façade is taken into account.

5.0 DESIGN STAGE IMPACT ASSESSMENT: PLANNING CONDITION 6

Proposals are to install 3 external air conditioning condenser units, which will be subject to the requirements of Planning Condition 6. Calculations have therefore been undertaken in order to investigate whether mitigation would be required.

5.1 Established Criteria

It is understood that plant would be in use during proposed operating hours of 17:00 to 19:00 only.

Based on the measured background noise levels summarised in Table 3.1 and the requirements of Planning Condition 6, the stablished criterion for plant noise emissions is **34 dB(A)** at the closest residential window.

5.2 Proposed Installation

Proposals are to install three new external condenser units to serve the new rooms. The units will be installed on the side façade of the building facing towards residential units.

Figure 5.1 shows the proposed plant location on the side of the proposed extension and the closest identified receivers to the plant location.

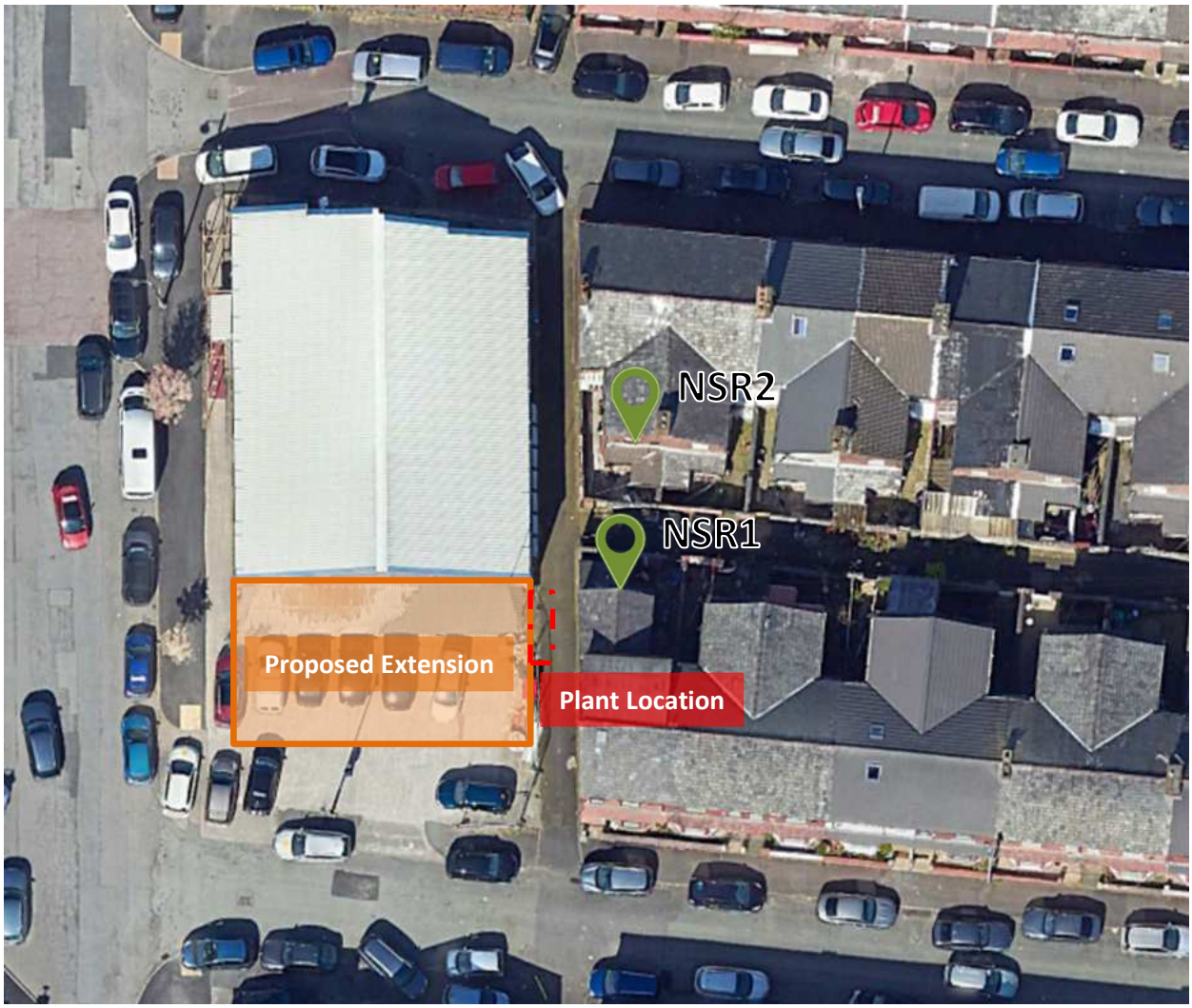


Figure 5.1 Plan view showing proposed plant location and closest receivers

The proposed plant installation comprises 3 No. Mitsubishi Electric Condenser Units type PUHZ-W85VAA. Manufacturer noise levels for the proposed unit type are shown in

Unit	Sound Pressure Level (dB) in each Frequency Band, at 1 m								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Mitsubishi Condenser Unit type PUHZ-W85VAA	48	48	49	44	36	34	27	20	45

Table 5.1 Manufacturer noise emissions for proposed plant units

5.3 Noise Impact Assessment

Calculations have been undertaken for the receivers identified in Figure 5.1, with the following considerations:

- NSR1:
  - Rear façade of a residential property on Wordsworth Avenue
  - Approximately 6 m from the proposed plant location
  - There are no side windows to the residential property, meaning a small amount of screening is introduced by the building envelope.
- NSR2:
  - Rear façade of a residential property on Kelvin Grove
  - Approximately 12 m from the proposed plant location
  - Direct line of sight between the plant and receiver assumed

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 5.2. Detailed calculations are shown in Appendix A at the end of this Technical Note.

Receiver	Design Criterion	Noise Level at Receiver (due to proposed plant)
NSR1	34 dB(A)	33 dB(A)
NSR2		31 dB(A)

Table 5.2 Noise levels and project criterion at noise sensitive receivers

As presented in Table 5.2 and Appendix A, the proposed plant installation would be expected to meet the requirements of the proposed criteria.

6.0 REQUIREMENT FOR COMMISSIONING WORKS

Planning Conditions 5 and 6 each include a Part (b) which calls for certain commissioning exercises once works are completed but prior to occupation. The requirements are summarised as follows:

> *"5. (b)Prior to occupation of the development a verification report will be required 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 acceptable 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."*

> *"Prior to the operation of the scheme a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria."*

Once all works are complete, including the installation of external plant, commissioning measurements will be undertaken to ensure that compliance has been achieved.

7.0 CONCLUSION

Updated noise impact assessments have been undertaken to consider the noise breakout of proposed internal activities and plant installations.

Calculations have shown that current designs are considered suitable to ensure established criteria will be complied with.

Commissioning measurements will be undertaken on completion of development works to ensure that compliance has been achieved, in line with the requirements of the Local Authority.

Appendix A

Acoustic Calculations

17578

Al Falah Masjid, Cheetham Hill, Manchester

Receiver 1: NSR1

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturer provided sound pressure level at 1 metre									
Mitsubishi Condenser Unit type PUHZ-W85VAA	48	48	49	44	36	34	27	20	45
Correction for number of units (3)	5	5	5	5	5	5	5	5	
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of building envelope	-1	-2	-3	-5	-9	-12	-12	-12	
Distance correction to receiver, dB (6 m) [1]	-16	-16	-16	-16	-16	-16	-16	-16	
Sound pressure level at receiver	**39**	**38**	**38**	**31**	**19**	**14**	**7**	**0**	**33**

[1] Distance loss calculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)

Design Criterion	34

Receiver 2: NSR2

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturer provided sound pressure level at 1 metre									
Mitsubishi Condenser Unit type PUHZ-W85VAA	48	48	49	44	36	34	27	20	45
Correction for number of units (3)	5	5	5	5	5	5	5	5	
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (12 m) [1]	-22	-22	-22	-22	-22	-22	-22	-22	
Sound pressure level at receiver	**34**	**34**	**35**	**30**	**22**	**20**	**13**	**6**	**31**

[1] Distance loss calculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)

Design Criterion	34