Goulden Street (Peeler's Yard), Manchester

Stage 4 Acoustic Design Report

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24033-R01-BT Goulden Street

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REVISION HISTORY

Revision	Date	Revision Details	Author	Checked
R01	04/06/2024	Initial issue	Ben Tomlin Ben Tomlin BSc MIOA	Susan Witterick Susan Witterick BSc MIOA

1 INTRODUCTION

1.1 dBx Acoustics Ltd has been appointed by Big Red Industries Group to undertake an acoustic design review for the proposed Goulden Street residential development.

1.2 The development comprises a new build 8-storey residential apartment block, to form 81 apartments.

1.3 The development has been granted planning permission, with conditions, under Manchester City Council planning reference 125678/FO/2019. An updated planning application was made to reflect the replacement of ground floor commercial units with apartments, and given approval under decision notice reference 135818/JO/2022. Planning Conditions 12 and 13 of this decision relate to acoustics.

1.4 Plant noise egress is considered based on discharging planning condition 12.

1.5 The acoustic requirements of the external envelope are assessed in terms of noise ingress to the apartments, to meet the requirements of and hence discharge Planning Condition 13.

1.6 An assessment of internal sound insulation, and reverberation control for common areas, which need to comply with the requirements of Approved Document E (ADE) of the Building Regulations (but are not planning conditions) is also undertaken.

1.7 A glossary of acoustic terminology has been supplied in Appendix A to assist the reader.

2 ASSESSMENT CRITERIA

Manchester City Council – Planning Conditions

2.1 Manchester City Council's requirements in terms of noise are detailed in Decision Notice 135818/JO/2022, conditions 12 and 13, as confirmed below.

Condition 12

2.2 Condition 12 relates to plant noise emissions, and is reproduced below.

"12) Notwithstanding the noise impact assessment stamped as received by the City Council, as Local Planning Authority, on the 23 December 2019,

(a) Prior to the first occupation of the development hereby approved, details of any externally mounted ancillary plant, equipment and servicing shall be submitted for approval in writing by the City Council, as Local Planning Authority. For the avoidance of doubt, externally mounted 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 5 db (Laeq) below the typical background (La90) level at the nearest noise sensitive location.

(b) Prior to the first occupation of the development, a verification report will be required to validate that the work undertaken conforms to the recommendations and requirements approved as part of part (a) of this planning condition. The verification report shall include post completion testing to confirm the noise criteria has been met.

In instances of non conformity, these shall be detailed along with mitigation measures required to ensure compliance with the noise criteria. Any mitigation measures shall be implemented in accordance with a timescale to be agreed with the City Council, as Local Planning Authority, and thereafter retained and maintained in situ.

Reason - To minimise the impact of plant on the occupants of the development pursuant to policies SP1 and DM1 of the Manchester Core Strategy (2012) and saved policy DC26 of the Unitary Development Plan for the City of Manchester (1995)."

Condition 13

2.3 Condition 13 relates to external noise ingress into the apartments, and is reproduced below.

"13) Notwithstanding the noise impact assessment stamped as received by the City Council, as Local Planning Authority, on the 23 December 2019, (a) prior to the first occupation of the residential element of the development, a scheme for acoustically insulating the proposed residential accommodation against noise from Oldham Road and local traffic network shall be submitted for approval in writing by the City Council, as Local Planning Authority. The approved noise insulation scheme shall be completed before the first occupation of the development.

Noise survey data must include measurements taken during a rush-hour period and night time to determine the appropriate sound insulation measures necessary. The following noise criteria will be required to be achieved:

Bedrooms (night time - 23.00 - 07.00) 30 dB LAeq (individual noise events shall not

exceed 45 dB LAmax,F by more than 15 times)

Living Rooms (daytime - 07.00 - 23.00) 35 dB LAeq

Gardens and terraces (daytime) 55 dB LAeq

(b)Prior to the first occupation of the development, a verification report will be required to validate that the work undertaken conforms to the recommendations and requirements approved as part of part (a) of this planning condition. The verification report shall include post completion testing to confirm the noise criteria has been met.

In instances of non conformity, these shall be detailed along with mitigation measures required to ensure compliance with the noise criteria. Any mitigation measures shall be implemented in accordance with a timescale to be agreed with the City Council, as Local Planning Authority, and thereafter retained and maintained in situ.

Reason: To secure a reduction in noise from traffic or other sources in order to protect future residents from noise disturbance pursuant to policies SP1, H1 and DM1 of the Core Strategy (2007) and saved policy DC26 of the Unitary Development Plan for the City of Manchester (1995)."

Internal Acoustics (Building Control)

Building Regulations 2010 – Approved Document E Requirements

Sound Insulation

2.4 The development falls under the classification of "purpose-built dwelling houses and flats" per the Building Regulations 2010 Approved Document E (ADE). The relevant criteria set out within Approved Document E are presented in Table 1, below.

Table 1: Sound Insulation Criteria set out in Approved Document E.

Description		Minimum Airborne Sound Insulation $D_{nT,w} + C_{tr}$ dB	Maximum Impact Sound Pressure Level $L'_{nT,w}$ dB
Purpose built dwelling-houses and flats	Walls	45	-
	Floors and stairs	45	62

2.5 These criteria are to be achieved on site, and must be demonstrated by a program of pre-completion testing (unless Robust Details are used).

2.6 Under ADE, internal floors, and internal walls which do not contain a door should achieve a minimum laboratory value for airborne sound insulation of 40dBR_w. Corridor walls which are not compromised by a door should be designed as separating walls.

Doors

2.7 Doors to common areas should achieve a minimum performance of 29dBRw.

Reverberation Control - Corridors and Stairwells

2.8 Reverberation control in the common parts of residential buildings is prescribed in Approved Document E. Two methods of compliance are presented which are discussed later in this report.

Acoustics, Ventilation and Overheating: Residential Design Guide 2020 (AVO)

2.9 AVO outlines a two-level procedure to estimate the potential impact on occupants in the case of the overheating condition.

2.10 The AVO Level 1 assessment is used to determine the 'Potential Effect without Mitigation' and to establish if there is a requirement for a Level 2 Assessment.

2.11 A level 1 assessment is undertaken by comparing the external noise levels measure to the values shown on Table 3-2 of AVO, reproduced as Figure 1, below.

Figure 1: AVO Table 3-2, Guidance for Level 1 Site Risk Assessment

Table 3-2 Guidance for Level 1 site risk assessment of noise from transport noise sources [Note 1] relating to overheating condition

Risk category for Level 1 assessment [Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
$L_{Aeq,T}$ [Note 3] during 07:00 - 23:00 / $L_{Aeq,8hr}$ during 23:00 - 07:00 High: 65 dB / 55 dB Medium: 60 dB / 50 dB Low: 55 dB Negligible: 50 dB / 45 dB	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

2.12 If required, a Level 2 assessment is then undertaken by comparing the predicted internal noise levels to Table 3-3 of AVO, reproduced as Figure 2, below.

Figure 2: AVO Table 3-3, Guidance for Level 2 Assessment

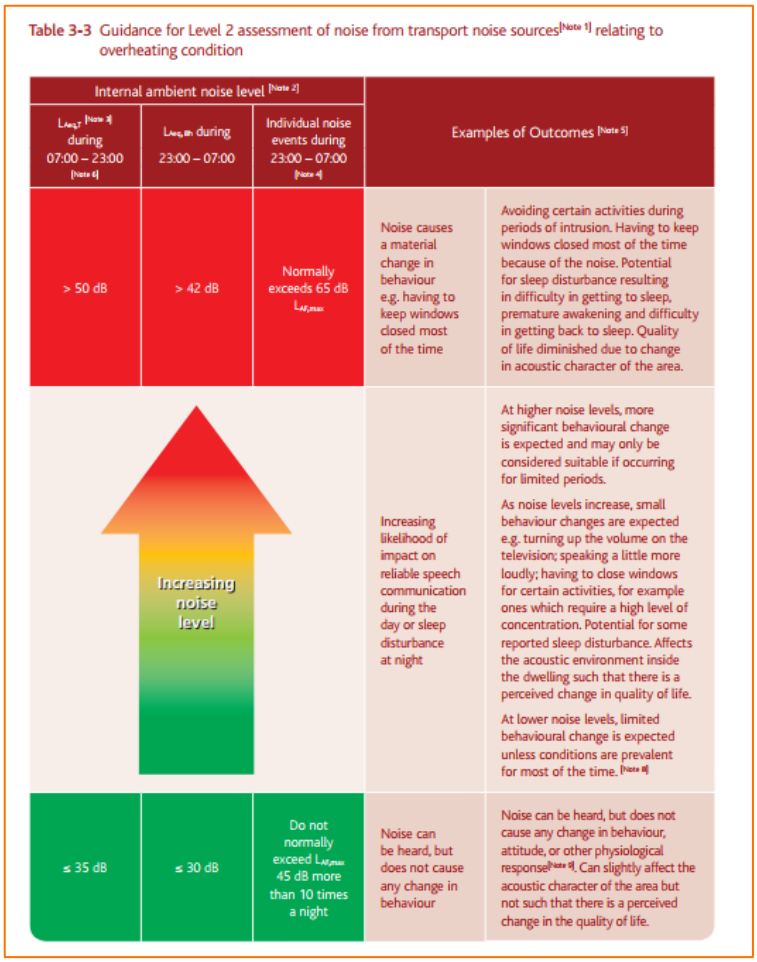


Table 3-3 Guidance for Level 2 assessment of noise from transport noise sources[Note 1] relating to overheating condition

Internal ambient noise level [Note 2]			Examples of Outcomes [Note 5]	
$L_{Aeq,T}$ [Note 3] during 07:00 – 23:00 [Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{Af,max}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. Having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
Increasing noise level			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. [Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{Af,max}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response[Note 9]. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

2.13 It can be seen from the figures above that there are no strict numerical limits for an acceptable level of noise within residences during the overheating condition.

2.14 Table 3-3, however, does suggest that daytime noise levels of ≥50dB$L_{Aeq,8hour}$, and night-time noise levels of ≥42dB$L_{Aeq,8hour}$, or 65dB$L_{Amax,F}$ can be considered upper limits for acceptable noise levels in rooms in which overheating is controlled by the use of open windows.

3 NOISE SURVEYS

3.1 In order to establish the existing sound environment around the site, noise surveys were undertaken overnight on Wednesday/Thursday 8th/9th August and Saturday/Sunday 11th August 2018, and during the daytime on Tuesday 4th September 2018.

3.2 Additional daytime measurements were carried out on Tuesday 29th and Wednesday 30th October 2019 in order to confirm that the noise climate used in the assessment remains valid.

3.3 The noise survey and measurement results are detailed in dBx Acoustics' report reference *18070 New Cross Goulden R01C Noise Impact Assessment* dated 11th November 2019.

3.4 The results of the noise survey were used to construct and calibrate a noise model of the site. A summary of the model output and hence the external noise levels affecting each façade is detailed in Table 2, below.

Table 2: External noise level by façade location.

Façade	Daytime $L_{Aeq,16hr}$ (dB)	Night-time $L_{Aeq,8hr}$ (dB)	Night time $L_{Amax,F}$ (dB)
Cross Keys Street	65	57	67
Goulden Street	63	61	76
North east (alley between Bendix St and Cross Keys St)	63	53	62
Bendix Street (south east)	63	57	62

4 NOISE INGRESS

Noise Ingress (Condition 13)

4.1 Given the height and location of the proposed development, it is not feasible to incorporate noise control measures such as screening or building orientation. The primary noise sources in the area are due to road infrastructure which cannot be relocated. Therefore, the acoustic design must be based on the use of appropriate building constructions.

4.2 The building is to be mechanically ventilated using an MVHR system, and therefore, whilst residents will have the option to open windows (e.g. for purge ventilation), the design is not reliant on open windows for background ventilation. Noise ingress will therefore be dominated by the glazing.

4.3 In order to ensure that the internal ambient noise level within the apartments does not exceed MCC requirements, both noise ingress via the glazing, and noise from the ventilation system will be designed to be no greater than 3 dB below the overall limit in the space.

4.4 The design noise limit for ventilation noise within each habitable room is therefore as follows;

- Bedrooms at night (23:00-07:00) 27 $dBL_{Aeq,8hour}$ (approx. NR 20)
- Bedrooms during the daytime (07:00-23:00) 32 $dBL_{Aeq,16hour}$ (approx. NR 25)
- Living rooms 32 $dBL_{Aeq,16hour}$ (approx. NR 25)

4.5 It is not intended that the building façade should be sealed; residents should have the freedom and flexibility to open windows as they consider appropriate. The intent of the acoustic design, however, is to ensure that appropriate acoustic conditions for rest and sleep are achievable internally.

4.6 Table 3, below, shows the worst-case predicted external façade noise level at each façade.

Table 3: External noise level by façade location.

Façade	Daytime $L_{Aeq,T}$ (dB)	Night-time $L_{Aeq,T}$ (dB)	Night time $L_{Amax,F}$ (dB)
Cross Keys Street	65	57	67
Goulden Street	63	61	76
North east (alley between Bendix St and Cross Keys St)	63	53	62
Bendix Street (south east)	63	57	62

Façade Sound Reduction

4.7 Based on the external noise levels and the target internal levels presented above, the indicative sound insulation performance requirement for each façade is shown in Table 4, below.

Table 4: Required Glazing Sound Insulation Performance to Achieve Target Internal Noise Levels.

Façade	Room Type	Glazing Sound insulation Performance	Example Glazing Build-up
Goulden Street	Living Rooms, day	41dBR_w and 37dBR_w+C_{tr}	Saftigard 11.2mm /TC/12mm
Goulden Street	Bedrooms, Night	42dBR_w and 38dBR_w+C_{tr}	SG Phonip 9mm/TC/12mm
All other facades	Living Rooms, day	40dBR_w and 35dBR_w+C_{tr}	12mm/TC/4mm
All other facades	Bedrooms, Night	37dBR_w and 33dBR_w+C_{tr}	8mm/TC/6.4mm pvb

TC = Thermal Cavity

4.8 To maintain the overall sound insulation performance, the external wall needs to achieve a sound insulation performance of 10dB greater than the windows – i.e. up to 52dBR_w.

4.9 Due to the distance from the roads, and screening effects, noise levels at the roofs would be at least 10dB lower than the worst-case noise levels detailed in Table 2, above. Therefore, the roof would need to achieve a sound insulation performance of at least 42dBR_w.

External Walls

4.10 There are six external wall types shown on TGA drawing *0321-TGA-XX-XX-DR-A-21000 REV P02*.

EW-101

4.11 EW-101 is comprised of 103mm brick, with a 70mm cavity, 100mm rigid insulation, 12.5mm cementitious board (assumed density ~1100kg/m^3), 100mm SFS and 2 layers of plasterboard (type unspecified). This wall has a predicted sound insulation performance of at least 55dBR_w as a worst case (2x 12.5mm WallBoard.)

EW-101A

4.12 EW-101 A is comprised of 103mm brick, with a 50mm cavity, 100mm rigid insulation, 12.5mm cementitious board (assumed density ~1100kg/m^3), 100mm SFS and 2 layers of plasterboard (type unspecified). This wall has a predicted sound insulation performance of at least 55dBR_w as a worst case (2x 12.5mm WallBoard.)

4.13 These two proposed external walls will therefore meet the 52dBR_w requirement, and hence will be acceptable in all locations, and could be reduced if desirable (e.g. one layer of plasterboard, replace mineral fibre with rigid insulation, etc.).

EW-102

4.14 EW-102 is comprised of 103mm brick, with a 170mm cavity, 12.5mm cementitious board (assumed density ~1100kg/m^3), 100mm SFS, 12.5mm cementitious board, a 170mm cavity and 103mm brick. This wall has a predicted sound insulation performance of at least 65dBR_w. On of the layers of CPB could be removed, if desired.

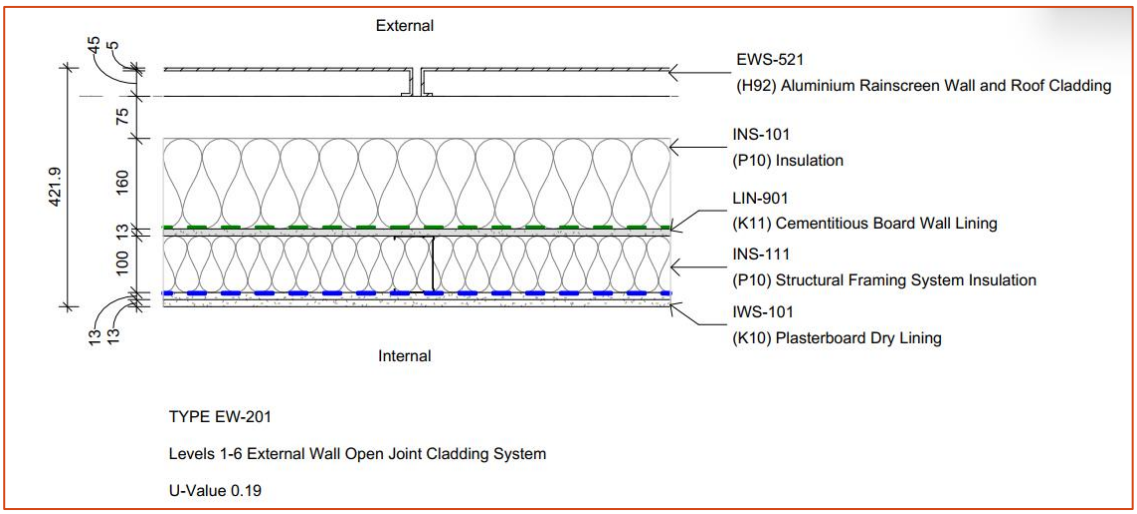
EW-103

4.15 EW-103 is comprised of the existing masonry/ashlar wall (thickness varies – 300mm drawn as an example), with a minimum 50mm cavity, 100mm rigid insulation, 12.5mm cementitious board (assumed density ~1100kg/m^3), 100mm SFS and 2 layers of plasterboard (type unspecified). This wall has a predicted sound insulation performance of at least 55dBR$_w$ as a worst case (2x 12.5mm WallBoard.)

EW-201

4.16 EW-201 comprises a rainscreen cladding panel, 50mm cavity, 100mm rigid insulation, 12.5mm cementitious board (assumed density ~1100kg/m^3), 100mm SFS and 2 layers of plasterboard (type unspecified). It should be noted that this wall is indicated as having a gap between panels – see Figure 3, below.

Figure 3:EW-201



4.17 It is assumed that this gap would be sealed in some way (e.g. mastic). Assuming this is the case, this wall would have a predicted sound insulation performance of around 55dBR$_w$ as a worst case (2x 12.5mm WallBoard).

4.18 However, if there is a gap between the panels, this would reduce to around 49dBR$_w$. If this is the case, then the CPB would need to be increased to around 1500kg/m^3 (i.e. around 18mm thick).

EW-301

4.19 EW-301 comprises the existing wall (width varies, assumed minimum 100mm brick) with minimum 50mm cavity and 150mm rigid insulation, and a layer of 140mm blockwork. This wall has a predicted sound insulation performance of at least 53dBR$_w$ and is therefore acceptable in all locations.

Roofs

4.20 There are four proposed roof types shown on TGA drawing reference *0321-TGA-XX-XX-DR-A-27000 Rev P02.*

RT-101

4.21 RT-101 comprises an inverted roof system, comprising paving slabs on rigid insulation on 65mm screed, 18mm cement particle board, with a ceiling comprising 2 layers of plasterboard (type unspecified) with at least 400mm cavity. This roof has a predicted sound insulation performance of at least 60dBR_w (worst case, based on two layers of 12.5mm WallBoard) and is hence acceptable.

RT-102

4.22 RT-102 comprises an inverted roof system, comprising 40mm ballast on rigid insulation on 65mm screed, 18mm cement particle board, with a ceiling comprising 2 layers of plasterboard (type unspecified) with at least 400mm cavity. This roof has a predicted sound insulation performance of at least 60dBR_w (worst case, based on two layers of 12.5mm WallBoard) and is hence acceptable.

RT-201

4.23 RT-201 comprises a steel standing seam roof, 135mm cavity, 18mm cement particle board, with a ceiling comprising 2 layers of plasterboard (type unspecified) with at least 400mm cavity. This roof has a predicted sound insulation performance of at least 55dBR_w (worst case, based on two layers of 12.5mm WallBoard) and is hence acceptable.

RT-202

4.24 RT-202 comprises an aluminium rainscreen cladding roof, 135mm cavity, 18mm cement particle board, with a ceiling comprising 2 layers of plasterboard (type unspecified) with at least 400mm cavity. This roof has a predicted sound insulation performance of at least 55dBR_w (worst case, based on two layers of 12.5mm WallBoard) and is hence acceptable.

4.25 Although there are no criteria in terms of rain noise for residential accommodation, the proposed roofs would all be expected to adequately control rain noise in the apartments below.

Overall

4.26 Overall, the sound insulation performance of the proposed external envelope elements would control noise ingress to meet MCC's requirements in all habitable rooms, and hence Planning Condition 13 can be discharged.

Overheating

4.27 At this stage, it has not been established whether the overheating condition will occur.

Level 1 Assessment

4.28 The AVO Level 1 Assessment is used to determine the 'Potential Effect without Mitigation' and to establish if there is a requirement for a Level 2 Assessment.

4.29 The Level 1 Assessment (based on Figure 1, above) is summarised in Table 5, below.

Table 5: Level 1 Assessment

Façade	Daytime L_{Aeq} (dB)	Night-time L_{Aeq} (dB)	Night time L_{Amax} (dB)	Risk Category
Cross Keys Street	65	57	67	High
Goulden Street	63	61	76	High
North east (alley between Bendix St and Cross Keys St)	63	53	62	Medium
Bendix Street (south east)	63	57	62	High

4.30 AVO indicates that a Level 2 assessment is 'recommended' when ambient noise levels of 65dB$L_{Aeq,16hour}$ (daytime) and 55dB$L_{Aeq,8hour}$ (night-time) are exceeded.

4.31 A Level 2 assessment is therefore recommended for all facades other than the north-east. On this elevation, a Level 2 assessment is between 'recommended' and 'optional'.

4.32 On this basis, a Level 2 assessment has been undertaken for all 4 facades.

Level 2 Assessment

4.33 AVO specifies an expected reduction from external to internal noise levels of 13dB when a window is open.

4.34 On this basis, the Level 2 assessment is shown in Table 6, below.

Table 6: AVO Level 2 Assessment

Facade	Period	External Noise Level, dB	Reduction, open window, dB	Internal Noise Level, dB	Upper Limit Outlined in AVO, dB	Exceedance, dB
Cross Keys Street	Day, $dBL_{Aeq,16hr}$	65	-13	52	50	2
	Night, $dBL_{Aeq,8hr}$	57	-13	44	42	2
	Night, $dBL_{Amax,F}$	67	-13	54	65	-11
Goulden Street	Day, $dBL_{Aeq,16hr}$	63	-13	50	50	0
	Night, $dBL_{Aeq,8hr}$	61	-13	48	42	6
	Night, $dBL_{Amax,F}$	76	-13	63	65	-2
North east	Day, $dBL_{Aeq,16hr}$	63	-13	50	50	0
	Night, $dBL_{Aeq,8hr}$	53	-13	40	42	-2
	Night, $dBL_{Amax,F}$	62	-13	49	65	-16
Bendix Street	Day, $dBL_{Aeq,16hr}$	63	-13	50	50	0
	Night, $dBL_{Aeq,8hr}$	57	-13	44	42	2
	Night, $dBL_{Amax,F}$	62	-13	49	65	-16

Daytime

4.35 It can be seen that in the daytime, the suggested limits are met on all facades, other than Cross Keys Street, where a marginal exceedance of 2dB is predicted.

Night-time

4.36 At night, the maximum noise limits, which subjectively are generally considered a bigger problem in terms of sleep disturbance, are all lower than the recommended limits, in most cases significantly.

4.37 On all facades other than Goulden Street, the ambient noise limits are met or marginally exceeded (2dB).

4.38 However, on Goulden Street, the ambient noise limit is predicted to be exceeded by around 6dB.

4.39 On this basis, it is therefore recommended that alternative means of overheating mitigation are provided to bedrooms facing Goulden Street, such as mechanical or hybrid ventilation, or attenuated louvres.

4.40 This needs to be reviewed by the mechanical services consultant.

External Amenity

4.41 There is a private courtyard proposed on the corner of Goulden Street and Chadderton Street.

4.42 External noise levels within this area have been predicted, and will be below 55dB$L_{Aeq,T}$ during the daytime as indicated in Figure 4, below.

Figure 4: Daytime Noise Map of External Amenity Area



5 INTERNAL ACOUSTICS / APPROVED DOCUMENT E

Walls

5.1 The internal wall types are shown on TGA drawing reference *0321-TGA-XX-XX-DR-A-22000 Rev P01*.

Separating Walls

IW-01 / IW-04

5.2 IW-01 is a separating wall and hence needs to achieve a sound insulation performance of $45dBD_{nT,w}+C_{tr}$ on site, and is tested at PCT Stage. This wall is used both between apartments, and to separate apartments from corridors.

5.3 The proposed construction comprises 2 layers of 15mm SoundBloc each side of twin/independent studs, forming a cavity of 200mm, with 50mm mineral fibre. The plasterboard has a nominal 3mm plaster skim coat.

5.4 This wall is similar to BG partition reference A216002, which has a laboratory tested performance of $57dBR_w+C_{tr}$, and hence should achieve around $50dBD_{nT,w}+C_{tr}$ on site, which is 5dB greater than the required performance, hence allowing some tolerance.

5.5 It is critical that the two leaves of the partition are not rigidly connected (e.g. with plasterboard). The drawing is not clear, but there appears to be a plasterboard bridge between the two leaves. If this element is plasterboard, it will significantly reduce the sound insulation performance of the partition, and hence will need to be reconsidered.

5.6 IW-04 is identical to IW-01, and is used in the stair core, in some cases separating the stair core from apartments, and would therefore also need to achieve a sound insulation performance of $45dBD_{nT,w}+C_{tr.}$ It is therefore acceptable in these locations.

Internal Walls

5.7 IW-02 and IW-03 are internal walls (within apartments), and hence only need to achieve a laboratory tested sound insulation performance of $40dBR_w$, but are not tested at PCT stage.

IW-02

5.8 IW-02 comprises 2 layers of 15mm SoundBloc each side of a 100mm stud with no mineral fibre.

5.9 This wall is similar to BG partition reference A216002, which has a laboratory tested performance of $50dBR_w$ and hence easily meets the requirement.

5.10 One layer of 15mm SoundBloc each side of a 100mm cavity would be acceptable, although this does not appear to be in the White Book. No mineral fibre would be required.

IW-03

5.11 IW-03 comprises one layer of 15mm SoundBloc each side of a 70mm stud, and is BG partition reference A216165, which has a laboratory tested performance of $42dBR_w$, and hence also meets the requirement. This partition could therefore be used for all internal walls if desirable.

IW-11

5.12 IW-11 is used to separate the WCs from commercial and back of house areas, and between back of house areas. This is a 140mm blockwork wall, and, assuming a density of around 1,880kg/m^3, would achieve around $46dBD_w$ on site, which is acceptable.

IW-12

5.13 IW-12 is used to separate the sub-station from the bin store. This wall is a double-skin brick construction, which would achieve around 46dBD_w, which is acceptable.

5.14 This wall is upgraded with independent lining IW-22 to the LV Switch room (unnecessary acoustically).

IW-23

5.15 IW-12 is further upgraded with independent lining IW-23 to the upper levels of the apartments on level -01 comprising 2 layers of 15mm SoundBloc.

5.16 This wall has a predicted sound insulation performance of around 70dBR_w+C_{tr}, and hence would achieve around 65dB$D_{nT,w}$+C_{tr} on site. This is significantly higher than the requirements of ADE, and hence the lining could be reduced to one layer of WallBoard, if preferable.

5.17 The bike store, water store and bin store all have a double wall comprising both IW-11 and IW-12 separating them from the corridor. This should achieve at least 52dBD_w on site and hence will be acceptable.

IW-21

5.18 IW-21 appears to be a boxing in system for services in the apartments, and comprises one layer of 12.5mm SoundBloc (mass of 10.6kg/m^2). If these services penetrate the separating floors or walls, then the mass of the enclosure needs to be at least 15kg/m^2, and hence two layers of plasterboard would be required (WallBoard can also be considered).

IW-22

5.19 IW-22 is a wall lining to concrete/blockwork walls in the corridor next to the bin store, comprising 90mm British Gypsum Gyproc Thermaline Super. This will add a negligible (up to 1dB) improvement to the base wall.

IW-23

5.20 IW-23 (seemingly labelled IW-24 on wall types drawings) is a wall lining comprising 2 layers of 15mm SoundBloc on 70mm studs, with mineral fibre in the cavity.

5.21 This is used behind the curtain walling in a small area of one Level 0 apartment, and between the switch room and LGF dwelling, lining IW-11.

5.22 This will increase the performance of these partitions to around 50-60dBR_w respectively, and hence would be acceptable. THe lining could be reduced to one layer of plasterboard if desirable.

Doors

5.23 Apartment doors to corridors should achieve a sound insulation performance of at least 29dBR_w. Seals should be provided to the head, jambs and threshold.

Floors

5.24 The proposed separating floor types are shown on TGA drawing reference *0321-TGA-XX-XX-DR-A-23000 rev P01*, and assessed below.

FT-201 - Typical Level 1 Floor

5.25 FT-201 separates apartments from apartments, and comprises a 150mm profiled concrete slab, with a cavity of around 660mm and a ceiling comprising two layers of 12.5mm plasterboard (assumed 2x 12.5mm WallBoard, the worst case).

5.26 Assuming normal weight concrete (~2,400kg/m^3), this floor has a predicted airborne sound insulation performance of 53dBR_w+C_{tr}, and hence should achieve around 48dB$D_{nT,w}$+C_{tr} on site, assuming good detailing and workmanship. This is around 3dB higher than the required performance of 45dB$D_{nT,w}$+C_{tr}, and hence should be acceptable, although leaves little tolerance.

5.27 Adding 25-50mm mineral fibre within the ceiling void will increase this performance by 5-10dB and hence provide a much greater tolerance for workmanship and detailing.

5.28 The predicted impact sound insulation performance is around 59dB$L_{nT,w}$ which is 3dB lower (better) than required. While it should meet the requirements, this is a very low tolerance for impact sound, and is likely to be subjectively perceived poorly.

5.29 On this basis, a proprietary resilient layer should be provided beneath the proposed floor finish. This should achieve an impact sound insulation improvement performance of at least 15dBΔL_w ('delta L_w').

FT-202 - Internal Insulated Floor

5.30 FT-202 separates apartments from back of house areas – generator room, bike store, bin store, water storage, switch room and substation.

5.31 There are therefore no impact sound insulation requirements for this floor.

5.32 In terms of airborne sound insulation, this should achieve the same performance as floors separating apartments from apartments. It is understood that the generator would only operate in emergency conditions.

5.33 FT-202 comprises a 150mm profiled concrete slab, with a cavity of around 460mm and a ceiling comprising one layer of 18mm cement particle board. The insulation as drawn appears to be rigid, which has no acoustic performance and hence is not considered.

5.34 Assuming normal weight concrete (~2,400kg/m^3), this floor has a predicted airborne sound insulation performance of 54dBR_w+C_{tr}, and hence should achieve around 49dB$D_{nT,w}$+C_{tr} on site, assuming good detailing and workmanship. This is around 4dB higher than the required performance of 45dB$D_{nT,w}$+C_{tr}, and hence should be acceptable, although leaves little tolerance.

FT-301 – Apartments

5.35 This floor comprises a 65mm screed on 18mm cement particle board, with a cavity of around 660mm and a ceiling comprising two layers of 12.5mm plasterboard (assumed 2x 12.5mm WallBoard). The insulation as drawn appears to be rigid, which has no acoustic performance and hence is not considered.

5.36 This floor has a predicted airborne sound insulation performance of around 56dBR_w+C_{tr} and hence should achieve around 51dB$D_{nT,w}$+C_{tr} on site, assuming good detailing and workmanship. This is around 5dB higher than the required performance of 45dB$D_{nT,w}$+$C_{tr,}$ and hence should be acceptable.

5.37 Insulation is not therefore necessary acoustically, although it is generally beneficial, in terms of absorbing any sound which breaks into the cavity via any small gaps etc.

5.38 In terms of replacing the screed with a dry solution, as requested by Big Red, one option could be to replace the screed with a proprietary screed board. Most of these come with a resilient layer which would also control the impact sound.

5.39 The board element should achieve a minimum mass of 20kg/m^2, and the resilient element should provide a minimum impact sound insulation improvement performance of at least 15dBΔL_w ('delta L_w').

5.40 One suitable product is the Cellecta ScreedBoard28[1].

5.41 It should be noted however that ~50mm mineral fibre in the ceiling cavity would be required with this solution.

5.42 Other manufacturers can provide similar products, but any proposed alternatives should be checked with dBx Acoustics.

FT-302 – Corridors

5.43 This floor is the same as FT-301 but with a larger cavity.

5.44 There are no sound insulation performance standards to be achieved between corridors. On this basis, the ceiling can be reduced to one layer of plasterboard.

5.45 Reverberation control in common areas of residential buildings (e.g. lobbies and hallways) is however prescribed in Approved Document E.

5.46 Two methods of compliance are presented. The simplest means of compliance (Method A) is to provide a Class C acoustically absorptive ceiling throughout all common areas. Alternatively, calculations can be undertaken based on the proposed finishes (Method B).

5.47 It is understood that the previously proposed absorptive ceilings in the corridors have been replaced with plasterboard for fire safety reasons. On this basis, the only absorption will be provided by the carpet, which is not in itself enough to meet the requirements of Approved Document E.

[1] https://www.cellecta.co.uk/product/screedboard-28/

5.48 dBx Acoustics are not fire experts. However, one option might be to provide a plasterboard border/bulkhead around the perimeter of the corridors, and an absorptive ceiling in the centre. If the Class C ceiling is upgraded to a Class A ceiling, then the required area would reduce by around 20%, and hence this would satisfy Method A.

5.49 Alternatively, either suspended rafts or wall panels could be considered.

5.50 Although not strictly in accordance with Approved Document E, on previous projects dBx Acoustics has agreed with Building Control that just a carpet finish is acceptable in, and this can be explored as a further alternative.

Flanking

External Wall

5.51 Based on drawing *0321-TGA-XX-XX-DR-A-21302 rev P01*, the inner linings of the external wall are not continuous between floors, and a cavity barrier is to be located at floor level in the external wall cavity. Overall, therefore, flanking via the external wall would be adequately controlled vertically.

Horizontally (Beneath Walls)

5.52 The floated screed has a mass significantly greater than 25kg/m^2, and hence, assuming the floated layer is isolated from the walls, flanking horizontally would be adequately controlled.

Services Penetrations

5.53 Where services pass through separating floors or walls, they should be wrapped with 25mm (min) mineral wool quilt (10-36 kg/m^3) and boxed in with plasterboard achieving a minimum mass of 165g/m^2. It is acceptable to internally line the enclosure with mineral fibre if preferable, rather than wrapping the services. Any gaps at the floor/wall penetration should be fully sealed with mastic, or a pattress if larger than around 10mm.

Socket in Separating Walls

5.54 Where sockets, switches etc are located within separating walls they should be staggered. Two or more layers of plasterboard (min 22kg/m^2) should fully enclose the rear of the electrical boxes, or appropriate putty pads should be used.

Downlighters and Recessed Lighting

5.55 Provided there is a minimum ceiling void of 75mm, downlighters or recessed lighting may be installed in the ceiling;

- At no more than one light per 2m2 of ceiling area in each room;
- At centres not less than 750mm;
- Into openings not exceeding 100mm diameter or 100x100mm.

6 PLANT NOISE EMISSION LIMITS (CONDITION 12)

6.1 Manchester City Council requires that 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 below the typical background $L_{A90,T}$ level at the nearest noise sensitive location.

6.2 The nearest noise sensitive locations to the site have been identified as the Turning Point residential treatment facility to the north west of the site, and the apartments currently under construction on Bendix Street.

6.3 Based on the requirements of MCC and the typical background noise levels measured during the noise surveys, the rating noise level for building services plant should not exceed the following levels when assessed at the noise sensitive receptors;

Table 7: Plant Noise Emission Limits, $L_{Ar,Tr}$

Location	BS 4142 Rating Level	
	Day (07:00-23:00)	Night (23:00-07:00)
Bendix Street	51dB$L_{Ar,Tr}$	41dB$L_{Ar,Tr}$
Turning Point	51dB$L_{Ar,Tr}$	41dB$L_{Ar,Tr}$

6.5 A detailed assessment should be undertaken once details of the proposed plant are known.

7 SUMMARY AND CONCLUSIONS

7.1 dBx Acoustics Ltd has been appointed by Big Red Industries Group to undertake an acoustic design review for the proposed Goulden Street residential development.

7.2 The development comprises a new build 8-storey residential apartment block, to form 81 apartments.

7.3 The development has been granted planning permission, with conditions, under Manchester City Council planning reference 125678/FO/2019. An updated planning application was made to reflect the replacement of ground floor commercial units with apartments, and given approval under decision notice reference 135818/JO/2022. Planning Conditions 12 and 13 of this decision relate to acoustics.

7.4 Plant noise limits have been set suitable for discharging planning condition 12.

7.5 The acoustic requirements of the external envelope have been assessed in terms of noise ingress to the apartments, which meet the requirements of and hence discharge Planning Condition 13.

7.6 An assessment of internal sound insulation, and reverberation control for common areas, which need to comply with the requirements of Approved Document E (ADE) of the Building Regulations has also been undertaken.

7.7 A review of the plant should be undertaken once details are available.

7.8 On this basis the proposed design should meet all Planning and Building Control requirements.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (Lp) the reference quantity is 2x10-5 N/m2. The sound pressure level existing when microphone measured pressure is 2x10-5 N/m2 is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A-weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
L_{Fmax}	The instantaneous maximum sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
L_{AFmax}	The instantaneous maximum A weighted sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
$L_{Ar,Tr}$	The rating level: the equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Reverberation Time, T	The time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. The descriptor *T,* often includes other nomenclature to describe the type of reverberation time measurement or if the reverberation time is an average taken for specific frequencies. For example, a T_{mf} is the mid-frequency reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Acoustic Class, A - E	Classification of sound absorbers into Sound Absorption Classes A-E, according to BS EN ISO 11654, including frequencies 200-5000 Hz
NRC	A single-number rating system used to compare the sound-absorbing characteristics of building materials. A measurement of the acoustical absorption performance of a material, calculated by averaging its Sound Absorption Coefficients at 250, 500, 1000 and 2000 Hz
STI	**Speech Transmission Index**, Metric ranging between 0 and 1 representing the transmission quality of speech with respect to intelligibility by a speech transmission channel
R	**Sound Reduction Index,** the laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
R_w	**Weighted Sound Reduction Index**, a single number which represents the sound reduction of a material. It is derived by plotting the sound reduction index against a set of reference curves. The curves are shifted until a best-fit is established and the curve which best fits the sound reduction spectrum is used to represent the single figure value.
D_w	**Weighted Level Difference**, the weighted level difference between a pair of rooms, stated as a single figure.

D_{nT}	**Standardised Level Difference,** a frequency-dependent measurement of airborne sound insulation, calculated using the following formula: $D_{nT} = L_1 - L_2 + 10\log(T/T0)$ dB Where: L_1 is the energy-averaged sound pressure level due to the pink noise source measured in the source room using a sweep technique. L_2 is the energy-averaged sound pressure level measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (= 0.5s for dwellings).
$D_{nT,w}$	**Weighted Standardised Level Difference,** a single-figure value of airborne sound insulation performance, derived according to procedures in BS EN ISO 717-1, based on the D_{nT} values at different frequencies (100-3150 Hz third octave bands).
$D_{n,F,w}$	**Weighted, Normalised Flanking Level Difference,** the normalised, weighted difference in sound level between a pair of rooms via a flanking element, such as mullion or ceiling detail. The level difference in octave bands is first normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
D_{ne}	**Normalised Element Level Difference**. The normalised difference in sound level between a pair of rooms via a small element such as a trickle ventilator. The level difference in octave bands is normalized to a reference amount of absorption.
$D_{n,e,w}$	**Weighted, Normalised Element Level Difference**. The normalised, weighted difference in sound level between a pair of rooms via a small element such as a trickle ventilator, stated as a single figure. The level difference in octave bands is normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
C_{tr}	**Spectrum Adaptation Term** , a correction term applied to the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) in accordance with BS EN ISO 717-1. Applying the C_{tr} penalises a construction's performance if its low frequency performance is poor in relation its performance at higher frequencies.
Impact Sound	The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking or moving furniture on a floor structure.
L_{nT}	**Standardised Impact Sound Pressure Level,** a frequency dependent measurement of impact sound insulation, calculated using the following formula: $L_{nT} = L_1 + 10\log(T/T0)$ dB Where: L1 is the mean sound pressure level due to the tapping machine measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T30 measured in seconds). T_o is the reference reverberation time (0.5s for dwellings)
$L'_{nT,w}$	**Weighted Standardised Impact Sound Pressure Level,** a single-figure value (@ 500 Hz) of impact sound insulation, performance, derived according to BS EN ISO 717-2, based on the L_{nT} values at different frequencies (100Hz- 3150 Hz third octave bands).
Insertion Loss, IL	The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence.
NR	The **Noise Rating level**. This is a single figure value derived by plotting a noise spectrum against a set of curves. The curve under which the spectrum fits is the resulting NR level.

This report (including any enclosures and attachments) has been prepared by dBx Acoustics with reasonable skill and care in accordance with generally accepted acoustic principles and the terms agreed between dBx Acoustics and our Client. Any information provided by third parties and referred to herein may not have been checked or verified by dBx Acoustics unless expressly stated otherwise. This document contains confidential information, and no part of this report should be reproduced, distributed or communicated to any third party without express prior written consent from dBx Acoustics. We do not accept any liability if this report is used for an alternative purpose from that for which it is intended, nor to any third party in respect of this report. Where a noise survey has been undertaken, this report is based on the noise climate at the site at the time of the survey and no warranty is given as to the possibility of changes at differing times.

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24033-R01-BT Goulden Street Stage 4 Acoustic Design Report

Final Audit Report 2024-06-04

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