**Revision History**

| Revision | Date | Description |
|---|---|---|
| 2v1 | 27/01/2022 | First Issue |
| 2v2 | 08/03/2022 | Update to validation testing method |
| 2v3 | 25/05/2022 | Update to include on site validation testing |
| 2v4 | 13/10/2022 | Update to include MCC discussions |

**13th October 2022**

## Introduction

Caddick Construction has appointed Stroma Built Environment (SBE) to provide acoustic consultancy in relation to planning requirements for Base Building, Manchester Science Park. The development was granted planning consent subject to conditions set out in Decision Notice ref 125018/FO/2019.

Condition 19 relates to control of noise break out from four 'Maker Space' units located at ground floor level. The units are double height workshop spaces which will be separately tenanted. The specific planning condition is reproduced below for information.

> 19) The Maker Space and ancillary workshop 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 designed by an approved acoustic consultant and shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.
> Upon completion 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 has 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 residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy.

A scheme of acoustic treatment has been set out by the client side acoustician BDP, and is outlined in BDP report '*Base, Manchester Science Park – RIBA Stage 4 Acoustic Design Strategy Report'.*

This technical note summarises the noise insulation scheme and provides a more detailed assessment of external noise breakout. Additional on site verification measurements are included.

## Consultation with Manchester City Council (MCC)

Consultation discussions were carried out between SBE and Lisa Jones, Environmental Protection Officer at MCC regarding the proposed methodology to discharge Condition 19.

During discussions MCC agreed generally with SBEs proposed methodology and understood the limitations given that the Maker Space was unoccupied at the time of verification measurements being carried out. MCC agreed that verification measurements were undertaken in worst case conditions

given the source noise level used was higher than those likely anticipated from the Maker Space, given the proposed internal noise limits of 85 dB $L_{Aeq,T}$.

MCC did highlight that further verification measurements may be required once occupied, particularly dependant on the type of occupant (e.g. if it were obvious that the occupant may generate high levels of noise), however a noise level limit (such as that proposed) may also be acceptable.

## Noise Insulation Scheme

The existing noise insulation scheme set out by BDP is based on limiting the internal noise levels within Maker Space workshops and providing appropriate sound insulation to the façade to ensure noise breakout is controlled to suitable levels. Site background sound levels are taken from a site noise survey undertaken by BDP and set out in report *'Base, Manchester Science Park – Environmental Noise Assessment Report'* which was submitted with the planning documents and is referenced in the planning decision notice.

Identified Noise Sensitive Receptors (NSR) adjacent to the new building are summarised in Table 1. Site plans are included in Appendix I.

The noise limits proposed by BDP are reproduced below in Table 2. A separate noise limit has been assigned to each of the four Maker Spaces such that the total cumulative noise level from all four units does not exceed 5 dB below the background sound level at the closest noise sensitive receptors.

**Table 1: Noise Sensitive Receptors**

| Noise Sensitive Receptor | Type | Approximate distance from Base Building (m) |
|---|---|---|
| Greenheys Lane | Residential Properties considered noise sensitive during daytime and night time | 33 |
| Greenheys Building | Commercial building considered noise sensitive during daytime hours | 15 |
| Darul Aman Mosque | Religious building considered noise sensitive during daytime hours | 32 |

**Table 2: BDP Proposed Operational Noise Limits (Table 6 of BDP Stage 4 report)**

| Noise Sensitive Receptor | Time Period | Operational Noise Limits at NSR façade dB $L_{Ar,Tr}$ | | | | |
|---|---|---|---|---|---|---|
| | | North Corner Maker Space | South Corner Maker Space | West Maker Space | North Maker Space | Total Noise Level all units[1] |
| Greenheys Lane | Daytime (07:00 – 19:00) | 36 | 36 | 29 | 33 | 40 |
| | Evening (19:00 – 23:00) | 36 | 36 | 29 | 33 | 40 |
| | Night (23:00 – 07:00) | 29 | 25 | 21 | 22 | 31 |
| Greenheys Building | Daytime (07:00 – 23:00) | 33 | 24 | 20 | 33 | 36 |
| Darul Aman Mosque | Daytime (07:00 – 23:00) | 28 | 36 | 25 | 19 | 37 |

**Notes to Table 2:**
1. Calculated by SBE from BDP limits

In order to achieve the above external noise limits it has been proposed that noise limits within Maker spaces are limited to a maximum level of 85 dB $L_{Aeq,T,}$ which would represent a typical internal noise level for a busy workshop space. Based on this internal noise level a glazing sound insulation of 30 dB $R_w + C_{tr}$ has been set to ensure that the external noise limit are met.

## Noise Break Out Assessment

The Maker's Spaces are to be mechanically ventilated such that open windows or ventilators are not required to provide air supply and extract. The façade is to be constructed of solid areas of insulated cladding panels with a brick external face and an internal plasterboard lining, and areas of glazed curtain walling.

Calculations indicate that the proposed solid façade build up will provide a sound insulation of 48 dB $R_w + C_{tr}$. Glazing to curtain walling is to be formed of double glazed units with two glass types. Sound insulation test certificates are not available for the glazing, however the sound insulation of the glazing system has been assessed by calculation and comparison to similar constructions and is set out in Table 3 below.

**Table 3: Glazing sound insulation assessment**

| Glazing Build up | Assessed Sound Insulation dB $R_w + C_{tr}$ |
|---|---|
| 8.8mm laminate glass, 14mm argon filled cavity, 11.5mm laminate glass | 37 |
| 6.8mm laminate glass, 18mm argon filled cavity, 9.5mm laminate glass | 35 |

Sound insulation calculations are appended to this note. Both glazing proposals significantly exceeds the project requirement of 30 dB $R_w$ + $C_{tr}$ set by BDP.

Calculations have been undertaken to assess the noise break out at the closest noise sensitive properties based on the assessed sound insulation of the building façade. As with the design stage assessment an internal noise level of 85 dB $L_{Aeq,T}$ has been used to inform the assessment. The assessment makes an allowance for the potential reduction in sound insulation of doors to units, however assumes that doors and any openable windows are kept closed to limit noise break out.

Table 4 sets out an assessment of calculated break out noise in relation to pre-development background sound levels and BDP proposed noise limits. The calculations assume all four Maker Space units are in use, each with a maximum internal noise level of 85 dB $L_{Aeq,T}$.

The calculated rating level has been assessed in line with guidance set out in British Standard 4142. The noise from Maker Spaces when considered at the closest NSR is not expected to be tonal, impulsive, or intermittent, however may feature other acoustic characters that are noticeable against the background sound at quieter times. A +3dB acoustic feature correction has been applied to account for sound characteristics.

Calculations indicate that the rating level of noise break out from all four units will be at least 7 dB below the lowest measured pre-construction background sound level. When assessed in line with BS 4142[1] this is classed as an indication of a low noise impact.

It is recommended that the maximum reverberant Maker Space noise level of 85 dB LAeq,5mins is set within tenancy agreements for each Maker Space. If tenants need to exceed these noise levels then further upgrade of the unit façade would be required.

Noise levels should be considered as an average reverberant level averaged across at least 4 separate positions within the space.

**Table 4: Noise break out desktop assessment**

| Noise Sensitive Receptor | Lowest Background Sound Level[1] dB $L_{A90,T}$ | BDP Proposed Operational Noise Limit dB $L_{Ar,Tr}$ | Calculated Operational Break out Rating Level dB $L_{Ar,Tr}$ |
|---|---|---|---|
| Greenheys Lane Daytime | 48 | 40 | 31 |
| Greenheys Lane Evening | 44 | 40 | 31 |
| Greenhays Lane Night | 38 | 31 | 31 |
| Greenheys Building | 42 | 36 | 34 |
| Darul Mosque | 45 | 37 | 31 |

**Notes to Table 4:**
1. As measured and reported by BDP

[1] BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*'

## Verification Measurements

At the time of writing the Maker Spaces' have been constructed as Shell and Core and are not tenanted. As such it is not possible at this time to undertake any verification measurements on site with the Maker Spaces' in use.

An indicative test has been undertaken by using a pink noise source to create a representative noise level within a single Maker Space. Measurements of breakout noise have been taken outside the façade of the unit to validate the above noise break out desktop assessment.

A noise source was placed in Maker Space 00.01 on the north west corner of the building. A pink noise source was used to represent a broadband noise source with equal energy in each octave frequency band. The noise source was set to provide an internal reverberant level of 85 dB $L_{Aeq,T}$ inside the Maker space, however it was noted that this level was readily audible outside of the unit above the ambient noise climate dominated by local traffic noise. The internal source level was therefore increased to a reverberant level of 96 dB $L_{Aeq,T}$ to allow for an accurate external measurement.

An external measurement was taken at a location 5m from the centre if the façade of the maker unit. It was noted that ambient noise due to local traffic was highly variable at the time of assessment due to intermittent passing traffic, and therefore it was not considered accurate to assess the specific sound level of the break out noise from the Maker unit by comparison of measurements taken with the source noise on and off.

As the breakout noise from the Maker Space is continuous and stable in nature, the $L_{90,T}$ parameter has been used to best represent the underlying break out sound level and reduce the contribution of variable traffic noise.

An example BS 4142 calculation is shown in Table 5 for the closest residential property on Greenhays Lane. The measured specific sound level have been corrected by -11 dB to account for the internal noise limit of 85 dB $L_{Aeq,T}$ within Maker Units.

**Table 5: BS 4142 validation assessment – Maker Space 00.01**

| | | |
|---|---|---|
| Measured Specific sound level at 5m from facade | $L_{A90,3\ min}$ = 53 dB | Measured Specific noise level with 96 dB $L_{Aeq,T}$ internal level |
| Corrected Specific sound level at 5m from facade | $L_{A90,3\ min}$ = 42 dB | Corrected for an internal source level of 85 dB $L_{Aeq,T}$ |
| Maximum Specific sound level at NSR | $L_{s,T}$ = 25 dB | Calculated Specific noise level at NSR Greenhays Lane |
| BS 4142 Rating level | $L_{Ar,Tr}$ = 28 dB | +3dB acoustic feature correction applied |
| Representative Background sound level | $L_{A90,T}$ = 38 dB | Night time background level |
| Excess of rating over background sound level | - 10 dB | No indication of an adverse noise impact |

The rating level has been assessed in line with guidance set out in British Standard 4142. The noise from Maker Spaces when considered at the closest NSR is not expected to be tonal, impulsive, or intermittent, however may feature other acoustic characters that are noticeable against the background sound at quieter times. A +3dB acoustic feature correction has been applied to account for sound characteristics.

The calculations set out in Table 4 above have been revised based on the site measured breakout level. Table 6 presents a summary of verification assessments for all identified NSR, and include simultaneous use of all Maker Spaces with a maximum internal level of 85 dB $L_{Aeq,T}$, and includes the +3dB feature correction.

**Table 6: Noise break out validation assessment**

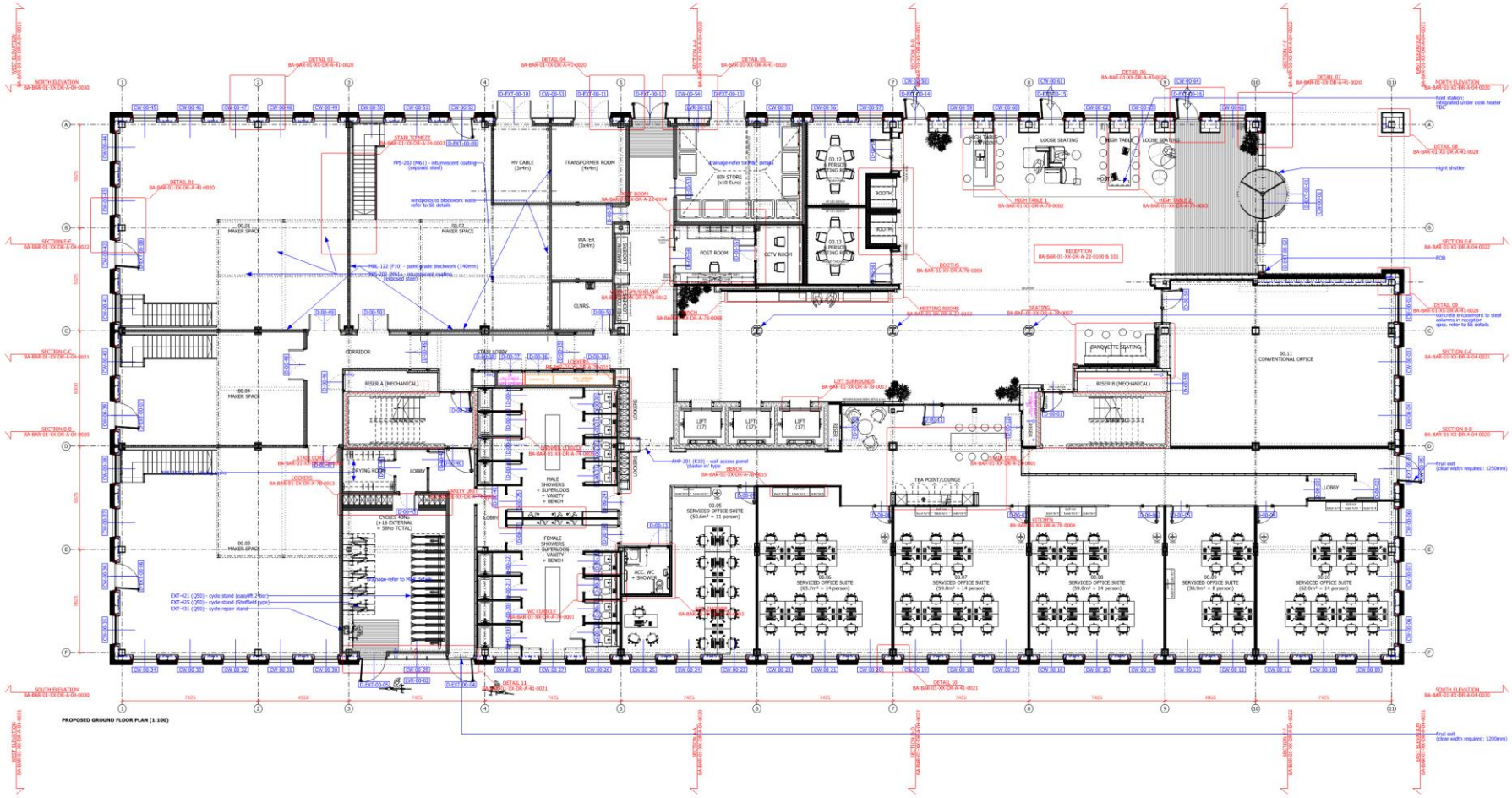
| Noise Sensitive Receptor | Lowest Background Sound Level dB $L_{A90,T}$ | Operational Break out Rating Level dB $L_{Ar,Tr}$ |
|---|---|---|
| Greenheys Lane Daytime | 48 | 32 |
| Greenheys Lane Evening | 44 | 32 |
| Greenhays Lane Night | 38 | 32 |
| Greenheys Building | 42 | 35 |
| Darul Mosque | 45 | 31 |

The results in table 5 indicate that the rating level assessed from on site measurements exceeds the desktop review by 1 dB; however the rating level is at least 6 dB below lowest measured site background sound level. This rating level indicates a BS 4142 assessment of ‘low noise impact’.

Although the Maker Spaces will be limited to an internal noise level of 85 dB $L_{Aeq,T}$, it is considered that if source noise levels were to exceed the limit by 5dB, a BS 4142 assessment of ‘low noise impact’ would still be achieved at the identified NSR.

**Tom Chaffer MSc BSc MIOA**
**Principal Acoustic Consultant**

# Appendix I. Site Plans


PROPOSED GROUND FLOOR PLAN (1:100)
RECEPTION
CONVENTIONAL OFFICE
SERVICED OFFICE SUITE
CORRIDOR
STAIR LOBBY
LOBBY
TEA POINT/LOUNGE
POST ROOM
CCTV ROOM
WATER
TRANSFORMER ROOM
HV CABLE
BIN STORE
MAKER SPACE
RISER A (MECHANICAL)
RISER B (MECHANICAL)
LIFT
BANQUETTE SEATING
LOOSE SEATING
HIGH TABLE
BOOTH
MALE SHOWERS + SUPERLOOS + VANITY + BENCH
FEMALE SHOWERS + SUPERLOOS + VANITY + BENCH
ACC. WC + SHOWER
DRYING ROOM
CYCLE RING (+16 EXTERNAL = 58No TOTAL)
LOCKERS
CLNRS
MEETING ROOMS
KITCHEN
NORTH ELEVATION
SOUTH ELEVATION
WEST ELEVATION
EAST ELEVATION

# Appendix II. Glazing Sound Insulation Calculations

## Sound Insulation Prediction (v9.0.8)

Program copyright Marshall Day Acoustics 2017
margin of error is generally within Rw +/- 3 dB
- Key No. 1599
Job Name:
Job No.: Initials:tom.chaffer
Date: 26/01/2022
File Name:

Notes:

Rw 43 dB
C -2 dB
Ctr -6 dB

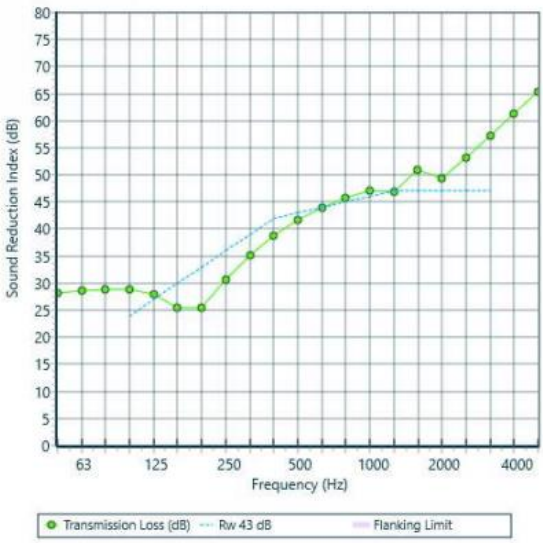
Mass-air-mass resonant frequency = =164 Hz
Panel Size = 2.0 m x 1.5 m
Partition surface mass = 48.1 kg/m²

### System description

Pane 1 + 1 x 8.76 mm Laminated Glass (generic PVB-0.76 mm )

argon: 14 mm
Pane 2 + 1 x 11.38 mm Laminated Glass (generic PVB-0.38 mm )

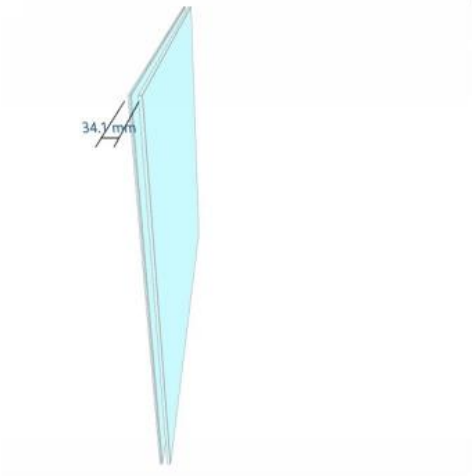
| freq.(Hz) | TL(dB) | TL(dB) |
|---|---|---|
| 50 | 28 | |
| 63 | 29 | 29 |
| 80 | 29 | |
| 100 | 29 | |
| 125 | 28 | 27 |
| 160 | 25 | |
| 200 | 25 | |
| 250 | 31 | 29 |
| 315 | 35 | |
| 400 | 39 | |
| 500 | 42 | 41 |
| 630 | 44 | |
| 800 | 46 | |
| 1000 | 47 | 47 |
| 1250 | 47 | |
| 1600 | 51 | |
| 2000 | 49 | 51 |
| 2500 | 53 | |
| 3150 | 57 | |
| 4000 | 61 | 60 |
| 5000 | 65 | |



## Sound Insulation Prediction (v9.0.8)

Program copyright Marshall Day Acoustics 2017
margin of error is generally within Rw +/- 3 dB
- Key No. 1599
Job Name:
Job No.: Initials:tom.chatter
Date:.26/01/2022
File Name:

Notes:

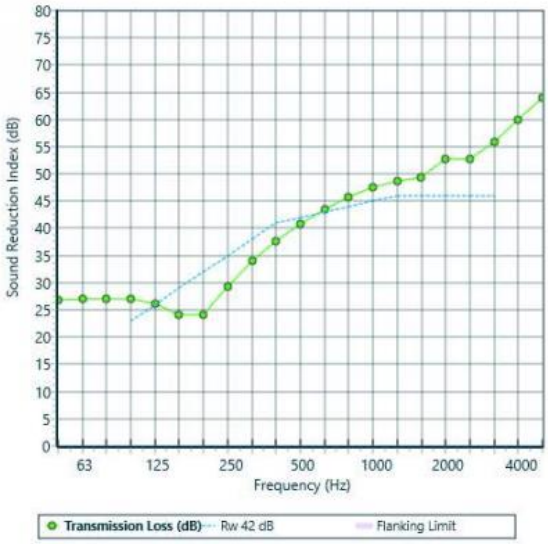



Rw 42 dB
C -2 dB
Ctr -7 dB

Mass-air-mass resonant frequency = =163 Hz
Panel Size = 2.0 m x 1.5 m
Partition surface mass = 38.4 kg/m²

### System description

Pane 1 + 1 x 6.76 mm Laminated Glass (generic PVB-0.76 mm )

argon: 18 mm
Pane 2 + 1 x 9.38 mm Laminated Glass (generic PVB-0.38 mm )

| freq.(Hz) | TL(dB) | TL(dB) |
|---|---|---|
| 50 | 27 | |
| 63 | 27 | 27 |
| 80 | 27 | |
| 100 | 27 | |
| 125 | 26 | 26 |
| 160 | 24 | |
| 200 | 24 | |
| 250 | 29 | 27 |
| 315 | 34 | |
| 400 | 38 | |
| 500 | 41 | 40 |
| 630 | 44 | |
| 800 | 46 | |
| 1000 | 48 | 47 |
| 1250 | 49 | |
| 1600 | 49 | |
| 2000 | 53 | 51 |
| 2500 | 53 | |
| 3150 | 56 | |
| 4000 | 60 | 59 |
| 5000 | 64 | |