



Ref: P4071/L06/AGB

14 October 2022

To:	Rob Metcalfe	of:	Caddick Construction
Cc:	As per email distribution	of:	

Dear Rob

TMC Openshaw Campus – Pre-completion Testing

After measuring noise levels from external plant in September 2022, the final testing report is presented below.

The testing was required to demonstrate:

- compliance with relevant BREEAM criteria;
- compliance with other relevant criteria identified in AEC's acoustic design report (P4117/R1b/AGB), which was largely based on achieving the requirements of the Department for Education and Education Funding Agency's Building Bulletin 93 '*Acoustic design of schools – performance standards*' (Feb 2015).
- compliance with Manchester City Council's planning requirements.

A brief CV of the author and tester is attached as Appendix A.

Acoustic terminology used throughout the report is presented in Appendix B.

1.0 AIRBORNE SOUND INSULATION

Methodology & Results

Measurements were undertaken in accordance with ISO 16283-1:2014 Acoustics — '*Field measurement of sound insulation in buildings and of building elements Part 1: Airborne sound insulation*'. However, in all instances, cabinet speakers were used.

The measured sound insulation performance of the walls between different areas are presented in Table 1.1, below, compared to the required values.

It should be noted that a difference in sound insulation performance of up to 2dB is not perceptible for people with normal hearing and, as such, where the measured performance is up to 2dB below the required limit, this is considered to be a pass within reasonable tolerance.

Table 1.1 – Measured Sound Insulation Performance Compared to Requirements

Source Room	Receive Room	Sound Insulation dB D _{nT,w} (Tmf max)		Requirements Achieved?
		Measured	Required	
SP01 Gym	SP03 Studio	45	45-50	Yes (See note 1)
SP01 Gym	SP02 Strength	61	50	Yes

Source Room	Receive Room	Sound Insulation dB $D_{nT,w}$ (Tmf max)		Requirements Achieved?
		Measured	Required	
SP26 Changing	SP36 Theory	71	50	Yes
SP13 Theory	SP36 Theory	46	45	Yes
SP13 Theory	SP12 Theory	47	45	Yes
SP08 Theory	SP09 Theory	45	45	Yes
SP08 Theory	SP37 Theory	45	45	Yes
SP07 Media	SP20 Tutorial	42	45-50	No (See note 2)
SP20 Tutorial	SP21 Tutorial	36	45-50	No (See note 3)
SP17 Sports	SP37 Tutorial	65	50	Yes

***Considered to be within reasonable tolerance**

Note 1 – The performance was limited by flanking transmission via the perforated deck. This was identified in the AEC report when it was stated that a performance of around $45\text{dB}D_{nT,w}$ should be classed as acceptable as a result of this.

Note 2 – It was noted that the weakness was over the top of the partition. The foam used to seal the profile fillers needs to be sufficiently cut out to seal the profile fillers with flexible acoustic mastic on each side of the partition. This mastic needs to be to a depth of at least 15mm on each side of the partition.

In addition, the penetrations through the wall need to be cloaked in plasterboard with smaller gaps sealed using flexible acoustic mastic.

Note 3 – Weakness over the top of the partition. Although it could not be inspected, the same comments for note 2 apply

The required values should be achieved when the above works have been appropriately completed.

Discussion

Based on the above, when the weaknesses above the partitions separating the media and tutorial rooms are rectified as described in notes 2 and 3 above, BB93 and hence BREEAM Hea 05 requirements will be achieved in all instances and the BREEAM credits can be awarded.

2.0 REVEBERATION TIMES

Methodology and Results

Reverberation time (RT) measurements were undertaken in line with methodology in BS EN ISO 3382-2: 2008 '*Acoustics – Measurement of room acoustic parameters – Part 2: Reverberation time in ordinary rooms*'.

The measured RT compared to the required performance is presented in Table 2.1, below.

2.1 – Measured RTs Compared to the Required Values

Room	RT, s (T _{mf} 500Hz to 2kHz)		Requirements Achieved?
	Measured	Required	
SP17 Sports Hall	2.3	2.0	Yes (See note 1)
SP03 Studio	1.5	1.5	Yes
SP01 Gym	1.0	1.5	Yes (See note 2)
SP12 Theory	0.5	0.8	Yes
SP08 Theory	0.6	0.8	Yes
SP07 Media	≈0.4	<0.8	Yes (See note 3)
CE13 Machine Shop	0.8	<1.2	Yes
Workshop	1.8	≈1.5	N/A (See note 4)

***Within reasonable tolerance.**

Note 1 – The difference in noise levels in the space will be less than 1dB as a result of achieving 2.3 compared to 2.0s, which is negligible. Furthermore, the RT will reduce to closer to 2.0s when the nets and bleacher seating is installed – which will provide scattering. Based on this, the reverberation time in the sports hall is considered to be a pass within reasonable tolerances.

Note 2 – The lower than anticipated reverberation time was due to all equipment being installed in the room at the time of testing. This provided a significant level of scattering in the space which could not be accurately accounted for in the original calculations.

Note 3 – The space was being used to temporarily store college materials and the actual RT could be marginally longer than identified. However, the space will still readily comply with the 0.8s requirement.

Note 4 – There is no specific requirement for control of RTs in such a space. A limit of 1.5s was suggested by AEC to control noise levels in the space and assist with speech intelligibility. However, a limit of 2.0s could well apply considering the size of the space compared to a sports hall. At the design stage, the end user decided to use the space in the first instance and make the decision to install additional absorption in the future assuming it is considered necessary.

Discussion

Based on the above appropriate RTs have been achieved in all spaces tested and the relevant credits under BREEAM issue Hea 05 can be awarded.

3.0 INDOOR AMBIENT NOISE LEVELS

Methodology and Results

All measurements of indoor ambient noise levels (IANL)s were undertaken in line with the Association of Noise Consultants (ANC) guidance for noise measurements in buildings. The measured noise levels are presented in Table 3.1 below, compared to the required values

The mechanical plant was not operational at the time of the survey and, as such, the noise levels below represent noise break-in only.

Table 3.1 – Measured IANLs Compared to Required Values

Room	IANL, dBL _{Aeq,30min}		Requirements Achieved?
	Measured	Required	
SP07 Media	18	35	Yes
SP02 Strength	<35	40	Yes (affected by construction noise)
SP03 Studio	<35	40	Yes (affected by construction noise)
SP12 Theory	23	35	Yes
SP09 Theory	26	35	Yes
SP17 Sports Hall	<35	40	Yes (affected by construction noise)

Discussion

Based on the above appropriate IANLs in line with the requirements of BREEAM Hea 05 have been achieved in all instances with regard to external to internal noise intrusion.

4.0 GYM NOISE TO BELOW

In addition to the above measurements, maximum noise levels were also measured in the media room whilst 2 people were running and bouncing a basketball directly above.

Maximum noise levels were no greater than 34dB(A) as a result of sports hall activities and there was no perceptible rattling of light fittings etc.

The noise was not considered intrusive and when the mechanical plant is running in the rooms it is considered that the noise from sports hall activities will be largely inaudible in the teaching spaces below.

5.0 NOISE BREAKOUT

Criteria

BREEAM POL 05

To achieve the available credit an assessment must be undertaken in line with the requirements of BS 4142:2014 '*Methods for rating and assessing industrial and commercial sound*'.

The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5dB lower than the background noise throughout the day and night.

Planning (MCC)

In terms of atmospheric plant noise emissions, paragraph 3.6.1.5.1 of MCC's Technical Guidance '*Planning & Noise*' states:

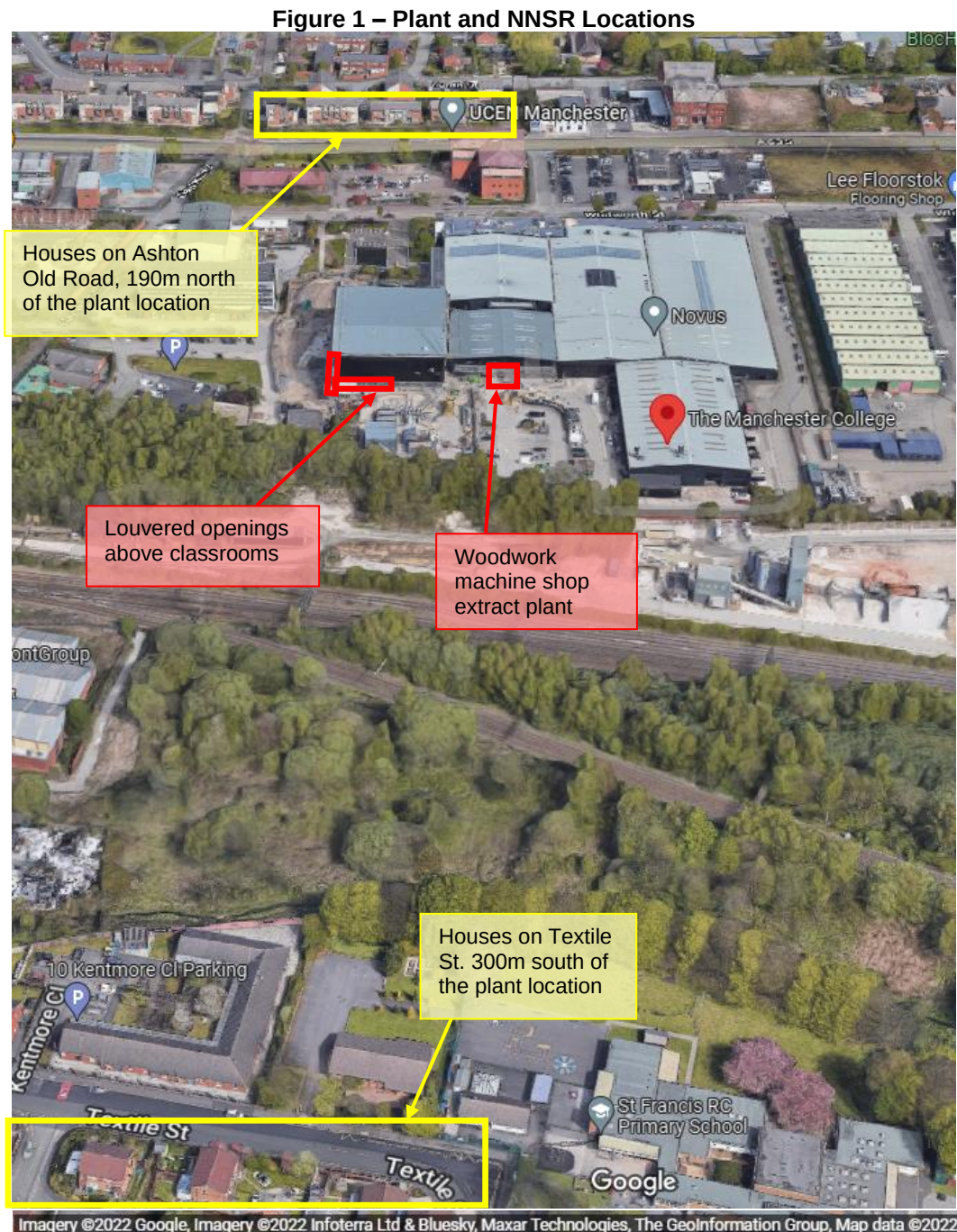
'Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that:

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 (L_{Aeq}) below the typical background (L_{A90}) level at the nearest. noise sensitive location'.

i.e. the requirements are equivalent to the BREEAM requirements.

Locations of Mechanical Plant and Nearest Noise Sensitive Receivers

The mechanical plant locations and nearest noise sensitive receivers (NNSR)s are identified on Figure 1, below.



Measured Noise Levels

Background

The plant will only be operational in the daytime and the previously measured daytime background noise levels were:

- Ashton Old Road – 51dBL_{A90, 5min}
- Textile Street – 43dBL_{A90, 5min}

Operational Plant

Due to roadwork activities in the area, it was not possible to obtain appropriate noise level data at the residential properties and, as such, measurements were undertaken close to the plant items with them operating.

At 10m to the south the woodwork machine shop, noise levels due to the plant were 73dBL_{Aeq,T}. This was a continuous broadband fan noise with no discernible character.

At 10m from the louvered openings, the noise levels from all classrooms combined would be no greater than 45dBL_{Aeq,T}. Again, this was continuous broadband fan noise.

Assessment

With reference to the above, the resultant noise levels at the NNSRs are presented in Table 1, below.

The calculation allows for -15dB acoustic screening reduction via the college building to properties on Ashton Old Road and -5dB acoustic screening from the plant and college perimeter fences to properties on Textile Street (considered to be a conservative screening allowance).

Table 1 – Resultant Plant Noise Levels at NNSRs

Item	Noise Level @10m per	Increased distance attenuation	Reduction due to Acoustic screening	Noise Character Penalty	Resultant Noise Rating Level @ Residential
Ashton Old Road					
Workshop Extract	73	-26dB (10 to 190m)	-15dB	0dB	32dB(A)
Classroom Plant	45	-26dB (10 to 190m)	-15dB	0dB	4dB(A)
Total at Ashton Old Road					32dB(A)
Textile Street					
Workshop Extract	73	-30dB (10 to 310m)	-10dB	0dB	38dB(A)
Classroom Plant	45	-30dB (10 to 310m)	-10dB	0dB	10dB(A)
Total at Textile Street					38dB(A)

* (Based on total number of units – see LHS column and the bullet points above)

Comparing the predicted noise levels in Table 1 to the background noise levels presented in section 3 demonstrates that the rated noise levels from the mechanical plant are at least 5dB lower than the prevalent background noise levels.

This demonstrates that the BREEAM pol 05 credits can be awarded and that the plant noise levels comply with MCC's planning requirements.

Yours sincerely



Andrew Burke

Checked by: DMT

Appendix A – CV of the Author



Acoustic & Engineering Consultants Limited

Brief Curriculum vitae of:	Andrew G Burke
Current Position:	Director
Qualifications:	BSc (Hons) Music, Acoustics & Recording IOA Diploma in Acoustics and Noise Control Member of the Institute of Acoustics

Director with Acoustic & Engineering Consultants Ltd and a consultant in the field of noise and vibration engineering since 2001, with a wide scope of experience of encompassing industrial, planning, environmental and building acoustics.

Approved sound insulation tester with the Association of Noise Consultants

Experience

2002 – date Director, Acoustic & Engineering Consultants Ltd, Marple, Stockport

Experience in the following fields, which required full acoustics consultancy services, including feasibility and site surveys, detailed design, support during construction and compliance testing:

- Leisure buildings containing multi-screen cinemas, Nightclubs and Hotels;
- Healthcare Buildings, including Hospitals, Healthcare Centres and GP Surgeries
- Educational buildings, for Universities, Colleges and Schools. Accommodation includes Classrooms, Libraries, Laboratories, Lecture Theatres, Music Studios, TV studios, Drama Studios and Theatres;
- Infrastructure schemes;
- Inner city residential schemes, some of which are adjacent to A3 uses and nightclubs;
- Expert witness in projects concerning environmental noise issues;
- Occupational and environmental industrial assessments.

Large scale project experience includes:

- New Brighton, Phase 2 – Mixed use building with cinema, casino, supermarket, retail, restaurants and hotel;
- Christie Hospital , Youngs Oncology Unit – Including Private Wards, Multi-bed Wards, Treatment Rooms;
- Burnley College / UCLAN – Including Music Studios, Lecture Theatre, Atrium, Sports Hall and Theatre;
- Ashton Northern Bypass – Noise modelling for New bypass road.
- South Lambeth Road – Large Multi floor Student Residential adjacent to railway and roads.

2001 – 2002 Assistant Consultant, Hann Tucker Associates, Woking, Surrey

Work as either part of a multi-disciplinary design team or as independent consultants included:

- Building acoustics, including noise prediction, field measurement and assessment of reverberation time and sound reduction indices;
- Environmental impacts assessments and noise surveys in accordance with BS4142:1992 (Method of rating noise affecting mixed residential and industrial areas);
- External and Internal noise level surveys and assessment with regards to building sound insulation requirements for existing and proposed buildings;
- Noise and vibration monitoring of demolition and construction site activities.



AGB-CV-Brief, General

Appendix A - Acoustic Terminology in Brief

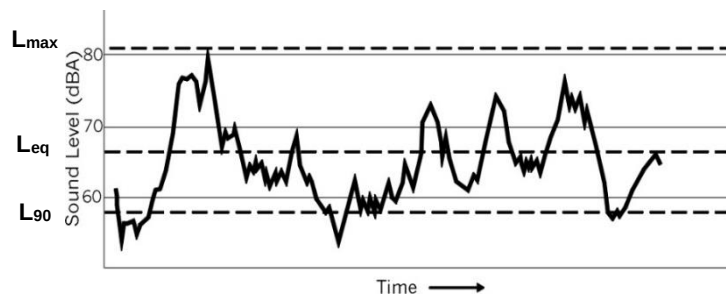
General

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasizes or reduces the importance of certain frequencies within the audible range

Sound / Noise Units

The figure below shows an example of sound level varying with time. Because of this variation over time the same period of noise can be described by several different levels. The most common of these are described below.



L_{Amax}	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.
L_{Aeq, T}	The equivalent continuous (A-weighted) sound level. It may be thought of as the "average" sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the "ambient" noise level.
L_{A90}	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
L_{A10, T}	The (A-weighted) sound level exceeded for 10% of a measurement period. It is the value often used to describe traffic noise.
L_{A1}	The (A-weighted) sound level exceeded for 1% of a measurement period. It is the value generally used to indicate a 'typical' maximum noise level.
Free-field	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	This refers to the sound level measured outside, at 1m from a hard reflecting surface, typically 3dB greater than the free-field level.
NRC	Noise Reduction Coefficient – a single figure number sometimes used to describe the performance of sound absorbing materials based on a combination of its absorption coefficient at various frequencies.

NR	Noise rating – a graphical method for assigning a single number rating to a noise spectrum and is often use to specify noise level limits for mechanical services.
R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
R'_w	Apparent sound reduction index - Single number rating used to describe the sound reduction index of an on-site construction over a range of frequencies, typically 100-3150Hz.
D_w	Single number rating used to describe the on-site airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
D_{nT,w}	Weighted standardized level difference. A single number rating used to describe the on-site airborne sound insulation performance properties of a material or building element over a range of frequencies, typically 100-3150Hz. Standardized to a reference reverberation time of 0.5s (unless otherwise stated).
D_{nT(Tmf,max),w}	Single number rating used to describe the on-site airborne sound insulation performance properties of a material or building element over a range of frequencies, typically 100-3150Hz, which is calculated in terms of the maximum allowable reverberation time for the specific room.
D_{n,e,w}	Element normalised level difference. Single number rating used to describe the sound insulation performance of small elements
D_{n,f,w}	Flanking normalised level difference. Single number rating used to describe the sound insulation performance.
C_{tr}	A road traffic spectrum adaptation term which is referenced to demonstrate the to the low frequency sound insulation performance of building elements.
L'_{nT,w}	Single number rating used to describe the on-site impact sound insulation performance properties of a floor over a range of frequencies, typically 100-3150Hz.
L'_{nT (Tmf, max), w}	Single number rating used to describe the on-site impact sound insulation performance properties of a floor over a range of frequencies, typically 100-3150Hz, which is calculated in terms of the maximum allowable reverberation time for the specific receiving room.
RT	Reverberation Time. Time (in seconds) required for the sound pressure level in a room to decrease by 60dB after the sound source has stopped
T_{mf}	The average value of the reverberation times one of the frequency range 500Hz–2KHz.