Technical Report

Report Number C/06/6W/40540/R05/CB

Date 02/09/2008

Project

Manchester Schools Framework
East Manchester Academy
Noise Assessment

Prepared for

BBCL
C/o Manchester City Council
3rd Floor
Heron House
47 Lloyd Street
Manchester M2 5LE

By

Craig Barson BEng (Hons) MIOA

Sound Research Laboratories Limited
Consultants in Noise & Vibration
Northern Office: LynnfieldHouse, Church Street,
Altrincham, Cheshire, WA14 4DZ
Telephone +44 (0)161 929 5585 Fax +44 (0)161 929 5582
e-mail:srl@soundresearch.co.uk

SRL

Summary

SRL was commissioned by Balfour Beatty to carry out environmental noise surveys at six sites proposed for the new Manchester Academies. The surveys were to enable us to establish the dominant noise sources present on each site and to assess the feasibility of various ventilation strategies. We have assessed schemes using mechanical ventilation throughout the Manchester Academies schemes but where available we have also provided natural ventilation solutions capable of satisfying the acoustic criteria of BB93 and BB101. The results of these surveys were also used to assess the impact of noise breaking out from the school, mechanical services and noise generated from activities on new sports pitches on nearby residents.

From our assessment of the noise levels at the various sites where external levels are below 50dBL_{Aeq} standard double glazing of sound insulation 33dBR_w (6mm glass/12mm cavity/6mm glass) with an external wall build up of 40dBR_w will be sufficient to control noise break in to standard classrooms (56sqm) when windows are open or closed. For external noise levels 50-65dBL_{Aeq} a minimum of 33dBR_w glazing is required with an external wall build up, minimum sound insulation of 40dBR_w assuming that windows will remain closed. For levels above 65dBL_{Aeq} the glazing specification will need to be increase to 38dBR_w (10mm glass/12mm caity/6mm glass) for a standard classroom. The specifications for glazing and external wall build up are not particularly onerous requirements. However, once internal layouts have been finalised further investigation will be necessary as some rooms, like music have higher specifications and noise break-in will also be dependent on room size as well as orientation.

New East Manchester Academy is to be placed on the site of an existing retail park. The site runs along Grey Mare Lane a road linking Alan Turing Way and Ashton New Road, both of which have a constant traffic along them, that contributes significantly to the noise levels across the site. Levels across the site ranged from 55-60dBL_{Aeq}, and although natural ventilation solutions are available they do have significant aesthetic and cost implications. As a result mechanical ventilation is the preferred option for general teaching areas.

S R L

We hope this report meets your requirements, should you require any further information please call.

Yours sincerely,

Craig Barson
Executive Consultant

Checked by,

Ray Woolley
Executive Consultant

SRL

Contents

1.0 Introduction

2.0 BB93 ACOUSTIC REQUIREMENTS

3.0 New East Manchester

6.1 Noise Ingress
6.2 Noise Break Out
6.3 Mechanical Services Noise in Classrooms
6.4 Noise from Playing Fields and Pitches
6.5 Noise from Fixed Plant

Appendix A

Survey Details

Appendix B

Measured Noise Levels

Appendix C

Acoustic Terms Glossary

Appendix D

Site Plans and Measurement Positions

1.0 Introduction

BB93 and BB101 requires that in general teaching spaces the internal ambient noise level should not exceed 35dBL_{Aeq} and that this should achieved with a ventilation rate of 3 litres per second per person. If ventilation is achieved by fully natural means BB101 allows a 5dB relaxation on the internal level so that it must not exceed 40dBL_{Aeq} in general teaching spaces at a rate of 8litres/second/person.

SRL was commissioned by Laing O'Rourke and Balfour Beatty to carry out noise surveys at the six proposed sites for the new Manchester academies including the New East Manchester Academy.

We visited each of the sites during the day, evening and night-time to establish the ambient noise levels across the site and identify the dominant noise sources i.e.: traffic, aircraft etc. This data was then used to assess the feasibility of various ventilation strategies for each proposed academy, in line with the acoustic requirements of BB93 and BB101.

The surveys also allowed us to measure the existing background level to assess the impact of noise from any mechanical services, new sports pitches and activities with in the building on nearby residents.

2.0 BB93 Acoustic Requirements

BB93 requires the internal noise level of a general teaching area to be <35dBL_{Aeq} when a ventilation rate of 3litres/sec/person is achieved. BB101 however, allows a 5dB increase on this level at 8litres/sec/person. provided that fully natural ventilation system is used.

The sections that follow provide a summary of the noise surveys for each school site with ventilation options which could be adopted to meet the requirements of BB93. Where possible we have suggested fully natural ventilation options in line with BB101. Table 1 below indicates the internal noise levels within different teaching spaces as defined in BB93.

Table 1 - Typical Maximum Permissible Intrusive Noise Levels ($L_{eq, 30\ min}$) with Background Ventilation

Room Type	$L_{Aeq, 30\ min}$	L_{A1} ** (where specified)	
Music Recital / Recording / Drama Studios	30	55	
Classrooms specifically for Hearing-Impaired Pupils	30	55	
Open Plan Teaching / Resource Spaces	40	-	
Library Resource Areas	40	-	
ICT Rooms / Science Laboratories	40	-	
"Art / Craft" Rooms (inc. Practical Rooms	40	-	
Sports Hall / Gymnasium / Dance Studio	40	-	
Offices and Staff Rooms	40	-	
Atria & Circulation Areas used by pupils	45	-	
Corridors & Stairwells	45	-	*
Cloakrooms, Changing Rooms,	45	-	*
Dining Rooms	45	-	*
Kitchens	50	-	*
Toilets	50	-	*
All other Teaching / Learning Spaces (inc. classrooms, quiet rooms, multipurpose halls, etc.)	35	55	

** BB93 gives these for guidance only and are not mandatory.*

*** L_{A1} is The (A-weighted) sound level exceeded for 1% of the time T. It reflects the maximum levels during the time period measured.*

These sections also contain recommendations for controlling noise break out from within the school and noise generated by mechanical services.

More detailed survey information is contained within Appendix B with measurement positions for each site shown in Appendix A.

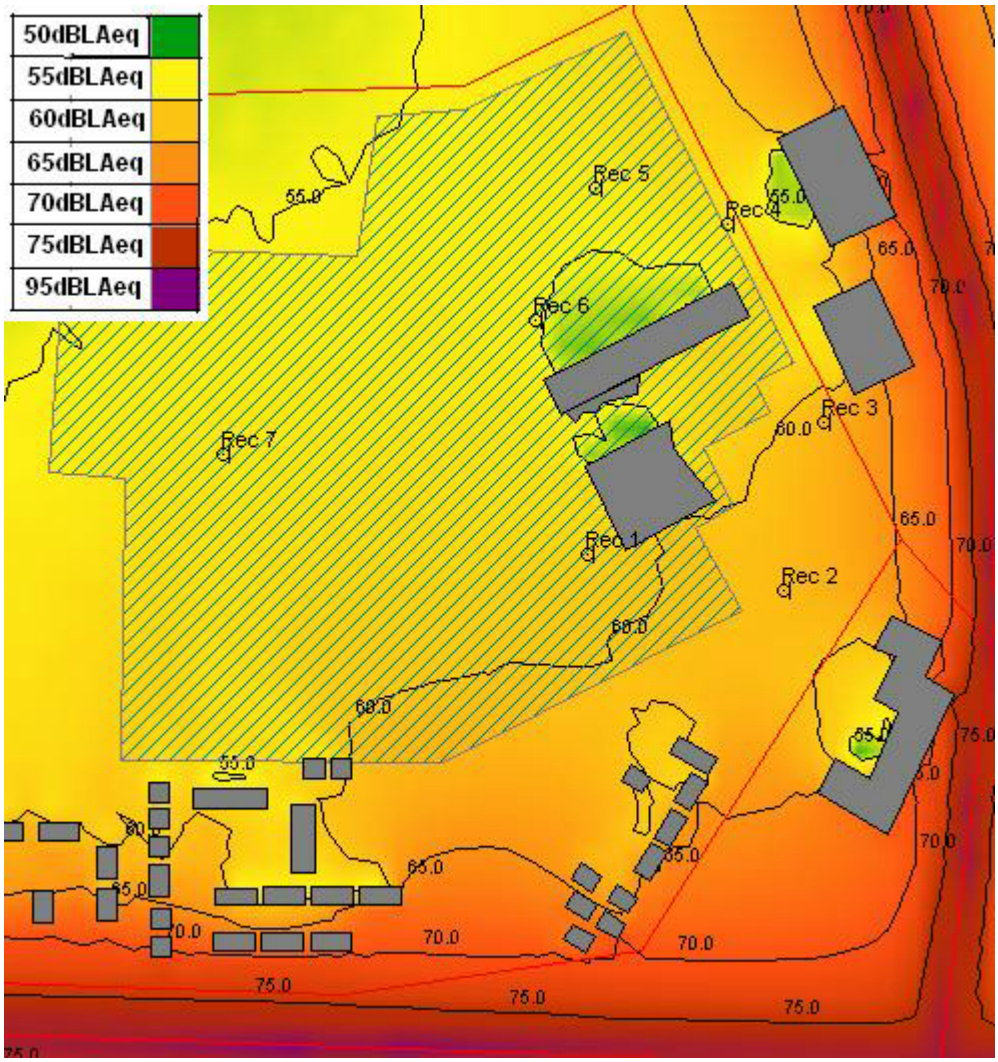
6.0 New East Manchester

6.1 Noise Ingress

New East Manchester Academy is to be placed on the site of an existing retail park along Grey Mare Lane which links Alan Turing Way and Ashton New Road. The main noise source was from traffic along the surrounding roads. Traffic flow remained constant throughout our daytime surveys. There is a train line close to the south and west of the site and train horns were heard during the day, although they were not a regular occurrence.

From our noise survey of the site the predicted levels at the facades of the new academy are shown below:

New East Manchester: Noise Map showing Predicted Ambient Noise Levels across the Site



North East Facade:	55 - 60dBL_{Aeq}
North Facade:	55 - 60dBL_{Aeq}
South East Facade:	55dBL_{Aeq}
South Facade:	55dBL_{Aeq}

These levels mean that natural ventilation through open windows are not a viable solution. Suitable solutions capable of meeting the internal requirements of BB93 (<40dBL_{Aeq} for standard classroom) and achieving a ventilation rate of 8litres/sec/child (<1000ppm CO_2) would include but are not limited to are shown below but are not limited to :

- Mechanical ventilation to meet BB93 internal noise levels. (<35dBL_{Aeq} for standard classroom. See Table 1).
- Single sided ventilation strategy using attenuated openings in the facade (please note the aesthetic implications on design and cost).
- Two sided ventilation strategy using attenuated stacks and openings.
- Passive windcatchers with additional attenuation and/ or screening.
- A bespoke system could be employed such as a breathable building skin.
- Any passive system which would meet BB93 at 3litre/sec/person would also need to achieve BB93+5dB with the greater openings needed for 8litres/sec/person

For standard classrooms a standard double glazed unit of 10mm glass, 12mm air gap, 6mm glass or R_w 38dB or better assuming the external wall construction achieves a sound insulation of >40dBR_w, this is not a particularly onerous specification. This specification should be sufficient to control noise break in to music rooms, were the maximum internal noise level under BB93 is 30dBL_{Aeq}. Care should be taken however, to place noise sensitive rooms such as music, drama and those for hearing impaired use along the quieter facade were possible. The assessment for glazing and building fabric are based on a standard classroom size of 56sqm and may change depending on final rooms dimensions and orientation. This can be investigated at a later design stage.

Based on the current layout, a mechanical ventilation system is proposed to general teaching areas in line with the requirements of BB93/BB101. Ancillary areas and the main atrium may utilise a natural ventilation system.

6.2 Noise Break Out

Since simple natural ventilation is not a viable option for general teaching areas, mechanical ventilation may be used in all teaching areas and as a result the windows will remain closed. Noise breaking out from the building will generally be from music classrooms, drama rooms and assembly halls, as these often generate the highest noise levels. In order to assess the impact of noise breaking out from within the school we measured the existing background level during the day relevant to the nearest properties and found it to be 43dBL_{A90}. In order to make complaints unlikely as a result of a new noise source the level generated at the nearest residency from this source e.g. instruments being played in a music lesson, should be a minimum of 5dB below the existing background level. This means that the overall noise level at the property should not increase. From our assessment we have found the nearest property to the proposed building to be 70m away on Bordan Street. Assuming a standard classroom size of 56m^2, Table 7 below shows the expected level at the nearest property:

Table 7: Maximum Internal Noise Levels in Teaching Spaces

Nearest Property	Distance from School Building	Existing background level L_{A90}	Max. Internal level to achieve 5dB below existing background level L_{Aeq}	Max. Internal level if activity taking place in 10 teaching areas L_{Aeq}
Bordan Street	70m	43dB	107dB	97dB

Levels within music and drama classrooms are likely to range between 90-100dB(A) and so it is unlikely that noise breaking out from the school to cause disturbance to

nearby residents. Therefore the glazing selected to control noise breaking in to the teaching spaces will be sufficient to control noise breaking out.

6.3 Mechanical Services Noise in Classrooms

All mechanical services must be sufficiently attenuated so that the internal noise levels detailed in BB93 are not exceeded. Where appropriate timers should be used to ensure that equipment only operates when necessary. For units with atmospheric connections directly to the outside they must have additional attenuation if required to meet the internal noise level requirements of BB93.

6.4 Noise from Playing fields and Pitches

Noise from playgrounds, sports pitches and other multi-use external grounds has the potential to impact on surrounding residential properties. Shouts and whistles in particular as well as the noise of balls hitting rebound boards can significantly exceed the existing background levels. Therefore the positioning of these outdoor areas and the intended hours of use is critical to limit the possibility of complaints from local residents. Unlike the academies being built on existing school sites, no precedent has been set for sports pitches and playing fields and so the risk of disturbance to local residents is higher. The playfields and pitches are to be located at the rear of the site, with some residential properties situated at the boundary. Due to the close proximity of the sports pitches to nearby properties it may be necessary to consider a close boarded fence along the boundary to break the line of sight from first floor bedrooms and so reduce noise levels at the facade. This option can be explored once the layout and hours of use of the sports pitches and out door teaching areas have been determined.
Where possible rebound boards should be avoided or replaced with softer backing material to limit impact noise from ball sports.

Although local residents are often less sensitive to noise from these areas during normal school hours, activity outside of these hours can give rise to complaint, particularly if it causes sleep disturbance. With this in mind we would recommend that if the pitches are to be in use during the weekend and evenings, activities should not go on later than 8pm and should not begin before 9am and therefore reduce the likelihood of sleep disturbance.

6.5 Noise from Fixed Plant

Similarly to noise break out from within the building, noise from fixed plant needs to be assessed against the existing background noise level. The lowest background noise level recorded at night the nearby properties was 38dB L_{A90}. In line with BS4142 the method for assessing the likelihood of complaint from industrial noise,

the combined noise level of any external plant or mechanical services should not exceed 28dBL_{Aeq} at the nearest property.

This information should be used in the specification of silencers and casing for external air handling units, acoustic performance of plant screens, noise from louvred plant room doors and any external condensers. The schedule of attenuation can be reviewed by SRL at the detailed design stage.

SRL

Appendix A

Survey Details

A1. Location of Survey

Various Manchester Sites

A2. Date & Time of Survey

17-21 December 2006 08:00 to 17:00
17-21 December 2006 19:00 to 21:00
17-21 December 2006 01:00 to 04:00
3 January 2007 08:00 to 17:00

A3. Personnel Present During Survey

Tom Cooper SRL
Tris Edwards SRL

A4. Instrumentation

Bruel & Kjaer

Type 4230 Sound Level Calibrator (Serial: 2467018)
Type 2260 Sound Level Meter (Serial No: 2482655)

Type 2250 Brüel & Kjær Sound Analyser (Serial No: 02506736)
Type 4231 Sound Level Calibrator (Serial No: 2482655)

Larson Davis

A5. Calibration Procedure

Before and after the survey the Type 2260 Brüel & Kjær Sound Analyser was check calibrated to an accuracy of ±0.3 dB using the Type 4231 Brüel & Kjær Sound Level Calibrator. This Calibrator produces a sound pressure level of 94dB re 2 x 10^{-5} Pa at a frequency of 1 kHz.

A.6 Survey Procedure

Ambient noise levels were monitored at various positions around the site as shown in Appendix D. The measurements are tabulated in Appendix B, and explanations of the parameters used are listed in Appendix C

SRL

Appendix B

Measured Noise Levels

Table B4.1: New East Manchester Measured Broad Band Levels. 18 & 19 December 2006

Position	Time	L_{Aeq} (dB)	L_{A1} (dB)	L_{A10} (dB)	L_{A90} (dB)	L_{Amax} (dB)
1	19:11-19:16	43.8	51.2	44.8	41.4	57.4
2	19:50-19:55	47.5	56	48	45.2	61.2
1	01:14-01:19	39.8	43.2	41.4	37.8	46.7
2	01:42-01:48	47	45.4	49.4	42.8	60.2

Table B4.2: New East Manchester Measured Broad Band Levels. 20 December 2006

Position	Time	L_{Aeq} (dB)	L_{Amax} (dB)
1	13:08-13:13	51.5	67
2	13:28-13:34	58.5	68.2
3	13:53-14:01	63.4	74
4	14:26-14:32	70.6	84.3
5	14:46-14:52	52.6	61.8
6	15:05-15:11	50.8	68.2
7	15:28-15:34	48	63.1

Table B4.3: New East Manchester Measured L_{eq} Noise Levels. 20 December 2006

Position	Time	L_{eq} Octave Band Centre Frequencies (Hz)								L_{Aeq} (dB)
		63	125	250	500	1k	2k	4k	8k	
1	13:08-13:13	66.2	57.5	51.7	47.0	46.1	43.6	32.6	33.8	51.5
2	13:28-13:34	70.8	63.1	55.6	53.7	54.1	51.5	44.9	41.9	58.5
3	13:53-14:01	71.8	65.8	60.0	58.8	60.4	55.7	46.7	39.6	63.4
4	14:26-14:32	74.7	65.3	64.1	65.1	68.4	62.8	52.4	44.6	70.6
5	14:46-14:52	70.6	58.8	51.2	46.1	48.6	42.2	35.8	26.3	52.6
6	15:05-15:11	67.7	58.8	52.2	44.5	43.3	43.1	37.6	31.8	50.8
7	15:28-15:34	65.0	56.1	46.5	42.2	42.7	39.4	34.8	27.1	48.0

Appendix C

Noise measurement Parameter Definitions

L_{A90} - The "A" weighted sound pressure level that is exceeded for 90% of the measurement period. It is commonly used as the "Background Noise Level".

L_{A10} - The "A" weighted sound pressure level that is exceeded for 10% of the measurement period. This is often used for assessing traffic noise.

L_{Aeq} - The "A" weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise, over the measurement period. It can be considered as the "average" noise level.

SRL

Appendix D

Site Plans Showing Measurement Positions

SRL

New East Manchester Daytime Measurement Positions



SRL

New East Manchester Night-time Measurement Positions

