



NOISE ASSESSMENT

on behalf of

MR ROGER KENNEDY

for the site at

**1161 ROCHDALE ROAD, BLACKLEY,
MANCHESTER**

REPORT DATE: 17 MARCH 2021

REPORT NUMBER: 102517

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Summary

This report provides evidence to discharge condition 13 of planning reference 116936/FO/2017.

Condition 13

Before the development commences a scheme for acoustically insulating the residential accommodation against noise from Rochdale Road shall be submitted to and approved in writing by the City Council as local planning authority. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.

The consented development is for the erection of two pairs of three storey, semi-detached dwelling houses fronting Rochdale Road with a three-storey detached dwelling house to the rear (Class C3), together with access alterations, landscaping, parking and boundary treatment.

Noise measurements have been undertaken at the site to provide sufficient information to address the condition relating to noise.

Calculations of façade performance have been undertaken to determine the glazing and ventilation specifications required to meet the internal criteria described in Condition 13.

The information provided within this report provides sufficient evidence to discharge the planning condition.

Record of changes

Prepared By Claire Starley AMIOA

Reviewed By Matt Wilson MIOA

Signed



Signed



Date

17 March 2021

Date

17 March 2021

Version	Date	Change	Initials
1	17 March 2021		CS

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1 Introduction

- 1.1 Miller Goodall Ltd has on behalf of Mr Roger Kennedy, undertaken a noise assessment for a site at 1161 Rochdale Road, Blackley, Manchester.
- 1.2 The site has planning approval ref 116936/FO/2017 and the conditions relating to noise are detailed below:

Condition 13

Before the development commences a scheme for acoustically insulating the residential accommodation against noise from Rochdale Road shall be submitted to and approved in writing by the City Council as local planning authority. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.

- 1.3 This assessment aims to provide sufficient information to discharge the noise conditions.

2 Site Description and Consented Development

- 2.1 The site is located at 1161 Rochdale Road, Blackley, Manchester. The site location is shown outlined in red in Appendix 1.
- 2.2 The site is adjacent to Rochdale Road, in Blackley, north east Manchester. The area is dominated by residential buildings.
- 2.3 The planning consent is to develop the site for additional residential development and associated access on the open land, with refurbishment of the existing property on the site.
- 2.4 The noise survey details are in Appendix 2.

3 Acoustic Standards and Guidance

3.1 ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise – New Residential Development – May 2017

3.1.1 ProPG: Planning and Noise is new guidance with the aim of delivering sustainable development and promoting good health and well-being through the effective management of noise which may impact on new residential developments. The guidance aims to complement the national planning policy and encourages the use of good acoustic design at the earliest phase of the planning process. It builds upon the recommendations of various other guidance documents including NPPF, NPSE and PPG-Noise, BS 8233 and WHO.

3.1.2 The guidance is applicable to new residential developments which would be exposed predominantly to noise from existing transport sources. The ProPG advocates a risk based approach to noise using a two-stage process:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements: –
 - Element 1 – demonstrating a 'Good Acoustic Design Process';
 - Element 2 – observing internal 'Noise Level Guidelines';
 - Element 3 – undertaking an 'External Amenity Area Noise Assessment'; and
 - Element 4 – consideration of 'Other Relevant Issues'.

3.1.3 The ProPG approach is underpinned by the preparation and delivery of an 'Acoustic Design Statement' (ADS), whereby the higher the risk for noise at the site, the more detailed the ADS. The ADS should address the following issues:

- Present the initial site noise risk assessment, including the pre-development acoustic conditions prior to development;
- Describe the external noise levels that occur across the site both before and after any necessary mitigation measures have been incorporated. The external noise assessment with mitigation measures in place should use an informed judgement of typical worst-case conditions;
- Demonstrate how good acoustic design is integrated into the overall design and how the proposed acoustic design responds to specific circumstances of the site;
- Confirm how the internal noise level guidelines will be achieved, including full details of the design measures and building envelope specifications;
- A detailed assessment of the potential impact on occupants should be undertaken where individual noise events are expected to exceed 45 dB $L_{AF,max}$ more than 10 times a night inside bedrooms;

- Priority should be given to enable the use of openable windows where practical across the development. Where this is not practical to achieve the internal noise level guidelines with windows open, then full details of the proposed ventilation and thermal comfort arrangements must be provided;
- Present the findings of the external amenity area noise assessment;
- Present the findings of the assessment of other relevant issues;
- Confirm for a low risk site how adverse impacts of noise will be mitigated and minimised;
- Confirm for a medium or high noise risk site how adverse impacts of noise will be mitigated and minimised and clearly demonstrate that a significant adverse noise impact has been avoided.

3.1.4 ProPG target noise levels are based on existing guidance from BS 8233 and WHO (see below). Table 1 below outlines the guidance noise levels for different room types during day and night times.

Table 1: ProPG guideline indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,F}$

3.1.5 The footnotes to this table suggest that internal noise level limits can be relaxed by up to 5 dB where development is considered necessary or desirable, and still represent “reasonable” internal conditions. They also suggest that in such cases, external levels which exceed WHO guidance target levels (see WHO section below) may still be acceptable provided that reasonable internal noise levels are achieved. Although, where the acoustic environment of external amenity areas is intrinsic to the overall design, “noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$ ”. The wording of ProPG (and BS 8233:2014) is clear that exceedance of guideline noise levels in external areas should not prohibit the development of desirable developments in any event.

3.2 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

3.2.1 This standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999)¹. These guideline noise levels are shown in Table 2, below.

¹ World Health Organisation Guidelines for Community Noise, 1999

Table 2: BS 8233: 2014 guideline indoor ambient noise levels for dwellings

Location	Activity	07:00 to 23:00	23:00 to 07:00
Living Room	Resting	35 dB $L_{Aeq,16hr}$	-
Dining room/area	Dining	40 dB $L_{Aeq,16hr}$	-
Bedroom	Sleeping (daytime resting)	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

3.2.2 BS 8233:2014 advises that:

“regular individual noise events...can cause sleep disturbance. A guideline value may be set in terms of SEL^2 or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values”.

3.2.3 BS 8233:2014 adopts guideline external noise values provided in WHO for external amenity areas such as gardens and patios. The standard states that it is “desirable” that the external noise does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ whilst recognising that development in higher noise areas such as urban areas or those close to the transport network may require a compromise between elevated noise levels and other factors that determine if development in such areas is warranted. In such circumstances, the development should be designed to achieve the lowest practicable noise levels in external amenity areas.

4 Impact of Existing Noise Sources on the Development

4.1 Ambient noise environment

4.1.1 Day and night-time noise levels in the area are dominated by road traffic noise. The site is immediately adjacent to Rochdale Road which is a main artery from central Manchester to the M60 and Middleton. The noise assessment was undertaken for 24 hours between 10:00 3/3/21 and 10:00 4/3/21. Broadband noise levels are shown in Appendix 2.

4.1.2 At night, typical maximum noise events are due to road traffic.

4.1.3 Noise data used in assessment calculations are shown in Table 3, below. Distance corrections have been applied to these spectrums where required and an additional 5dB reduction applied to any window on the rear of the property.

² Sound exposure level or L_{AE}

Table 3: Noise source data used in calculations.

Description	Sound Pressure Level, dB in Octave Band Centre Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Day $L_{Aeq,16h}$	70.3	62.3	59.3	60.4	64.4	59.1	47.8	38.9	66.6
Night $L_{Aeq,8h}$	62.9	55.4	52.3	54.1	59.4	55.5	43.7	37.3	61.9
Max L_{AFMAX}	81.6	74.5	69.8	71.3	74.6	69.2	62.8	60.7	77.2

4.2 Mitigation for Achieving Good Acoustic Design

4.2.1 In order to assess the potential glazing and ventilation requirements for dwellings, noise ingress calculations were undertaken based on the methodology in BS EN 12354-3³. The following assumptions were made regarding the internal rooms:

- Assessed within first floor bedrooms with an internal volume of 30 m³
- 'Normal' internal surface finishes e.g. carpeted with curtains etc.
- Glazed area of 1.5 m² per room.

4.2.2 The areas of the proposed site where internal noise may exceed the standards are bedrooms on elevations closest to, and facing, Rochdale Road. Night-time periods have been assessed as the standards are more onerous than for daytime periods.

4.2.3 Noise ingress calculations are provided in Appendix 3 with a summary of the results in Table 5 & 5, below:

Table 4: Predicted internal noise levels for detached property.

Description	External Noise Levels		Predicted Internal Noise Levels		BS 8233 Criteria		Exceedance of Criteria		Proposed Glazing and Ventilation
	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	
Living area	61	N/A	31	N/A	35	N/A	-4	N/A	Option 1
Bedroom 1	57	72	28	44	30	45	-2	-1	Option 1
Rear facing bedrooms	52	67	23	38	30	45	-7	-7	Option 1
side facing bedrooms	62	72	30	43	30	45	0	-2	Option 2
Attic bedrooms	57	72	23	29	30	45	-7	-6	Option 1

- Option 1** - Glazing with minimum weighted sound reduction index of 27 dB $R_w + C_{tr}$ (e.g. 4/12/4); ventilators with a minimum element normalised sound level difference of 33 dB $D_{ne,W}$.

³ BS EN 12354-3:2000 Building acoustics. Estimation of acoustic performance in buildings from the performance of elements - Airborne sound insulation against outdoor sound

- **Option 2** - Glazing with minimum weighted sound reduction index of 27 dB $R_w + C_{tr}$ (e.g. 4/12/4); ventilators with a minimum element normalised sound level difference of 38 dB $D_{ne,W}$.

Table 5: Predicted internal noise levels for 2no semi detached.

Description	External Noise Levels		Predicted Internal Noise Levels		BS 8233 Criteria		Exceedance of Criteria		Proposed Glazing and Ventilation
	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	
Living area	67	N/A	33	N/A	35	N/A	-2	N/A	Option 1
Rear facing bedrooms 1 & 5	57	72	30	45	30	45	0	0	Option 1
Bedroom 2	62	77	28	45	30	45	-2	-1	Option 3
Bedroom 3	62	77	29	45	30	45	-1	0	Option 4
Bedroom 4	62	77	27	44	30	45	-3	-1	Option 5

- **Option 1** - Glazing with minimum weighted sound reduction index of 27 dB $R_w + C_{tr}$ (e.g. 4/12/4); ventilators with a minimum element normalised sound level difference of 33 dB $D_{ne,W}$.
- **Option 3** - Glazing with minimum weighted sound reduction index of 27 dB $R_w + C_{tr}$ (e.g. 6/12/6); ventilators with a minimum element normalised sound level difference of 38 dB $D_{ne,W}$.
- **Option 4** - Glazing with minimum weighted sound reduction index of 33 dB $R_w + C_{tr}$ (e.g. 10/12/6); ventilators with a minimum element normalised sound level difference of 38 dB $D_{ne,W}$.
- **Option 5** – Glazing with minimum weighted sound reduction index of 38 dB $R_w + C_{tr}$ (e.g. 10/12/16 acoustic laminate); ventilators with a minimum element normalised sound level difference of 44 dB $D_{ne,W}$.

Table 6: Minimum sound reduction indices of glazing.

Glazing Option	Sound Reduction Index, dB R_w in Octave Band Centre Frequency, Hz								R_w	C_{tr}	$R_w + C_{tr}$
	63	125	250	500	1k	2k	4k	8k			
Option 1 & 2	18	24	20	25	35	38	35	35	31	-4	27
Option 3	18	24	22	29	39	33	38	38	32	-3	29
Option 4	20	26	27	34	40	38	46	46	37	-4	33
Option 5	24	30	33	42	41	42	56	56	42	-4	38

4.2.4 In each of the options described in table 6 above, ventilation is to be provided to the whole dwelling using naturally opening windows. Ventilation is required and the options for ventilators are shown in table 7 below.

Table 7: Minimum sound reduction indices of ventilation.

Ventilation Option	Sound Reduction Index, dB R_w in Octave Band Centre Frequency, Hz								$D_{n,e,w}$
	63	125	250	500	1k	2k	4k	8k	
Option 1	34	38	35	34	31	34	37	42	33
Options 2,3 & 4	27	31	33	42	43	39	44	44	38
Option 5	29	33	39	41	48	52	52	52	42

4.2.5 A coloured mark-up illustrating the location of the glazing and ventilation options proposed is provided in Appendix 4.

4.3 Building Envelope –

4.3.1 Roof Construction

4.3.2 The calculations in this report have been based on a roof build-up of:

- Tiled/slate roof,
- 25 mm plasterboard ceiling,
- 100 mm mineral wool insulation.

4.3.3 Wall construction

4.3.4 The calculations in this report have been based on a roof build-up of

- Double leaf 112 mm brickwork,
- 50 mm cavity,
- rigid wall ties

4.4 Consideration of Other Discipline Requirements

4.4.1 It is recommended that you confirm the suitability of all recommended noise mitigation measures with your architects, structural engineers, building contractors, fire consultants and material manufacturers prior to procurement and field application so that when the recommended noise control measures are implemented on site they will satisfy the requirements of all disciplines, therefore, should not cause any health and safety issues.

5 Conclusions

5.1 Conditional planning consent has been granted for a residential development at 1161 Rochdale Road, Blackley, Manchester, planning reference 116936/FO/2017. Condition 13 has been addressed as part of this assessment.

- 5.2 Façade levels have been measured for daytime and night-time at both future dwellings and noise levels have been distance corrected for both daytime and night-time at the proposed dwelling. Measured levels have been used to determine specifications for glazing and ventilation to ensure internal criteria for living spaces is achieved.
- 5.3 In conclusion, the noise assessment has provided sufficient information for the discharge of Condition 13.

6 Health and Safety Information

The Construction (Design and Management) Regulations (CDM 2015) are the main set of regulations for managing the health, safety and welfare of construction projects. CDM 2015 applies to all building and construction work and includes new build, demolition, refurbishment, extensions, conversions, repair and maintenance in order to reduce injury and ill health.

Under the regulation we are Designers. As a Designer, our decisions can affect the health and safety of workers and others who will construct, maintain, repair, clean, refurbish and eventually demolish or remove the building or structure, as well as those who will use it as a completed workplace. Taking risks arising from the design into account can positively affect the project and make it easier for these risks to be managed by contractors and those who will maintain or use the structure. Our designs must contribute to the safe delivery of a project without risks to health.

As Designers we must:

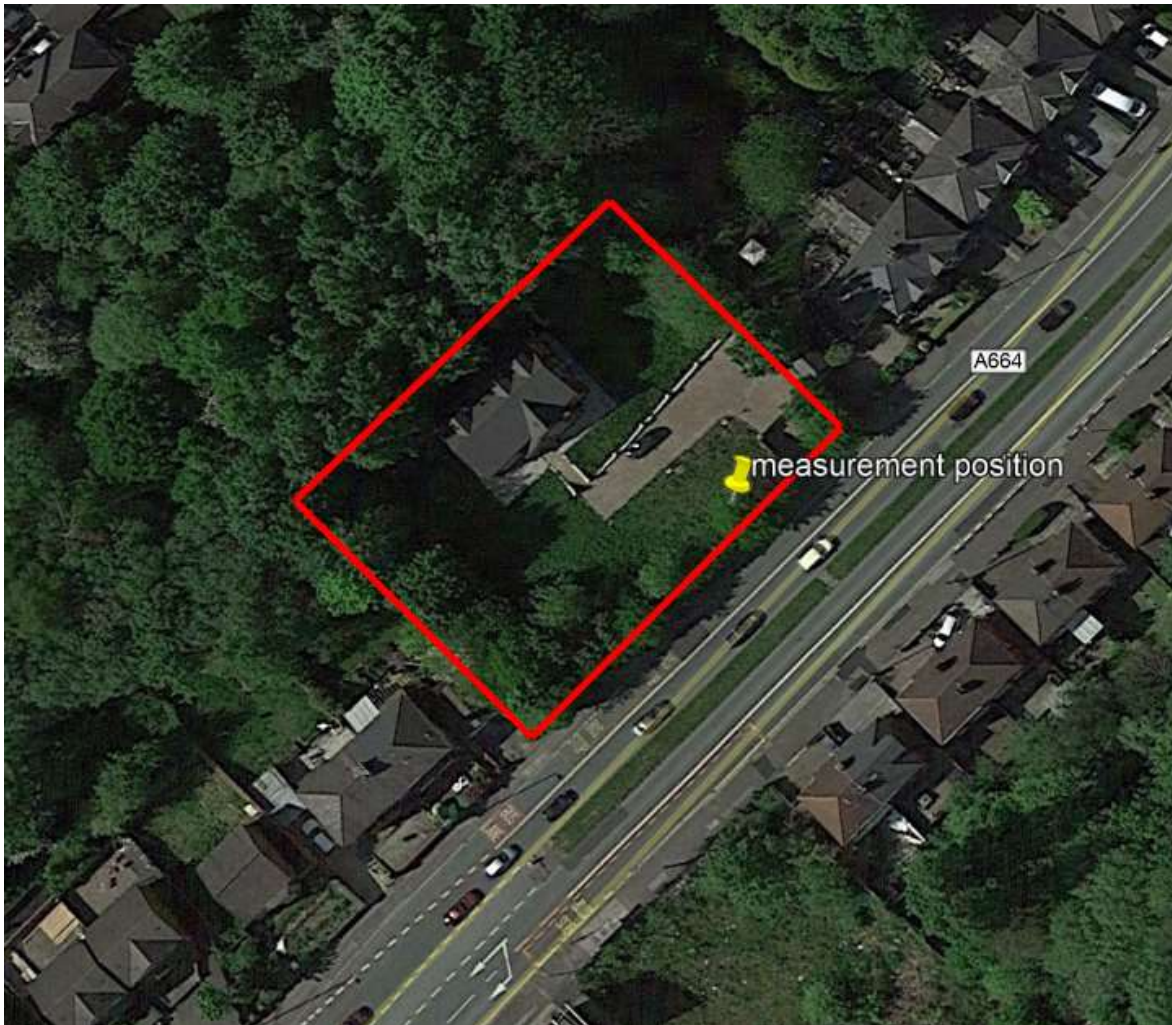
- understand and be aware of significant risks that workers and users can be exposed to and how these can arise from our design decisions;
- have the right skills, knowledge, and experience and be adequately resourced to address the health and safety issues likely to be involved in the design;
- check that Clients are aware of their duties;
- co-operate with others who have responsibilities, in particular the Principal Designer;
- take into account the general principles of prevention when carrying out our design work;
- provide information about the risks arising from our design;
- co-ordinate our work with that of others in order to improve the way in which risks are managed and controlled.

Our designer's risk assessment for this project and the mitigation work we have recommended is shown in Appendix 5.

APPENDICES

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Appendix 1: Site Plan and Measurement Position



Appendix 2: Noise Monitoring

Measurements of Existing Noise Sources

- 6.1.1 Noise measurements were undertaken at a location consistent with the proposed development in accordance with BS 7445-1: 2003⁴ by Matt Wilson of Miller Goodall Ltd. The calibration of the sound level meter was checked before and after measurements with negligible deviation (<0.1 dB). Details of the equipment used are shown in Table , below.

Table 2.1: Noise monitoring equipment

Equipment Description	Type Number	Manufacturer	Serial No.	Date Calibrated	Calibration Certification Number
Outdoor microphone housing	NOR 1217	Norsonic	12175146	N/a	N/a
Weather Station	Vantage Vue	Davis	MJ150128029	N/a	N/a
Class 1 ^{5,6} Integrating Real Time 1/3 Octave Sound Analyser	NOR 140	Norsonic	1406017	22/10/2019	U33164
Microphone	NOR 1225	Norsonic	358159	22/10/2019	33163
Class 1 Calibrator ⁷	Type 4231	Brüel & Kjær	2478249	20/07/2020	04743/1

- 6.1.2 Specific, background and ambient noise monitoring was undertaken at the times specified in Table 2.2, below. Weather conditions were determined both at the start and on completion of the survey. It is considered that meteorological conditions were appropriate for environmental noise measurements. Measurement locations are shown in Appendix 1.

⁴ BS 7445-1: 2003 Description and measurement of environmental noise - Part 1: Guide to quantities and procedures

⁵ IEC 61672-1 (2002) Electroacoustics – Sound level meters Part 1: Specifications

⁶ IEC 61260 (1995) Electroacoustics – Octave-band and fractional-octave-band filters

⁷ IEC 60942 (2003) Electroacoustics – Sound calibrators

Table 2.2: Dates, times and weather conditions during noise measurements

Measurement Location	Date/Time	Weather conditions		
		Description	At Start of Survey	On Completion
P1	03/03/21, 10:00 to 04/03/21, 10:00	Temperature:	1 °C	2 °C
		Precipitation:	Dry	Dry
		Cloud cover (oktas – see opposite):	6	6
		Any fog/snow/ice?	No	No
		Any damp roads/wet ground?	No	No
		Wind speed:	1 - 2 m/s	1 - 2 m/s
		Wind direction:	Variable, generally Easterly	
		Any conditions that may cause temp. inversion (e.g. calm nights with no cloud):	No	No

Cloud Cover	
Symbol	Scale in oktas (eighths)
	0 Sky completely clear
	1
	2
	3
	4 Sky half cloudy
	5
	6
	7
	8 Sky completely cloudy
	(9) Sky obstructed from view

6.1.3 Measurements were taken at times considered to be representative of the periods during which the proposed residential accommodation would be subject to the highest levels of ambient noise. Measurements were made under free-field conditions at a height of 1.5 m above the ground and approximately 3.0m above the road level.

6.1.4 The measurement locations are detailed below and indicated on Appendix 1.

- P1 approximately 7m from the road, at the location of the residential facade.

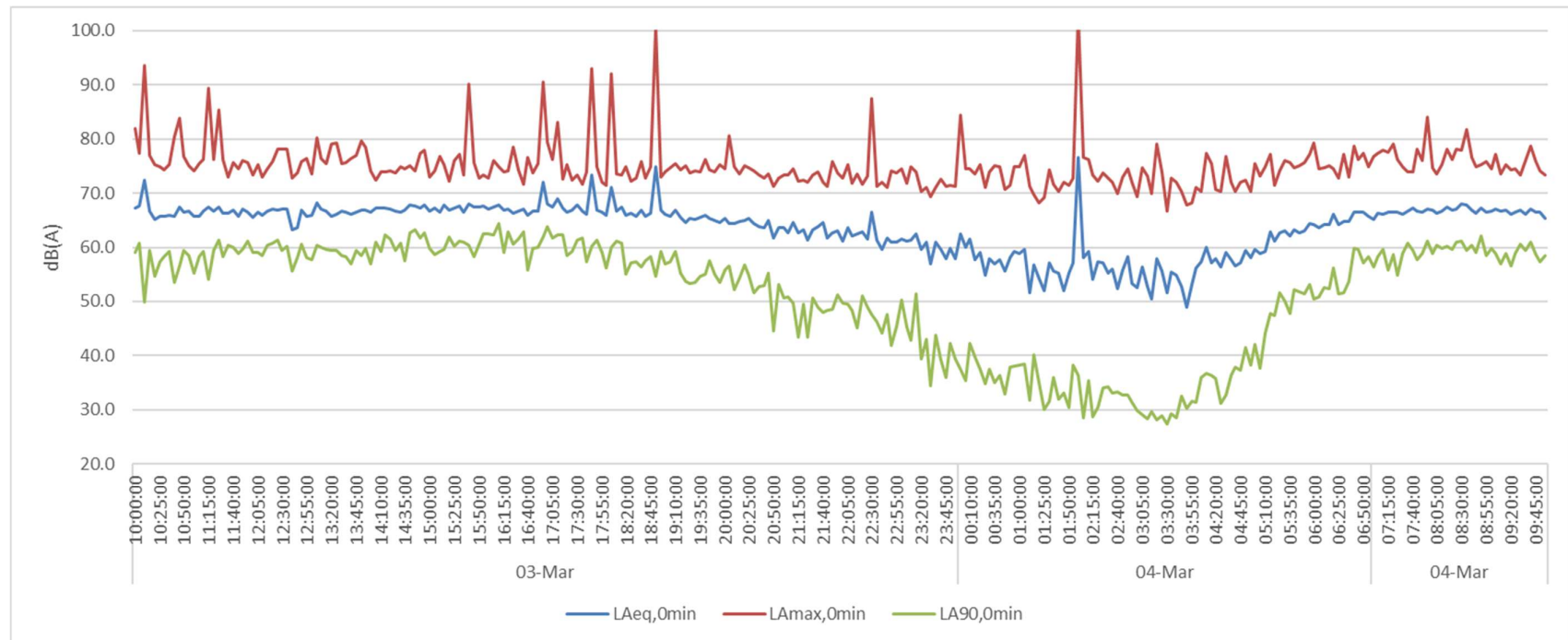
6.1.5 The noise sources within the vicinity of the measurement locations are summarised in Table , below:

Table 2.3: Description of noise sources affecting the site

Measurement Locations	Noise Sources
P1	Road noise is dominant during the day and night. Other sources included birds, and some human voices. Maximum noise events were as a result of road traffic, mostly HGV and bikes, as well as a couple of emergency services sirens.

Monitoring Results

6.1.6 A summary of the broadband measurement data is provided below. All data are sound pressure levels in dB re 20 μ Pa.



6.1.7 Each measurement period consisted of sequential 5-minute samples which therefore allowed the variation in noise level over time to be assessed. This data was subsequently used to determine a 'typical' L_{AFmax} noise level and octave band spectrum based on the 95th percentile of individual 5-minute measurements. This data was subsequently utilised within the noise model.

6.1.8 The 10 second noise levels have not been presented in this report but are kept on file for future reference.

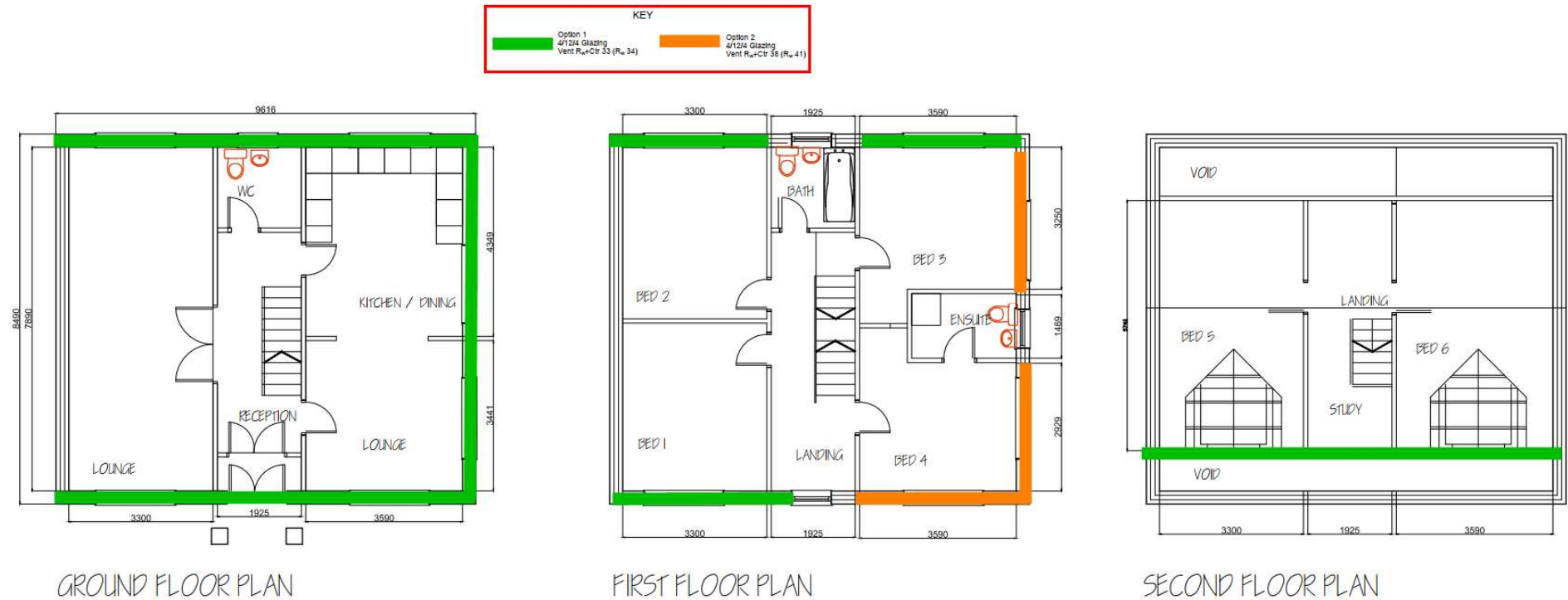
Appendix 3 - Noise Ingress Calculations

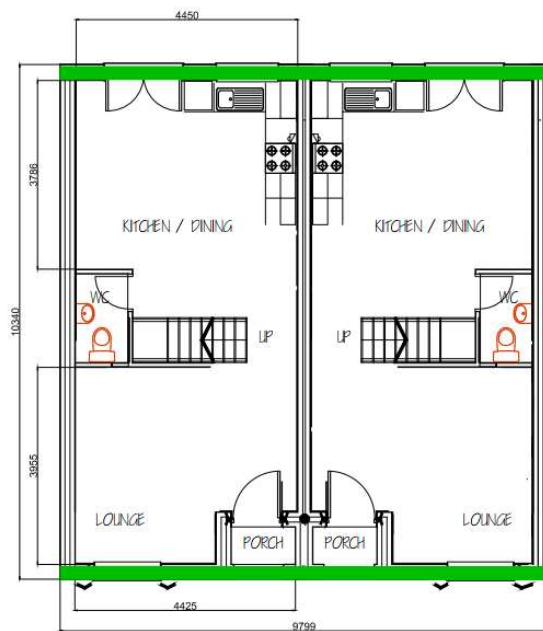
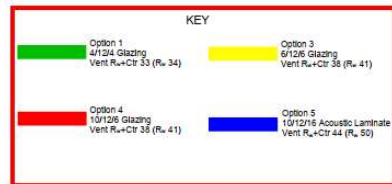
Miller Goodall Environmental Services: Noise Ingress Calculation													
Project:		102517 - Rochdale Road		Calcs By:		Claire							
Description:		Ground Floor - Living Area front façade		Date:		09/03/2021							
Calculation is based on methodology within BS 8233:2014 & BSEN ISO 12354-3. The following equation is utilised:													
$L_{internal} = L_{external} - IR + 10 \log S/A - DL_f + 3$													
where $A = 0.16V/T$													
and DL_f is a correction to account for the influence of façade shape (e.g. where balconies or terraces are present)													
This can be broken down further to:													
$L_{eq,2} = L_{eq,ff} + 10 \log \left(\left(\frac{A_0}{S \times 10^{(-D_{re}/10)}} \right) + \left(\frac{S_{wi}}{S \times 10^{(-R_{wi}/10)}} \right) + \left(\frac{S_{ew}}{S \times 10^{(-R_{ew}/10)}} \right) + \left(\frac{S_{rr}}{S \times 10^{(-R_{rr}/10)}} \right) \right) + 10 \log (S/A) - DL_f + 3$													
The above terms are described below:													
Description	Term	Value	Room assessed:										
Total facade area (m2)	S_f	7.92	Height: 2.4 Width: 3.3 Width is horizontal length of façade in question Length: 7.8										
Window area (m2)	S_{wi}	2.16											
External wall area (Sf - Swi)	S_{ew}	11.52											
Area of ceiling (m2)	S_{rr}	0											
Total area of elements (Sf + Srr)	S	7.92											
Volume of receiving room (m3)	V	61.776											
Reference absorption area (m2)	A_0	10											
Number of ventilators in facade:		1											
Façade shape correction	DL_f	0	See Annex C of BS EN 12354-3										
Input	Octave band centre frequency, Hz								dBA	R_w	C_{tr}	$R_w + C_{tr}$	Description
	63	125	250	500	1k	2k	4k	8k					
External Leq, freefield (dB Leq,ff)	65	57	54	55	59	54	43	34	61	-	-	-	Freefield daytime level
External Lmax, freefield (dB Lmax,ff)									#VALUE!	-	-	-	loudest Lmax Freefield daytime level
Dne of each ventilator	34	38	35	34	31	34	37	42	-	34	-1	33	Greenwood 4000DFW, open
Total Dne of all ventilators	34	38	35	34	31	34	37	42	-	34	-1	33	
SRI of window (Rwi)	18	24	20	25	35	38	35	35	-	31	-4	27	4/12/4
SRI of external wall (Rew)	35	37	42	52	60	63	68	68	-	54	-6	48	Double leaf 112 mm brickwork, 50 mm cavity, rigid wall ties
SRI of roof and ceiling (Rrr)	21	27	37	43	48	52	52	52	-	46	-7	39	Tiled/slate roof, 25 mm plasterboard ceiling, 100 mm mineral wool
Rev time of receiving room (T) - secs	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	Habitable room ref Part E				
All ventilators [eqn. B]	5E-04	0.0002	0	0	0	0	0	0	$A_0/S \times 10^{(-D_{ne}/10)}$				
Glazing [eqn. C]	0.004	0.00109	0	0	0	0	0	0	$S_{wi}/S \times 10^{(-R_{wi}/10)}$				
External wall [eqn. D]	5E-04	0.00029	0	0	0	0	0	0	$S_{ew}/S \times 10^{(-R_{ew}/10)}$				
Ceiling [eqn. E]	0	0	0	0	0	0	0	0	$S_{rr}/S \times 10^{(-R_{rr}/10)}$				
All ventilators [10 x log "B"]	-33.0	-37.0	-34.0	-33.0	-30.0	-33.0	-36.0	-41.0					
Glazing [10 x log "C"]	-23.6	-29.6	-25.6	-30.6	-40.6	-43.6	-40.6	-40.6					
External wall [10 x log "D"]	-33.4	-35.4	-40.4	-50.4	-58.4	-61.4	-66.4	-66.4					
Ceiling [10 x log "E"]	#####	#####	#####	#####	#####	#####	#####	#####					
All elements combined [eqn. F]	-22.8	-28.0	-24.9	-28.6	-29.6	-32.6	-34.7	-37.8	Log sum of equations B,C,D,E				
Equiv. absorption area of rec. room (m²)	20	20	20	20	20	20	20	20					
10 x log(S/A) [eqn. G]	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0					
Façade shape correction, DL_f	0	0	0	0	0	0	0	0					
Linear Spectra													
	63	125	250	500	1k	2k	4k	8k	dBA	Target	Exc.		
Internal Leq,2	41	28	28	25	28	20	7	-5	31	35	-5	Equations (A+F+G) - DLfs +3 dB	
Internal Lmax,2												Equations (A+F+G) - DLfs +3 dB	

Miller Goodall Environmental Services: Noise Ingress Calculation										MILLER GOODALL ACOUSTICS AND AIR QUALITY						
Project:		102517 - Rochdale Road				Calcs By:		Claire								
Description:		2nd Floor Bedroom 4				Date:										
Calculation is based on methodology within BS 8233:2014 & BSEN ISO 12354-3. The following equation is utilised:																
$L_{\text{internal}} = L_{\text{external}} - 2R + 10 \log S/A - DL_s + 3$																
where A = 0.16V/T																
and DL _s is a correction to account for the influence of façade shape (e.g. where balconies or terraces are present)																
This can be broken down further to:																
$L_{\text{eq},2} = L_{\text{eq},ff} + 10 \log ((A_0/S \times 10^{(-D_{\text{ref}}/10)}) + (S_{\text{sw}}/S \times 10^{(-R_{\text{sw}}/10)}) + (S_{\text{ew}}/S \times 10^{(-R_{\text{ew}}/10)}) + (S_{\text{rr}}/S \times 10^{(-R_{\text{rr}}/10)})) + 10 \log (S/A) - DL_s + 3$																
The above terms are described below:																
Description		Term	Value	Room assessed:						External Leq						
Total facade area (m2)		S _f	8.616	Height: 2.4 Width: 3.59 Length: 2.929 Width is horizontal length of façade in question						Measured linear						
Window area (m2)		S _{wi}	2.16							CadnaA (A-weighted)						
External wall area (Sf - Swi)		S _{ew}	6.456							External Leq						
Area of ceiling (m2)		S _r	0													
Total area of elements (Sf + Srr)		S	8.616													
Volume of receiving room (m3)		V	25.23626													
Reference absorption area (m2)		A ₀	10							External Lmax						
Number of ventilators in facade:			1							Measured linear						
Façade shape correction		DL _s	0	See Annex C of BS EN 12354-3						CadnaA (A-weighted)						
Input		Octave band centre frequency, Hz							dBA	R _w	C _v	R _w + C _v	Description	Source		
		63	125	250	500	1k	2k	4k	8k							
External Leq, freefield (dB Leq,ff)		58	50	47	49	54	50	38	32	57	-	-	-	Freefield night-time level		
External Lmax, freefield (dB Lmax,ff)		76.25	69.14887	64.45	65.95	69.25	63.85	57.45	55.35	72	-	-	-	loudest Lmax Freefield night-time level		
Dne of each ventilator		27	31	33	42	43	39	44	44	-	41	-3	38	Renson AK38 acoustic trickle vent	Mfrs test data	
Total Dne of all ventilators		27	31	33	42	43	39	44	44	-	41	-3	38			
SRI of window (Rwi)		18	24	20	25	35	38	35	35	-	31	-4	27	4/12/4	Crib book	
SRI of external wall (Rew)		21	27	37	43	48	52	52	52	-	46	-7	39	Tiled/slate roof, 25 mm plasterboard ceiling, 100 mm mineral wool	Draft changes to AD Part E	
SRI of roof and ceiling (Rrr)		21	27	37	43	48	52	52	52	-	46	-7	39	Tiled/slate roof, 25 mm plasterboard ceiling, 100 mm mineral wool	Draft changes to AD Part E	
Rev time of receiving room (T) - secs		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	Habitable room ref Part E				Part E		
All ventilators [eqn. B]		0.002	0.00097	0	0	0	0	0	0	A0/S x 10^(-Dne/10)						
Glazing [eqn. C]		0.004	0.001	0	0	0	0	0	0	Swi/S x 10^(-Rwi/10)						
External wall [eqn. D]		0.006	0.0015	0	0	0	0	0	0	Sew/S x 10^(-Rew/10)						
Ceiling [eqn. E]		0	0	0	0	0	0	0	0	Srr/S x 10^(-Rrr/10)						
All ventilators [10 x log "B"]		-26.2	-30.2	-32.1	-41.1	-42.6	-38.1	-43.6	-43.4							
Glazing [10 x log "C"]		-24.0	-30.0	-26.0	-31.0	-41.0	-44.0	-41.0	-41.0							
External wall [10 x log "D"]		-22.3	-28.3	-38.3	-44.3	-49.3	-53.3	-53.3	-53.3							
Ceiling [10 x log "E"]		#####	#####	#####	#####	#####	#####	#####	#####							
All elements combined [eqn. F]		-19.1	-24.6	-24.8	-30.4	-38.3	-37.0	-38.9	-38.9	Log sum of equations B,C,D,E						
Equiv. absorption area of rec. room (m²)		8	8	8	8	8	8	8	8							
10 x log(S/A) [eqn. G]		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3							
Façade shape correction, DL _s		0	0	0	0	0	0	0	0							
Linear Spectra																
		63	125	250	500	1k	2k	4k	8k	dBA	Target	Exc.				
Internal Leq,2		42	29	25	22	19	16	3	-4	25	30	-5	Equations (A+F+G) - DLfs +3 dB			
Internal Lmax,2		60	48	43	39	34	30	22	20	42	45	-3	Equations (A+F+G) - DLfs +3 dB			

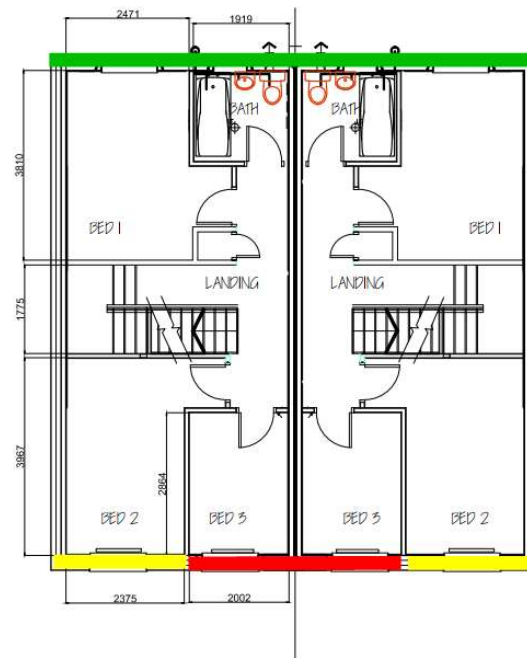
Appendix 4 – Glazing Mark-up

Proposed Dwelling

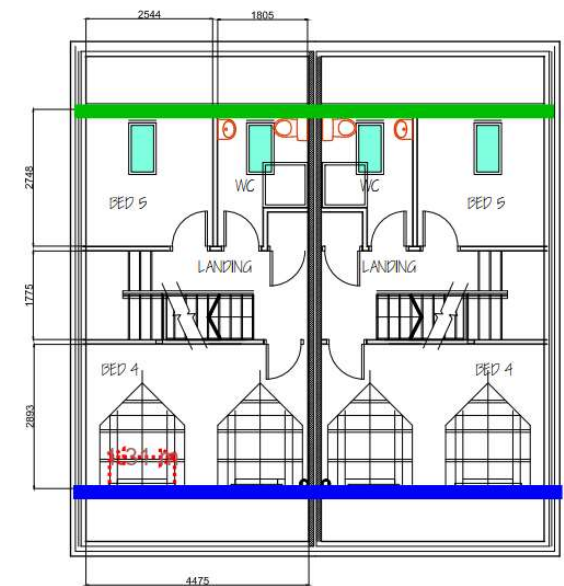


Future Dwelling

GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN

ALL DIMENSIONS TO BE CHECKED
PRIOR TO ORDERING OR ERECTING

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Glossary of Terms

Decibel (dB) The unit used to quantify sound pressure levels; it is derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μPa , the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is usually only perceptible under controlled conditions.

dB L_A Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB L_A broadly agree with an individual's assessment of loudness. A change of 3 dB L_A is the minimum perceptible under normal conditions, and a change of 10 dB L_A corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB L_A ; normal conversation about 60 dB L_A at 1 meter; heavy road traffic about 80 dB L_A at 10 meters; the level near a pneumatic drill about 100 dB L_A .

$L_{Aeq,T}$ The equivalent continuous sound level. The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

L_{Amax} The highest A weighted noise level recorded during the time period. It is usually used to describe the highest noise level that occurred during the event.

R_w Single number rating used to describe the sound insulation of building elements and is defined in BS EN ISO 10140-2: 2010 (formerly BSEN ISO 140-3:1995). It is derived by measurement under laboratory conditions and does not take into account the effects of flanking transmissions.

$D_{nT,w}$ The weighted standardized level difference is a single figure rating used to describe the sound insulation of a construction separating two rooms, for example a wall or floor, and is defined in BS EN ISO 16283-1:2014 (formerly BSEN ISO 140-4:1998). It is derived by measurement of an in-situ construction and therefore takes into account the effects of flanking transmissions, workmanship etc.

$D_{ne,w}$ The weighted element-normalized level difference is a single figure rating used to describe the sound insulation of small elements within a larger construction and is defined in BS EN ISO 10140-2:2010 (BSEN ISO 140-10:1991). It is most often used to rate the sound insulation performance of ventilator units e.g. trickle vents.

C_{tr} A single-number spectrum adaptation term used to characterise the sound insulation rating with respect to urban traffic. It is defined in ISO 717-1:2013.

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