Romilly Park Road, Barry

Review of Noise & Vibration Control Requirements

Planning *15 January 2014*

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Romilly Park Road, Barry

Review of Noise & Vibration Control Requirements

contents

document control

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Romilly Park Road, Barry

Review of Noise & Vibration Control Requirements

Introduction

A residential development is proposed on land located on Romilly Park Road, Barry, adjacent to the twin track Cardiff to Bridgend railway line. There are existing houses on both sides of the railway line and adjacent to the site, on the south side of Romilly Park Road.

A previous environmental noise investigation was completed by Hunter Acoustics and Adnitt Acoustics, which was detailed in the report 1006/ENV/R1 dated 5th October 2009. The report assessed the environmental noise and vibration levels impinging on the site from the railway and Romilly Park Road and compared these levels with current planning guidance.

A further preliminary design review was undertaken by Aulos Acoustics with respect to a prior design.

Aulos Acoustics has been commissioned to provide an assessment of the required sound insulation performance and construction scheme required to ensure reasonable internal noise levels at the proposed property.The following reports the results and conclusions of the investigation made in accordance with local, regional, national requirements.

Information Used

The following documents and drawings have been used in completing the investigation in addition to the submitted planning package and drawings:-

Reference	Description	Source / ©
1006/ENV/R1	Environmental Noise & Vibration Investigation dated 5 October 2009	Adnitt Acoustics
1004 JT 1012 R392.02	Environmental Noise Planning Report dated 8 August 2010	Aulos Acoustics

Further guidelines and standards are referenced in the report and detailed in the attached Appendix A.

Planning Framework

The policy framework under which the application site needs to be assessed is defined in the following documents in the Adopted Unitary Development Plan 2006-2011 of the Vale of Glamorgan Council and Planning Guidance (Wales), Technical Advice Note (Wales) 11, Noise - October 1997.

The specific planning policy of relevance to noise in this context is Policy ENV29, which is reproduced below.

POLICY ENV 29 - PROTECTION OF ENVIRONMENTAL QUALITY

DEVELOPMENT WILL NOT BE PERMITTED IF IT WOULD BE LIABLE TO HAVE AN UNACCEPTABLE EFFECT ON EITHER PEOPLE'S HEALTH AND SAFETY OR THE ENVIRONMENT:

(i) BY RELEASING POLLUTANTS INTO WATER, SOIL OR AIR, EITHER ON OR OFF SITE; OR

(ii) FROM SMOKE, FUMES, GASES, DUST, SMELL, NOISE, VIBRATION, LIGHT OR OTHER POLLUTING EMISSIONS.

Prevailing Noise & Vibration Climate

Based on direct observations and listening, the ambient noise climate at the application site is determined by railway noise.

On elevations shielded from the railway, road traffic noise will make a contribution to the noise climate also.

The previous reports have been reviewed.

The noise climate observed and measured in 2009 is not expected to have varied.

Substantial variation to railway and road traffic has not occurred in that time to the best knowledge and understanding of the author. Significant changes would be required for there to be a noticeable and critical change in noise exposure or the audible noise climate.

No such changes have been identified.

Similarly, measured vibration magnitudes are not expected to have changed.

The results of the 2009 report were as follows for railway noise:-

Period	Noise Exposure	Noise Exposure Category
Daytime 0700-2300hrs:	$L_{eq(16\ hour)}$ = 58.6dB(A)	NEC B
Night time 2300-0700hrs:	$L_{eq(8\ hour)}$ = 55.1dB(A)	NEC B

Position B Railway Noise TAN11 Assessment

The results of the 2009 report were as follows for railway vibration:-

Period	Vibration Dose Value
Daytime 0700-2300hrs:	VDV 0.108 $m/s^{-1.75}$
Night time 2300-0700hrs:	VDV 0.108 $m/s^{-1.75}$

Position B Railway Vibration Results

Road traffic noise was of interest on the site also and was measured in accordance with the Calculation of Road Traffic Noise. From these results the daytime noise exposure was estimated.

CRTN	L_{Aeq}	L_{A10}	L_{Amax}
Position A			
13:50-14:00 h	58.1	60.3	75.3
14:50-15:00 h	58.4	62.1	74.7
15:00-15:10 h	58.2	60.5	75.1
Mean L_{A10}		61.0	
$L_{Aeq,\ 16h}$ **		58.0	

Position A Road Traffic Noise Survey Results

** Predicted in accordance with CRTN and TAN11

Period	Noise Exposure	Noise Exposure Category
Daytime 0700-2300hrs:	$L_{eq(16\ hour)}$ = 58dB(A)	NEC B

Position A Road Traffic Noise TAN11 Assessment

The night-time LAeq,8hour has been stated as 6-7dB(A) lower than the above, potentially.

The 2009 report stated in conclusion:-

"...levels measured should not prohibit the use of this site for residential development (it lies adjacent to similar development), though acoustic treatment to the rear (rail) façade may be required to control Lmax levels from occasional night-time train pass-bys.

The detailed design may influence the amplification of vibration and transmission of sound. Further consideration should be given to the detailed acoustic design, although the implications are expected to be relatively minor."

Noise Exposure

The October 2009 report established the application site achieved the following with respect to TAN11:

- Noise Exposure Category NEC B for both day and night due to both road and railway noise
- Individual railway event noise levels not exceeding the boundary of TAN11 for NEC B with only four events with maximum noise levels exceeding 82dB(A) during the night (i.e. not "...several times in any hour...")

These results were achieved based on open site noise levels at the measurement positions. Noise exposure of particular elevations alters according to the building position, orientation with respect to the noise source and the layout of habitable rooms. Effects taken into account in determining noise exposure on the elevations at habitable windows are limited to changes in distance and angle of view for ambient noise levels (i.e. LAeq) and to distance for individual noise events, in this case.

The reference point for each noise source is the nearest potential source of railway or road noise; the nearest track and the nearest carriageway, respectively. No corrections have been made for the elevation of the windows relative to the railway or for screening provided to some ground floor windows.

Private garden noise levels have been determined also. These include screening and elevation effects as well as distance and angle of view.

Ambient Noise

The calculated free-field ambient noise levels at different positions are shown on the enclosed drawing 13P302 JT D958-201.

The drawing shows that the majority of road traffic noise levels near the windows of habitable rooms are equivalent to NEC A, day and night. The majority of rail traffic noise levels are equivalent to daytime NEC A or B and NEC B at night.

Consequently, the site at the proposed building line cannot be considered to be exposed to high levels of ambient noise, although some degree of environmental noise control is required to ensure internal noise is reasonable at night.

TAN11 Planning Requirements

The planning requirements of TAN11 refer as follows:

NEC	TAN11 Planning Requirement
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.

As stated in the October 2009, it is expected that sound insulation requirements may be subject to planning condition. Such conditions would normally be considered adequate to address the above requirements for NEC B.

Individual Events at Night

Based on the measurement results, the typical maximum sound pressure level during the night is less than 65dB(A). There are some brief events between 65 and 70dB(A), with very few greater than 70dB(A): seven distinct periods of higher noise levels are noted.

Only four events of greater than LAmax(SLOW) 82dB occurred during the survey and none of these were not "...several times in any hour..." which is the criteria by which TAN11 determines if night-time events are within NEC C. This included three events during the early morning when no other trains were running, which are considered to be due to freight train operation.

It must be noted that it is the absolute noise level of these brief events and the number of events which determines the degree of disturbance expected. The aim must be to ensure disturbance can be minimised by ensuring events are few; as they are; and are limited to low noise levels inside, where people will be most affected.

Control of Noise Entering Houses

Design Criteria

The internal noise levels in the houses need to be reasonable to ensure the amenity of future residential occupants. These should preserve the normal domestic use of residential buildings and habitable rooms.

The normal references for such reasonable noise levels are BS8233:1999 and TAN11, the reasonable target ranges of noise level being defined in BS8233:1999 as follows:

Design Space	Design Criteria
Living Rooms Bedrooms	Daytime 30-40dB LAeq,16hour Night-time 30-35dB LAeq,8hour
Open Space	Night-time not greater than 45dB LAmax,FAST Community Annoyance
	Severe >55dB LAeq,16 hour Moderate 50-55dB LAeq,16 hour
Reasonable Design Targets	

Private gardens do not equate to open, community spaces. Reaction may be similar for introduced noise sources, but consideration should be given to the effect of personal choice and ability to accept existing noise sources on private property.

It should be noted that Humans are demonstrably less sensitive to “predictable” noise, such as railways and aircraft, due to the gradual approach of such traffic and the regular nature of movements. By contrast, road traffic tends to be more unpredictable, anonymous and irregular, so increasing its impact, relatively.

The design range of BS8233 is determined to represent a reasonable noise climate in the United Kingdom, taking into account all factors, following wide consultation. By defining a range of values BS8233 adopts best engineering practice in ensuring criteria are not solely a statement of maxima and allows for a practical design range.

The lower values in these ranges represent the minimum level at which critical health effects may be measured or observed, including such matters as changes in sleep cycle whilst remaining asleep. Below these lower values, there is no measurable benefit, thus it cannot be considered reasonable to require significant increases in building costs and complexity to achieve them.

Nor is it a reasonable aim to expect no disturbance of normal domestic activity, rest or sleep. The objective is to ensure the adverse effects are controlled. Hence, TAN11 adopts the “...several times in any hour...” test for individual events, accepting some disturbance may occur. Consequently, achieving noise levels lower than 30dB LAeq or significantly below 45dB LAmax has no measurable benefit to amenity and is not a reasonable or sustainable planning or design aim.

The Noise Exposure Categories and planning policy of TAN11 are based on the ability of new residential buildings to achieve these reasonable noise levels, not the ideal lower noise levels of WHO Guidance10 (WHO 1999) .

The design objective is to achieve the reasonable design ranges and improve on them where practicable.

As a matter of policy, Aulos Acoustics does not recommend low internal noise levels as this tends to increase the intrusiveness of normal domestic activity, such as machines and multiple occupants, which, in our knowledge and experience, leads to a perception of reduced quality in modern housing and reduced amenity. Very low internal noise levels; 5dB less than the lower limits above; may well become an adverse effect on amenity and are to be avoided.

Sound Insulation Performance Required

The required sound insulation performance of the building envelope elements has been defined or calculated in the appended calculations based on the architectural drawings.

13P302 JT C958-199 South Elevation

13P302 JT C958-200 North Elevation

The sound insulation requirements are moderate, but allowance is made for the relatively high proportions of openable glazed windows and doors.

Firstly, direct trickle ventilation of the habitable room shall be avoided, ensuring the full sound insulation performance of the building envelope may be attained.

Secondly, to ensure the residents have an effective choice between open windows and closed windows if occasional noise events disturb them, then a mechanical whole-house ventilation system shall be included within the design. Current balanced ventilation systems incorporate extract and fresh air intake and distribution in one unit, with additional options for heat recovery and sensor control.

The external ducts of any mechanical ventilation system shall have a Weighted Normalised Element Level Difference of Dn,e,w 35dB minimum.

The walls and roof of the houses shall have a Weighted Sound Reduction Index of Rw 45dB minimum to be provided by a combination of masonry and framed construction. Each element of the construction shall be capable of achieving Rw45dB, which will necessitate particular care for lightweight elements, including the roof.

All windows and doors to habitable rooms on the North elevation (facing Romilly Park Road) shall achieve a Weighted Sound Reduction Index of Rw 33dB minimum.

All windows and doors to Living Rooms on the southern elevation (facing the railway) shall achieve a Weighted Sound Reduction Index of Rw 33dB minimum.

All windows and doors to Bedrooms on the southern elevation (facing the railway) shall achieve a Weighted Sound Reduction Index of Rw 35dB minimum.

All windows and doors on the flank elevations; notionally east and west; shall achieve a Weighted Sound Reduction Index of Rw 33dB minimum.

It is advisable for all non-habitable rooms with open access to habitable areas, such as bathrooms, studies and other such occupied rooms, have windows and doors of Weighted Sound Reduction Index of Rw 27-30dB minimum. This will ensure a consistent internal environment is maintained acoustically,

Achievable Internal Noise Levels

If the above minimum sound insulation performances are attained and the ventilation provisos are implemented, then it is feasible to achieve internal noise levels at or below the Reasonable Design Target Range of BS8233:1999.

The internal noise climate would be “good” as referred to by BS8233.

Ambient noise levels are within acceptable and reasonable norms and the night-time noise events are expected to achieve the purpose of the acoustic design. Disturbance of normal domestic activity, including rest and sleep, is expected to be minimised.

The calculations are included at Appendix B for information.

Private Gardens

In general, the private gardens are expected to experience noise levels in the range LAeq,16hour 50-55 dB. This would imply moderate community annoyance taken across a wider population than the occupants of houses.

The occupants can be expected to be more tolerant of the noise in choosing to live at the location, particularly as the fences and buildings and the elevation of the track will result in lower noise levels than the “headline” value in most areas.

For much of the time, short duration ambient noise levels in the gardens will remain markedly lower than 50dB(A). The contribution of passing trains over the course of the day is the main reason for the elevated level.

As mentioned previously, the sensitivity of people to railway noise is less than for more anonymous and unpredictable road traffic. It is considered that the regular passage of passenger trains and the short and infrequent duration of freight train passbys provide a satisfactory basis for a reasonable external noise climate and enjoyment of the property.

This is supported by the designation of the site under TAN11 as NEC B, so allowing for development with consideration of noise.

Notwithstanding the above, it is recommended the boundary walls / fences are of at least 15kg/sq.m mass per unit area and are solid and imperforate. At the eastern end of the site the walls shall provide an interrupted line of sight to the head of the rails.

Boundary fences / walls between properties shall be of similar construction.

It is also recommended that all balustrades and screens are similarly solid and imperforate including to any terraces or balconies. These will interrupt sound propagating across the site and to the windows and doors. Glazed screens are suitable for this purpose of opaque screens are unacceptable.

Vibration

The prior assessment of vibration magnitude remains extant as detailed in the 2009 report.

Vibration trigger levels considered therein equated to the boundary between ‘Low probability of adverse comment’ and ‘Adverse comment possible’ as quoted in BS6472:2008 ‘Assessment of building vibration with respect to human response’ (0.5Hz to 80Hz).

The measured vibration magnitude, stated as vibration dose values, were below the stated boundary values during day and night, which were $0.4ms^{-1.75}$ and $0.2ms^{-1.75}$, respectively.

Daytime equates to 07.00-23.00 hours and night-time equates to 23.00-07.00 hours, for reference.

Detailed design will need to considered amplification in the building structure once the details of substructure and main structural frame are known to a greater extent.

Conclusions

Aulos Acoustics has undertaken a review of the proposed application for five houses at the application site on Romilly Park Road, Barry.

Previous surveys and assessments of noise and vibration completed in 2009 remain extant to the best knowledge of the author. No substantive changes in operation of the road or railway have been identified that would lead to a significant change in noise level, if any.

For the purposes of the review, the measured and calculated noise exposure of the application site remains as stated in 2009. Similarly, the assessment of Noise Exposure Category under TAN11 remains the same with the site being NEC B.

Noise is a consideration in planning and the design and construction of the houses shall reflect this.

Control of noise entering houses shall be achieved by the provision of good quality building envelope construction, including all windows, doors, walls and roofs. The minimum sound insulation performance required of the building envelope has been defined in the report.

The critical components of the sound insulation are:-

- External windows and doors
- Means of ventilation

The windows and doors shall achieve the highest sound insulation performance attainable within the constraints of the design, but not less than that stated. The performance shall be achieved for all elements of the windows and doors, including frames, seals, furniture, joints and junctions with the openings.

The primary, available means of ventilation shall be openable windows and doors, however; there may be occasions when the noise climate has the potential to disturb normal domestic activity. To ensure the future residents have an effective choice to avoid disturbance an alternative means of ventilation is required. The recommended method is a whole-house balanced, mechanical ventilation system incorporating extract serving the wet areas and fresh air supply serving the habitable rooms.

No direct openings shall be maintained in the envelope from outside, including window or door trickle ventilators.

Vibration has previously been measured at below the threshold for low probability of adverse comment. These are ground-borne vibration measurements. Final vibration magnitude experienced by residents will be dependent on site ground conditions, method of sub-structure / foundation construction and

method of structural frame construction. Some influence due to the dimensions of the property may be expected.

Consideration of building amplification is not included here and must be addressed during detailed design at an early stage.

The application site is suitable for residential development within the prevailing guidance of TAN 11. The proposed design is capable of achieving reasonable internal and external noise levels to ensure a reasonable to good standard of residential amenity.

Consequently, the proposal for five houses at Romilly Park Road accords with the requirements of Policy ENV29 of the Vale of Glamorgan Adopted UDP

James Tomalin MIOA

Appendix A- Glossary

Term	Description	
Sound	Physical oscillation of air or other material which is normally detected by the ear as a complex, time-varying and detailed description of the environment around the listener. Interpretation and subjective filtering of sound by the brain results in comprehension, emotional response and physical reactions to sound. Sound can also be detected by touch when transmitted in a solid medium and be perceived as motion at very low frequencies (i.e. vibration).	
Noise	Generally defined as unwanted sound, which as a highly subjective description is subject to wide interpretation. Some describe noise as harsh or dissonant conditions, but such descriptions tend to be value-based and will vary from person to person.	
Ambient Noise	The noise climate heard over a period of time due to all normal sources, in the absence of extraneous or atypical sounds. Used to describe noise in the absence of the introduced sound, generally.	
Ambient Noise Level	Describes the average noise level of the ambient noise over a stated period of time, e.g. hourly noise	
	Parameter: A-weighted Continuous Equivalent Sound Pressure Level determined over the time period T. Expressed in decibels / A-weighted decibels	$L_{eq,T}$ or $L_{Aeq,T}$ dB(A) or dB
Note:	Used in the reports generically to represent both current noise climate and noise level of vehicle noise to encourage direct comparison	
Leq,T	the notionally-steady sound level having the same acoustic energy as the time varying sound pressure level over the same period	
Background Noise	The underlying noise climate in the absence of an introduced or extraneous noise. Describes the quieter periods in the noise climate.	
Background Noise Level	Describes the “average minimum” level of the background noise climate over a stated period of time	
	Parameter: A-weighted Statistical Index 90% Sound Pressure. The quietest decile of the sound pressure levels or level exceeded for 90% of the time period, T Expressed in decibels / A-weighted decibels	$L_{90,T}$ or $L_{A90,T}$ dB(A) or dB
Acoustic screening	Physical barrier to sound formed by fence, wall, building or other structure, which has the effect of reducing the sound transmitted.	
Individual Event Noise	The noise of a distinctive event with the varying noise climate, usually a transient activity, such as a vehicle pass-by, aircraft flyover or similar, rather than an isolated impulsive noise.	
Event Noise Level	Highest noise level during the event as measured under particular conditions of time-weighting	
	Parameter: A-weighted Maximum Sound Pressure Level with FAST or SLOW time weighting Expressed in decibels / A-weighted decibels	$L_{Amax,FAST}$ or $L_{Amax,F}$ $L_{Amax,SLOW}$ or $L_{Amax,S}$ dB(A) or dB
Event Frequency	The number of times an individual event of a similar type occurs in the time period under consideration. Important descriptor as the impact of Individual Event Noise is dependent on changes in both level and event frequency.	
Time Weighting	The sampling rate at which a sound level meter measures the time-varying sound pressure level: originally described how fast the needle moved on analogue meters. Ensures the measurements respond to the type of noise source accurately and are representative. FAST = 125ms sampling rate = 480 samples / minute SLOW = 1s sampling rate = 60 samples / minute	

Appendix B - References

1. **BSI.** *BS8233:1999 'Sound insulation and noise reduction for buildings-Code of practice'.* B/209/18, BSI. London : BSI, 1999. p. 56, Standard. 15/08/99. ISBN 0 580 33009 5.

2. **World Health Organization.** *Guidelines for Community Noise.* SDE, PHE, OEH, WHO. Geneva : World Health Organization, 1999. Guidelines.

3. **World Health Organization Europe.** *Night Noise Guidelines for Europe.* Regional Office for Europe, WHO. Geneva : WHO, 2009. p. 154, Guidelines. ISBN 978 92 890 4173 7.

4. **BSI.** *BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures.* London : BSI, 2003. Standard. BS 7445-1:2003.

5. —. *BS 7445-2:1991, ISO 1996-2:1987 Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use.* London : BSI, 1991. Standard. Current UK standard. EN ISO standard is updated. BS 7445-2:1991.

6. —. *BS 7445-3:1991, ISO 1996-3:1987 Description and measurement of environmental noise. Guide to application to noise limits.* London : BSI, 2003. Standard. ISO edition already updated.

7. —. *BS4142:1997 'Method for rating industrial noise affecting mixed residential and industrial areas'.* EH/1, BSI. London : BSI, 1997. p. 20, Standard. ISBN 0 580 28300 3.

8. **HM Government.** *Calculation Of Road Traffic Noise: 1988.* DoT – Welsh Office, HM Government. London : HMSO, 1988. Calculation method. ISBN 0 11 550847 3.

9. **The Highways Agency et al.** *Design Manual for Roads and Bridges Volume 11 Environmental Assessment Section 3 Environmental Assessment Techniques Part 7 HD 213/11 - Revision 1 Noise & Vibration.* London : Highways Agency et al, 2011. p. 65, Guidance. HD213/11.

Calculations

Job # 13P302
Project Romilly Park Road
Elevation North **Level** First
Calculation Typical Sound Insulation - Medium BS8233
Engineer James Tomalin

Reference	13P302 JT C958-200			14/01/14
Rev				

Frequency, Hz			dB(A)	125	250	500	1000	2000	4000	8000	dB(A)
Source Noise Levels			**Nominal**	*Typical Spectrum will vary with position and height*							**Calculated**
LAeq,16hour	Daytime	L1	54.0	*50.0*	*51.0*	*49.0*	*50.0*	*48.0*			*53.8*
LAeq,8hour	Night-time	L2	48.0	*44.0*	*45.0*	*43.0*	*44.0*	*42.0*			*47.8*
LAmax,night %	Night-time	L3									
LAmax,night	Night-time	L4	64.4	*60.0*	*61.0*	*59.0*	*60.0*	*58.0*			*63.8*
Building Element Sound Insulation											
R_{ew}	Framed system	Specification Type A		30	34	38	43	46			
R_{wi}	10-16-6 unit	Specificaton Type D		24	24	27	34	33			
	10-16-6 unit+ heavy	Specificaton Type D2		28	30	36	42	39			
	6-16-6 unit	Specificaton Type E		19	19	22	29	28			
$D_{n,e}$	Attenuated ventilator	Specification Type G		35	35	35	38	35			
R_{rr}	Projected Area	Not applicable									
Room Sound Absorption, A											
A living				16	12	14	16	17			
A bed				14	9	10	11	12			

Dimensions		Bedroom	Living Room	
Term	**Derivation**			
S_f	Façade area (including window)	8.75	17.5	sq.m
Sr	Roof area (exposed side)	0	0	sq.m
S_{wi}	Window area	3.6	14	sq.m
S_{ew}	S_f-S_{wi}	5.15	3.5	sq.m
S_{rr}	Area of ceiling	0	0	sq.m
S	S_f+S_{rr}	8.75	17.5	sq.m
Vn	*Number of vents serving room*	0	0	
A_0	Given in BS EN 20140-10			sq.m

Bedroom			**Ref**	**Octave Band Centre Frequency**				
				125	**250**	**500**	**1000**	**2000**
$D_{n,e}$	adjusted for number of							
t e			B					
R_{wi}		Specificaton Type E		19	19	22	29	28
t wi			C	0.00518	0.00518	0.00260	0.00052	0.00065
R_{ew}		Specification Type A		30	34	38	43	46
t ew			D	0.00059	0.00023	0.00009	0.00003	0.00001
R_{rr}								
t rr			E					
10 $\log_{10}$(B+C+D+E)			**F**	**-22.4**	**-22.7**	**-25.7**	**-32.6**	**-31.8**
A (furnished)				14	9	10	11	12
10 log ($^{S}/_{A}$)			G	-2.0	-0.1	-0.6	-1.0	-1.4
Level Difference, Corrections?	**(F+G)**		**T1**	**-24.4**	**-22.8**	**-26.3**	**-33.6**	**-33.1**

Living Room			**Ref**	**Octave Band Centre Frequency**				
				125	**250**	**500**	**1000**	**2000**
$D_{n,e}$	adjusted re number vents							
t e			B					
R_{wi}		Specificaton Type E		19	19	22	29	28
t wi			C	0.01007	0.01007	0.00505	0.00101	0.00127
R_{ew}		Specification Type A		30	34	38	43	46
t ew			D	0.00020	0.00008	0.00003	0.00001	0.00001
R_{rr}								
t rr			E					
10 $\log_{10}$(B+C+D+E)			**F**	**-19.9**	**-19.9**	**-22.9**	**-29.9**	**-29.0**
A (furnished)				16	12	14	16	17
10 log ($^{S}/_{A}$)			G	0.4	1.6	1.0	0.4	0.1
Level Difference, Corrections?	**(F+G)**		**T2**	**-19.5**	**-18.3**	**-22.0**	**-29.5**	**-28.8**

Internal Noise Levels **Target shall be Living Rooms Leq,T 40-45dBA daytime, Bedrooms Leq,T 30-35dBA & Lmax,FAST < 45dBA night-time**

Bedroom		**Ref**	**Octave Band Centre Frequency**						
			125	**250**	**500**	**1000**	**2000**	**dB(A)**	
LAeq,16hour	Daytime	L1+T1	26	28	23	16	15	24.3	Good
LAeq,8hour	Night-time	L2+T1	20	22	17	10	9	18.3	Good
LAmax,night	Night-time	L3+T1	36	38	33	26	25	34.3	Good

Living Room		**Ref**	**Octave Band Centre Frequency**						
			125	**250**	**500**	**1000**	**2000**	**dB(A)**	
LAeq,16hour	Daytime	L1+T2	31	33	27	20	19	28.6	Good
LAeq,8hour	Night-time	L2+T2	25	27	21	14	13	22.6	Good
LAmax,night	Night-time	L3+T2	41	43	37	30	29	38.6	Good

Outcome

The above shows the use of a standard thermal double-glazed window units (typically two 4mm panes separated by at least 16mm cavity) is likely to be sufficient if an Rw30-33 dB sound insulation performance is achieved. increased mass window system of Rw35 performance approximately for road traffic noise ONLY. No further improvement would be required, except to allow for variations with design, including opening sections and seals. The Bedrooms will attain a "Good" standard BS8233:1999.
Living Rooms will be able to achieve a similar quality with the provision of Rw27-30 windows and external doors.
The internal noise climate will be consistent and above interference levels in general, although Bedrooms at night may seem very quiet particularly between activity.

Increasing construction to a high mass / high sound inulation of more than Rw37dB performance will not be necessary.

Requirement

The above outcome requires the provision of a ducted and attenuated whole-flat balanced ventilation / ventilation & heat recovery system and exclusion of direct / open vents in windows and walls. Detailed design review will be required.
Side and south elevation sound insulation is controlled by railway noise not road traffic noise as above.

			Job # 13P302					**Reference**	**13P302 JT C958-199**		**14/01/14**
			Project Romilly Park Road					**Rev**			
			Elevation South			**Level**	First				
			Calculation Typical Sound Insulation - Medium				BS8233				
			Engineer James Tomalin								

Frequency, Hz			**dB(A)**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
Source Noise Levels			**Measured**	*Typical Spectrum will vary with position and height*							**Calculated**
LAeq,16hour	Daytime	L1	61.0	*56.0*	*56.0*	*60.0*	*58.0*	*51.0*			*61.3*
LAeq,8hour	Night-time	L2	57.0	*61.0*	*57.0*	*54.0*	*52.0*	*50.0*			*57.0*
LAmax,night %	Night-time	L3									
LAmax,night	Night-time	L4	73.0	*77.0*	*73.0*	*70.0*	*68.0*	*66.0*			*73.0*
Building Element Sound Insulation											
R_{ew}	Framed system	Specification Type A		30	34	38	43	46			
R_{wi}	10-16-6 unit	Specificaton Type D		24	24	27	34	33			
	10-16-6 unit+ heavy	Specificaton Type D2		28	30	36	42	39			
	6-16-6 unit	Specificaton Type E		19	19	22	29	28			
$D_{n,e}$	Attenuated ventilator	Specification Type G		35	35	35	38	35			
R_{rr}	Projected Area	Not applicable									
Room Sound Absorption, A											
A living				16	12	14	16	17			
A bed				14	9	10	11	12			

Dimensions		**Bedroom**	**Living Room**	
Term	**Derivation**			
S_f	Façade area (including window)	8.75	17.5	sq.m
Sr	Roof area (exposed side)	0	0	sq.m
S_{wi}	Window area	3.6	14	sq.m
S_{ew}	S_f-S_{wi}	5.15	3.5	sq.m
S_{rr}	Area of ceiling	0	0	sq.m
S	S_f-S_{rr}	8.75	17.5	sq.m
Vn	*Number of vents serving room*	0	0	
A_0	Given in BS EN 20140-10			sq.m

Bedroom			**Ref**	**Octave Band Centre Frequency**				
				125	**250**	**500**	**1000**	**2000**
$D_{n,e}$	adjusted for number of							
t e			B					
R_{wi}		Specificaton Type D		24	24	27	34	33
t wi			C	0.00164	0.00164	0.00082	0.00016	0.00021
R_{ew}		Specification Type A		30	34	38	43	46
t ew			D	0.00059	0.00023	0.00009	0.00003	0.00001
R_{rr}								
t rr			E					
10 $\log_{10}$(B+C+D+E)			**F**	**-26.5**	**-27.3**	**-30.4**	**-37.1**	**-36.6**
A (furnished)				14	9	10	11	12
10 log (S / A)			G	-2.0	-0.1	-0.6	-1.0	-1.4
Level Difference,	**(F+G)**		**T1**	**-28.6**	**-27.4**	**-31.0**	**-38.1**	**-37.9**
Corrections?								

Living Room			**Ref**	**Octave Band Centre Frequency**				
				125	**250**	**500**	**1000**	**2000**
$D_{n,e}$	adjusted re number vents							
t e			B					
R_{wi}		Specificaton Type E		19	19	22	29	28
t wi			C	0.01007	0.01007	0.00505	0.00101	0.00127
R_{ew}		Specification Type A		30	34	38	43	46
t ew			D	0.00020	0.00008	0.00003	0.00001	0.00001
R_{rr}								
t rr			E					
10 $\log_{10}$(B+C+D+E)			**F**	**-19.9**	**-19.9**	**-22.9**	**-29.9**	**-29.0**
A (furnished)				16	12	14	16	17
10 log (S / A)			G	0.4	1.6	1.0	0.4	0.1
Level Difference,	**(F+G)**		**T2**	**-19.5**	**-18.3**	**-22.0**	**-29.5**	**-28.8**
Corrections?								

Internal Noise Levels **Target shall be Living Rooms Leq,T 40-45dBA daytime, Bedrooms Leq,T 30-35dBA & Lmax,FAST < 45dBA night-time**

Bedroom		**Ref**	**Octave Band Centre Frequency**						
			125	**250**	**500**	**1000**	**2000**	**dB(A)**	
LAeq,16hour	Daytime	L1+T1	27	29	29	20	13	28	Good
LAeq,8hour	Night-time	L2+T1	32	30	23	14	12	24.8	Good
LAmax,night	Night-time	L3+T1	48	46	39	30	28	40.8	Good

Living Room		**Ref**	**Octave Band Centre Frequency**						
			125	**250**	**500**	**1000**	**2000**	**dB(A)**	
LAeq,16hour	Daytime	L1+T2	37	38	38	28	22	36.9	Good
LAeq,8hour	Night-time	L2+T2	42	39	32	22	21	33.9	Good
LAmax,night	Night-time	L3+T2	58	55	48	38	37	49.9	Reasonable

Outcome

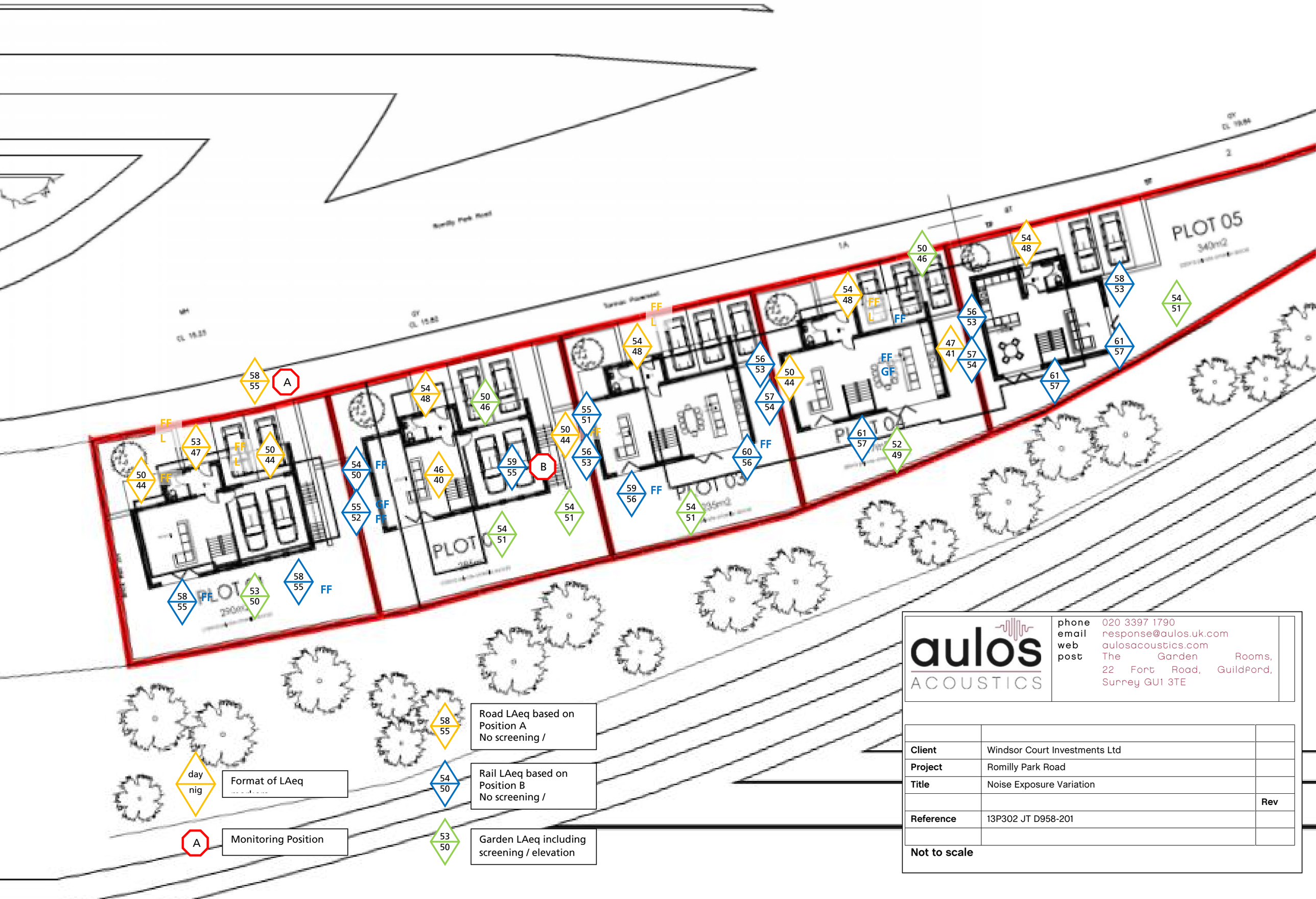
The above shows the use of a increased mass window system of Rw35 performance approximately. No further improvement would be required, except to allow for variations with design, including opening sections and seals. The Bedrooms will attain a "Good" standard BS8233:1999.
Living Rooms will be able to achieve a similar quality with the provision of Rw33-35 windows and external doors.
The internal noise climate will be consistent and above interference levels in general, although Bedrooms at night may seem very quiet particularly between activity.

Increasing construction to a high mass / high sound inulation of more than Rw37dB performance will not be necessary.

Requirement

The above outcome requires the provision of a ducted and attenuated whole-flat balanced ventilation / ventilation & heat recovery system and exclusion of direct / open vents in windows and walls. Detailed design review will be required.

Drawing 13P302 JT D958-201 Noise exposure variation



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Client	Windsor Court Investments Ltd	
Project	Romilly Park Road	
Title	Noise Exposure Variation	
		Rev
Reference	13P302 JT D958-201	

Not to scale