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Environmental Noise Survey
Willow Cottage
Ruabon
Wrexham

AB Acoustics
4 Cumbrian Close
Shaw
Oldham

December 2017- **Revised June 2018 (all the revisions are in blue) – Revised July 2018 (in Red)**

Introduction

AB Acoustics were commissioned by Blueprint Architectural on behalf of Lucy Aiston and Amy Guy - Jovy to undertake an environmental noise assessment at Willow Cottage Ruabon Wrexham LL14 6LE in order to support a planning application for residential housing.

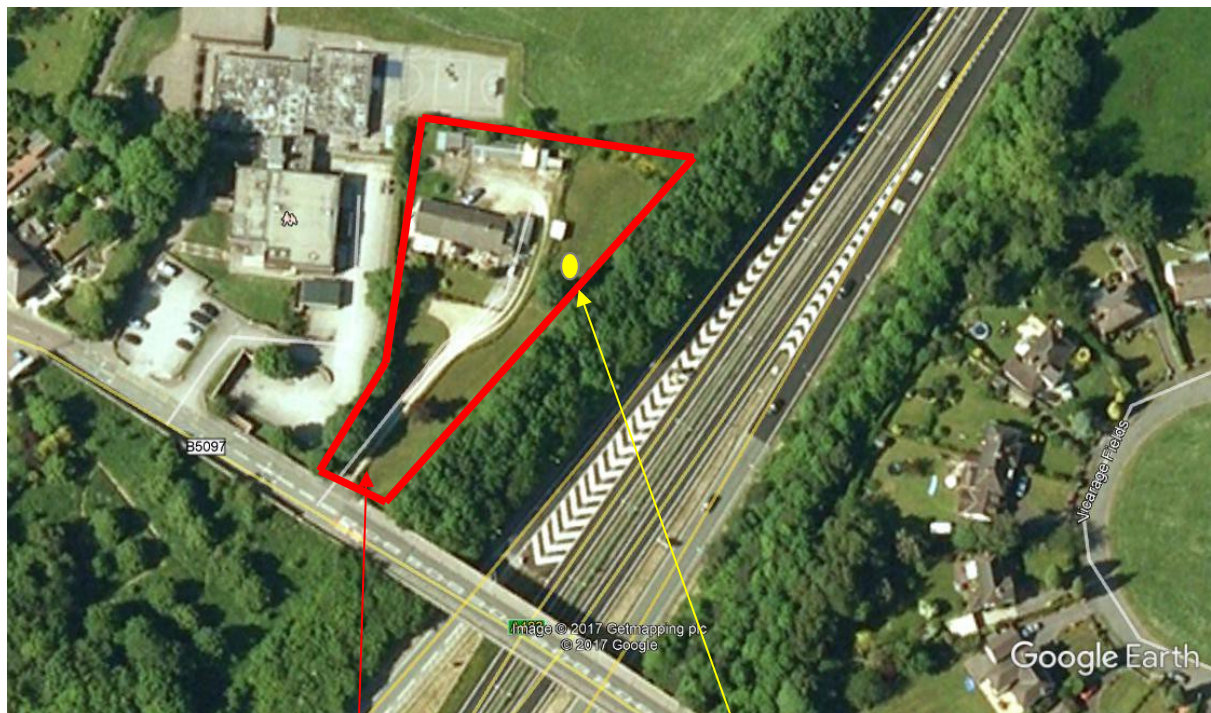
As can be seen from the plan attached at the end of the report and the photograph below the site is located on the B5097 adjacent to the Ruabon Community Centre – and also adjacent to the north bound side of the A 483.

The A483 is to the East of the proposed site – as are new residential houses – the the North of the site are playing fields and to the West are the actual School buildings and Car Park.

To the South on the opposite side of the B 5097 is vacant land

It is proposed to build eleven houses on the site.

Detailed below is the measurement location used in the survey – this was considered to be representative of the noise level at the whole of the proposed site.



Approximate Measurement Location

Approximate Site Location

Further information has been requested by the LPA which is attached at the end of the report – the site layout has also been changed and these changes are included.

Noise Assessment Criteria

In BS 8233: 2014 (Sound Insulation and Noise Reduction in Building, Ref.4) design criteria is provided for noise levels inside buildings : summarised these are :

Bedrooms : $L_{Aeq} = 30$ dBA

Lounge : $L_{Aeq} = 35$ dBA

The above 30 dBA level is acceptable as avoiding sleep disturbance.

The measured external levels are compared to the required internal levels in the Standard to determine the attenuation that must be offered by the structure of the building in order to achieve the required internal levels.

Also it is generally accepted that an open window (Reference The World Health Organisation) will achieve an attenuation of 15 dBA to the external noise.

The requirements specified in the following report should be regarded as the minimum.

Also relevant are the World Health Organisation (WHO) Guidelines for Community Noise – these identify that sleep may be disturbed by short term noise events and the level associated with this is 45 dB L_{Amax} inside the bedroom – this relates to 60 dB L_{Amax} external to the bedroom.

In brief an 'Outdoor Living Area' should be subject to a noise level less than 55 dBA in order to prevent serious annoyance during the daytime and evening - a level less than 50 dBA is desirable to prevent moderate annoyance : reference World Health Organisation.

As there will be no industrial premises in the immediate area then a BS 4142 : 2014 assessment was not considered necessary.

National Planning Policy Framework

This provides brief guidance on planning and noise – it states that planning policies and the resultant decisions should aim to :

A – 'avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of the development.'

B – 'mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from the new development – this includes the use of conditions'.

C – recognise the development will often create some noise and existing businesses wanting to expand to develop in continuance of their business should not have unreasonable restrictions placed on them because of changes in nearby land uses since they were established.

D – identify and protect areas of tranquility which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.'

Therefore the above internal values from BS 8233 : 2014 are used

BS 4142 : 2014 – whilst this does not apply to the present site – this was considered.

It is now a requirement of BS 4142 to consider the potential uncertainty of the assessment – the steps taken to reduce uncertainty as far as practical include :

All the measurements were made with a Type 1 sound level meter with certificates of calibration and field calibration checks were undertaken after each series of measurements with a minimal drift (0.1 dB) recorded.

The weather conditions were considered ideal for environmental noise measurements during the attended measurements with no rain – low wind speeds (< 5.0 m /sec).

Variations in ground cover between the proposed site and the receivers could affect the ground absorption and therefore the calculated levels at the various receivers – in order to reduce this problem it has been assumed that there is acoustically reflective ground cover over the various distances.

Inaccuracies that could result from estimates of the intervening ground cover – meteorological conditions etc. will not be significant.

Equipment Used and Measurement Method

The noise levels were measured using a :

Bruel & Kjaer type 2238 Precision Sound Level Meters (Type 1 instrument)

Calibration was undertaken using a :Bruel & Kjaer type 4231 calibrator

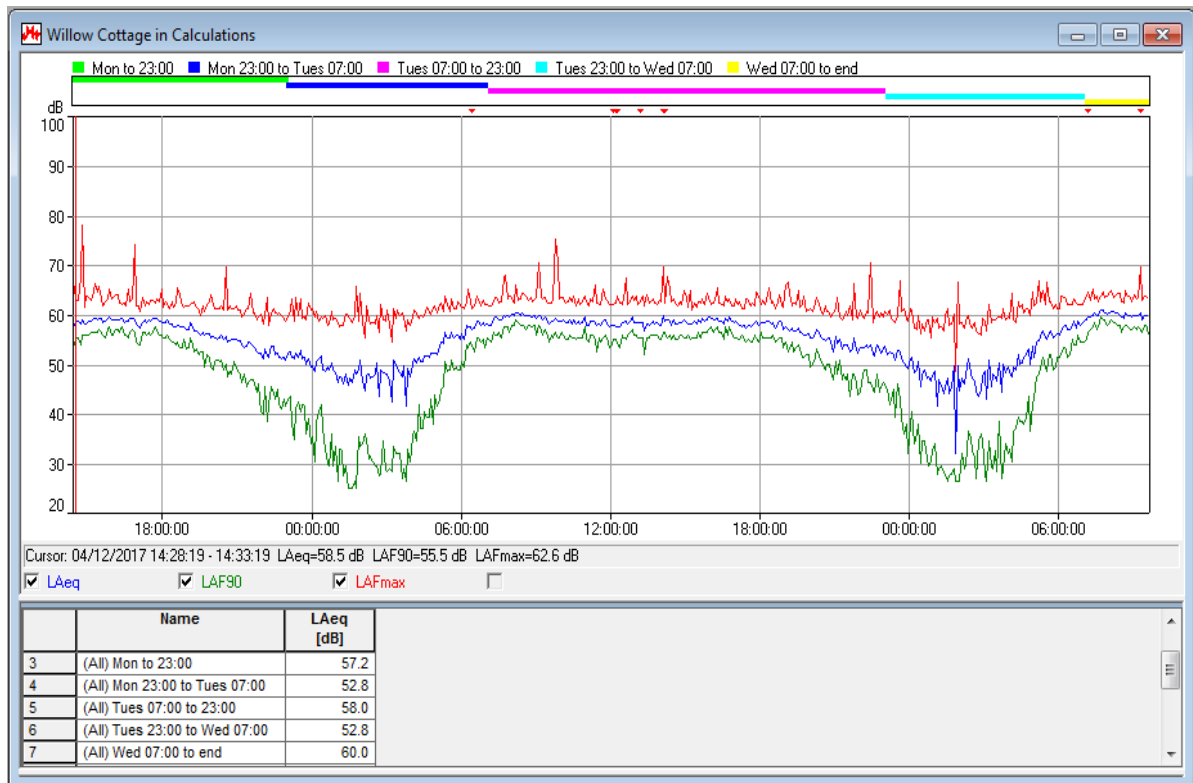
The measurements were carried out at the location shown at a height of 1500mm above the ground and away from reflecting surfaces.

The measurements were undertaken at the times stated in the results.

The location of the measurements are indicated on the plan above.

Results

These are tabulated below : most of the measurements were unattended : measurements were undertaken at the times detailed.



Date	Wind Speed M/sec	Wind Direction	Temperature C	Rain	Cloud Cover %	Road Conditions
04/12/17	0	-	12	No	60	Dry
05/12/17	1	West	11	No	60	Dry
06/12/17	0	-	8	No	70	Dry

During all the above measurements the main source of noise was that of the traffic flow along the A483 and the associated slip road.

From the above graph it can be seen that the traffic noise is reasonably constant between the hours 07.00 and 18.00 hrs and then as the traffic volume decreases the noise level also falls

Between the hours 07.00 – 23.00 the Log average LA eq is calculated to be **59 (58.5) dBA** and between 23.00 – 07.00 hrs **53 (52.8) dBA**.

The general LA max was measured at **65 dBA**.

These are the figures used to determine the glazing / ventilation requirements of the various rooms in the proposed development.

Between the hours 07.00 – 23.00 the required attenuation is $59 - 35 = 24 \text{ dBA}$

Between the hours 23.00 and 07.00 the required attenuation is $53 - 30 = 23 \text{ dBA}$

The LA max is required to be attenuated by $65 - 45 = 20 \text{ dBA}$

The required attenuation is detailed above - however as the main source of noise is due to the traffic movement the A 483 then the **Rw + Ctr** indicator is used rather than the Rw indicator as traffic noise contains the majority of its sound energy in the lower frequency bands.

As can be seen the glazing / ventilation requirements are governed by the day time requirements of **24 dB** – therefore the glazing could be 4 / 6 to 20mm / 4mm IGU's (or any glazed unit having the same quoted attenuation) which as can be seen from the data sheet enclosed at the end of the report has a quoted $D_{n,ew} + C_{tr}$ of **25dBA**.

This glazing will attenuate the LA max to the required level having a quoted Rw of **29dB**. The **Rw** indicator is usually used for the LA max levels as the LA max levels contain the majority of the noise energy in the high frequency range rather than in the lower frequencies where the **Rw + Ctr** is used as above.

Due to the above some sort of ventilation means will have to be provided as the attenuations are in excess of that of an open window.

With respect to the ventilation of the habitable rooms these are usually regarded as the bedrooms, lounges, dining kitchens and kitchens but only if they are dining kitchens.

The type of ventilation fitted will depend also upon the number of air changes per hour that are required by Building Regulations – this is beyond the scope of this report – however suppliers of suitable acoustically treated ventilation systems can be found on the following web sites;

www.passivent.com

These supply vents that fit into the window header and can be acoustically treated or:

www.vents.com

supply core vents that are wall mounted.

Both these types of vent will be suitable acoustically provided that they meet the minimum attenuation requirements .

Or any ventilation unit having a quoted $D_{n,ew}$ in excess of **24 dB**.

As the present application is for – we understand – Outline Planning Permission – and the detailed design has not yet been finalised then only general information can be supplied regarding the ventilation method with respect to the habitable rooms – this is included at the end of the report.

It is important that the windows are correctly fitted into the wall – gaps and holes around the frames must be kept to a minimum and those that occur must be fully sealed with a high density sealer – *on no account must light weight expanding foams be used.*

In general the construction of the building must be undertaken with great care as even small gaps will reduce the attenuation provided by the structure and even if a complete wall, which may have an

attenuation of 50 dBA has a hole in it equivalent to 1/1000 of the wall area the effective attenuation of the wall is limited to a maximum of 30 dBA.

The actual area of the window in the wall affects the internal noise level: the greater the window area the higher the internal noise level. In general a normal double skinned brick wall will have an attenuation of 45/50 dBA .

The attenuation of the external wall can be reduced by in excess of 5 dBA if the area of the windows is of the order of 25%. The type of glazing then becomes important.

When the windows are open the only important consideration is the area of the opening: if it is 10% of the total area the noise attenuation will be of the order of 12 dBA regardless of the construction of the remaining 90% of the wall.

With regard to the roof, if it is pitched slated or tiled roof with an under ceiling and mineral fibre insulation then an attenuation of the order of 45 dBA should be achieved.

The attenuations required will be easily met with the proposed construction of the external walls.

External Areas

These are governed by the requirements of the WHO as detailed above .

As can be seen from the above measured noise levels the log average LA eq at the proposed residential development is **59 dBA**.

As can be seen this is in excess of the WHO Guideline noise levels of 50 / 55 dBA.

However BS 8233 : 2014 states that the main criteria to be considered are the internal levels in the various rooms – and as can be seen from the above if the glazing / ventilation specified is installed then these will be met .

Therefore the external levels in 'private amenity areas' whilst obviously desirable are possibly not the main criteria and as acoustic screening is recommended to be included then it is likely that the above is the best that can be practically achieved.

As can be seen from the enclosed site plan the *private amenity areas* to the front of the proposed residential properties are open and therefore we would suggest are not regarded as *private amenity areas*.

This is not the case of the rear gardens of the proposed development.

However the rear garden areas of Plots 1 to 4 are screened from the traffic noise by the development itself and according to **BS 5228 : Part1 : 2009 Section F.2.2.1 Section C** an attenuation to the noise from the A 483 of the order of 5 to 10 dBA can be expected – as the road will not actually be visible from the rear gardens then an attenuation of 10 dBA is assumed – if this is the case then the noise level in the rear gardens of Plots 1 to 4 could be of the order of **49 dBA**.

Plots 5 – 6 – 7 – 8 – 9 - 10 will be separated from the neighbouring Plots by fences – we would recommend that these fences are 2.0m high and have a mass of at least 14 kg / sq m.

It is important that there are no gaps in the structure is used – this particularly applies to gaps at the support posts or between the structure and the ground.

Again it is estimated that the attenuation offered will be of the order of 10 dB therefore the external level of the order of **49 dBA**.

In addition to the attenuation offered by the screening these Plots are at a greater distance from the road traffic than the measurement location used and therefore the actual noise level at these locations will be attenuated accordingly.

With respect to Plot 11 which borders the A 483 there is an existing light weight timber fence of approximately 1.8 / 2.0m in height – this should be replaced by a fence as detailed above but the height increase to 2.5m

According to **BS 5228 : Part1 : 2009 Section F.2.2.2.1 Section C** an attenuation to the noise from the A 483 of the order of 5 to 10 dBA can be expected – we would estimate in the rear garden an attenuation of 5 dBA will be achieved – if this is the case then the noise level in the rear gardens of the residential properties could be of the order of **54 dBA**.

As can be seen this is within the WHO Guidelines.

Roger Leach

AMIOA

Date : December 2017

Revised information – June 2018

The following e mail has been received regarding the above site :

Following out submission to the LA they have requested design changes to the scheme. As part of the initial consultation welsh government have requested additional information in relation to the acoustic fencing.

I attach a copy of their consultation report and a copy of the revised layout, which I assume will alter things slightly.

The planning officer has also provided us with a steer on things extract below for her email to myself:

“The Welsh Government are asking for specific detail which outlines a clear conclusion to the acoustic assessment – I have read through this and the outcome is generalised at the moment. We would need further details in terms of precise mitigation measures required to reduce noise levels to an acceptable level throughout the site, so that this element of the scheme can be conditioned accordingly.

The mitigation measures would then help to inform the overall design and layout of the scheme.

As discussed, if the acoustic fencing only stretches along part of the eastern boundary, then it may be appropriate to retain the dwellings where possible furthest south of the site. This will need to be established as part of the conclusion to the noise assessment.”

In addition the site lay out has been changed as detailed below :



Proposed new wall

With reference to the acoustic treatment to the proposed residential properties on the above revised site plan.

Conclusion

Glazing

Between the hours 07.00 – 23.00 the required attenuation is $59 - 35 = 24 \text{ dBA}$

Between the hours 23.00 and 07.00 the required attenuation is $53 - 30 = 23 \text{ dBA}$

The LA max is required to be attenuated by $65 - 45 = 20 \text{ dBA}$

As can be seen the glazing / ventilation requirements are governed by the day time requirements of **24 dB** – therefore the glazing could be **4 / 6 to 20mm / 4mm IGU's** (or any glazed unit having the same quoted attenuation) which as can be seen from the data sheet enclosed at the end of the report has a quoted **Rw + Ctr of 25dBA**.

This glazing will attenuate the LA max to the required level having a quoted **Rw of 29dB**

Ventilation

With respect to the ventilation of the habitable rooms these are usually regarded as the bedrooms, lounges, dining kitchens and kitchens but only if they are dining kitchens.

Any ventilation unit having a quoted **$D_{n,ew}$ in excess of 24 dB** will result in an internal level within the requirements of the Standard.

The type of ventilation fitted will depend also upon the number of air changes per hour that are required by Building Regulations – this is beyond the scope of this report – but the acoustic performance should be a minimum of $D_{n,ew} = 24 \text{ dB}$ – please see information at the end of the report.

External Levels.

The noise levels on various plots will have to be controlled by the building of acoustic fences / barriers – these are available commercially – one such supplier being www.jacksons-fencing.co.uk.

The barrier could take the form of a small earth bund for part of the overall height of the barrier and then an acoustic fence on top

The screen to the eastern boundary of the site – see attached drawing above - can be constructed from virtually any solid material provided it has a mass of at least 15 kg / sq m and have a height of 2.5m.

This screen / barrier will provide attenuation to Plots 5 – 6 – 7 – 8 – 9 -10 as discussed above resulting in an external noise level of 49 dBA – the Plots to the West of the development will also benefit from the attenuation provided by the screens between the various properties.

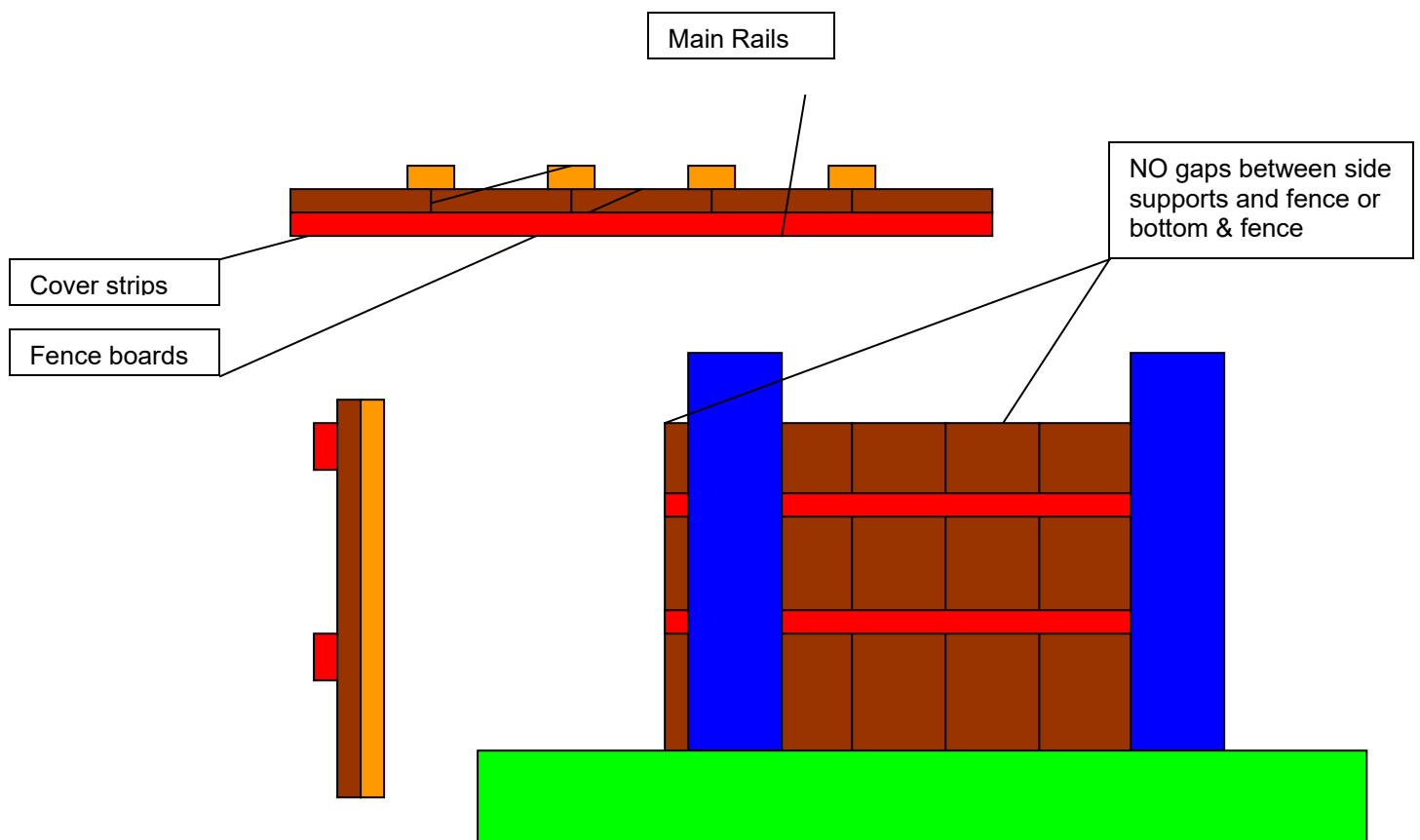
Plots 3 – 4 are screened by the development itself and again the expected external noise level will be 49 dBA.

If the screen is constructed from timber then it is important that the timber is properly weather treated in order to minimise any deterioration due to weather.

There must be no holes or gaps in the screen – this is particularly important at the base of the screen between it and the ground – there must also be no gaps between the screen and the posts – ideally slotted posts should be used to reduce the likelihood of this happening.

The posts etc can be of any suitable construction that will support the fence with the wind loading etc.

The important thing acoustically is that there are NO gaps at all along the edges of the wooded panels – at the side and the bottom – and that there are NO gaps between the individual wooden slats that the fence is constructed from.



The actual fence posts can be whatever you want – wooden posts – metal posts or brick pillars.

The actual fence boards and cover strips need to be about 25mm and be tight fitted with no gaps between the joints , hence the cover strip on the back.

The top of the fence will just need to be weather stripped.

The proposed location of the acoustic barrier is shown on the revised site plan above.

To the East of the Car Park area adjacent to Plots 1 and 2 a 2.0m high stone barrier wall has been included– as shown – in order to afford attenuation to the rear amenity areas of Plots 2 and 1.

Again as the A483 will not be visible from the rear amenity areas of these Plots an attenuation of 10 dBA can be assumed resulting in an external level of 49 dBA (Reference : BS 5228 : Part1 : 2009 Section F.2.2.2.1 Section C).

Roger Leach AMIOA



Pilkington Optiphon™

	dB sound reduction index by octave band – Hz						$R_w(C;C_{tr})$	R_w	R_w+C	R_w+C_{tr}
	125	250	500	1000	2000	4000				

Configuration single glazing

6.8 mm Pilkington Optiphon™	21	26	31	35	37	38	35(-1;-3)	35	34	32
8.8 mm Pilkington Optiphon™	24	28	34	38	37	43	37(-1;-4)	37	36	33
10.8 mm Pilkington Optiphon™	28	31	36	38	39	47	38(-1;-2)	38	37	36
12.8 mm Pilkington Optiphon™	30	32	37	39	41	51	39(-0;-2)	39	39	37
16.8 mm Pilkington Optiphon™	29	34	37	39	46	55	40(-0;-2)	40	40	38

Configuration Insulating Glass Unit (IGU), thickness in mm

6 / 6 to 20 mm / 6.8 Pilkington Optiphon™	23	24	34	42	43	52	38(-2;-5)	38	36	33
6 / 6 to 20 mm / 8.8 Pilkington Optiphon™	24	26	40	48	46	54	41(-3;-7)	41	38	34
6 / 6 to 20 mm / 10.8 Pilkington Optiphon™	23	28	41	47	45	55	42(-3;-7)	42	39	35
6 / 6 to 20 mm / 12.8 Pilkington Optiphon™	20	29	43	47	46	49	42(-3;-8)	42	39	34
8.8 Pilkington Optiphon™ / 6 to 20 mm / 12.8 Pilkington Optiphon™	26	36	46	50	52	63	47(-2;-7)	47	45	40
16.8 Pilkington Optiphon™ / 6 to 20 mm / 16.8 Pilkington Optiphon™	29	40	45	47	54	68	48(-2;-6)	48	46	42

The above IGUs with Pilkington K Glass™ on one pane and a 16 mm 90 % Argon-filled cavity achieve a U value of 1.5 W/m² K.

Further information on solar and thermal performance is available on the Pilkington website using the Spectrum program: www.pilkington.com/spectrum

Impact classification EN12600 Class 1(B)1 for all above Pilkington Optiphon™ products

$R_w(C;C_{tr})$ are in accordance with EN717-1

Non Pilkington Optiphon™ glass products. Figures from BS EN 12354

	dB sound reduction index by octave band – Hz						$R_w(C;C_{tr})$	R_w	R_w+C	R_w+C_{tr}
	125	250	500	1000	2000	4000				

Configuration single glazing

4 mm Float Glass	17	20	26	32	33	26	29(-2;-3)	29	27	26
6 mm Float Glass	18	23	30	35	27	32	31(-2;-3)	31	29	28
8 mm Float Glass	20	24	29	34	29	37	32(-2;-3)	32	30	29
10 mm Float Glass	23	26	32	31	32	39	33(-2;-3)	33	31	30
12 mm Float Glass	27	29	31	32	38	47	34(-0;-2)	34	34	32

Configuration Insulating Glass Unit (IGU), Float glass, thickness in mm

4 / 6 to 20 mm / 4	21	17	25	35	37	31	29(-1;-4)	29	28	25
6 / 6 to 20 mm / 6	20	18	28	38	34	38	31(-1;-4)	31	30	27
6 / 6 to 20 mm / 4	21	20	26	38	37	39	32(-2;-4)	32	30	28
10 / 6 to 20 mm / 4	24	21	32	37	42	43	35(-2;-5)	35	33	30
10 / 6 to 20 mm / 6	24	24	32	37	37	44	35(-1;-3)	35	34	32

Note that these are conservative figures and cover all products by European glass manufacturers.

R_w = Weighted sound reduction. This scale allows for the response of the human ear and could be used for determining a suitable product to reduce noise such as voices.

C = An adjustment to the R_w scale that could be used for selecting a product to reduce noise from music, radio, tv, high speed traffic and other medium to high frequencies.

C_{tr} = An adjustment to the R_w scale that could be used for selecting a product to reduce noise from urban road traffic, disco music and other noises with a large component of low frequencies.

Note that a 3 dB difference is barely discernable, 5 dB is clearly discernable and 10 dB is a doubling or halving of the noise.

WINDOWS / GLAZING

All windows are to comprise sealed double glazed units set within good quality Grey uPVC frames. Sealed double glazed units are to achieve a minimum U-value of 1.6 W/m²K. Opening areas of windows are to be equal to at least 5% of enclosed floor area with part of the opening set at 1750mm above floor level. Provide background ventilation to habitable rooms by means of 8000mm² controllable trickle ventilators set in head frame member of windows or locking mechanism that provides adequate background ventilation. Windows to bedrooms at first floor level to have opening lights of at least 0.33m² with a minimum clear opening of 750mm high x 450mm wide. Window cill is to be positioned to ensure that cill level is within 1100mm of floor level. Window Cills positioned within 800mm of First Floor level to have removable guarding fitted. Glazing in critical locations such as within 800mm of floor level to windows, within 1500mm of floor level to doors, and windows adjacent to doors is to consist of laminated toughened safety glass in accordance with BS 6206 and permanently marked.

MECHANICAL VENTILATION

Provide mechanical ventilation to kitchen, en-suite and bathroom by means of Vent Axia or similar wall/ceiling mounted electrically operated fans extracting directly to external air to the following requirements:

Bathroom & en-suite - fans to extract at a rate of 15 litres per second, (type of fan to be in line extractor confirmed adequate by manufacturer) to be operated in conjunction with light switch with a 15 minute over run facility. Door to en-suite to be undercut by 10mm to allow adequate ventilation.

Kitchen - cooker hood to extract at a rate of 30 litres per second.

Vents to be covered with weather proof grilles at points of discharge to external air