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NOISE IMPACT ASSESSMENT

Prepared For :	Studio Tashkeel Architecture Ltd.	Date :	30 Mar 2023
Site :	Land off Woodlands Rd, Crumpsall	Report No. :	11106

1 INTRODUCTION

Braiden Acoustics has been commissioned by Studio Tashkeel Architecture Ltd. to undertake an acoustic survey at the site of Land off Woodlands Rd, Crumpsall, in order to support a planning application 135323/FO/2022 which proposes "Erection of 4 semi-detached houses with associated driveways and bins".

1.1 AIM

The aim of the report is to describe the site and its surroundings with regards to potential noise sources affecting the site. The noise assessment shall recommend noise mitigation measures, where and if, necessary.

2 DESCRIPTION OF SITE

The site is currently an empty parcel of land with some vegetation, as shown in Figure 1.

Figure 1
Street view of site

2.1 SITE LOCATION AND NEIGHBOURING USES

The site is triangular-shaped and bounded by Woodlands Road to the south, existing housing to the west and the Bury-Manchester tram line to the north east, with Abraham Moss station some 150m to the north west.

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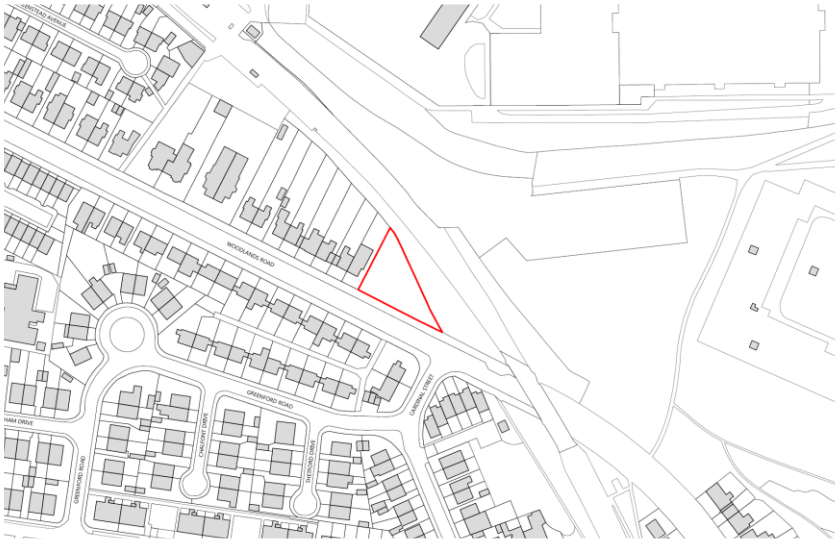

Figure 2
Site location showing surrounding uses

On the other side of tram tracks is Abraham Moss school, some green space with trees and Crumpsall & Cheetham Model Allotments.

2.2 PROPOSED USE

The proposal is to build 4no. semi-detached houses.

Figure 3
proposed site layout

The shortest distance between the rear / side elevations and the nearest tram rail is approximately 15m.

The front elevations are approximately 10m from the nearest kerb.

3 ACOUSTIC CRITERIA AND METHODOLOGY

This is a residential development that may be susceptible to environmental noise, such as road traffic noise and/or noise from local industry. Recommended noise levels due to environmental noise are taken from BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings" [i] which, in turn, takes guidance from the research based World Health Organisation "Guidelines for Community Noise". Where

necessary, mitigation measures have been recommended so that the noise level thresholds are not breached.

Noise levels are usually given separately for the night-time – 2300-0700 hrs and day time – 0700-2300 hrs.

3.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework is the current document for planning guidance. Paragraph 123 of the NPPF says that planning decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

3.2 BS 8233: 2014

The British Standard BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings" gives guidance on recommended indoor ambient noise levels for residential dwellings.

Room	Criterion	$L_{Aeq,T}$	
		night	day
Bedroom	Sleeping	30	35
Dining Room/Area	Dining	--	40
Living Room	Resting	--	35

Table 1
Recommending indoor ambient noise level thresholds from anonymous noise (taken from Table 4, BS 8233:2014)

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

Internal noise levels in habitable rooms are calculated using either the simple or rigorous method as described in Annex G in BS 8233:2104.

3.2.1 Noise levels in external living areas

For external living areas such as gardens and balconies, BS 8233:2014 § 7.7.3.2 recommends an upper limit of 55dB $L_{Aeq,day}$ although there is a caveat:

However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

3.2.2 Maximum noise levels

In the 2014 edition of the Standard, the criterion of 45dB L_{AFMax} inside bedrooms has been removed although there is Note 4:

> *NOTE 4 regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,P depending on the character and number of events per night. Sporadic noise events could require separate values.*

The use of the phrases 'may be set' and 'could require' imply that this is a discretionary criterion.

The L_{Amax} criterion is used where the level is not exceeded more than 10 times during the night time period.

3.3 BS 4142

BS 4142:1999 "Method for rating industrial noise affecting mixed residential and industrial areas" [ii] assesses industrial noise with regards to nearby residential dwellings. The guidance is commonly used to compare the equivalent noise from an industrial source only (*specific noise level*), L_{Aeq}, to the background noise level, L_{A90}, at the nearest sensitive receptor (NSR).

When measuring the Background Noise Level, the Standard states:

> *Choose outdoor measurement locations that will give results that are representative of the ambient sound and residual sound at the assessment location(s). Make the measurement of the ambient sound level, the residual sound level and the background sound level at a height of 1.2 m to 1.5 m above the ground, unless there is a specific reason to use an alternative height (which should be justified), and under similar conditions, e.g. similar influence of reflections and measurement height above the ground. Where practical, minimize the influence of reflections by making the measurements at least 3.5 m from any reflecting surface other than the ground.*
>
> *Where it is necessary to undertake measurements above ground floor level, choose a location which is approximately 1 m from the facade on the relevant floor of the building if it is not practical to make the measurements at least 3.5 m from the facade at this elevation. NOTE When measurements for distant sources are made at 1 m from a facade, the measured level can be adjusted to an equivalent free-field level by subtracting a 3 dB correction factor. For sources that are relatively close or not perpendicular to the facade the correction may be 1 dB or 2 dB, in which case the reasons for not using a correction of 3 dB ought to be explained.*

Essentially, background noise measurement should be made free field. If measurements are made at the façade then a correction should be made in order to represent the free field.

This Standard has been recently updated, BS 4142:2014 "Methods for rating and assessing industrial and commercial sound" [iii]. Whereas the old standard added 5dB 'penalty' to the Specific Noise Level (SNL) if the noise source has a 'character' that can draw attention that may be described as tonal, intermittent or impulsive, the new standard gives clearer guidance on noise 'character'. Furthermore, the previous Standard gave only one 5 dB penalty whereas the new Standard may not. When added to the specific noise level it forms the *rating level*. The new Standard gives the guidance for the following types of noise character:

> *Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.*
>
> *Correct the specific sound level if a tone, impulse or other characteristic occurs, or is expected to be present, for new or modified sound sources.*
>
> *NOTE 1 The prominence of tonal or impulsive sound from a source can be masked by residual sound. In many cases the amount of masking varies as the residual sound changes in level and possibly character. The source's tonal and/or impulsive characteristics could also vary with time.*

Consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention.

Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

Other sound characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

NOTE 2 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Once a penalty for noise character is added to the Specific Noise Level then this is termed the *Rating Level*.

The background level is then compared to the rating level. It is usual that the rating level due to the source should be below the background noise level at the nearest sensitive receptor; indeed BS 4142 states:

"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

3.4 Council noise criteria

3.4.1 Residential noise criteria

For residential developments, the noise thresholds are taken from BS8233:

- *Bedrooms (night time - 23.00 - 07.00) 30 dB LAeq (individual noise events should not normally exceed 45 dB LAmax,F by more than 15 times)*
- *Living Rooms (daytime - 07.00 - 23.00) 35 dB LAeq*
- *Gardens and terraces (daytime) 55 dB LAeq*

4 Monitoring Details

4.1 Monitoring overview

Personnel: John Braiden, BSc & MSc Acoustics, MIOA.

Equipment: NTi XL2 integrated real time analyser & B&K 4231 calibrator.

The sound level meter was calibrated before after the measurements with no significant drift reported.

Monitoring was unmanned with audio recorded.

4.2 Monitoring Locations

Noise monitoring took place in two locations: one near to the railway and one near to the road. Both monitoring location were 1.2-1.5m from local ground and were in otherwise free-field locations.

Figure 4
Site location showing monitoring locations

4.3 Visit One - Front

The first visit was to monitor noise levels at the front of the site.

Date: Wed 4th March to Thurs 5th March 2020 (>21 hours)

Weather: 4 – 9°C temperature; ~5ms^{-1} wind; ~20-40% cloud;

4.3.1 Results

Date	Time		Duration	Time Period	L_{A90} dB	L_{Aeq} dB	L_{Amax} dB
	Start	Finish					
Thurs 27/02/2023	16:13:14	23:00:00	07:56:18	day	43.0	58.0	85.1
	23:00:00	07:00:00	08:00:00	night	42.1	60.2	81
	07:00:00	13:23:56	06:23:56	day	50.3	65.3	87.4

Table 2
Summary of visit 1 - front

The measured noise levels were dominated by road traffic noise from nearby roads.

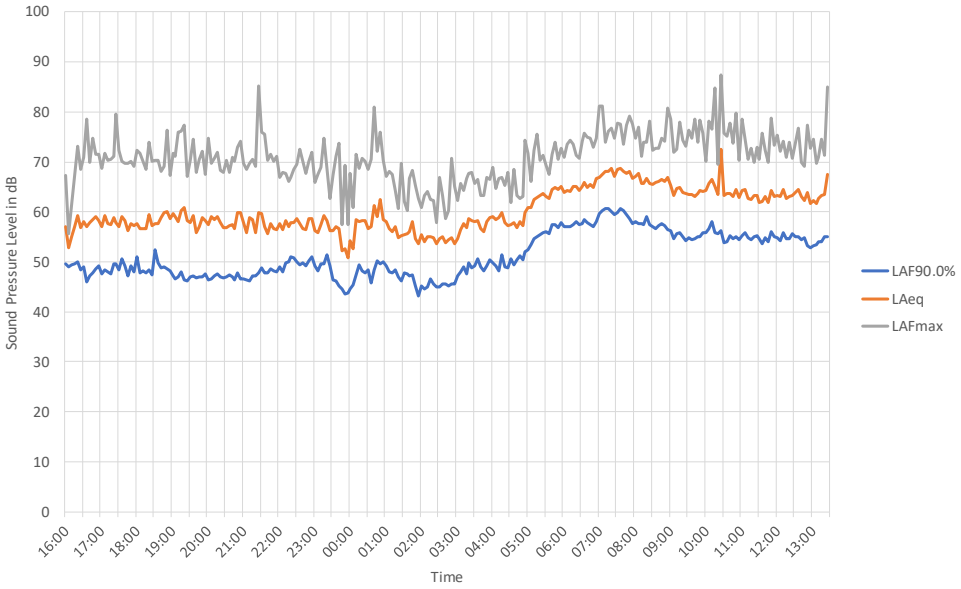

Figure 5
Time history

The increase in noise levels from 05:00 shows the influence of traffic noise from the M56.

L_{Aeq} (night) 60 dB(A)

L_{Aeq} (day) 63 dB(A)

4.4 VISIT 2 – REAR

Noise measurements focussed on noise from the railway line and possibly the road.

Weather: 4 - 8-°C temperature; ~5ms^{-1} wind; ~60 - 80% cloud; some light precipitation.

Date: Friday 7th February 2023.

Monitoring was unmanned.

4.4.1 Results

Noise levels at the monitoring location were dominated by passing trains which remained relatively consistent throughout the daytime and for part of the night time period. Freight as well as passenger trains were detected. This was very little evidence of any significant road noise.

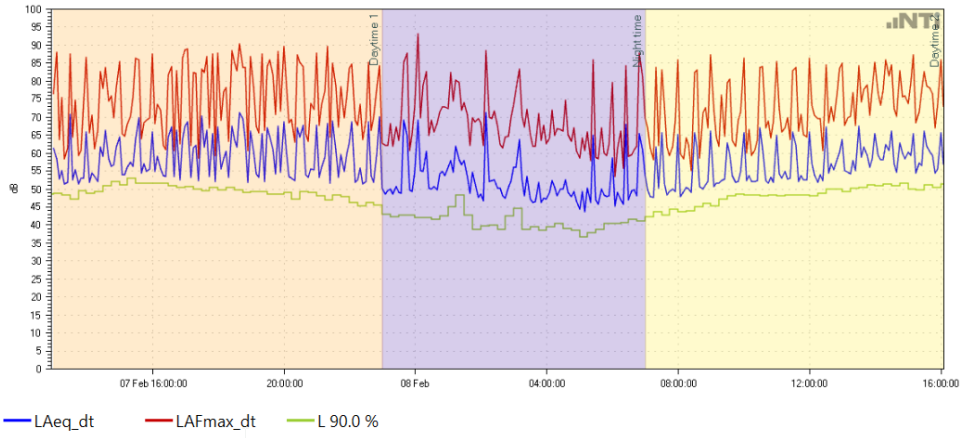

Figure 6
Time history

Date	Time		Duration	Time Period	L_{A90} dB	L_{Aeq} dB	L_{Amax} dB
	Start	Finish					
Fri 13/02/2023	12:56:54	23:00:00	10:09:06	day	48.8	63.0	90.1
	23:00:00	07:00:00	08:00:00	night	40.1	58.1	93.1
	07:00:00	14:26:20	07:26:20	day	46.6	59.9	87.1

Table 3
Summary of free field noise monitoring results

The overall free field noise levels are as follows:

L_{Aeq} (night) 58 – 0 = 58dB(A)

L_{Aeq} (day) 62 –0 = 62 dB(A)

5 Acoustic Assessment

5.1 Environment Noise Break In

Given the external noise levels, the initial glazing scheme can be suggested. However, it should be noted that this assumes windows closed in order to achieve the internal noise levels based on BS 8223:1999.

The amount of attenuation from the building façades were readily computed using the simple method in Appendix G of BS 8233:2014 whereby the sound insulation index (SRI) of the glazing (the weakest element of the building façade, acoustically) is determined by simply deducting the required internal noise level from the external free field noise level.

5.1.1 Façade effect

A -3dB façade correction was not necessary as the noise monitoring was free-field.

5.1.2 Distance correction

There was no distance correction applied as the monitoring location was representative of the location proposed residential dwellings.

5.1.3 Barrier effect

There is no barrier correction due to direct line of sight to the noise sources.

5.1.4 BS 8233 assessment

The weakest structural element is the glazing. The required glazing was calculated using recommended internal values. The Table below shows the required Sound Reduction Indices (SRI) for the bedrooms (night) and living areas (day) on each relevant elevation.

Noise levels will be attributed to all elevations as a worst-case methodology.

Façade	period	room	External Levels measured / calc'd		Internal Levels recommended		Required glazing	
			L_{Aeq} (dB)	L_{Amax} (dB)	L_{Aeq} (dB)	L_{Amax} (dB)	SRI ($R_w + C_{tr}$)	Example Spec[1]
FRONT	night	bedroom	60		30		**30**	10/(6-16)/4mm
	day	lounge	63		35		**28**	10/(6-16)/4mm
REAR	night	bedroom	58		30		**28**	10/(6-16)/4mm
	day	lounge	62		35		**27**	10/(6-16)/4mm

Table 4
Calculated SRI values and recommended glazing

Upgraded double glazing is required ***for all habitable rooms***.

The required amount of attenuation is between 27-30 dB: The following specification will achieve this:

10/(6-16)/4mm 30 dB $R_w + C_{tr}$.

6 Conclusion

An acoustic survey has taken place at Land off Woodlands Rd, Crumpsall to support a planning application for residential dwellings.

The main issue of noise was passing vehicles on the nearby road network and the Bury-Manchester tram lines, which resulted in relatively high noise levels.

Adequate Internal noise levels will be achieved with upgrade double glazing, ***for all habitable rooms.***

- install 10 /(6-16)/ 4mm double glazed units.

Adequate sound reduction indices can be achieved with the glazing specification above.

7 References

[i] BS8233: 2014
Guidance on sound insulation and noise reduction for buildings
British Standards Institute, 2014.

[1] Example glazing build up and performance from BS 12354-3 – table in Appendix. Other glazing build-ups available.

[ii] BS 4142: 1997
Method for Rating industrial noise affecting mixed residential and industrial areas
British Standards Institute, 1997.

[iii] BS 4142: 2014
Methods for rating and assessing industrial and commercial sound
British Standards Institute, 2014.

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Appendix

A1 Pilkington - Glazing Spec

Sound insulation data for Pilkington **Optiphon**™

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						R_w (C; C_{tr})	R_w	R_w+C	R_w+C_{tr}
	125	250	500	1000	2000	4000				
Single glazing										
6.8 mm Pilkington **Optiphon**™	22	26	31	37	40	40	36 (-1; -4)	36	35	32
8.8 mm Pilkington **Optiphon**™	27	29	34	38	40	43	37 (0; -2)	37	37	35
10.8 mm Pilkington **Optiphon**™	26	30	35	39	40	46	38 (-1; -3)	38	37	35
12.8 mm Pilkington **Optiphon**™	29	32	36	41	42	51	40 (-1; -3)	40	39	37
16.8 mm Pilkington **Optiphon**™	31	33	38	41	43	54	41 (-1; -3)	41	40	38
Insulating glass units										
6 mm / 16 mm argon / 6.8 mm Pilkington **Optiphon**™	21	28	37	48	48	54	40 (-2; -6)	40	38	34
6 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon**™	25	27	38	48	47	55	41 (-2; -6)	41	39	35
8 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon**™	21	30	39	47	50	55	42 (-3; -8)	42	39	34
10 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon**™	28	31	42	45	50	58	44 (-2; -6)	44	42	38
10 mm / 20 mm argon / 8.8 mm Pilkington **Optiphon**™	28	36	43	47	49	58	46 (-2; -6)	46	44	40
8.8 mm Pilkington **Optiphon**™ / 16 mm argon / 12.8 mm Pilkington **Optiphon**™	28	36	45	53	56	64	48 (-2; -7)	48	46	41
10.8 mm Pilkington **Optiphon**™ / 24 mm argon / 16.8 mm Pilkington **Optiphon**™	35	41	48	53	55	65	52 (-2; -6)	52	50	46
12.8 mm Pilkington **Optiphon**™ / 20 mm argon / 16.8 mm Pilkington **Optiphon**™	35	45	49	50	54	65	51 (-1; -4)	51	50	47

Measurements undertaken in accordance with BS EN ISO 10140 and Rw (C; C_{tr}) determined in accordance with BS EN ISO 717-1.
For insulating glass units, there is little difference in the sound insulation for cavity widths in the range 6 to 16 mm.
To calculate performance data for Pilkington products, please use our Spectrum online calculator at https://spectrum.pilkington.com/
For glass combinations to achieve an R_w value higher than 52 dB, please contact us for more details.

A2 BS12354-3 – GLAZING SPEC

Table B.1 - Examples of the sound reduction index of glazing

Glazing type	Sound reduction index (dB)						
	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 k Hz	R_w (C;C_{tr}) dB
Single panes (mm)							
3	14	19	25	29	33	25	28 (–1; –4)
4	17	20	26	32	33	26	29 (–2; –3)
5	19	22	29	33	29	31	30 (–1; –2)
6	18	23	30	35	27	32	31 (–2; –3)
8	20	24	29	34	29	37	32 (–2; –3)
10	23	26	32	31	32	39	33 (–2; –3)
12	27	29	31	32	38	47	34 (0; –2)
Laminated panes (mm) + plastic laminate (0,5 to 1) mm							
6+	20	23	29	34	32	38	32 (–1; –3)
8+	20	25	32	35	34	42	33 (–1; –3)
10+	24	26	33	33	35	44	34 (–1; –3)
Double pane units with single or laminated panes (mm); air filled cavity from (6 to 16) mm							
4-(6-16)-4	21	17	25	35	37	31	29 (–1; –4)
6-(6-16)-4	21	20	26	38	37	39	32 (–2; –4)
6-(6-16)-6	20	18	28	38	34	38	31 (–1; –4)
8-(6-16)-4	22	21	28	38	40	47	33 (–1; –4)
8-(6-16)-6	20	21	33	40	36	48	35 (–2; –6)
10-(6-16)-4	24	21	32	37	42	43	35 (–2; –5)
10-(6-16)-6	24	24	32	37	37	44	35 (–1;–3)
6-(6-16)-6+	20	19	30	39	37	46	33 (–2;–5)
6-(6-16)-10+	24	25	33	39	40	49	37 (–1;–5)

NOTE 1 This selection and the values are in accordance with prEN 12758-1. The single number ratings are deduced from results in 1/3-octave bands and therefore single number ratings deduced from the given octave band data might result in values which differ 1 dB at the most.

NOTE 2 Though it is known that for a given double pane unit the sound reduction increases with increasing cavity width, this effect has been found to be too small to take into account here for air filled cavities in the light of the inherent spread in results for nominally identical units.

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