



BRAIDEN ACOUSTICS LTD

Innovation Forum // 51 Frederick Road // Salford // Manchester // M6 6FP

ACOUSTIC SURVEY FOR PLANNING

Prepared For : Mason & Marlowe

Date : 9 Mar 2022

Site : 46 Canal St, Manchester

Report No. : 10945revD

1 INTRODUCTION

Braiden Acoustics has been commissioned by Mason & Marlowe to undertake a noise survey at the site of 46 Canal St, Manchester in order to support a planning application for a rooftop garden area as part of On Bar.

1.1 AIM

This report assesses potential noise from the proposed roof garden in relation to nearby residents. Where appropriate, mitigation measures have been recommended.

2 DESCRIPTION OF SITE

The proposed site is the roof area of 46 Canal Street in Manchester – the bar is called ON BAR.

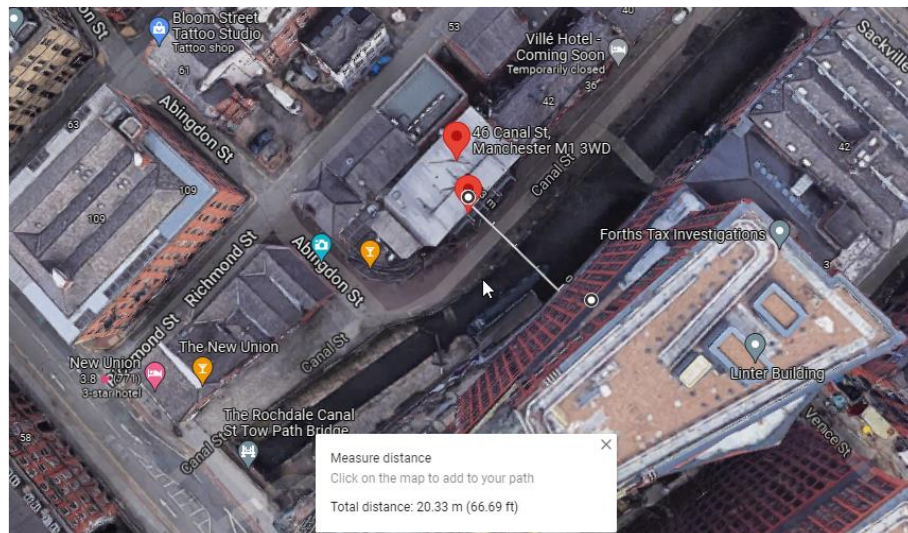


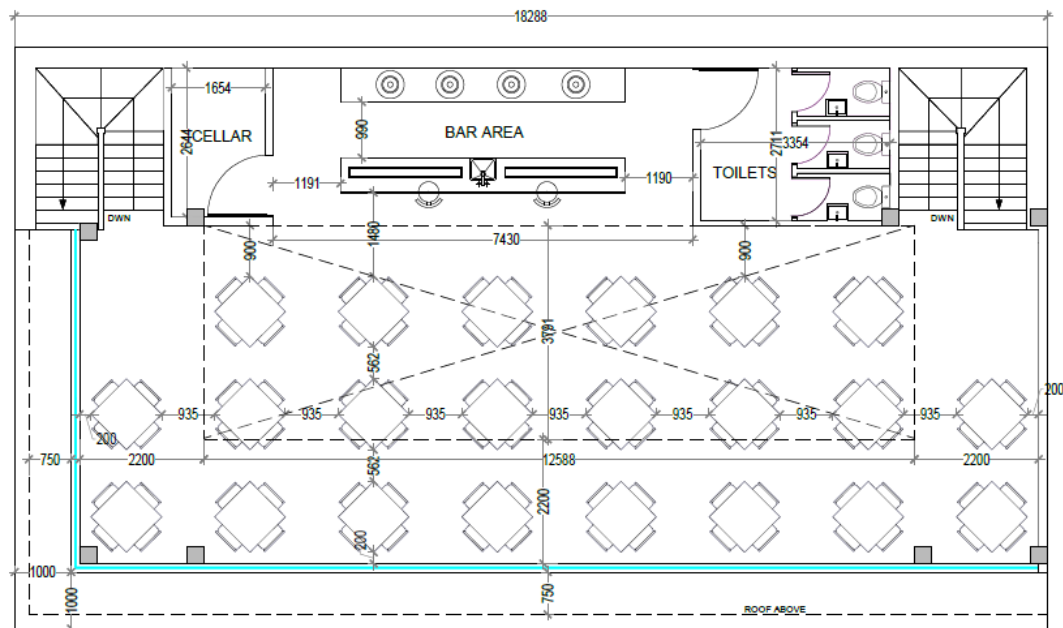
Figure 1
Site location and nearby residential dwellings

The site is within the lively Canal Street area of Manchester city centre. Canal Street is a mixture of café/bars, commercial units and some residential.

The nearest residents to the proposed roof garden are those in the newly built Linter Building on the other side of Rochdale Canal.

2.1 PROPOSED USE

The rooftop space will be converted into a rooftop garden for seated patrons only. There will be (22 s 4) plus 2 seats at the bar which is a total of 90 covers.



THIRD FLOOR PLAN

Figure 2
Roof Plan

The rooftop terrace will have a retractable roof as shown in the figure below.



Figure 3
Rooftop terrace showing retractable roof

2.1.1 Operating hours

It is proposed that the roof garden is open for the following hours:

Sunday to Thursday	10:00 to 23:00
Friday	10:00 to 23:00



When the roof is open, the area will be treated like outdoor seating; hence, the roof will be closed no later than 10pm, in line with outdoor seating of other venues in Manchester.

2.1.2 Sound system

There will be no music system on the roof terrace.

3 ACOUSTIC CRITERIA AND METHODOLOGY

There are no official methodologies for the assessment of noise from entertainment venues. However, there has been much work done in this area over the last ten years, especially since the relaxation of licensing laws.

There are some existing guidelines that have been used to assess noise from pubs and clubs (or more generically known as ‘entertainment venues’) – these shall be briefly described below.

3.1 BS 4142

BS 4142:1999 “Method for rating industrial noise affecting mixed residential and industrial areas” [1] 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).

This Standard has been recently updated, BS 4142:2014 “Methods for rating and assessing industrial and commercial sound” [2]. 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.**”*

3.2 BS 8233: 2014

3.2.1 Residential

The British Standard BS 8233:2014 “Guidance on sound insulation and noise reduction for buildings” [3] 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)

Internal levels are simply predicted by the subtraction of the estimated sound reduction index (SRI) of the building façade from the external free field noise measurements. When considering the SRI of a particular façade it is usual to only consider the glazing as this is the weakest element acoustically.

4 MONITORING DETAILS

Background noise measurements have been taken at a location that is representative of the nearest resident.



Typical patron noise has been measured at the roof garden at Terrace Bar in Northern Quarter.

4.1 BACKGROUND NOISE MEASUREMENT

4.1.1 The Measurement Time Interval, T_m

The Measurement Time Interval, T_m is given (in BS4142:2014 Section 3.6) as:

total time over which measurements are taken

For measuring background noise levels, Section 8.1.3 of BS 4142:2014 states:

“Ensure that the measurement time interval is sufficient to obtain a representative value of the background sound level for the period of interest. This should comprise continuous measurements of normally not less than 15 min intervals, which can be contiguous or disaggregated.”

In order to obtain a worse case methodology, noise measurements were made at a relatively quiet time of week.

4.1.2 Overview

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

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

Weather: 16-24°C temperature; <5ms⁻¹ wind; ~20-40% cloud.

Date: Wed 18/08/2021 18:35 to Fri 20/08/2021 12:00

The sound level meter was calibrated before and after the measurements with no significant drift reported (<0.5 dB).

Measurements were unmanned.

4.1.3 Monitoring location

Monitoring was 1m from second floor of 46 Canal Street. The background noise levels measured here are representative of those at the apartments on the other side of Rochdale Canal.

4.1.4 Monitoring results

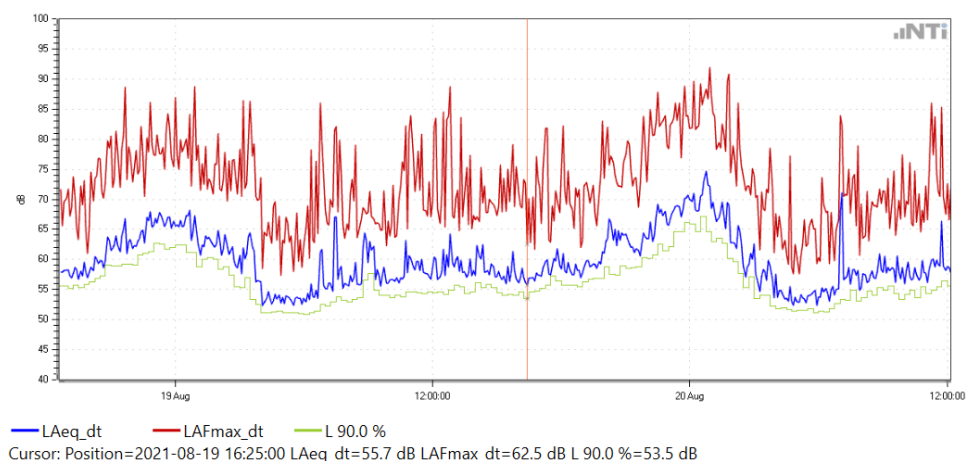


Figure 4
Measured Noise Levels



Canal Street is an unusual location when it comes to noise levels as it is noisier at night than it is during the day. The higher noise levels are around midnight where the background noise level can be higher than 65 dBA; and that is not even at the busiest night of the week.

Background noise levels were recorded in fifteen-minute intervals. The typical background noise level, when the site would be open, was 55 dB L_{A90} – see histogram below.

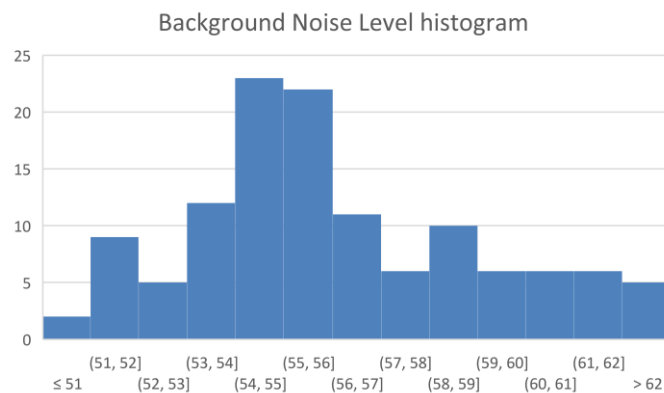


Figure 5
Background Noise Level - histogram

4.2 ROOF GARDEN NOISE MEASUREMENT – PATRON NOISE

4.2.1 Overview

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

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

Weather: 14 - 20°C temperature; <5ms⁻¹ wind; ~60-100% cloud; some light precipitation.

The sound level meter was calibrated before and after the measurements with no significant drift reported (<0.5 dB).

Measurements were unmanned.

4.2.2 Monitoring location

The microphone was placed within the top of one of the wall mounted kegs in the current roof garden – see Figure 6. The microphone protruded approximately 3cm from the handle location at the top of the keg. There will inevitably be a façade effect due to the microphone location being so close to a reflecting surface – both the keg (to a lesser extent due its curved surface) and the wall behind it. Therefore a modest 3 dB has been deducted in the assessment to account for the façade effect.





Figure 6
Microphone location from within one of the wall mounted kegs at high level

4.2.3 Monitoring results

The number of patrons using the roof garden was recorded every hour – as shown in Figure 7.

TIME	NO. OF PEOPLE
7PM ANNE SMITH	47 people
8PM ANNIE SMITH	~~48~~ 52 people
9PM George trueman	46 people
10PM Lennox Bryen	68 people
11PM Taylor Kinkpatrick	63 people
12AM ANNE SMITH	84 people
1AM ANNIE SMITH	80 people
2AM ANNIE SMITH	52 people
3AM ANNIE SMITH	34 people

Figure 7
Number of patrons using the roof garden

The highest number of patrons recorded was 84 at around midnight.

The corresponding noise levels from the roof garden is shown in the Figure below.



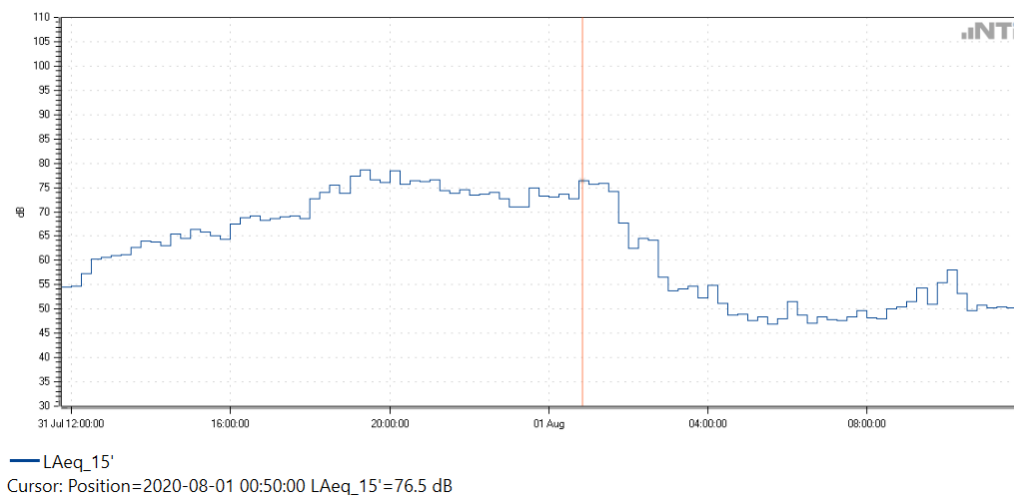


Figure 8
Noise Levels from patron noise on roof garden

The highest 15-minute noise level was 78.5 dB(A) at 19:15 – 19:30. However, according to Figure 7, there were 47 people on the roof garden at 19:00 and 52 people at 20:00. Therefore, it is assumed that the noise level of 78.5 dB(A) is representative of approximately 50 patrons.

The busiest period was at midnight with 84 patrons, although this only gave a 15-minute equivalent of 75.3 dB(A). This apparent discrepancy can initially be explained that patron noise is not easily predictable. Furthermore, the more people on the roof garden would likely lower the reverberant level due to the absorptive quality of humans and the fewer reflective surfaces when the roof garden has more patrons.

In any event, the highest noise level of 78.5 dB(A) will be used. It will also be assumed that the roof garden is at full capacity. Hence, the following noise level will be used, assuming an open top roof terrace:

79 dB(A) 50 patrons

5 ACOUSTIC ASSESSMENT

The rooftop terrace roof will shut at 10pm. Therefore, there needs to be an assessment of the break out noise from the enclosed roof top terrace.

5.1 NOISE BREAK OUT

5.1.1 Roof open

For the open roof, noise data has been taken from the noise measurements at Terrace Bar described in the previous section.

When the number of people using the roof terrace (Figure 7) is compared to the noise level at that time (Figure 8) then it is possible to determine a trend line for the likely noise level for increasing numbers of patrons – see Figure 9 below.

The trend line shows that the likely noise level of 90 patrons using an open roof terrace would be 80 dB(A).



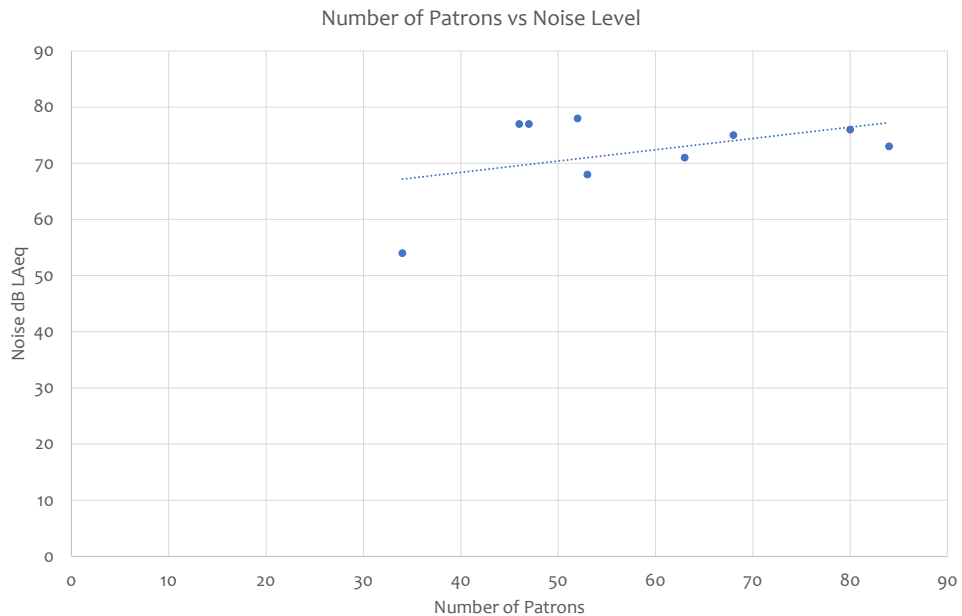


Figure 9
Graph showing numbers of patrons vs noise level and the trend line

Given the free field noise level of 80 dB(A) for 90 patrons, and the typical Background Noise Level of 55 dB (see Figure 5), then the BS 4142 assessment is as follows:

BS 4142 Noise Assessment Roof Terrace OPEN	Value	dB
Noise level from open roof terrace	90 patrons	80
Grazing incidence		-5
Distance	20	-26
Total Specific Noise Level @ NSR		49
BS 4141		
Tonality	0/2/4/4	0
Impulsivity	0/3/6/9	2
Intermittency	0/3	3
Rating Noise Level		54
Typical Background Noise Level		55
Target Met?		✓

Table 2
BS 4142 assessment for open roof terrace noise breakout

The BS 4142 assessment for the open roof noise break out includes a penalty for impulsivity, due to laughing etc. and also intermittency as the noise will not be constant.

The Rating Level of noise break out when the roof is open is below the Background Noise Level and therefore, of 'low impact'.

5.2 NOISE BREAK OUT FROM ENCLOSED ROOF TERRACE

From previous noise assessment of similar enclosed establishments (i.e. **not** an open roof terrace), it is envisaged that the upper reverberant noise level should not exceed 90 dB.



From this, the external noise level, at the nearest sensitive receiver, due to break out noise via the glazing is calculated as follows:

$$SPL_{ext} = SPL_{int,rev} - SRI + 10 \log S - A_{dist} - 14 \quad (1)$$

where SPL_{ext} = external open air sound pressure level (SPL), dB

$SPL_{int,rev}$ = internal reverberant SPL, dB

SRI = sound reduction index of building element, dB

S = area of building element, m²

A_{dist} = attenuation due to distance, dB

BS 4142 Noise Assessment Breakout Noise	Value	dB
L_{Aeq} of Roof Terrace (closed)		85
SRI glazing	6 / 16 / 4	-35
Area of glazing	42.4 m ²	16
Distance	20	-13
Correction value		-14
Noise Level at NSR		39
BS 4141		
Tonality	0/2/4/4	0
Impulsivity	0/3/6/9	2
Intermittency	0/3	3
Rating Noise Level		44
Background		55
Rating minus Background		-11

Table 3
BS4142 assessment – extract duct

The BS 4142 assessment of breakout noise with the roof closed assumes a penalty for intermittency and impulsivity, as before. Even with these penalties, the Rating Level is still 11 dB below the typical Background Level. Therefore noise breakout is of ‘low impact’, if any.

6 MITIGATION

There have been several methods of noise mitigation:

1. Roof terrace roof to be closed at 10pm.
2. Only seated patrons with table service
3. Rooftop terrace supervised by qualified door staff
4. Notices will be situated inside the premises and at the entrance requesting customers leave quietly and in an orderly manner. Staff will draw customers’ attention to such notices.
5. Acoustic glazing to be installed 6 / 16 / 4mm



7 CONCLUSION

An acoustic survey has taken place at 46 Canal St, Manchester to support a planning application for a roof top garden area.

It has been proposed that the rooftop terrace retractable roof should be closed at 10pm.

A noise breakout assessment has shown that, with acoustic glazing, the Rating Level at the nearby apartments is 13dB less than the Background Level. Therefore noise breakout is of 'low impact', if any.

8 REFERENCES

- [1] BS 4142: 1997
Method for Rating industrial noise affecting mixed residential and industrial areas
British Standards Institute, 1997.
- [2] BS 4142: 2014
Methods for rating and assessing industrial and commercial sound
British Standards Institute, 2014.
- [3] BS 8233:2014
Guidance on sound insulation and noise reduction for buildings
British Standards Institute, 2014.



Appendix



A1 GLAZING TYPES

Slim Aluminium Glass Facades

Updated June 2017

Acoustic Performance

Glass Rw (dB)	Glass Thickness	Glass Composition	Rw (C;Ctr) (dB)
35	26	6 / 16 / 4	35 (-1;-4)
32	36	4 / 12 / 4 / 12 / 4	32 (-1;-4)
36	38	6 / 12 / 4 / 12 / 4	37 (-2;-5)
39	42	8 / 12 / 4 / 12 / 6	38 (-1;-3)
42	42	8 / 12 / 4 / 12 / 6	40 (-1;-4)
46	48	10 / 12 / 6 / 12 / 8	45 (-1;-4)
50	50	12 / 12 / 6 / 12 / 8	47 (-1;-4)
51	46	15 / 24 / 8	49 (-1;-5)

Table based on test certificate 15-000241-PRO1 pb/15-000241-PR 03 GAS

Additional regulations may be prescribed for proof of sound insulation. In accordance with DIN 4109:1989-11, calculated value of airborne sound insulation index R_w R is based on the test value R_w minus a correction value of 2dB.

