

7-9 Piccadilly Manchester



Noise Impact Assessment Report
Report 22911.NIA.01. Rev A

Thackeray Estates
16 Thackeray Street
London
W8 5ET

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SUMMARY

KP Acoustics Ltd has been commissioned to assess the suitability of the site at 7-9 Piccadilly, Manchester M1 1LZ, for an office development in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

An environmental noise survey has been undertaken on site in order to establish the current ambient noise levels, as shown in Table 3.1.

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed elements in order to meet the requirements of BS8233:2014, taking into consideration the non-glazed external building fabric elements. The results of these calculations and the sound reduction performance requirements for the glazed elements are shown in Table 5.2.

The noise implications of the ventilation strategy have been considered, with options being provided to ensure that the ventilation requirements of Approved Document F are achieved.

Noise levels within external amenity areas would be expected to meet the recommended levels provided within BS8233:2014.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Thackeray Estates, 16 Thackeray Street, London, W8 5ET, to assess the suitability of the site at 7-9 Piccadilly, Manchester M1 1LZ, for an office development in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise levels and outlines any necessary mitigation measures.

2.0 SITE SURVEYS

2.1 Site Description

The site is bounded by Back Picadilly to the north, commercial properties and Tib Street to the west, Piccadilly and Piccadilly Gardens to the south, and commercial properties to the east. Entrance to the site is located to the south via Piccadilly. At the time of the survey, the background noise climate was dominated by road and tram traffic noise and pedestrian noise from Piccadilly.

2.2 Environmental Noise Survey Procedure

A noise survey was undertaken on the proposed site as shown in Figure 2.1. The location was chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources.

Continuous automated monitoring was undertaken for the duration of the survey between 15:00 on 07/07/2021 and 15:00 on 08/07/2021

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.3 Measurement Positions

Measurement positions are as described within Table 2.1 and shown within Figure 2.1.

Icon	Descriptor	Location Description
	Noise Measurement Position 1	The meter was installed on a balcony on the top floor of the south-west façade, as shown in Figure 2.1. A correction of 3dB has been applied to account for non-free field conditions
	Manual Noise Measurement Position 2	The meter was installed on a balcony on the top floor of the north-east façade, as shown in Figure 2.1. A correction of 3dB has been applied to account for non-free field conditions

Table 2.1 Measurement positions and descriptions

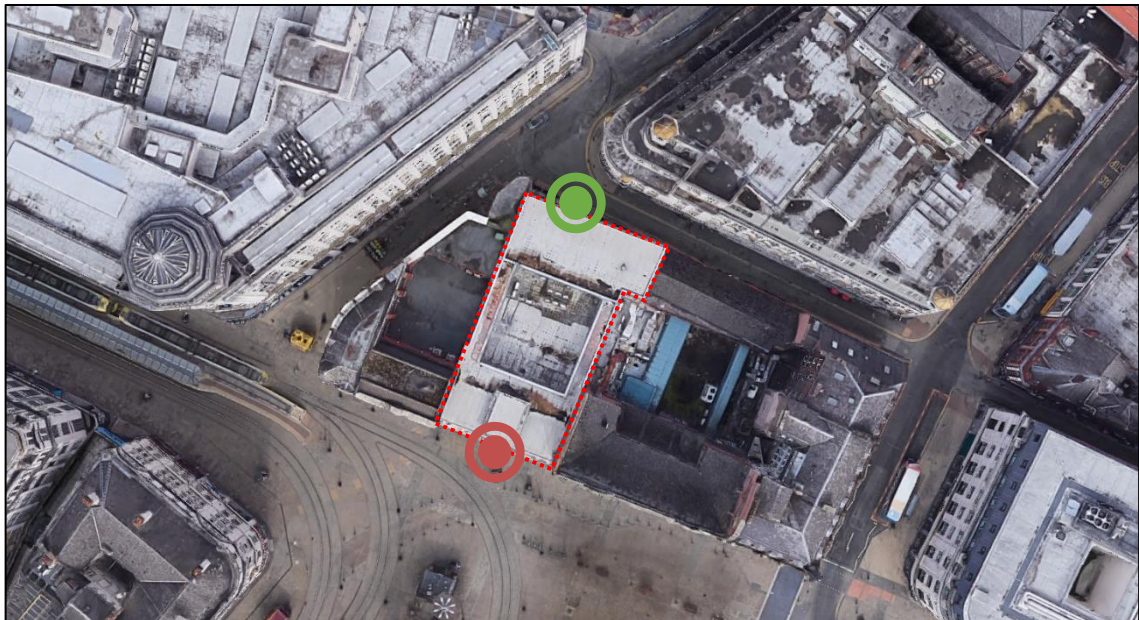


Figure 2.1 Site measurement positions (Image Source: Google Maps)

2.4 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

Measurement instrumentation		Serial no.	Date	Cert no.
Noise Kit 3	Svantek Type 977 Class 1 Sound Level Meter	34104	12/03/2020	14015015-2
	Free-field microphone Aco Pacific 7052E	66830		
	Preamp Svantek 2v12L	17293		
	Svantek External windshield	-	-	-
B&K Type 4231 Class 1 Calibrator		2147411	04/02/2021	05223/2

Table 2.2 Measurement instrumentation

3.0 RESULTS

3.1 Noise Survey

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figure 22911.TH1.

Measured noise levels are representative of noise exposure levels expected to be experienced by the front facades of the proposed development, and are shown in Table 3.1. Further manual measurements have been undertaken to derive the expected noise levels for the individual facades of the proposed development.

It should be noted that the representative background noise level has been derived from the most commonly occurring $L_{A90,5 min}$ levels measured during the environmental noise survey undertaken on site.

Time Period	Noise Measurement Position 1		Noise Measurement Position 2	
	Average background noise level L_{Aeq}	Representative background noise level L_{A90}	Average background noise level L_{Aeq}	Representative background noise level L_{A90}
Daytime $L_{Aeq,16hour}$	62dB	56dB	57dB	51dB
Night-time $L_{Aeq,8hour}$	65dB	46dB	60dB	41dB

Table 3.1 Site average noise levels for daytime and night time

4.0 NOISE ASSESSMENT GUIDANCE

4.1 BS8233:2014

BS8233:2014 'Sound insulation and noise reduction for buildings' describes recommended internal noise levels for office spaces. These levels are shown in Table 4.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Typical noise levels for acoustic privacy in shared spaces	Open plan office	45-50 dB(A)	-
Study and work requiring concentration	Executive Office	35-40 dB(A)	-

Table 4.1 BS8233 recommended internal background noise levels

The external building fabric would need to be carefully designed to achieve these recommended internal levels.

In addition to guidance on internal levels, BS8233:2014 also states the following with regards to noise within external amenity spaces:

‘For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$, which would be acceptable in noisier environments. 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.’

As outlined above, the resulting noise levels in external amenity areas should not be a reason for refusal, providing that the noise levels are designed to be as low as practically possible within external amenity areas.

Expected levels within the proposed external amenity areas are outlined in Section 7 in more detail.

5.0 EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-glazed elements in order to achieve the recommended internal noise levels shown in Table 4.1, taking into account average and maximum noise levels monitored during the environmental noise survey.

Typical sized rooms with a high ratio of glazing to masonry have been used for all calculations in order to specify glazing.

Please note that the glazed and non-glazed element calculations would need to be finalised once all design proposals are finalised.

5.1 Non-Glazed Elements

At this project stage, the exact construction of the non-glazed external building fabric is unknown, however, it is understood that it would be based upon the construction proposed

in Table 5.1 and would be expected to provide the minimum figures shown above when tested in accordance with BS EN ISO, 140-3:1995.

Element	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Brickwork Cavity Wall	41	43	48	50	55	55

Table 5.1 Assumed sound reduction performance for non-glazed elements

5.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 5.2. The performance is specified for the whole window unit, including the frame and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification.

Glazing performance calculations have been based on average measured daytime noise levels. The most robust results of these calculations are shown in Table 5.2.

Elevation	Octave band centre frequency SRI, dB						$R_w(C;C_{tr})$, dB
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
All Elevations	22	20	26	36	39	31	31 (-1;-4)

Table 5.2 Required glazing performance

The nominated glazing supplier should verify that their proposed window system meets the attenuation figures shown at each centre frequency band as shown in Table 5.2.

Example glazing types that would be expected achieve the above spectral values are shown in Table 5.3.

Elevation	Example glazing type
All Elevations	4/12/4

Table 5.3 Example glazing types

All major building elements should be tested in accordance with BS EN ISO 140-3:1995.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an 'actual' configuration.

Based on the results of the environmental noise survey and the minimum required glazing performance as presented above, it can be determined that a typical office façade glazing

system, anticipated to provide a minimum overall performance of approximately 30dB R_w , would be suitable to achieve recommended internal noise levels within the proposed office space.

Therefore, it can be determined that no further upgrades to the existing external building fabric would be required within the maintained office spaces, in order to achieve the recommended internal noise levels, as a result of the existing ambient noise profile of the area.

6.0 VENTILATION

6.1 Ventilation Strategy

Based on the noise levels measured on site, appropriate ventilation systems are outlined in Table 6.1 below in order to ensure the internal noise environment is not compromised.

Ventilation System	Whole Dwelling Ventilation	Extract Ventilation
ADF System 1	Trickle vents providing a minimum performance of 23dB $D_{n,e,w}$	Intermittent extract fans
ADF System 3	Continuous mechanical extract (low rate) and trickle vents for supply providing a minimum performance of 23dB $D_{n,e,w}$	Continuous mechanical extract (high rate) with trickle vents providing inlet air
ADF System 4	Continuous mechanical supply and extract (low rate)	Continuous mechanical supply and extract (high rate)

Table 6.1 Ventilation systems

In the case of mechanical ventilation, systems should be designed to meet the internal noise levels as defined in CIBSE Guide A (2015), as shown in Table 6.2.

Room type	Noise rating (NR)
All meeting rooms	30
Cellular offices	35
Open-plan offices	38
Ancillary spaces	40
Toilets, lift lobbies	40-45

Table 4.1 Acoustic design criteria for building services noise

In all cases, purge ventilation would be provided by openable windows. As outlined in Section 4.3, the internal noise level requirement would not be applicable during purge conditions as this would only occur occasionally.

7.0 EXTERNAL AMENITY AREA ASSESSMENT

The noise sensitive external amenity areas have been identified as the 5th/6th floor external amenity space, located on the front facade of the proposed development, overlooking Manchester Piccadilly.

A distance correction of 3dB has been applied to account for the distance of approximately 1.5m from the worst-case noise source levels occurring on the adjacent roads, as presented in Table 3.2, and the boundary of the site.

Taking all acoustic corrections into consideration, the noise level contribution expected in the external amenity areas would be as shown in Table 7.1.

Receiver	Criterion	Noise Level at Noise Measurement Position
5 th /6 th Floor External Amenity Space	55dB(A)	59dB(A)

Table 7.1 Predicted noise level and criterion at nearest noise sensitive location

As shown in Table 7.1, transmission of noise to the nearest external amenity areas due to the effects of the surrounding noise sources exceed the guidance provided by BS8233:2014 by 4dB.

Although slightly above the recommended level, an exceedance of 4dB can be considered negligible. It is also likely that the level at the receiver positions once finalised will be slightly reduced due to the increased distance from the adjacent noise source in comparison to the noise survey measurement position.

Based on the guidance of BS8233:2014 outlined in section 4.4, and the results presented in table 7.1, the level of noise within the external amenity areas of the proposed development, as a result of the surrounding noise sources, would not be expected to cause any negative noise impact.

8.0 PLANT NOISE IMPACT ASSESSMENT

An environmental noise survey has also been undertaken on site for the purpose of a plant noise assessment. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for all proposed plant units in agreement with the planning requirements of Manchester City Council.

8.1 Local Authority Guidance

In the absence of project specific requirements from Manchester City Council, the following guidance has been implemented:

“Noise emission levels from plant units should be 5dB below representative background noise level, L_{A90} , or 10dB below if tonal components are present in the noise emission spectrum.”

8.2 Plant Noise Emissions Criterion

As the proposed plant units will only be operational during the sites daytime hours of operation, the criterion has been set as shown in Table 8.1 in order to comply with the above requirements.

Time Period	Noise Criterion at Front Facade	Noise Criterion at Rear Facade
Daytime (23:00 to 07:00)	51	46
Daytime (23:00 to 07:00) - If tonal features are present	46	41

Table 8.1 Proposed plant noise emissions criterion

8.3 Plant Noise Discussion

Based on the measured background noise levels on site, the overall noise level as a result of the proposed plant unit should not exceed 51 dB(A) on the front façade and 46 dB(A) on the rear façade, at 1m from the nearest noise sensitive receiver during daytime hours. If tonal features are present in the proposed plant units operational noise emissions, the overall noise level should not exceed 46 dB(A) on the front façade and 41 dB(A) on the rear façade, at 1m from the nearest noise sensitive receiver during night-time hours. To achieve this level, it may be necessary to implement mitigation measures such as acoustic enclosures or barriers.

9.0 CONCLUSION

An environmental noise survey has been undertaken at 7-9 Piccadilly, Manchester M1 1LZ, allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Measured noise levels allowed a robust glazing specification to be proposed which would provide internal noise levels for all commercial and office environments of the development commensurate to the design range of BS8233.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

Additionally, a maximum noise emissions criterion has been set based on the requirements of Manchester City Council for new plant unit installations.

7-9 Piccadilly, Manchester
Environmental Noise Time History
From 07 July 2021 To 08 July 2021

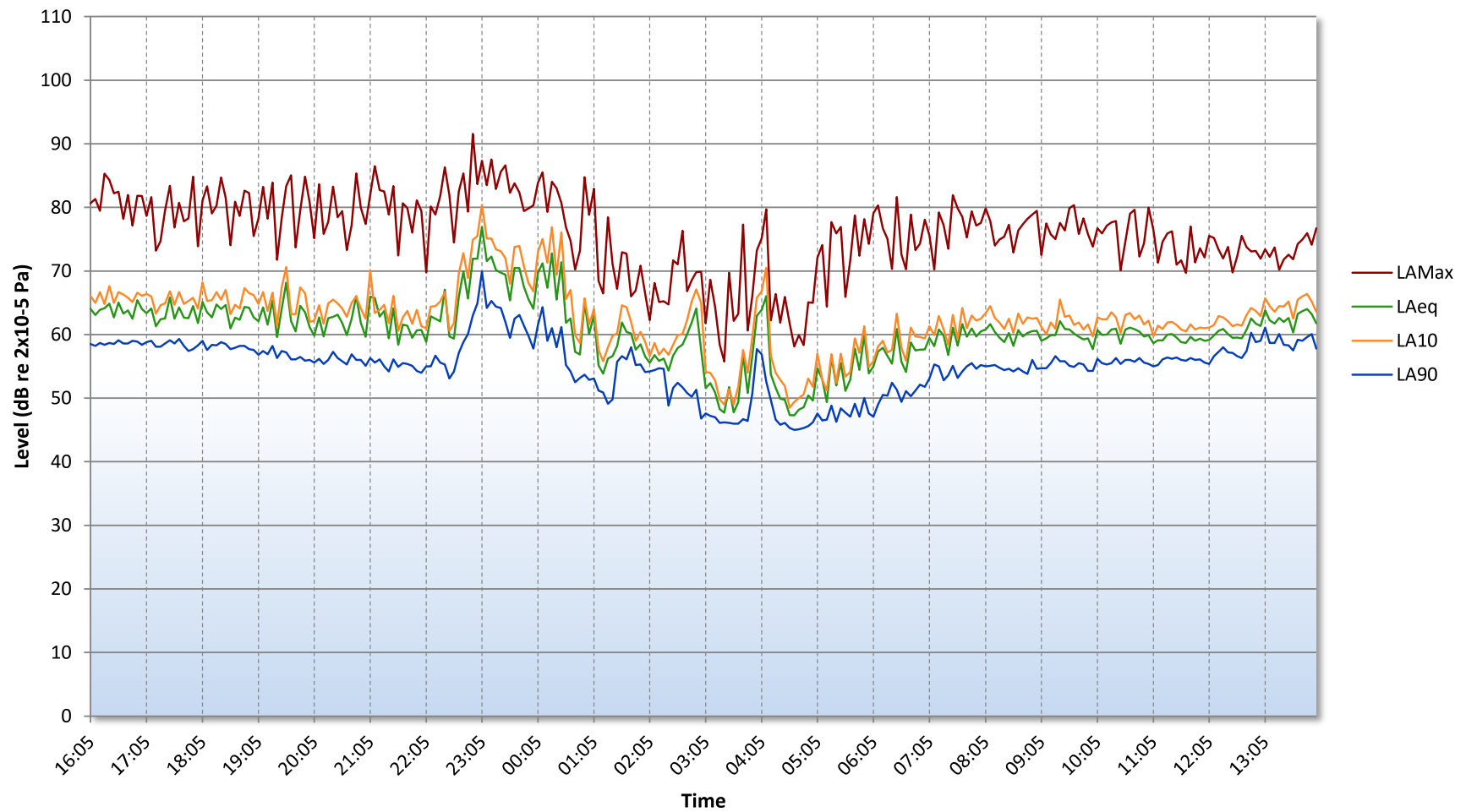


Figure 22911.TH1

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.