



Noise impact assessment

YA314.P1

Prior Notification for change of
use from office (Class A2) to
cafe/restaurant (Class A3)

Unit 1, The Southpoint, 12 Lane End
Road, Manchester, M19 1TU

Manchester, UK

Version 2.0

September 29, 2021

Identification

Title: Noise impact assessment: Prior Notification for change of use from office (Class A2) to cafe/restaurant (Class A3)

YA314.P1

Client: Hamit Arslan

Date: September 29, 2021

Local: Manchester, UK

Version: 2.0

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Revisions

Date	Changes / Comments	Reviser
29/09/2021	Technical drawings updated to include all requirements	LP

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Acronyms

IANLs internal ambient noise levels. [8](#), [17](#)

MCC Manchester City Council. [7](#), [8](#), [9](#), [15](#), [18](#)

NSR noise sensitive receiver. [11](#), [12](#), [14](#), [15](#)

SLM sound level meter. [12](#), [13](#)

Glossary

L_{A90} A-weighted background sound level - A-weighted sound pressure level obtained using time-weighting “F”, that is exceeded for 90% of the time interval considered. [13](#)

$L_{A90,15min}$ A-weighted background sound level - A-weighted sound pressure level obtained using time-weighting “F”, that is exceeded for 90% of the time interval of 15 minutes. [13](#)

L_{Aeq} equivalent A-weighted sound pressure level - value of the A-weighted sound pressure level in decibels (dB) of a steady sound that has the same mean-squared sound pressure as the sound under consideration that varies with time. [12](#), [17](#)

L_{eq} equivalent sound pressure level - value of the sound pressure level in decibels (dB) of a steady sound that has the same mean-squared sound pressure as the sound under consideration that varies with time. [17](#)

$L_{W,A}$ sound power level - ten times the logarithm to the base 10 of the ratio of the sound power radiated by a sound source to the reference sound power, determined by use of frequency-weighting network “A” (see BS EN 61672-1), expressed in decibels (dB). [14](#), [15](#)

R_w weighted sound reduction index - single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. [8](#), [17](#)

Summary

This report has been prepared in support of a planning application for a change of use from Office (Class A2) to cafe/restaurant (Class A3) at Unit 1, The Southpoint, 12 Lane End Road, Manchester, M19 1TU.

In line with the letter issued by the [Manchester City Council \(MCC\)](#) on the 26th of October 2020, Conditions limiting the noise emitted by the proposed extract fan and the noise transmission between the proposed restaurant and the adjacent residential units have been set.

Regarding the proposed extract fan

A site survey was carried out to determine appropriate typical background noise levels at the closest sensitive receiver.

Calculations indicate that without mitigation measures in place, the proposed extract fan rating noise exceeds the limits set out by the [MCC](#). As such, the following strategy shall be put in place:

Requirement 1 - The extract fan motor shall be located within the restaurant dropped ceiling plenum. To avoid noise transmission to the residence above, the fan motor casing must be acoustically treated as indicated in Figure 1.

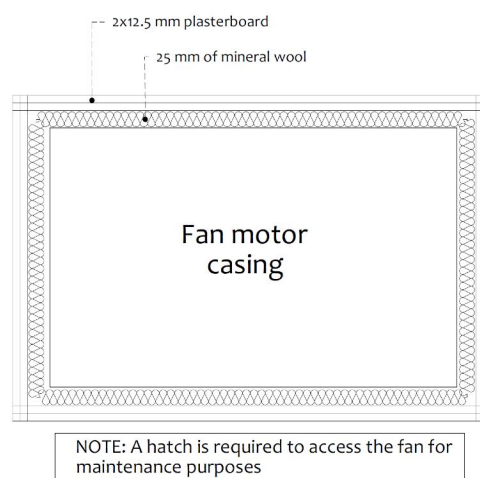


Figure 1 – Extract fan motor acoustic treatment

Requirement 2 - A duct silencer is required to minimize noise emitted by the extract outlet. Its performance shall be as stated in the table below. Typically this translates to a 1200 mm silencer - an example of a suitable system is provided as Annex C.

Table 1 – Duct attenuator required insertion loss

Item	Octave band mid frequency in Hz						
	125	250	500	1k	2k	4k	8k
Duct attenuator (Insertion Loss)	5	10	14	13	13	10	7

Regarding noise transfer to structurally adjoined residential properties

The MCC requires that noise transfer between the proposed restaurant and any structurally adjoined residential properties is kept below set limits. As such, the following strategy shall be put in place:

Requirement 3 - To safeguard appropriate internal ambient noise levels (IANLs) within the vertically adjacent apartment units, the floor between the proposed restaurant and the existing apartment units shall provide minimum airborne sound insulation of 54 dB $R_w + C_{tr}$. A solution compatible with the required performance is presented as Figure 2.

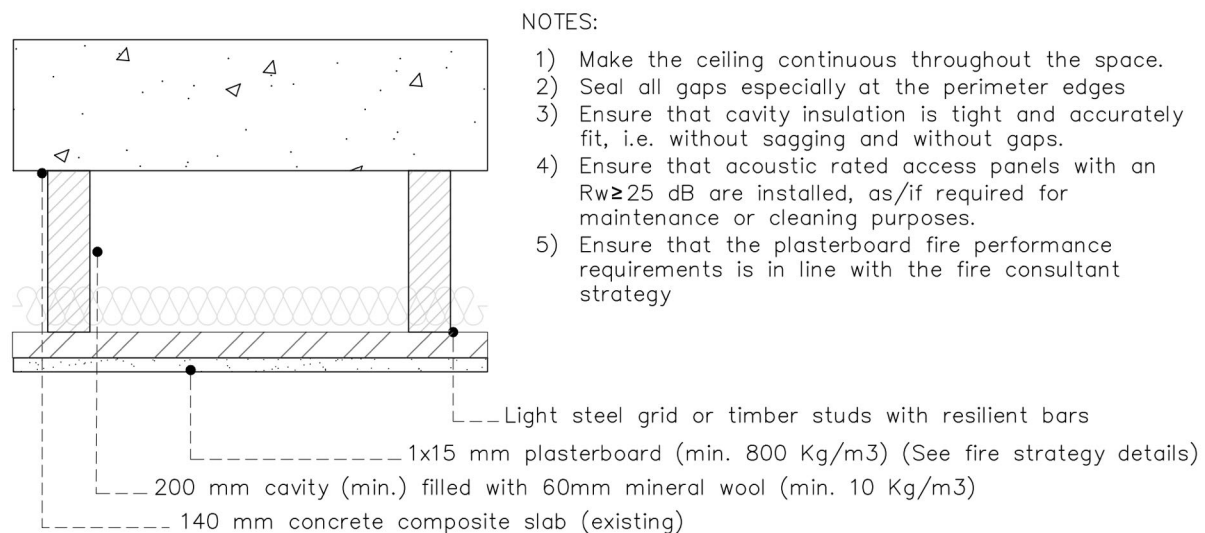


Figure 2 – Proposed floor build-up (between the proposed restaurant and the adjacent apartment units)

1 Introduction

A change of use from Office (Class A2) to cafe/restaurant (Class A3) is proposed at Unit 1, The Southpoint, 12 Lane End Road, Manchester, M19 1TU.

In line with the letter issued by the [MCC](#) on the 26th of October, the following acoustics Conditions have been set:

CONDITION 2: "Prior to the first use of the development hereby approved, details of any externally mounted ancillary plant or equipment shall be selected and/or acoustically insulated in accordance with a scheme designed so as to achieve a rating noise level of 5dB (LAeq) below the existing background (LA90) at the nearest noise sensitive location. Details of the scheme should be submitted to and approved in writing by the City Council as local planning authority, in order to secure a reduction in the level of noise emanating from the site prior to installation of any plant. The approved scheme shall be fully implemented prior to first use and in accordance with the details agreed and a verification report shall be submitted and approved in writing in order to validate the works undertaken conform to the requirements within the report within one month of the building is occupied."

Reason - To safeguard the amenities of existing and future occupiers of nearby residential accommodation, pursuant to saved policies DC10 and DC26 of the Unitary Development Plan for Manchester and policies SP1 and DM1 of the Core Strategy.

CONDITION 3: "The premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority. Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 10dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63HZ and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively. Upon completion of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion

testing to confirm that acceptable criteria has been met. Any instances of nonconformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria."

Reason - To safeguard the amenities of the occupiers of the building and occupiers of nearby properties pursuant to saved Unitary Development Plan policy DC26 and policies SP1 and DM1 of the Core Strategy.

Yacoustics Ltd has been commissioned to discharge the above Conditions in line with the requirements set out.

Figure 3 shows the site location.



Figure 3 – Development location (red line) (source: Apple Maps)

The proposed development will consist of a cafe/restaurant intended to operate Monday to Sunday, including Bank Holidays, from 09.00 am to 23.30 pm.

The **noise sensitive receiver (NSR)** likely to be the most affected by the proposed extract fan is the **3rd Floor** residence above the proposed development.



Figure 4 – Proposed extract fan location

3 Site survey

3.1 Methodology

An environmental noise survey was carried out on the 18th and 19th of September 2021 in line with BS 7445-2 [1], to determine the typical background noise levels at **NSR A**.

The measurements were carried out from 23:00 to 24:00 hrs as this is when the background noise is the quietest for the proposed operation hours.

Since it was not possible to install the meter at **NSR A** facade, in line with Section 8.1.2 of BS 4142 [3] the microphone was placed as indicated in Figure 5 at the height of 1.5 meters above ground level. This location's residual and background sound is comparable to **NSR A** due to its proximity and a similar distance to the primary site noise sources, i.e. traffic noise on Burnage Lane and Lane End Road.

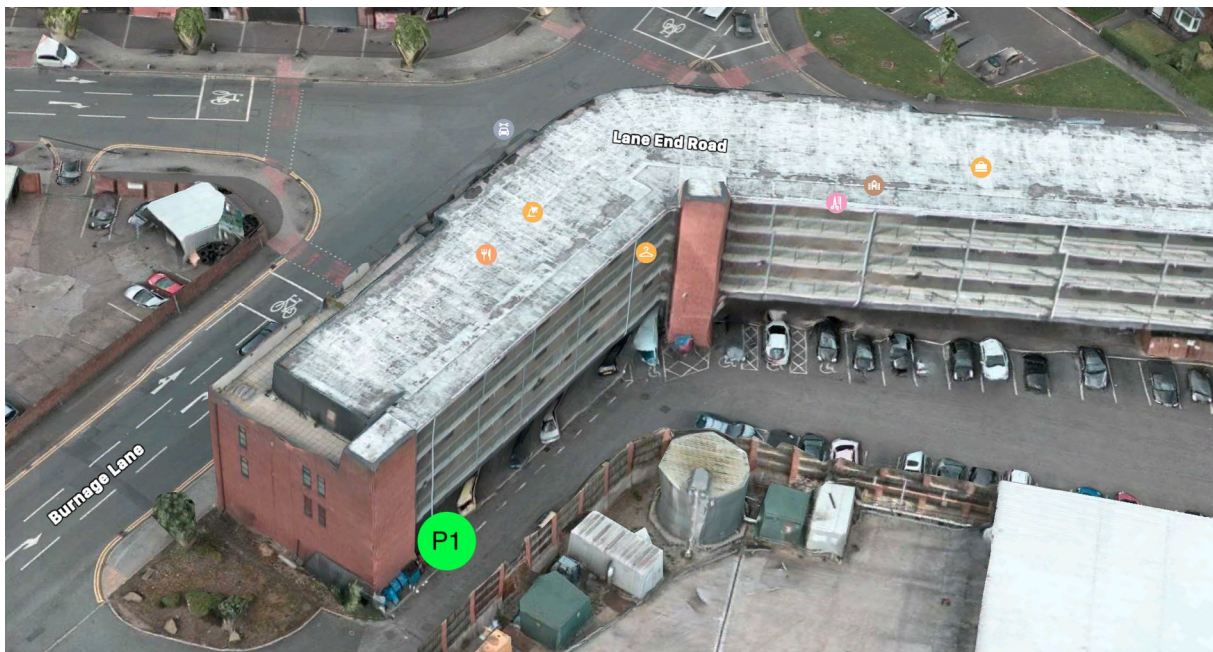


Figure 5 – Measurement position

The **sound level meter (SLM)** was set to measure L_{Aeq} values over 1-second intervals, and a wind-shield was used as a precaution against interference.

The measurements were carried out in the absence of rain or wind speeds higher than 5

m/s.

The **SLM** used meets the technical specifications of BS 7445 [1] and have current calibration certificates traceable to national standards. The equipment was field-calibrated before and after the measurements with no significant drift in sensitivity noted.

Table 2 – Equipment used

Equipment	Model	Serial no.
Sound Level Meter	SV307	82048
Calibrator	(with built-in calibrator)	

3.2 Results

The results of the site survey are outlined in Table 3.

In line with BS 4142 [3], the recorded background noise levels are shown for 15 minutes periods.

The typical L_{A90} value is 43 dB and corresponds to the time period 23:45 to 24:00 hrs.

Table 3 – Site survey results

	Period	Measured $L_{A90,15min}$
18/09/2021	23:00-23:15	45
	23:15-23:30	44
	23:30-23:45	43
	23:45-24:00	43
19/09/2021	23:00-23:15	45
	23:15-23:30	44
	23:30-23:45	43
	23:45-24:00	43

4 Noise from fixed plant

4.1 Methodology

Details of the proposed extract fan were provided by the client and are summarised in Table 4. The fan's technical details are included as Annex B.

Since the fan case will be located inside the restaurant premises, the only noise source that may affect NSR A is the extraction outlet, which will be placed at approximately 6 meters distance.

Table 4 – Acoustic performance of the proposed extract fan

Item	Octave band mid frequency in Hz							Global
	125	250	500	1k	2k	4k	8k	
Intake $L_{W,A}$	69	72	76	75	73	70	59	81
Extract $L_{W,A}$	70	72	82	83	80	72	62	87
Case breakout $L_{W,A}$	66	67	57	55	52	47	40	70

Noise emission calculations have been carried out in line with CIBSE Guide B4 [5], to take into account any losses due to the ductwork configuration, and the principles set out in *Smith et al.* [8] to take into account any losses due to distance, as follows:

$$L_w = L_p + 20\log(r) + 11 \quad (4.1)$$

where:

L_w is the sound power level of the relevant source, in decibels;

L_p is the sound pressure level at the relevant receiver, in decibels;

r is the overall distance between source and receiver, in decibels.

4.2 Results

The predicted noise emissions at **NSR A** are presented as Table 5. The proposed fan extraction outlet requires additional mitigation to comply with the limits set out by the **MCC**.

The most practical way to provide the required attenuation is to install a duct silencer to the extract side of the fan, with the minimum insertion loss provided in Table 6. An example of a suitable system is included in Annex C.

With the proposed duct silencer in place, the predicted noise emissions at **NSR A** are in line with the criteria set out by the **MCC** - see Table 7.

Table 5 – Calculation of noise emissions at **NSR A**

Item	Octave band mid frequency in Hz							Global
	125	250	500	1k	2k	4k	8k	
Extract $L_{W,A}$	70	72	82	83	80	72	62	87
Loss due to Duct length (> 12 m)	-2	-2	-2	-3	-3	-3	-3	-
Loss due to 710 mm duct elbow (6x)	-6	-12	-18	-18	-18	-18	-18	-
Loss due to distance loss (6 meters)	-16	-16	-16	-16	-16	-16	-16	-
SWL to SPL	-11	-11	-11	-11	-11	-11	-11	-
Noise at NSR A	35	31	35	35	32	24	14	41

Table 6 – Duct silencer - required insertion loss

Item	Octave band mid frequency in Hz						
	125	250	500	1k	2k	4k	8k
Duct attenuator (Insertion Loss)	5	10	14	13	13	10	7

Table 7 – Calculation of noise emissions at **NSR A** (with duct silencer in place)

Item	Octave band mid frequency in Hz							Global
	125	250	500	1k	2k	4k	8k	
Noise at NSR A	35	31	35	35	32	24	14	41
Duct attenuator (Insertion Loss)	5	10	14	13	13	10	7	-
Noise at NSR A	30	21	21	22	19	14	7	32

5 Noise transfer to structurally adjoined residential properties

5.1 Methodology

The methodology adopted to determine the airborne sound transmission between the proposed restaurant and the vertically adjacent apartment units is in line with the literature *Acoustics and Noise Control* [8].

The method is described as follows:

1. Determination of L_2 in line with the following equation:

$$R = L_1 - L_2 + 10 \log \frac{S_s}{A} \quad (5.1)$$

where

- a) R is the sound reduction index of the excited element (floor);
- b) L_1 is the average sound pressure level in the source room, in decibels;
- c) L_2 is the average sound pressure level in the receiving room, in decibels;
- d) A is the equivalent sound absorption area in the receiving room, in square metres; and
- e) S_s is the area of the separating element, in square metres.

The relevant areas and volumes have been taken from the architectural drawings provided.

It is understood that entertainment noise is not a concern as the premises will be used as a cafe/restaurant only, and as such, it is considered that the average sound pressure level in the source room is as indicated in Table 8.

After visiting the site, it was noticed that the 1st Floor slab consists of a composite concrete deck. According to the information provided by the client, the concrete floor has a minimum thickness of 140 mm.

In line with BS 8233 [4], the reverberation time of the receiving rooms is considered to be 0.5 seconds.

Table 8 – Typical spectral L_{eq} for a busy restaurant (source: The little Red Book of Acoustics 2012 [7])

Space	Octave band (Hz) L_{eq} (dB)							Global dB(A)
	63	125	250	500	1k	2k	4k	
Busy restaurant	60	70	75	75	75	75	70	80

5.2 Results

To safeguard appropriate $IANLs$ at the vertically adjacent apartment units, the floor between the proposed restaurant and the existing apartment units is required to provide minimum airborne sound insulation of 54 dB $R_w + C_{tr}$.

A solution compatible with the required performance is presented as Figure 6. It is expected that with this solution in place, the $IANLs$ will remain below 25 dB L_{Aeq} and therefore no impacts are expected.

Calculation details are included in Annex D.

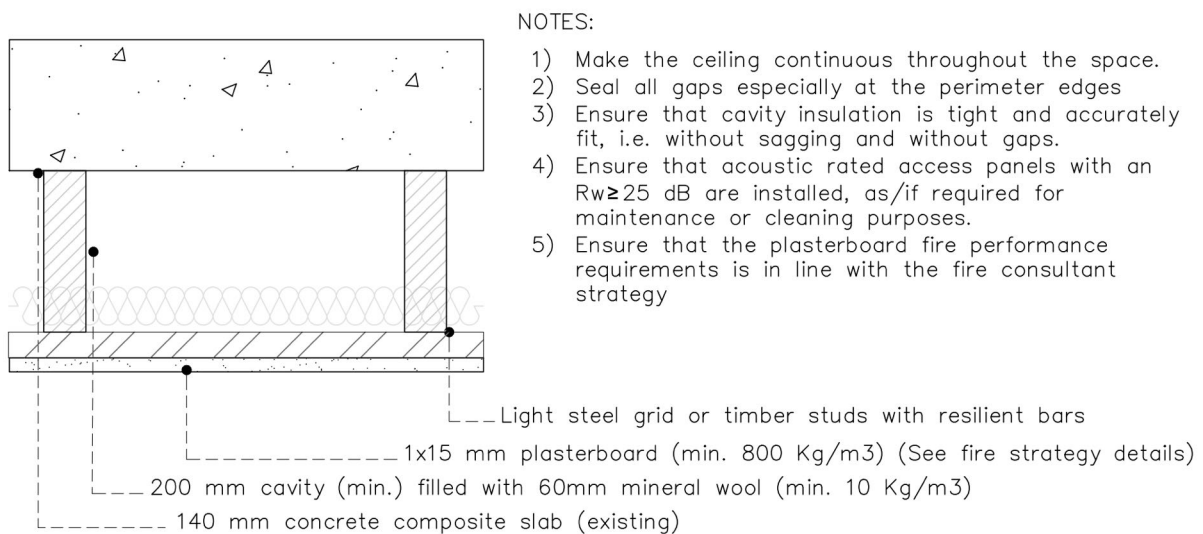


Figure 6 – Proposed floor build-up (between the proposed restaurant and the adjacent apartment units)

Final considerations

This report has been prepared in support of a planning application for a change of use from Office (Class A2) to cafe/restaurant (Class A3) at Unit 1, The Southpoint, 12 Lane End Road, Manchester, M19 1TU.

In line with the letter issued by the MCC on the 26th of October 2020, Conditions limiting the noise emitted by the proposed extract fan and the noise transmission between the proposed restaurant and the adjacent residential units have been set.

A site survey was carried out, and appropriate mitigation solutions have been provided accordingly.

Based on the implementation of the recommendations provided in this report, the proposed change of use is considered to be suitable in line with the planning Conditions set out by the MCC.

Bibliography

- [1] BS 7445-2:1991, Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use. Standard, BSI, 1991. Cited 2 on pages [12](#) and [13](#).
- [2] Noise Policy Statement for England (NPSE). Technical document, Department For Environmental, Food And Rural Affairs, 2010. Cited in page [22](#).
- [3] BS 4142:2014, Methods for rating and assessing industrial and commercial sound. Standard, BSI, 2014. Cited 2 on pages [12](#) and [13](#).
- [4] BS 8233:2014, Guidance on sound insulation and noise reduction for buildings. Standard, 2014. Cited in page [16](#).
- [5] CIBSE Guide B4: 2016 Noise and vibration control for building services systems. Technical document, CIBSE, 2016. Cited in page [14](#).
- [6] National Planning Policy Framework. Technical document, Ministry of Housing, communities and local government, 2018. Cited in page [21](#).
- [7] R. Watson & Owen Downey. *The Little Red Book of Acoustics*. Blue Tree Acoustics, 2012. Cited in page [17](#).
- [8] B.J Smith & Margaret Hollins R.J. Peters. *Acoustics and Noise Control*. Routledge, 2013. Cited 2 on pages [14](#) and [16](#).

Annexes

ANNEX A – National Planning Policy

A.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework [6] sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

In regards to noise, Paragraphs 170, 180, 204 and 205 state the following:

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

204. Planning policies should:

- g) when developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction.

205. When determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy. In considering proposals for mineral extraction, minerals planning authorities should:

- c) ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties.

A.2 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England [2] long term vision is to *"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development"*.

The NPSE states the three following policy aims:

First Aim:

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;

Second Aim:

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;

Third Aim:

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The NPSE uses two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. These are extended to the concept of a significant observed adverse effect level as follows:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

The third aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

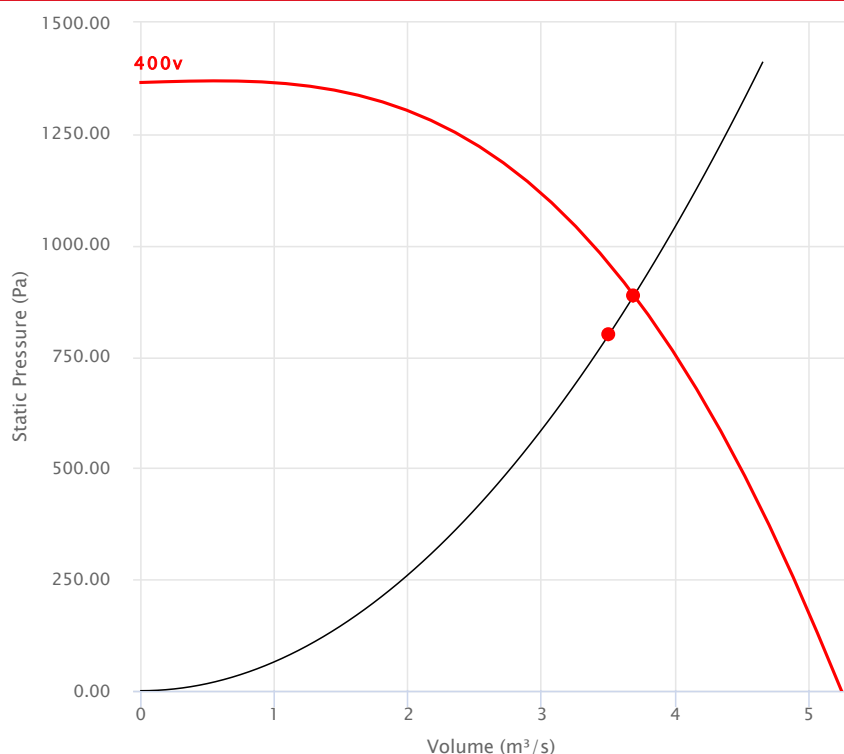
ANNEX B – Extract fan performance details

GBD 710/4 (CENT) GigaBox centrifugal box fan



Acoustic ventilation box with intake and extract spigots, with flexible connectors to reduce vibration transmission and variable applicable side panels to suit to structural conditions. Simple positioning by standard crane hooks. self-supporting frame construction made from hollow aluminium profiles. Lined with 20 mm thick double-walled side panels made from galvanised sheet steel, sound and thermally insulated with flame-retardant mineral wool. Free-running backward curved centrifugal impeller from aluminium, direct driven. Energy efficient with low noise development. Dynamically balanced with the motor to DIN ISO 1940 Pt.1 - class 6.3 Totally enclosed, maintenance-free 3-phase external rotor motor, to be operated via delta-star connection for 2 speed steps, Speed controllable by voltage reduction or with Helios frequency inverter and sinus filter on all poles, thermal contact wired to the terminal box. Low-noise, long-lasting greased, sealed for life ball bearings. Mains supply via terminal box which is fitted externally on the motor as standard (IP 54).

Performance Chart



Product

Ref.No.	5529
Model Code	GBD 710/4 (CENT)
Fan Size	710 mm
Maximum airflow temp.	50 °C
Weight	170.0 kg

Performance

Requested Duty	3.50 m³/s @ 800 Pa (Stat)
Actual Duty	3.69 m³/s @ 887 Pa (Stat)
Fan Nominal Speed	1465 rpm
Specific Fan Power	0.53 W/l/s
Output Power	5.97 kW

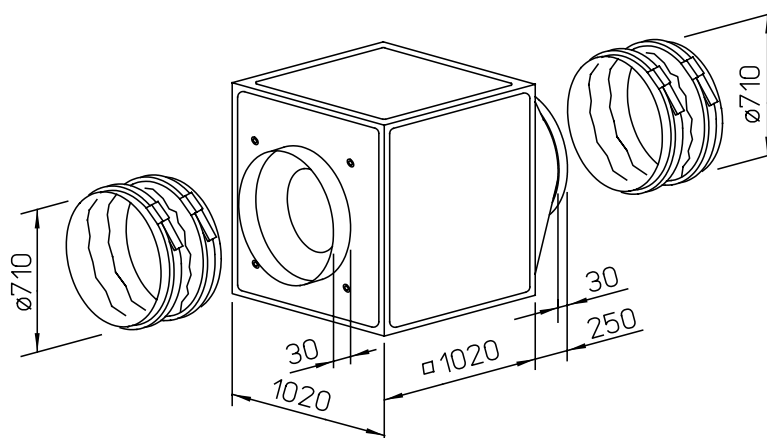
Motor

Rating	5.97 kW
Poles	4
Motor Input Power	2.11 kWh
Electrical Supply	400v/3Ph/50Hz
Full Load Current	10.2 A

Sound

Sound Pressure Level		49 dB(A) at 3m							
Spectrum	Hz	Total	125	250	500	1k	2k	4k	8k
LwA Intake	dB(A)	81	69	72	76	75	73	70	59
LwA Extract	dB(A)	87	70	72	82	83	80	72	62
LwA Breakout	dB(A)	70	66	67	57	55	52	47	40

Dimension and Drawing



*This drawing shows dimensions that should be used as a guide only and are subject to change. Certified drawings are available on request.

ANNEX C – Example of a suitable in-duct silencer

■ Design – Installation

Casing made of galvanised steel sheet. Lining with high-quality mineral wool, which is equipped with a fleece on the flow side for protection against abrasion. The dimensions and fixing holes of all sizes are based on the standard fan diameter (R 20). The fixing holes correspond to DIN 24155, p. 2.

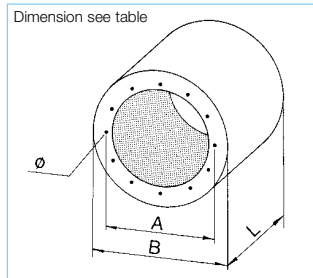
■ Insertion loss

Multiple silencers with the same diameter can be arranged one behind the other for larger insertion losses.

■ Pressure losses

The flow resistances of the RSD silencer are very low. Twice the friction resistance is taken into account for the system calculation.

Dimension see table



RSD



Reference	Page
Selection noise calculation	468

Type	Ref. no.	Basic length	Dimensions in mm			Hole Ø	Weight approx. kg	Insertion loss D _e dB								Average loss
Nominal Ø			L	A	B			125	250	500	1000	2000	4000	8000		
RSD 225/ 300	08734	1	300	259	404	6 x M 6	7	2	5	9	14	13	8	6	8	
RSD 225/ 600	08735	2	600	259	404	6 x M 6	12	4	10	17	27	25	17	14	15	
RSD 225/ 900	08736	3	900	259	404	6 x M 6	17	7	13	25	33	31	20	16	20	
RSD 250/ 300	08737	1	300	286	404	6 x M 6	7	3	5	8	8	9	7	5	8	
RSD 250/ 600	08738	2	600	286	404	6 x M 6	12	5	10	16	24	19	14	10	15	
RSD 250/ 900	08739	3	900	286	404	6 x M 6	16	6	12	22	28	21	15	11	18	
RSD 280/ 400	08740	1	400	322	454	8 x M 8	10	4	5	8	14	9	8	6	8	
RSD 280/ 800	08741	2	800	322	454	8 x M 8	18	7	9	16	28	18	17	14	14	
RSD 280/1200	08742	3	1200	322	454	8 x M 8	25	9	12	23	37	23	20	16	18	
RSD 315/ 400	08743	1	400	356	504	8 x M 8	11	3	3	7	13	8	7	5	5	
RSD 315/ 800	08744	2	800	356	504	8 x M 8	19	6	8	14	26	16	12	9	12	
RSD 315/1200	08745	3	1200	356	504	8 x M 8	28	9	12	21	36	18	17	14	18	
RSD 355/ 400	08746	1	400	395	564	8 x M 8	13	3	4	7	11	7	6	4	6	
RSD 355/ 800	08747	2	800	395	564	8 x M 8	23	6	7	13	22	14	12	8	11	
RSD 355/1200	08748	3	1200	395	564	8 x M 8	33	8	11	17	29	18	15	10	17	
RSD 400/ 400	08749	1	400	438	564	12 x M 8	12	3	4	6	9	7	5	3	6	
RSD 400/ 800	08750	2	800	438	564	12 x M 8	21	6	6	12	18	13	12	8	9	
RSD 400/1200	08751	3	1200	438	564	12 x M 8	30	7	10	14	22	18	13	9	15	
RSD 450/ 400	08752	1	400	487	634	12 x M 8	17	4	5	8	10	8	7	5	8	
RSD 450/ 800	08753	2	800	487	634	12 x M 8	27	6	7	13	18	13	12	9	11	
RSD 450/1200	08754	3	1200	487	634	12 x M 8	38	8	10	18	23	17	14	10	15	
RSD 500/ 600	08755	1	600	541	714	12 x M 8	27	4	5	9	11	9	9	6	8	
RSD 500/ 900	08756	2	900	541	714	12 x M 8	36	6	8	14	16	13	13	9	12	
RSD 500/1200	08757	3	1200	541	714	12 x M 8	45	8	11	22	24	17	16	12	17	
RSD 560/ 600	08758	1	600	605	804	8 x M 10	32	3	5	9	9	8	8	6	8	
RSD 560/1200	08759	2	1200	605	804	8 x M 10	52	6	10	19	19	16	13	10	15	
RSD 630/ 600	08760	1	600	674	900	8 x M 10	44	3	5	8	8	8	7	5	8	
RSD 630/1200	08761	2	1200	674	900	8 x M 10	68	5	10	16	15	15	11	8	15	
RSD 710/ 600	08762	1	600	751	1000	8 x M 10	51	3	5	7	7	7	6	4	8	
RSD 710/1200	08763	2	1200	751	1000	8 x M 10	80	5	10	14	13	13	10	7	15	
RSD 800/ 600	08764	1	600	837	1100	12 x M 10	57	2	5	7	6	6	5	4	8	
RSD 800/1200	08765	2	1200	837	1100	12 x M 10	88	5	9	13	11	11	9	6	14	
RSD 900/ 900	08766	1	900	934	1220	12 x M 10	82	2	4	10	9	6	5	4	6	
RSD 900/1800	08767	2	1800	934	1220	12 x M 10	135	4	9	21	17	13	9	8	14	
RSD 1000/ 900	08768	1	900	1043	1350	12 x M 10	96	2	4	8	7	5	4	3	6	
RSD 1000/1800	08769	2	1800	1043	1350	12 x M 10	157	4	7	16	14	10	7	6	11	
RSD 1120/ 900	08770	1	900	1174	1350	12 x M 10	81	2	3	7	6	4	3	3	5	
RSD 1120/1800	08771	2	1800	1174	1350	12 x M 10	136	3	6	14	11	8	6	5	9	
RSD 1250/ 900	08772	1	900	1311	1460	12 x M 10	86	1	2	5	4	3	2	2	3	
RSD 1250/1800	08773	2	1800	1311	1460	12 x M 10	146	2	4	11	9	7	5	4	6	

ANNEX D – Noise transfer - calculation details

Insulation - existing floor

S - area of partition in m ² V - volume of the receiving room NR - dB - dB (A) -					20				TR	A		
					48							
					25	63	0.5	15				
					55	125	0.5	15				
					35	250	0.5	15				
						500	0.5	15				
						1000	0.5	15				
						2000	0.5	15				
	4000	0.5	15									
Fz (Hz)	SPL ₁	SPL ₂	10*log ₁₀ (S)	10*log ₁₀ (A)	R'	140 mm concrete (profile deck)	R' _(adopted solution)	SPL ₂	SPL ₂ dB(A)			
63	60	55	13	12	6	40	38	23	-3			
125	70	44	13	12	27	43	41	30	14			
250	75	35	13	12	41	36	34	42	34			
500	75	29	13	12	47	41	39	37	34			
1000	75	25	13	12	51	49	47	29	29			
2000	75	22	13	12	54	61	59	17	18			
4000	70	20	13	12	51	66	64	7	8			
Total	82	55							44	38		

Insulation - proposed floor

S - area of partition in m ² V - volume of the receiving room NR - dB - dB (A) -					20	63 125 250 500 1000 2000 4000			TR	A	0.5 15 0.5 15 0.5 15 0.5 15 0.5 15						
					48												
					25												
					55												
					35												
Fz (Hz)	SPL ₁	SPL ₂	10*log ₁₀ (S)	10*log ₁₀ (A)	R'	140 mm concrete (profile deck)	R' (adopted solution)	SPL ₂	SPL ₂ dB(A)								
63	60	55	13	12	6	41	39	22	-4								
125	70	44	13	12	27	55	53	18	2								
250	75	35	13	12	41	51	49	27	19								
500	75	29	13	12	47	57	55	21	18								
1000	75	25	13	12	51	64	62	14	14								
2000	75	22	13	12	54	68	66	10	11								
4000	70	20	13	12	51	91	89	-18	-17								
Total											82	55				30	22

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