

**Proposed Installation of
Mechanical Plant**

**27 Graham Terrace,
London, SW1W 8JE.**

Environmental Noise Assessment



Author: Andy Dodd B.Sc. (Hons) MIOA
Senior Consultant

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Proposed Installation of Mechanical Plant	
Project Address:	27 Graham Terrace London SW1W 8JE
Project Reference:	104104

Issue/Revision Record			
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Author:		Andy Dodd	Senior Consultant	11/02/2021
Reviewer:		Phil Huffer	Principal Consultant	11/02/2021

1. INTRODUCTION

- 1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers. APL is engaged by both private and public sector clients.
- 1.2 APL is a registered member of The Association of Noise Consultants (ANC) and the author is a corporate member of The Institute of Acoustics (IOA).
- 1.3 APL has been instructed care of the applicant's, agent Residence One, to consider and advise upon the noise implications of the proposed installation of a comfort cooling system.
- 1.4 The comfort cooling system will consist of 1No. condenser unit that will be located on a rear wall located at ground floor level at the site.
- 1.5 It is proposed to house the unit within an enclosure and ventilate it via acoustic louvres.
- 1.6 It is understood the Local Planning Authority (LPA) require further information on noise levels from the proposed installation in order to fully assess the noise impact upon the surrounding neighbourhood.
- 1.7 This report provides the response to the LPA, on behalf of the Applicant.
- 1.8 This report has been prepared by Acoustics Plus Limited (APL) with all reasonable skill, care, and diligence in accordance with generally accepted acoustic consultancy principles and taking account the services and terms agreed between APL and our client.
- 1.9 Any information provided by third-parties and referred to herein may not have been checked or verified by APL unless expressly stated otherwise. Certain statements made in the report are predictions based on reasonable assumptions and good industry practice.
- 1.10 Such statements involve risk and uncertainty which could cause measured and predicted results to differ materially. APL does therefore not guarantee or warrant any prediction contained in this report.

2. BASELINE SITUATION

- 2.1 The Application Site (the “site”) is situated at 27 Graham Terrace, London, SW1W 8JE.
- 2.2 The ground floor plan is shown in Diagram 1 below:

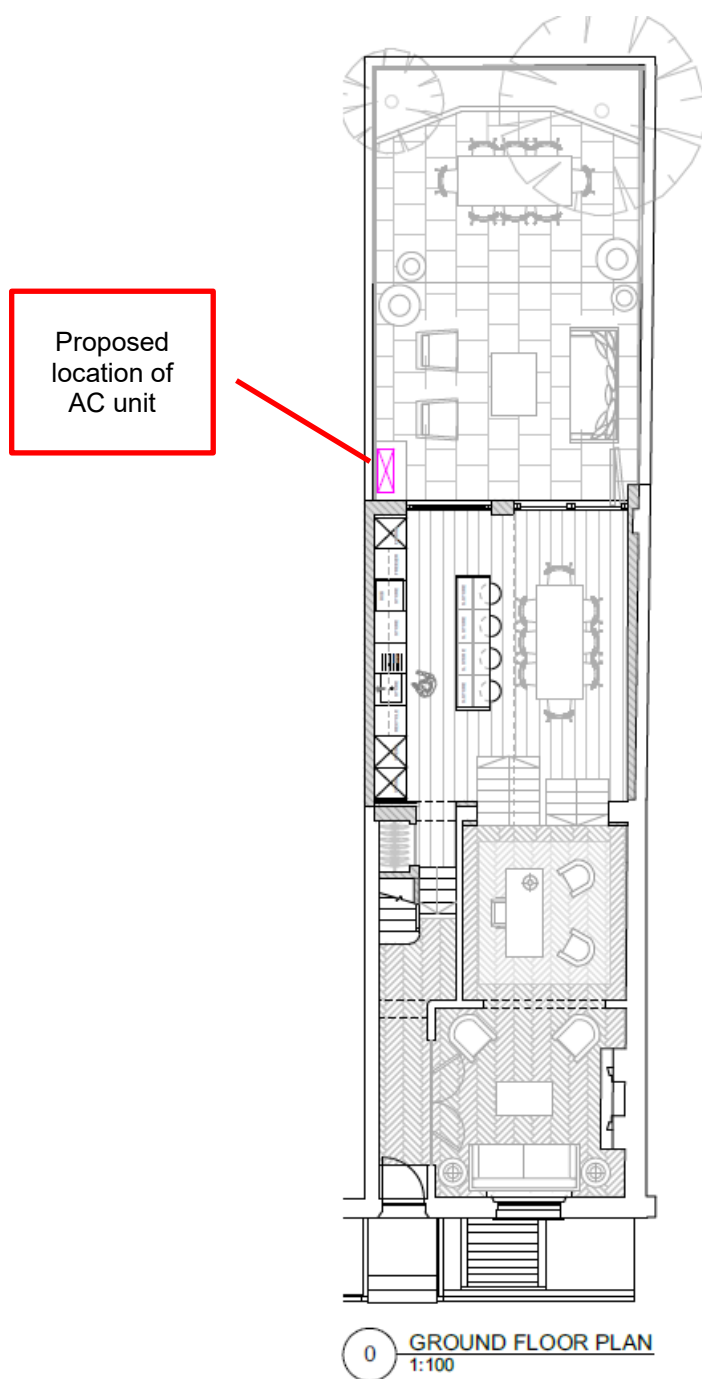


Diagram 1

2.3 The proposed condenser unit to be installed is detailed below, a copy of the data sheet is contained within Appendix A of this report:

(a) *1no. Daikin Altherma ERLQ008CA - 49dBA heating / 50dBA cooling @1m.*

2.4 The nearest noise sensitive windows considered within this assessment are considered to be the ground and upper floor rear façade windows of the residential dwelling neighbouring the site, the minimum distance has been judged to be 2.5m away, this distance has been obtained from drawings and observations made during visiting the site.

2.5 The location of the nearest affected noise sensitive façade is highlighted in diagrams 2 & 3 and Figure 1 below:

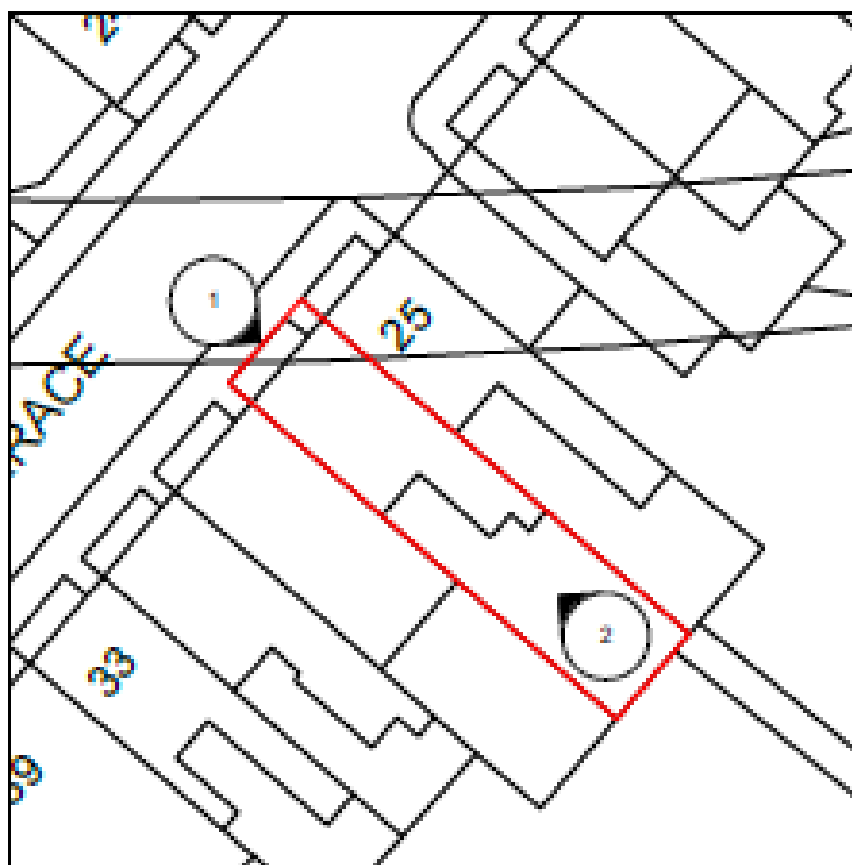
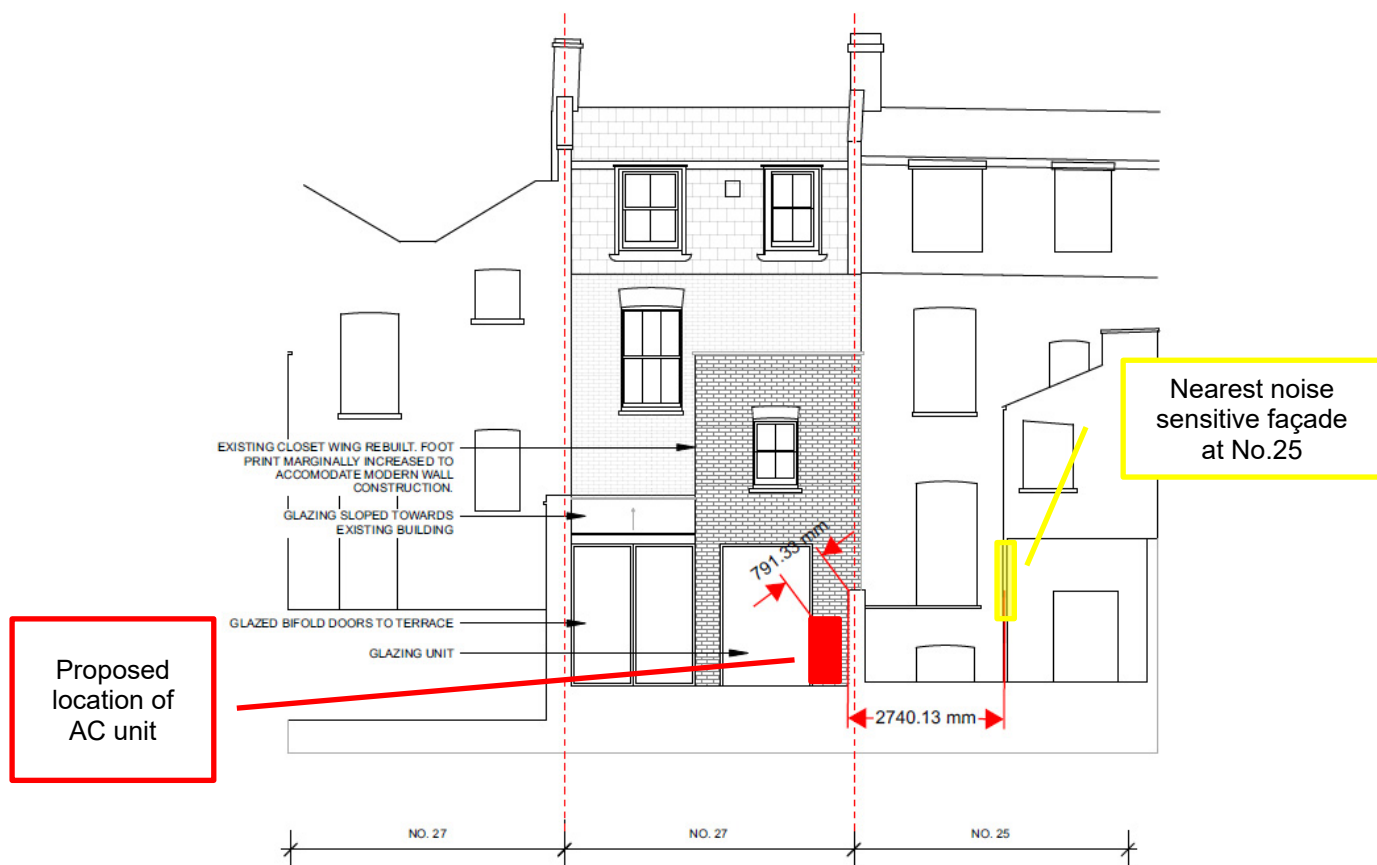


Diagram 2



2 PROPOSED REAR ELEVATION
1:100

Diagram 3



Proposed
location of
AC unit

Nearest
noise
sensitive
façade at
No.25

Figure 1

3. NOISE OUTLINE

- 3.1 In order to produce an environmental noise assessment, consideration must be given to the prevailing background noise in the locality of the installation.
- 3.2 Measurements of background noise were obtained over a 24 hour period at a location deemed representative of background noise levels experienced at the nearest noise sensitive façade. The measurements collected during the exercise were obtained within the rear garden of 27 Graham Terrace, in line with the nearest affected noise sensitive façade.
- 3.3 The particulars of the measurement exercise are recorded below. The weather conditions were considered appropriate to monitor environmental noise.

Date: 21st to 22nd January 2021
Start Time: 12:14 hrs
Location: Rear garden of 27 Graham Terrace.

3.4 Minimum background and average noise levels are shown in Table 1 below with the full 24 hour time history shown in Diagram 4 (L_{Aeq} and L_{A90}).

WHO period	Lowest L _{A90,15min}	Average L _{Aeq,T}	Maximum L _{Aeq,T}
07:00-19:00hrs	35	48	58
19:00-23:00hrs	32	43	50
23:00-07:00hrs	31	38	43

Table 1

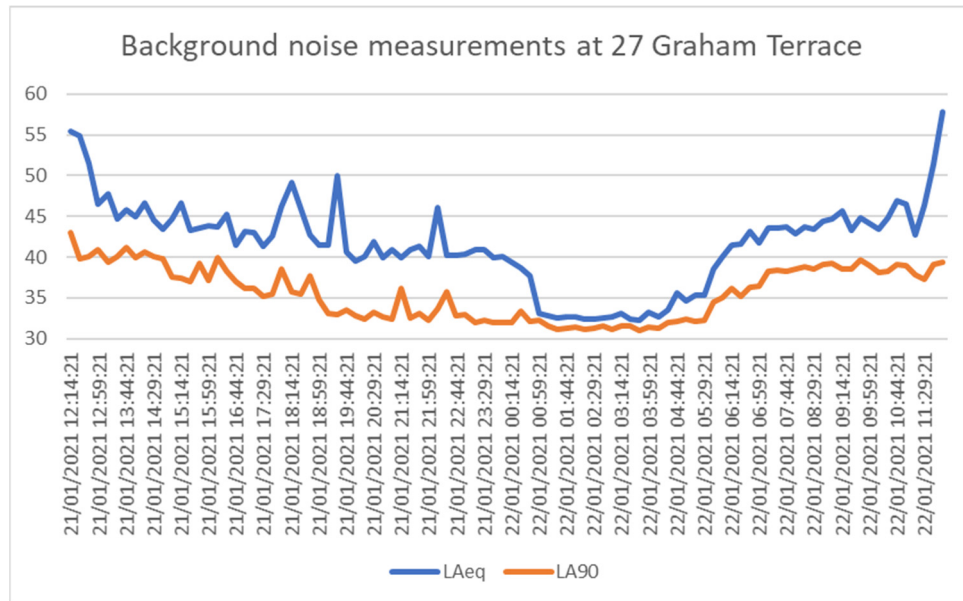


Diagram 4

4. DESIGN CRITERIA

- 4.1 Information regarding the noise levels not to be exceeded by the installation was provided by the LPA (London Borough of Westminster). The following condition applies [Policy ENV7 (A)(1)(a) and (b) & (A)(2)(a) and (b)]:

POLICY ENV 7: CONTROLLING NOISE FROM PLANT, MACHINERY AND INTERNAL ACTIVITY

(A) Where development is proposed, the City Council will require the applicant to demonstrate that this will be designed and operated so that any noise emitted by plant and machinery and from internal activities, including noise from amplified or unamplified music and human voices, will achieve the following standards in relation to the existing external noise level at the nearest noise sensitive properties, at the quietest time during which the plant operates or when there is internal activity at the development.

1) where the existing external noise level exceeds WHO Guideline levels of $L_{Aeq,12hrs}$ 55dB daytime (07.00- 19.00); $L_{Aeq,4hrs}$ 50dB evening (19.00-23.00); $L_{Aeq,8hrs}$ 45dB night-time (23.00- 07.00):

Either

(a) and where noise from the proposed development will not contain tones or be intermittent sufficient to attract attention, the maximum emission level ($L_{Aeq15min}$) should not exceed 10 dB below the minimum external background noise at the nearest noise sensitive properties. The background noise level should be expressed in terms of $L_{A90,15min}$.

Or

(b) and where noise emitted from the proposed development will contain tones, or will be intermittent sufficient to attract attention, the maximum emission level ($L_{Aeq15min}$) should not exceed 15 dB below the minimum external background noise at the nearest noise sensitive properties. The background noise level should be expressed in terms of $L_{A90,15min}$.

2) where the external background noise level does not exceed the above WHO Guideline levels, policy ENV 7(A)(1)(a) and (b) will apply except where the applicant is able to demonstrate to the City Council that the application of slightly reduced criteria of no more than 5 dB will provide sufficient protection to noise sensitive properties:

Either

(a) where noise emitted from the proposed development will not contain tones or be intermittent sufficient to attract attention, the maximum emission level ($L_{Aeq15min}$) should not exceed 5dB below the minimum external background noise level at the nearest noise sensitive properties. The background noise levels should be expressed in terms of $L_{A90,15min}$.

Or

(b) where noise emitted from the proposed development will contain tones or will be intermittent sufficient to attract attention, the maximum emission level ($L_{Aeq,15min}$) should not exceed 10 dB below the minimum external background noise level at the nearest noise sensitive properties. The background noise levels should be expressed in terms of $L_{A90,15min}$.

- 4.2 The octave band sound levels of the proposed plant do not indicate any tonal component. Therefore, it is considered that no corrections are necessary for tonality or impulsivity (the unit, when operated will generally run continuously).
- 4.3 The plant noise emission criteria that should be considered is therefore based on saved Policy ENV7 2(a).
- 4.4 The considered background noise level for use in this assessment is L_{A90} 31dB with a design level target of -5dB below the background noise level. The target design level is therefore L_{Aeq} 26dB.

5. CALCULATIONS

- 5.1 In order to predict the noise impact of the climate control system, consideration has been given to noise egress from the housed condenser unit to the nearest noise sensitive façade.
- 5.2 In considering the propagation of noise from the enclosure, consideration was given to point source propagation.
- 5.3 The area behind and below the proposed unit will be lined with a product such as Quietstone light to reduce and control reverberant sound.
- 5.4 A further correction to account for building edge diffraction as follows was assumed. This was extracted from the Department of Energy and Climate Change Planning Standard MCS020. The planning standard MCS020 states the following (Note 5):

*“Note 5: Barriers between the heat pump and the assessment position (STEP 5)
A correction should be made for attenuation due to barriers between the air source heat pump and an assessment position. A correction will be necessary if an installer is unable to see an assessment position from the top edge of the air source heat pump. Use the following instructions to determine whether a correction is appropriate:*

- *For a solid barrier (e.g. a brick wall or a fence) that completely obscures an installer’s vision of an assessment position from the top edge of the air source heat pump attenuation of -10 dB may be assumed.*
- *Where a solid barrier completely obscures an installer’s vision of an assessment position from the top or side edges of the air source heat pump, but moving a maximum distance of 25 cm in any direction to the air source heat pump allows an assessment position to be seen, attenuation of -5 dB may be assumed.*
- *If it is possible for an installer to see any part of an assessment position from the top or side edges of the air source heat pump no attenuation may be assumed. “*

- 5.5 A prediction exercise was undertaken. The calculation exercise utilised information provided by Caice. As it is proposed to locate the condenser within an acoustic enclosure, consideration has been given to the insertion loss performance figures for a Caice SH300 louvre. The performance figures for this element are detailed below, a copy of the data sheet is contained within Appendix B of this report:

Acoustic louvre	SRI Octave Band Centre Frequency (Hz)								R _w
	63	125	250	500	1k	2k	4k	8k	
Caice SH300	7	7	10	17	29	30	27	21	17

Table 2

- 5.6 In order to predict the noise impact of the climate control system, consideration has been given to noise egress from the unit to the noise sensitive façade located next door at 25 Graham Terrace.
- 5.7 In considering the propagation of noise from the condenser located within the enclosure, consideration was given to the following formulas:

$$L_p = L_w + 10\log_{10}T - 10\log_{10}V + 14$$

Where L_p is the reverberant sound pressure level in the enclosure
 L_w is the sound power level of the condenser unit
 T is the vault reverberation time, s
 V is the vault volume, m³

$$L_{p_2} = L_{p_1} - R - 6$$

Where L_{p_2} is the sound pressure level close to the vault on the outside
 L_{p_1} is the reverberant sound pressure level in the enclosure
 R is the sound reduction index of the acoustic louvre.

- 5.8 It has been assumed that the enclosure will have the following dimensions 1m (h) x 1.5m (w) and 1m (d) and the reverberation time will be 0.1s due to the inclusion of Quietstone or similar product located behind and below the unit to control and reduce reflected sound. A copy of the data sheets is included within Appendix B of this report.
- 5.9 In considering the propagation of noise from the condenser, consideration was given to point source propagation and attenuation provided by the acoustic enclosure.
- 5.10 The worst case noise levels during the cooling operation have been considered within the calculation exercise.

5.11 Noise leaving the condenser unit was propagated over 2.5m to the nearest noise sensitive façade.

Climate control unit	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
ERLQ008CA (cooling) SPL	48	55	49	46	47	40	37	34	50
ERLQ008CA (cooling) L _w	59	66	60	57	58	51	48	45	61
Reverberant L _p in enclosure	61	68	62	59	60	53	50	47	64
Acoustic louvre SH300	7	7	10	17	29	30	27	21	
Level outside of enclosure	48	55	46	36	25	17	17	20	42
Distance attenuation (2.5m)	-8	-8	-8	-8	-8	-8	-8	-8	
Reflecting plane (x0)	0	0	0	0	0	0	0	0	
Façade level	30	37	28	18	7	0	0	2	24

Table 3

5.12 In order to comply with the requirements of the LPA, any noise from the proposed installation of mechanical plant should not exceed a level of 26 dBA (-5dB below the considered background noise over the operational hours of the plant) at 1m from the nearest noise sensitive façade.

5.13 The calculation exercise (Table 3) demonstrates that the proposed installation meets the LPA criteria.

6. CONCLUSION

- 6.1 The foregoing assessment indicates that the proposed installation will meet the requirements imposed by the LPA. No further acoustic mitigation measures other than the use of Quietstone and an acoustically louvred enclosure are required.
- 6.2 If an alternative supplier or manufacturer of condenser or louvre is chosen, the acoustic performance should be checked prior to installation to ensure that the installation will still meet the requirements imposed by the LPA.
- 6.3 It is also recommended that the condensing unit is positioned on vibration isolation mounts to minimise structural borne vibration and re-radiated noise into other parts of the building and to mitigate against any possible building damage. Rubber turret mounts are suitable for this kind of application, available from the following, as shown in Diagram 5 below.



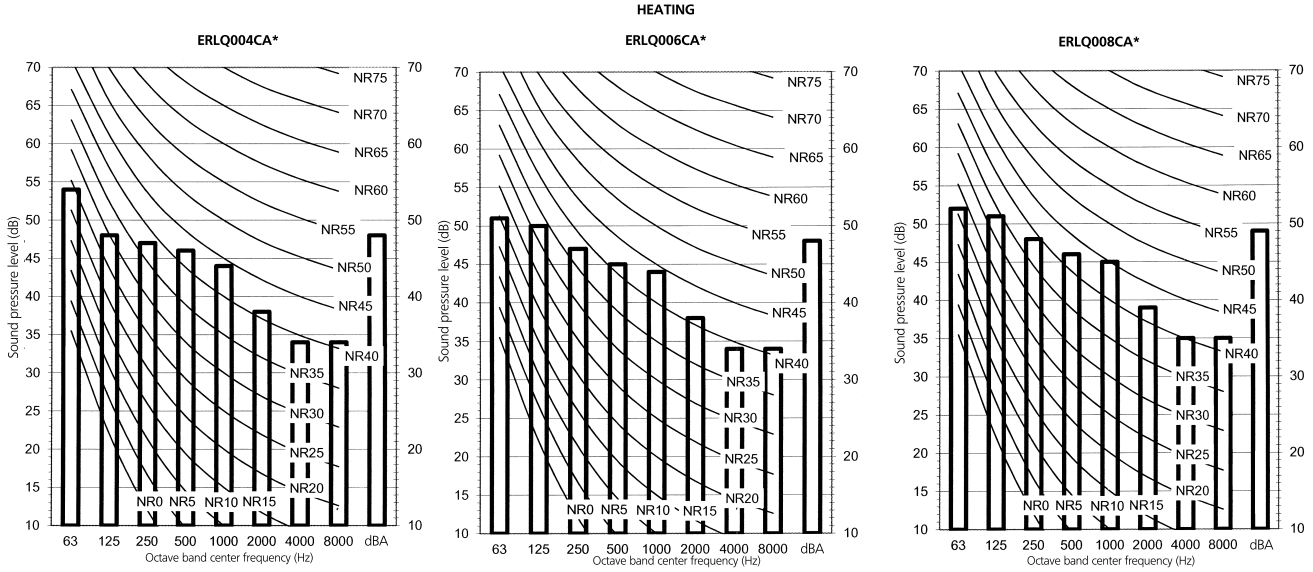
Diagram 5

Appendix A

8 Sound data

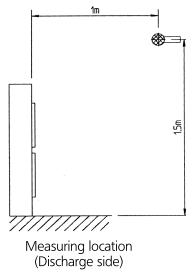
8 - 2 Sound Pressure Spectrum - Heating

ERLQ004-008CV3



Notes:

- 1 Data is valid at free field condition.
- 2 Data is valid at nominal operation condition.
- 3 dBA = A-weighted sound pressure level (A-scale according to IEC).
- 4 Reference acoustic pressures 0dB = 20μPa.

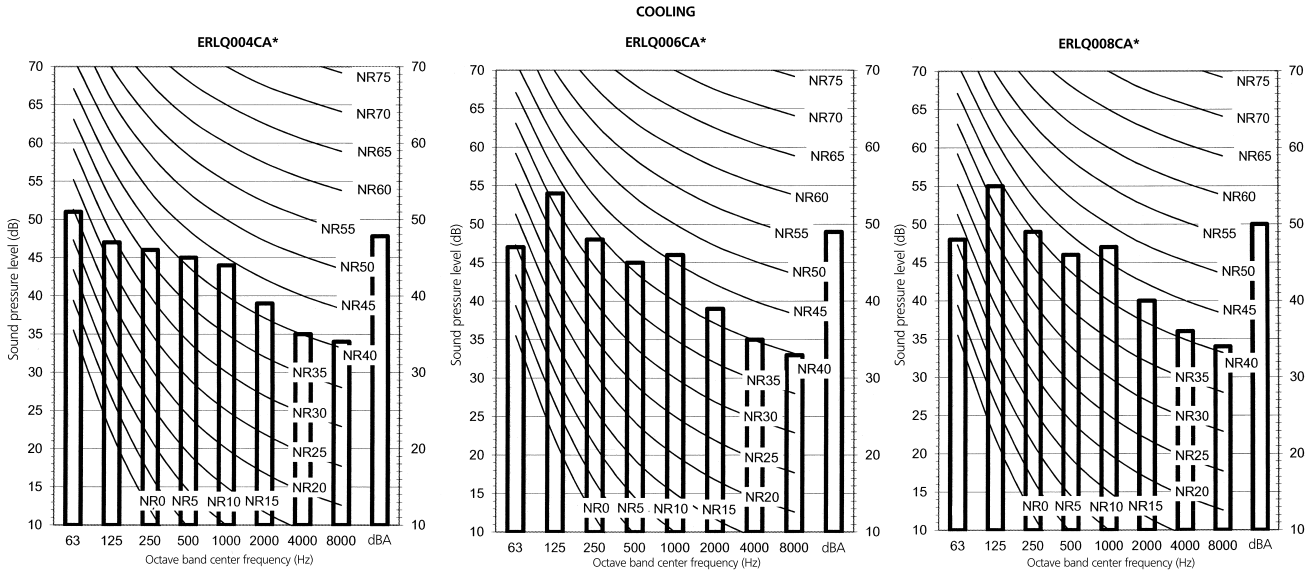


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8 Sound data

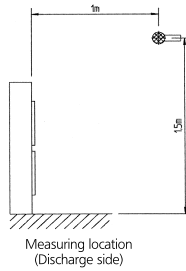
8 - 3 Sound Pressure Spectrum - Cooling

ERLQ004-008CV3



Notes:

- 1 Data is valid at free field condition.
- 2 Data is valid at nominal operation condition.
- 3 dBA = A-weighted sound pressure level (A-scale according to IEC).
- 4 Reference acoustic pressures OctB = 20μPa.



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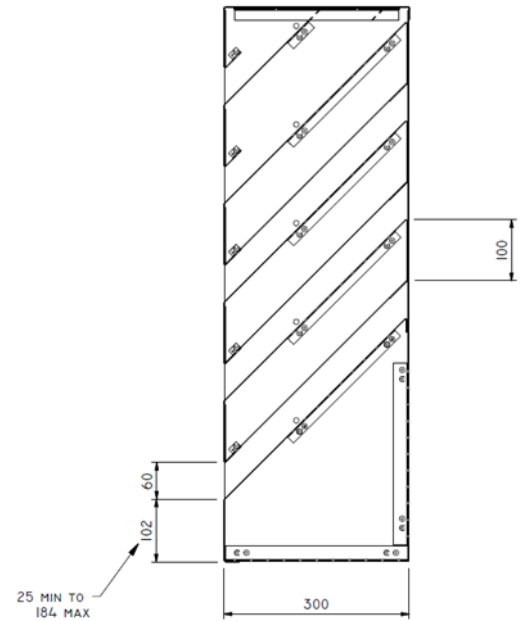
Appendix B

Technical Data For SH300 Acoustic Louvre

Single Bank Acoustic Louvre, Higher Performance Profile, 300mm Deep



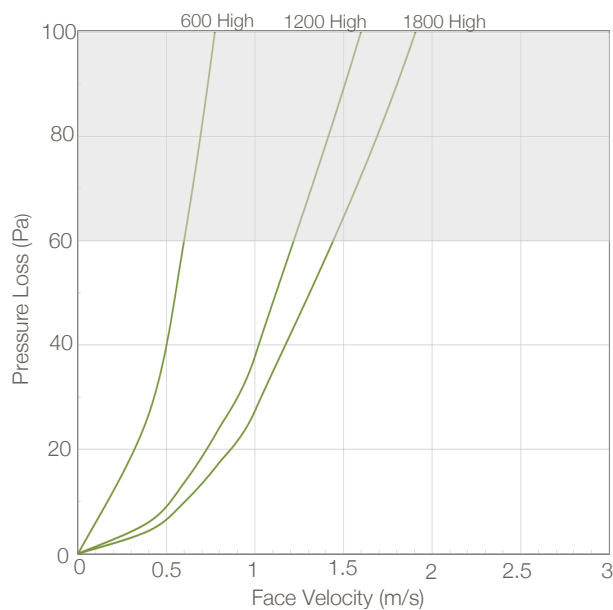
Typical weight
53kg/m³



Performance

Refer to the Performance Data section of this brochure for more details on the following data.

Acoustic Data	dB in each Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Sound reduction index	7	7	10	17	29	30	27	21
Weighted sound reduction index (Rw)	21							
Static insertion loss	6	7	10	18	31	28	26	25
Regenerated sound power level at 1m/s face velocity	50	44	39	34	30	26	17	12
Regenerated sound power level at 2m/s face velocity	70	60	55	52	49	49	43	35



Free Area and Height Range			
Height (mm)	Airway Free Area (%)	Face Area (%)	Airways (43mm)
665-824	13-10	18-15	2
825-984	15-13	22-18	3
985-1144	17-15	24-21	4
1145-1304	19-16	26-23	5
1305-1464	20-17	28-25	6
1465-1624	20-18	29-26	7
1625-1784	21-19	30-27	8
1785-1944	21-20	30-28	9
1945-2104	22-20	31-29	10
2105-2264	22-21	31-29	11
2265-2424	22-21	32-30	12
2425-2584	23-21	32-30	13

Acoustic Louvres should not be selected in the shade area above.

Aerodynamic coefficient at 1200 high is 18.38k



Versatile, sustainable sound absorbers

Quietstone Light is a rigid, durable absorber made from recycled glass. The material is suitable for external use, indoor use and settings which require high impact resistance. It can be worked on site, pigmented or treated with a range of finishes and is non combustible, chemically inert and non fibrous. Panels can be either mechanically fixed or bonded and a range of sizes are available including custom options.

Key features:

- High sound absorption
- Non combustible
- Weather resistant
- Self bearing
- Easily cut on site
- 94% recycled glass
- Bespoke sizes available

Technical properties

Physical properties

Standard width	600mm
Standard length	1200mm
Thicknesses	15 - 100mm
We can make other sizes with a maximum length of 2.4m. A small set up charge is incurred	
Weight at 25mm	8 kg/m ²
Weight	320 kg/m ³

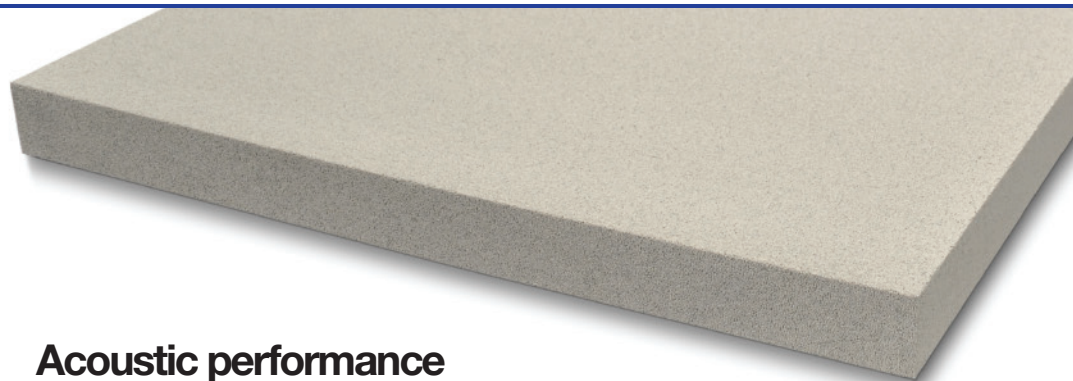
Fire resistance

BS476: Part 6: 1989 - Class 1
BS476: Part 7: 1997 - Class O

Freeze / thaw resistance

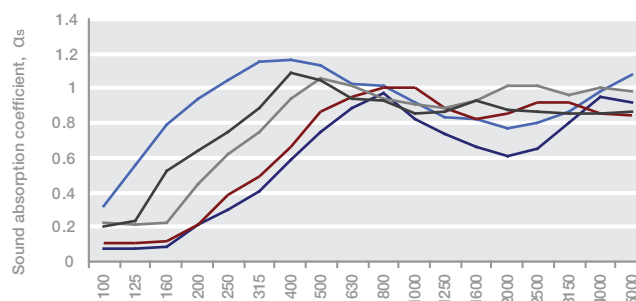
EN 1338 - Class 0

The main constituent of Quietstone Light - expanded glass beads



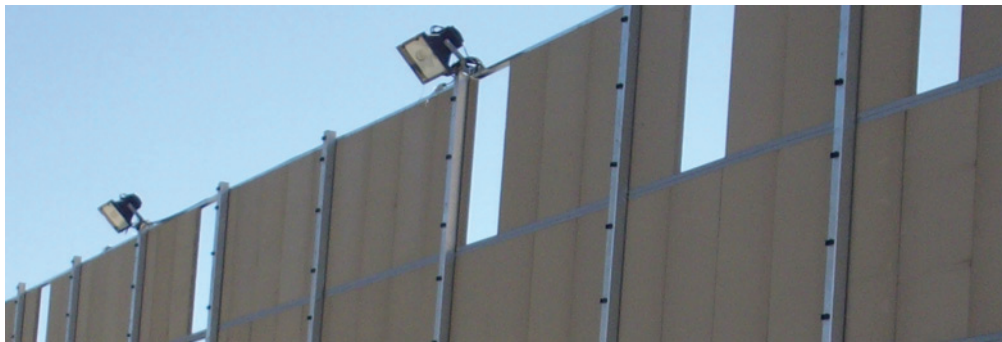
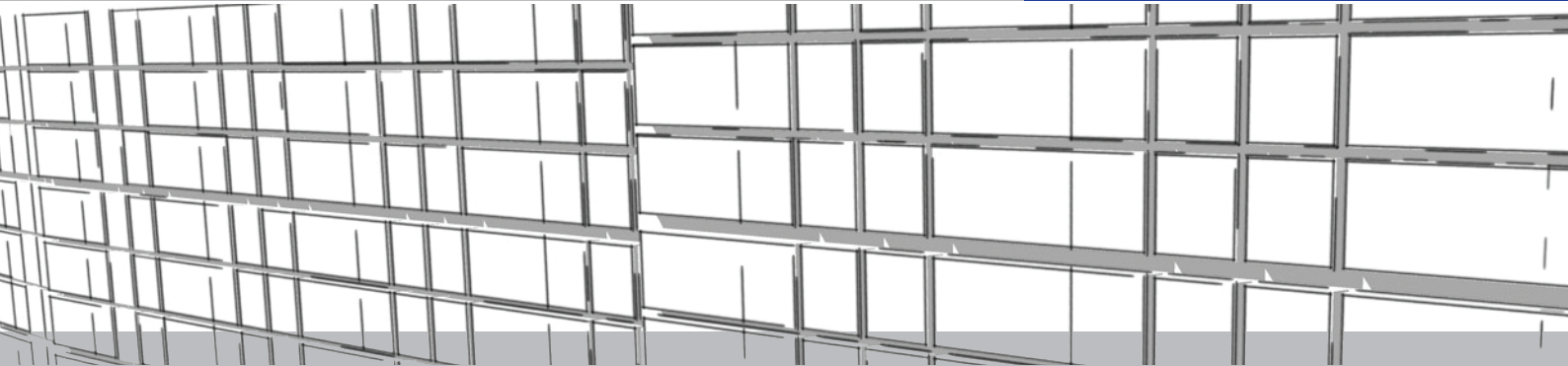
Acoustic performance

Tested in accordance with BS EN ISO 354: 2003



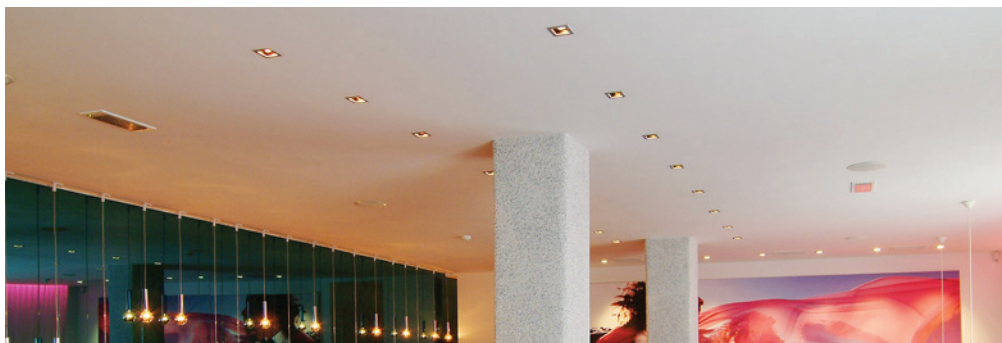
Mounting parameters:

	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	EN-ISO 11654, α _w
25mm panel, 50mm air gap	0.10	0.30	0.75	0.85	0.65	0.90	0.60 (M) (H) (H): class C
25mm panel, 50mm mineral fibre	0.55	1.05	1.10	0.90	0.80	0.90	0.90 (L): class A
50mm panel	0.10	0.35	0.85	0.95	0.85	0.85	0.65 (M) (H) (H): class C
50mm panel, 25mm air gap	0.20	0.60	1.00	0.90	1.00	1.00	0.90: class A
85mm panel 12 gap for fixings	0.30	0.75	1.00	0.90	0.90	0.85	0.95 : class A



Noise barriers, tunnels and industrial

Ideal for adding an absorbent facing to noise barriers and many other areas requiring a durable and weather resistant solution. Installation is simple as panels can be cut on site and mechanically fixed or bonded to the substrate. Many build up options can be used to suit acoustic requirements and budget.



Quietspray

Seamless acoustic spray system

When an aesthetically neutral finish is needed, Quietstone Light is the base panel of our Quietspray system. The system applied to a ceiling gives a perfect, plaster-like finish whilst providing high sound absorption.

More info at: www.quietstone.co.uk/products/quietspray-seamless-acoustic-spray-system

Working with Quietstone Light

One of the main advantages of Quietstone Light is the ease of installation. Panels can be worked using normal woodworking equipment and a dust mask. We can adjust the adhesive to create very flexible panels. Likewise, if you want an even surface on flat walls, our standard panels are ideal.

Fixing methods

Bonding can be achieved using either adhesive or mechanical fixing depending on substrate and setting. We can provide Ceresit CM18 thin-bed adhesive mortar which will adhere to all solid, loadbearing surfaces. This allows for very rapid, economical installation. Alternatively, Mechanical fixing is suitable and allows for frameworks and air gaps which improve acoustic performance. Contact us for guidance and technical details.

Other applications

- Swimming pools, spas -**
- Sports halls**
- Enclosure lining**
- Duct lining**
- Render board for external plastering**
- Many more...**

 **Made in The United Kingdom**

Telephone number +44(0) 1260 253 253
 email address info@quietstone.co.uk
 Website address www.quietstone.co.uk
 Company registration number 07592216



Quietstone UK Ltd
 Quietstone Works, Nab Quarry,
 Pott Shrigley, Macclesfield
 Cheshire, SK10 5SD, UK