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**TEST REPORT No : 06569 AC/R1**

**DATE OF ISSUE : 03 April 2024**

*This report is an amendment of 06569 AC and replaces it.*


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**BS EN 1793-1:2017**

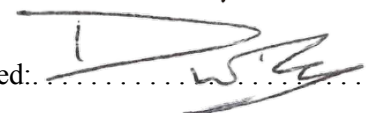
**Road Traffic Noise Reducing Devices – Test Method for Determining  
the Acoustic Performance**

Part 1: Intrinsic Characteristics of Sound Absorption

<b>Client:</b>	Genwork Ltd
<b>Job Number:</b>	06569
<b>Test Sample:</b>	Air Absorption
<b>Date(s) of Test:</b>	24 January 2024

Signed: ..... 

L Cambridge  
**Specialist Acoustics Technician**

Approved: ..... 

D Wong-McSweeney  
**Laboratory Manager**

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### Client Details:

Genwork Ltd  
Bromley Street  
Lye  
Stourbridge  
West Midlands  
DY9 8HU

### Manufacturer:

Client

### Mounting Type:

Type A Mounting

### Date Order Received:

14 December 2023

# 1. Test Samples

The following sample was installed in the large reverberation room of the University of Salford Acoustic Test Laboratory. It was installed in accordance with clause 5 of BS EN 1793-1:2017. All information regarding the samples comes from laboratory measurements unless marked with “*cs*” or otherwise stated.

## 1.1. Description of Test Samples

<b>Test Reference:</b>	<b>06569-6466</b>
<b>Sample Reference <sup>cs</sup>:</b>	Air Absorption
<b>Sample Description:</b>	Road Noise Barrier

The sample was constructed by the client on top of a bed of sand on the concrete floor of the reverberation room.

A steel ‘I’ beam was laid onto the bed of sand approximately two thirds (>2m) along the length of the sample. Perforated wall sections, consisting of a recycled PVC housing with channels filled with rock wool, were then slotted into either side of the steel beam. The perforated side was faced into the chamber. The nominal 32 mm thick rock wool had a mass density of 60 kg/m<sup>3</sup> (<sup>cs</sup>) with a glass fibre protection tissue(<sup>cs</sup>). The wall sections fitted together using a tongue and groove mechanism. Timber was used to secure the wall sections into the steel beam.

Timber was also used as a frame around the periphery and the join to the floor of the chamber was covered over with tape.

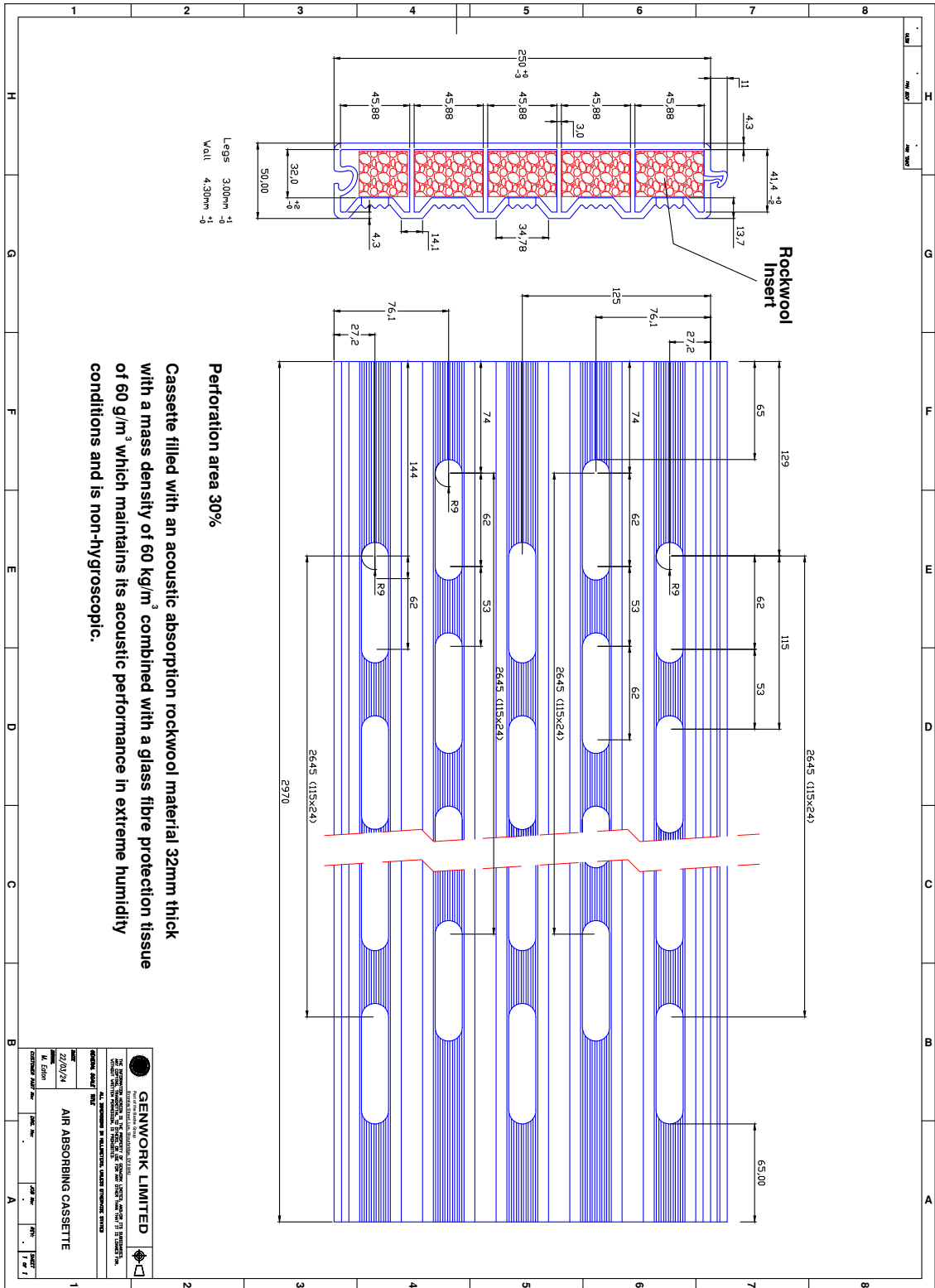
Sample area:	3950 × 3040 mm
Panel Thickness:	50 mm (Measured)
Sample Thickness:	70 mm (Measured, including sand and boundary)
Mass per unit area:	18.7 kg/m <sup>2</sup> (Measured, wall sections only)

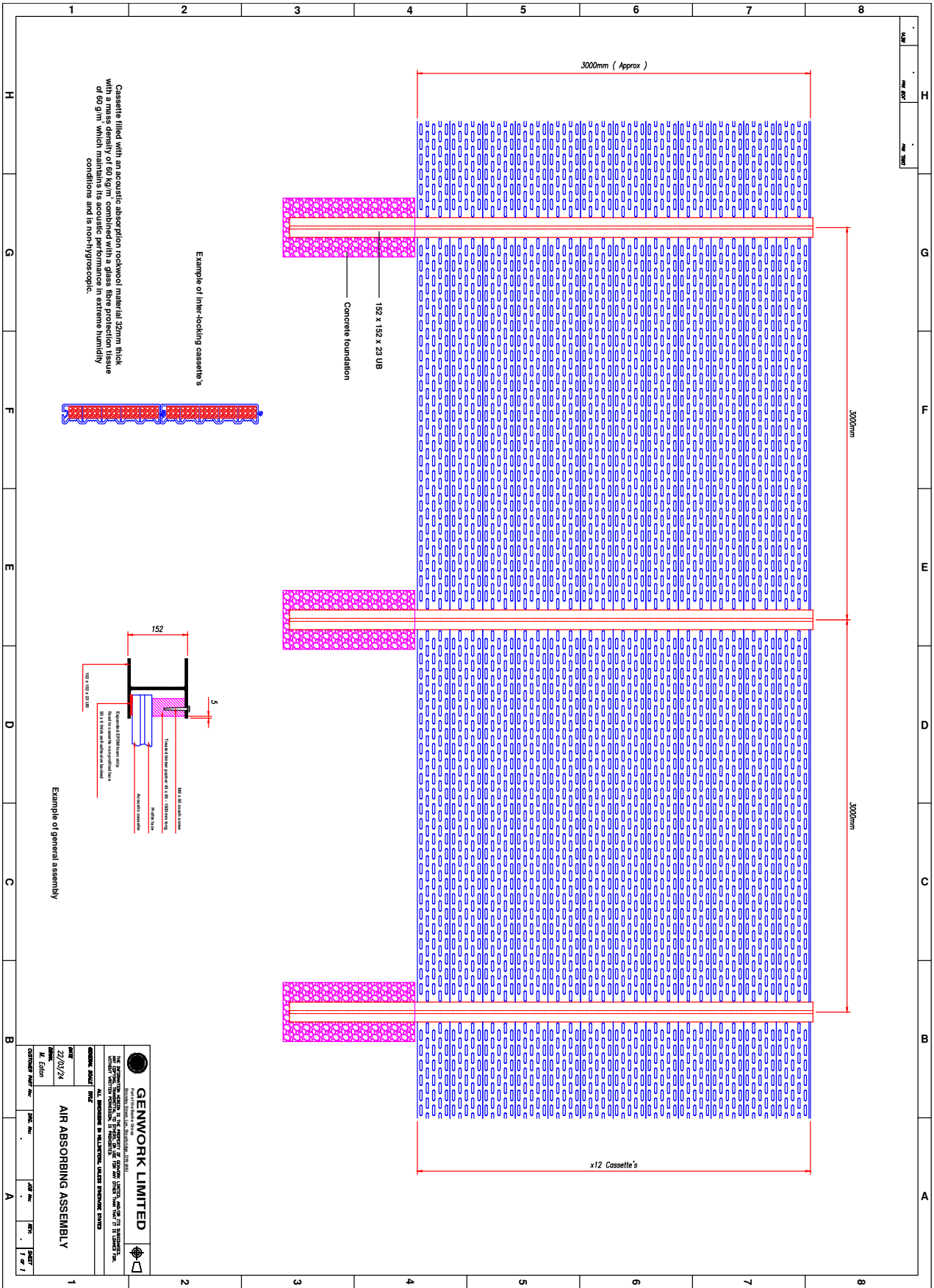
## 1.2. Photographs



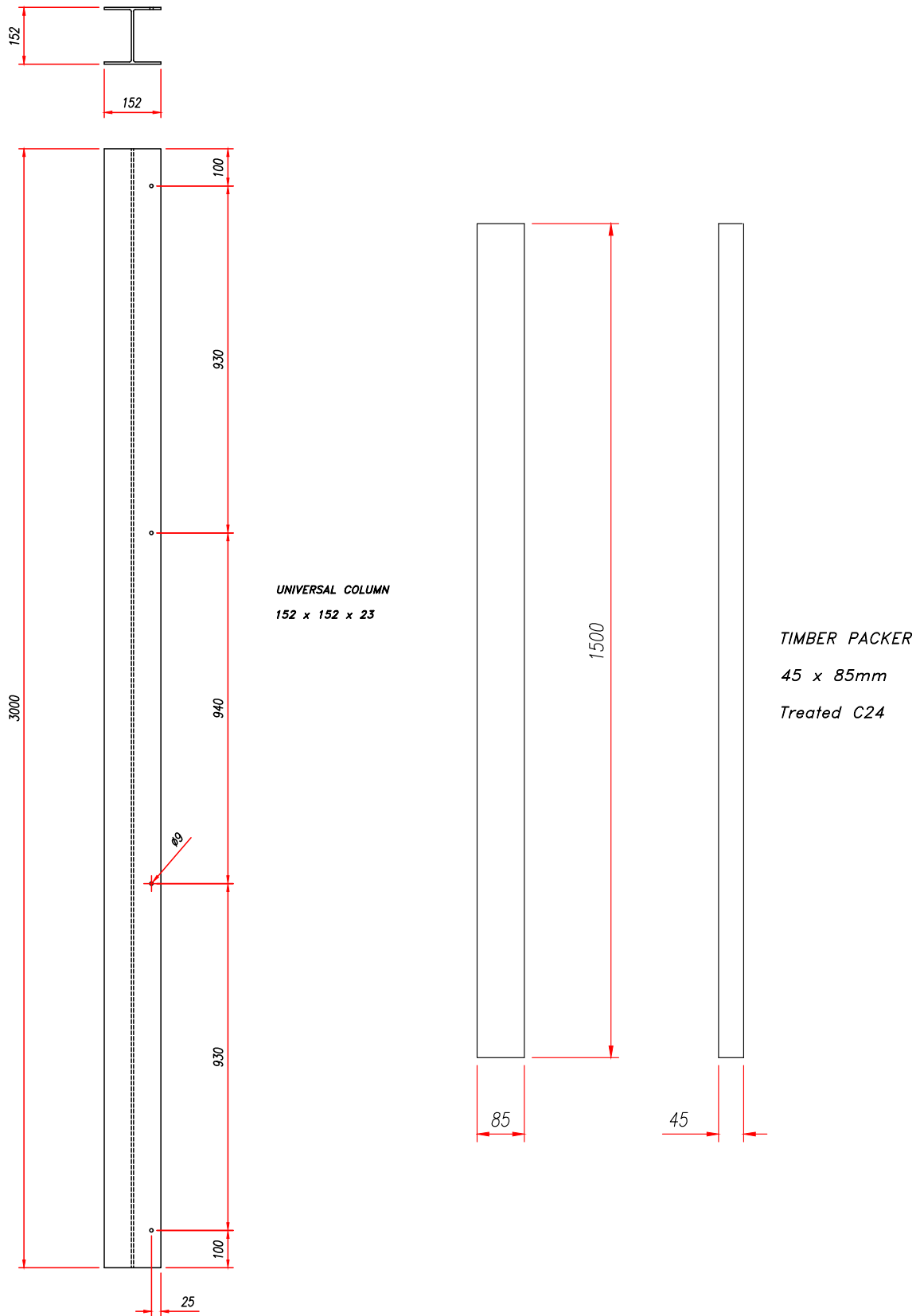
### 1.3. Sectional Drawings

Sectional drawings, as provided by the client, can be found below.





<p><b>GENWORK LIMITED</b> Proud to be ISO 9001:2015 Certified</p>	
<p>THE UNIVERSITY OF SALFORD Acoustic Test Laboratory Salford, Greater Manchester, M6 6PU, UK Tel: +44 (0)161 295 2611 Email: <a href="mailto:acoustic@u.salford.ac.uk">acoustic@u.salford.ac.uk</a></p>	
<p>ALL SERVICES IN ACCORDANCE WITH EN ISO 9001:2015</p>	
<p>DATE: 22/01/24</p>	<p>BY: M. Edlin</p>
<p><b>AIR ABSORBING ASSEMBLY</b></p>	
<p>GENWORK REF: 06569 AC/R1</p>	<p>DATE: 17/01/24</p>



## **2. Description of Test Procedure**

### **2.1. Description of Test Facility**

The tests were carried out in the large reverberation room at the University of Salford. The room has been designed with hard surfaces and non-parallel walls to give long empty room reverberation times with uniform decays. It has the shape of a truncated wedge. In addition 18 plywood panels, of various sizes, were hung in the room to improve the diffusivity of the sound field. The test sample was placed in the centre of the floor.

The excitation signal comprised wide band random noise played into the room via two dodecahedron, omnidirectional loudspeakers mounted in room corners. The sound was monitored at each of 6 microphone positions. The room is approximately 7.4 m long  $\times$  ~6.6 m wide  $\times$  4.5 m high with a volume of 221 m<sup>3</sup> and a total surface area of 224 m<sup>2</sup>. The volume of the room permits a maximum sample size of 12.79 m<sup>2</sup> to be tested, in accordance with Clause 6.2.1.1 in BS EN ISO 354: 2003, "Acoustics - Measurement of sound absorption in a reverberation room".

### **2.2. Test Procedure**

The procedure followed that detailed in BS EN 1793-1:2017, conforming to the conditions laid out within BS EN ISO 354:2003. Measurements were made on the rate of decay of sound in the test chamber with and without the sample in place. The frequency range from 100 Hz to 5000 Hz was covered in one-third octave bands. An average reverberation time was taken from five decays at each of six microphone positions for each of two loudspeaker positions (i.e. 60 decays per third octave band).

The decays were produced by exciting the room with amplified wide band random noise and stopping the excitation once the chamber became saturated. The time taken for the sound to decay by a given amount is measured and extrapolated to give the reverberation time. In practice this was determined by sampling the decaying sound field on a one-third octave band frequency analyser and storing the spectrum in a

computer. The reverberation time was obtained from the ensemble averaged decays at each frequency. The measurements with and without ( $T_2$  and  $T_1$  respectively) the sample in the room were carried out consecutively to avoid significant changes in relative humidity and temperature that influence air absorption at higher frequencies.

### 2.3. Calculation

The random incidence sound absorption coefficients were determined from the measured data by means of the equation below:

$$\alpha_{NRD} = \frac{A_T}{S}$$

where,

$A_T$  is the equivalent sound absorption area of the test specimen ( $m^2$ )

$S$  is the area covered by the test specimen ( $m^2$ )

The single-number rating,  $DL_{\alpha, NRD}$ , is given by:

$$DL_{\alpha, NRD} = -10 \lg \left| 1 - \frac{\sum_{i=1}^{18} \alpha_{NRDi} 10^{0,1 L_i}}{\sum_{i=1}^{18} 10^{0,1 L_i}} \right|$$

Where  $\alpha_{NRDi}$  is the absorption coefficient in the  $i$ th one-third octave band

$L_i$  is the normalized A-weighted sound pressure level of traffic noise in the  $i$ th one-third octave band as defined in BS EN 1793-3:1998.

No correction is applied for the absorption of the surface covered by the test sample.

### 3. Equipment

Equipment	Laboratory Equipment Record No.
Norwegian Electronics 1/3 octave band real time analyser type 850 with in-built random noise generator	RTA3-07 to 12
Quad 510 power amplifier	PA7
Norsonic Sound Calibrator type 1251	C8
2 × Norsonic Dodecahedron Loudspeakers	LS10-LS11
2 × Bruel & Kjaer random incidence condenser microphone type 4166 in the receiving room	M9, M18
4 × G.R.A.S. random incidence condenser microphones type 40AP in the receiving room	M20, M31, M19, M32
Environmental sensor data logger, hygrometers and barometer	HL1, HG2, BM3
Toshiba TECRA R850 119 laptop computer and related peripheral equipment (network switch, printer, monitor etc.)	RTA3-00
Yamaha GQ1031BII graphic equalizer	GEQ1

## 4. Results

The random incidence sound absorption coefficients in the  $i$ th one-third octave band,  $\alpha_{NRDi}$ , are given in the tables over leaf. Also given is the single-number rating of sound absorption,  $DL_{\alpha,NRD}$ , in decibels.

The results here presented relate only to the items tested and described in this report.

## BS EN ISO 354:2003 Acoustics - Measurement of absorption in a reverberation room

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**Client:** Genwork Ltd  
Bromley Street, Lye, Stourbridge, West Midlands  
DY9 8HU

Sample Reference: **Air Absorption**  
Description of Sample: Road Noise Barrier

Room Volume: 221 m<sup>3</sup>      Location: Acoustic Transmission Suite  
Sample Size: 12.01 m<sup>2</sup>      Test Room Large reverberation Room  
Sample Thickness: 70.0 mm      Condition: Clean

<b>Sample Out</b>		<b>Sample In</b>	
Temperature	20.4 °C	Temperature	20.7 °C
Relative Humidity	39.1 %	Relative Humidity	38.4 %
Static Pressure	102.0 kPa	Static Pressure	102.0 kPa

### Random Incidence Sound Absorption Coefficient

Frequency [Hz]	$T_1$ [s]	$T_2$ [s]	$\alpha_{NRDi}$
100	6.90	5.71	0.09
125	5.39	4.62	0.09
160	5.34	3.70	0.24
200	5.81	3.37	0.36
250	7.01	3.02	0.55
315	6.50	2.47	0.74
400	5.85	2.05	0.94
500	5.73	1.84	1.09
630	5.30	1.78	1.10
800	5.09	1.83	1.03
1000	4.95	1.92	0.94
1250	4.71	1.96	0.88
1600	4.38	2.00	0.80
2000	3.89	1.91	0.78
2500	3.28	1.81	0.73
3150	2.74	1.69	0.67
4000	2.12	1.50	0.57
5000	1.73	1.34	0.49

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**Test reference: 06569-6466**

Date: 24 January 2024

University of Salford, School of Computing Science & Engineering



## 5. **Amendments**

Added a detail and clarification in section **1.1**. The 'Sample Thickness' and the 'Panel Thickness' are presented, as well as further detail provided by the client regarding the rock wool used.

Added section **1.3**, including sectional drawings of the sample provided by the client.