



TEST REPORT No : 3464

DATE OF ISSUE : 22 February 2018

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**INTERNATIONAL STANDARD METHOD FOR
MEASUREMENT OF AIRBORNE SOUND
INSULATION OF BUILDING ELEMENTS
BS EN ISO 10140-2 : 2010**

CLIENT:	Deceuninck Ltd Porte Marsh Industrial Estate Calne Wiltshire SN11 9PX
JOB NUMBER:	ACOUS/03464
TEST SAMPLE:	Various Windows with Glazing
MANUFACTURER:	Client
DATE ORDER RECEIVED:	12 December 2017
DATE OF TEST:	30 - 31 January 2018

Signed:

D Wong-McSweeney
Laboratory Manager

Approved:

D J M Caul
Technical Manager

1 TEST SAMPLES

1.1 Description of Test Samples

The 3600 mm × 2400 mm aperture of the transmission suite was closed by constructing two 9" brick walls, one each side of the break. The 50 mm cavity between the two walls, spanning the break, was filled with mineral wool. This was tested (test number: 3464-3094) according to BS EN ISO 10140-2 yielding an SRI of $R_w(C; C_{tr})$ 76 (-2 ; -9) dB, well above the sound insulation of the samples subsequently tested at all frequencies. A new aperture, 1250 mm wide × 1500 mm high on the receiving room side, was then opened through the brick walls. The newly created aperture was wider on the source room side. The exposed cavity was covered over with plasterboard from the source room side. The joins between the plasterboard and the brick aperture were sealed with acoustic sealant.



Test Reference: 3464-3098

Sample Reference: "Deceuninck 2500 - 2"

Sample Description: Window and Glazing

The glazing from the previous test was exchanged for one with the following nominal make up: 6.8 mm standard PVB, 18 mm cavity and 4 mm float. Other than this the window was unchanged.

Mass per unit area: 31.7 kg/m² (total, frame and glazing, measured)
26.0 kg/m² (glazing only, measured)

Thickness: 70.1 mm (frame, measured)
29.1 mm (glazing measured)



2 DESCRIPTION OF TEST PROCEDURE

The test procedure adopted follows that detailed in BS EN ISO 10140: Part 2: 2010, "Acoustics – Laboratory measurements of sound insulation of building elements; Part 2: Measurement of airborne sound insulation".

The measurements are performed in the large transmission suite at the University of Salford. The suite comprises two structurally isolated reverberant rooms with a test opening between them in which the test specimen is inserted. The vertical sides of the test aperture and the base are made from dense brick, whilst the soffit is made from reinforced concrete. Both rooms have been designed with hard surfaces and non-parallel walls. The smaller source room has 6 plywood diffusers and the larger receiving room has 11 plywood diffusers, to increase the diffusivity of the sound field in these areas.

The test involves producing a known sound field in the source room and measuring the resultant sound level difference between the source room and the receiving room with the specimen installed in the test aperture. This level difference is then corrected so as to take into account the equivalent absorption area of the receiving room.

The Sound Reduction Index, R (dB), is defined in BS EN ISO 10140 – Part 2: 2010 as:

$$R = L_1 - L_2 + 10 \log_{10} \frac{S}{A} \quad (1)$$

where:

L_1 is the average sound pressure level in the source room (dB)

L_2 is the average sound pressure level in the receiving room (dB)

S is the area of the test specimen (m^2)

A is the equivalent absorption area of the receiving room (m^2)

2.1 Generation of Sound Field in the Source Room

Wide band, random noise from the generator in the real time analyser was amplified and reproduced in the source room using alternately one of two fixed loudspeaker systems, (La and Lb). Omni-directional loudspeakers were used. The output of the generator was set with the intention that the sound pressure level in the receiving room was at least 15 dB higher than the background level in any frequency band. The loudspeakers were positioned in the corners of the room and at such a distance from the test specimen that the direct radiation upon it was not dominant.

2.2 Frequency Range of Measurements

The sound pressure levels were measured using one-third octave band filters. Measurements covered all the one-third octave bands having centre frequencies in the range from 100 Hz to 5000 Hz.

2.3 Measurement of Sound Pressure Levels

Sound pressure levels were measured simultaneously in the source and receiving rooms using loudspeaker La as the sound source. Measurements were recorded at 6 fixed microphone positions in each room, using an averaging time of 16 seconds and the average level in each room was calculated on an energy basis in each one-third octave frequency band. The procedure was then repeated with loudspeaker Lb as the sound source. The overall average level difference in each frequency band was then calculated as the arithmetic average of the two sets of results.

For each set of microphone/loudspeaker positions, the distances separating microphones from other microphones, room boundaries and diffusers, were greater than 0.7 m and the distances separating microphones from the sound source and the test specimen were greater than 1 m.

2.4 Measurement and Evaluation of the Equivalent Absorption Areas

The correction term of equation (1) containing the equivalent absorption area, A , was evaluated from the reverberation time and calculated using Sabine's formula:

$$A = \frac{0.16 V}{T} \quad (2)$$

where:

V is the volume of the receiving room (m^3)

T is the reverberation time (s)

The reverberation time of the receiving room was measured using a decay technique. The decays were produced by exciting the room with wide band random noise and stopping the excitation once the room became saturated. The resulting decaying sound field was monitored at 6 fixed microphone positions using a one-third octave band real time analyser. The sound spectrum was sampled at 32 millisecond intervals and stored in memory. Five decays were measured at each microphone position and averaged. The time taken for the sound to decay by a given amount was measured and then extrapolated to determine the reverberation time. The measurements were repeated using an alternative sound source. The results from each set of positions were averaged (ie 60 reverberation decays at each frequency).

3 EQUIPMENT

	Departmental Record No
Norwegian Electronics 1/3 octave band real time analyser type 850 with in-built random noise generator	RTA3-01 to 12
Quad 510 power amplifier	PA7
Norsonic Sound Calibrator type 1251	C8
2 × broadband loudspeakers (receiving room)	LS3-LS4
3 × Bruel & Kjaer random incidence condenser microphones type 4166 in the source room	M2-M4
3 × G.R.A.S. random incidence condenser microphones type 40AP in the source room	M21, M22, M30
4 × Bruel & Kjaer random incidence condenser microphone type 4166 in the receiving room	M8, M9 M18, M19
2 × G.R.A.S. random incidence condenser microphones type 40AP in the receiving room	M20, M31
Environmental sensor data logger, hygrometers and barometer	HL1, HG1, HG2, BM2
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 sound reduction indices at one-third octave band intervals, R , are given in the tables overleaf.

Source room volume:	136 m ³
Receiving room volume:	221 m ³
Sample sizes:	1250 mm × 1500 mm

Environmental conditions:

Test Reference 3464-...	Source Room		Receiving Room		Static Pressure (± 0.2 kPa)
	Temperature (± 0.3 °C)	Humidity (± 2.0 %)	Temperature (± 0.3 °C)	Humidity (± 2.0 %)	
3097	22.3	30.0	21.0	36.4	102.2
3098	22.2	30.6	21.1	36.3	102.2
3100	22.1	32.6	20.8	36.7	101.8
3102	22.0	29.5	20.7	32.0	99.9
3106	22.1	30.5	21.1	34.7	99.7
3107	22.2	28.5	20.8	32.0	99.6
3108	22.8	27.5	21.1	32.6	99.5
3109	22.2	28.7	21.1	34.8	99.5

Also given in the attached tables and computed from the one-third octave band sound reduction indices, is the weighted sound reduction index, R_w , calculated according to ISO 717-1:2013. This evaluation is based on laboratory measurement results obtained by an engineering method.

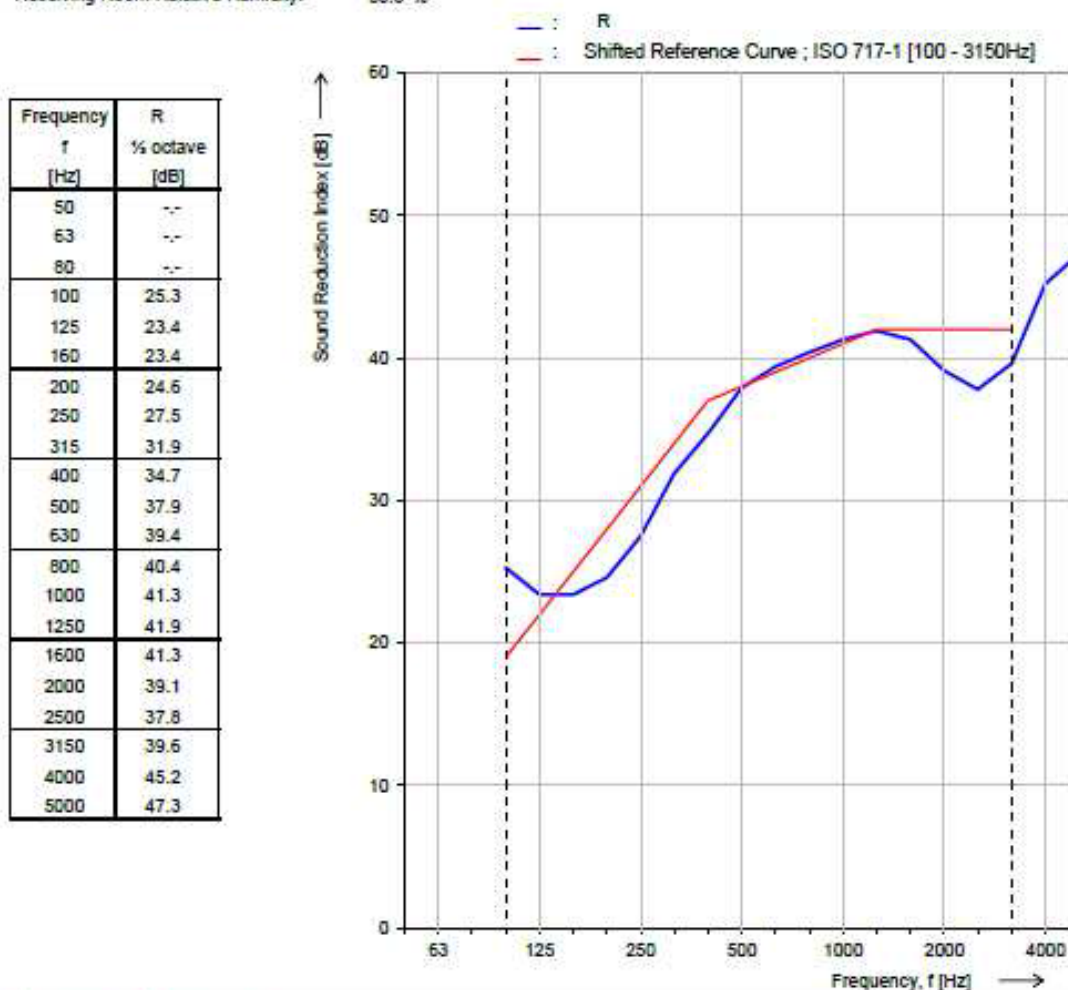
The results here presented relate only to the items tested and described in this report.

BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Deceuninck Ltd	Product Identification:	Deceuninck 2500 - 2
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	1.88 m ²	Date of Test:	30 January 2018
Manufacturer:	Client		
Description:	Window and Glazing		

Source Room Volume:	136 m ³	Ambient Pressure:	102.2 kPa
Source Room Temperature:	22.2 °C	Measured Mass per unit area:	31.7 kg/m ²
Source Room Relative Humidity:	30.6 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	21.1 °C		
Receiving Room Relative Humidity:	36.3 %		



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 38 (-1; -4) dB

C_{50-100} = -- dB ; $C_{50-1000}$ = -- dB ; $C_{100-5000}$ = 0 dB
 $C_{5,50-100}$ = -- dB ; $C_{5,50-1000}$ = -- dB ; $C_{5,100-5000}$ = -4 dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

Name of test institute: The University of Salford, Acoustic Test Laboratory
 No. of test report: 3464-3098
 Date: 30 January 2018

Signature: [Redacted]
 Operator: D. Wong-Mcweeney