



1262

TEST REPORT No : 2693

DATE OF ISSUE : 5 April 2017

Page 1 of 42

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

CLIENT: Latham's Steel Security Doorsets Ltd
Timmis Road
Stourbridge
West Midlands
DY9 7BQ

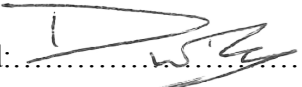
JOB NUMBER: ACOUS/02693

TEST SAMPLE: Various Doors


MANUFACTURER: Client

DATE ORDER RECEIVED: 20 December 2016

DATE OF TEST: 13 – 15 March 2017

Signed: 

D Wong-McSweeney
Laboratory Manager

Approved: 

D J M°Caul
Technical Manager

1 TEST SAMPLES

1.1 Description of Test Samples

The aperture of the transmission suite was reduced from 3600 mm wide × 2400 mm high to accommodate firstly single doors and then afterwards a double door. This was accomplished by the building of two brick walls, one on either side of the break between the two rooms of the transmission suite. The walls were made of common grey bricks (no frogs) and the cavity between the two walls was filled with mineral wool. The first opening was 1000 mm wide × 2025 mm high in the wall on the receiver room side. After testing of the single doors it was widened to 1800 mm wide × 2025 mm high for the double door. In both cases the opening on the source room side was wider and also lined with plasterboard to cover the cavity. All of the joints between the plasterboard and the brick walls were sealed. This construction of brick wall had an SRI of approximately R_w 77 dB.

Sectional drawings for all of the doors tested in these apertures can be found in the following section (§1.2). The doors and frames were delivered pre-assembled.

Test Reference: 2693-2671

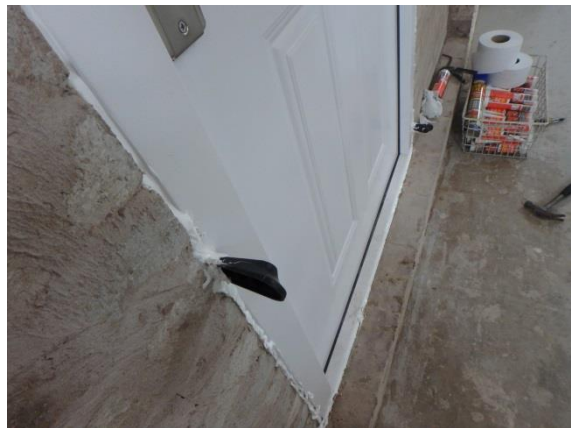
Sample Reference: “BGSD”

Sample Description: Single door and frame

The frame of the door was installed flush with the receiver room side of the brick wall. It was held in place using wooden and plastic wedges. The frame was 93 mm deep, 45 mm wide on the source room side and 67 mm wide on the receiver room side (client specified). The threshold was also 93 mm deep with a 12 mm high rebate 33 mm from the receiver room edge. A space between the door frame and the concrete lintel of the reduced aperture was filled with section of plasterboard. The joints between the frame,

the plasterboard and the brick were all sealed with silicone sealant. The door panel was 50 mm thick (client specified) with a panelled design shaping both faces.

The door opened into the source room and it was opened and closed prior to testing.



Test Reference: 2693-2672

Sample Reference: "BGSD Fully Sealed"

Sample Description: Single door and frame – Inoperable.

Using the sample installed in the previous test the join between the door and the frame was sealed with silicone sealant on both source and receiver room sides. Having been sealed, the door was inoperable.



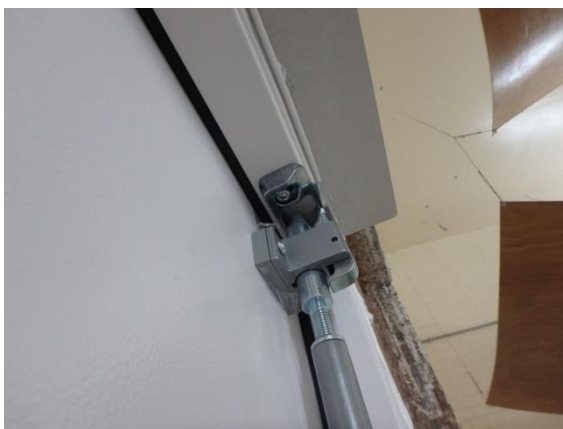
Test Reference: 2693-2673

Sample Reference: "EXDSD"

Sample Description: Single door and frame

This door and frame were installed in the same way as in the first (2693-2671) test; flush to the receiver room side of the aperture and with wedges holding it in place. It opened into the source room with a push bar mechanism. The leaf of the door had a flat surface which was measured to be 50.3 mm thick. The frame had a similar construction to that in the previous tests and had the plasterboard section filling a space between the frame and the lintel. The door latching mechanism was adjusted to ensure a good seal to the frame when closed.

The door was opened and closed prior to testing.



Test Reference: 2693-2674

Sample Reference: "HDS" "

Sample Description: Single door and frame

This door and frame were installed in the same way as in the previous tests. It opened into the source room with a push bar mechanism. The leaf of the door was flat and measured to be 52.4 mm thick at its edge. The frame had a similar construction to that in the previous tests including the plasterboard section filling a space between the frame and the lintel. The door latching mechanism was adjusted to ensure a good seal to the frame when closed.

The door was opened and closed prior to testing.



Test Reference: 2693-2675

Sample Reference: "HDSO Fully Sealed"

Sample Description: Single door and frame

The sample from the previous test was fully sealed by covering the join between the door and the frame with silicone sealant. This was carried out on both the source and receiver room sides of the door.

The door was inoperable.



Test Reference: 2693-2676

Sample Reference: "SSSD"

Sample Description: Single door and frame

As with the previous tests, the frame was installed flush with the receiver room face of the aperture and the door opened into the source room. The door and frame were both thicker than the previous tests with the frame specified to be 113 mm deep and the door panel measured to be 68.3 mm thick. The 12 mm rebate of the threshold was still 33 mm from the receiver room edge.

The door was opened and closed prior to testing.



Test Reference: 2693-2677

Sample Reference: “SSSD Fully Sealed”

Sample Description: Single door and frame

The sample from the previous test (2693-2676) was fully sealed. Silicone sealant was used to cover the join between the door leaf and the frame along all edges but only on the source room side.

This door was inoperable.



Test Reference: 2693-2678

Sample Reference: "UDSD"

Sample Description: Single door and frame

To ensure this door and frame stayed in place screws were used, together with wooden and plastic wedges, to fix the frame to the brick wall. The door leaf was measured to be 68.9 mm thick at the edge and the frame was specified to be 93 mm deep. The frame had an angled rebate for the leaf to sit into and the 12 mm threshold rebate was 13 mm from the receiver room side. As with previous tests, a section of plasterboard filled the space between the top of the frame and the brick wall. All joins to the wall were covered with silicone sealant.

The door was opened and closed prior to testing.



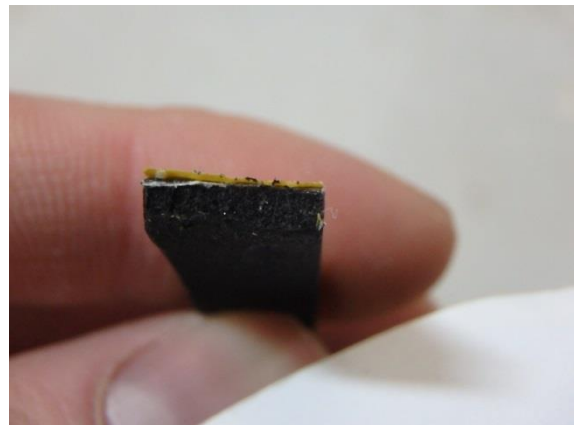
Test Reference: 2693-2679

Sample Reference: “UDSD + D-Seal + Rockwool”

Sample Description: Single door and frame

The frame of the sample used in the previous test (2693-2679) was removed from the aperture and filled with Rockwool. The seals around the door and frame were changed. A self-adhesive foam seal was fixed to the edges of the door leaf where it would meet the angled frame rebate. D-Seals were also adhered to the other frame rebate for the source room side of the door leaf to close against. This replaced a foam seal with a textured surface. The door and frame were then re-positioned in the aperture as in the previous test but with the plasterboard section beneath the frame rather than above. The joints between the frame, plasterboard and brickwork were covered with silicone sealant.

The door was opened and closed prior to testing.



Test Reference: 2693-2680

Sample Reference: "UDSD no seals"

Sample Description: Single door and frame

The same door and frame as in the previous two tests was used for this test. The seals on the both the door and the frame were removed. The only remaining seal was on the hinge side of the door which was not removable.

The door was opened and closed prior to testing.



Test Reference: 2693-2681

Sample Reference: “UDSD + Soundseal + D-Seal”

Sample Description: Single door and frame

The same door and frame as in the previous two tests was used for this test. Soundseals were added to the receiver room side frame at the sides and on the top. These consisted of an ‘O’ shaped neoprene seal held in an aluminium bracket. When closed the face of the door leaf pressed against these seals. A D-seal was fitted at the threshold rebate.

The door was opened and closed prior to testing.



Test Reference: 2693-2682

Sample Reference: "HDSD + Soundseal"

Sample Description: Single door and frame

The single door tested in test number 2693-2674 was re-installed into the aperture. The joints between the frame and the brick wall were filled with silicone sealant. A section of plasterboard was fitted underneath the threshold to fill the space and that too was sealed with silicone sealant.

The verticals bars of the locking mechanism were removed to allow for extra seals around the door leaving only the middle latching mechanism. Two types of seal were then fitted; thick, adjustable Soundseals screwed to the top and side frames and an auto lowering face-mounted threshold seal on the lower edge of the door leaf. A space was left on the leading edge side to leave space for the latching mechanism.

The door was *not* opened and closed prior to testing as it was difficult to close. As a result this door is described as inoperable.





Test Reference: 2693-2683

Sample Reference: "HDDD"

Sample Description: Double door and frame

The aperture between the source and receiver rooms was widened to accommodate a double door and frame with dimensions 1800×2025 mm. As for the single door aperture, the internal periphery of the wall on the source room side was lined with a layer of plasterboard which covered the cavity between the two rooms.

The frame of the double door was first fixed into the aperture on top of a section of plasterboard. The joins between the frame and the brick wall were filled with silicone sealant all the way around and from both source and receiver rooms. The two door leaves were then attached so that they opened into the receiver room. When closed an astragal covered the join between the two doors on the source room side.

The door was opened and closed prior to testing.



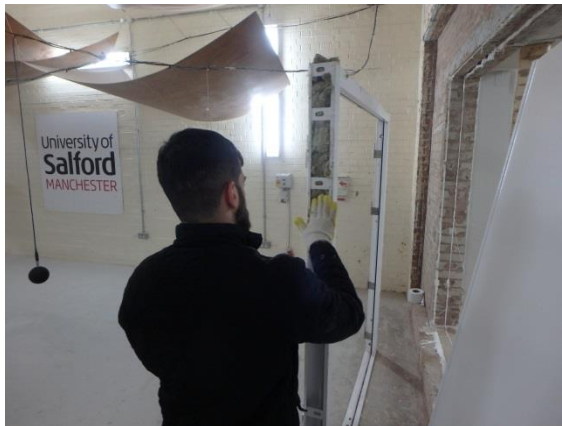
Test Reference: 2693-2684

Sample Reference: "HDDD + Extra Seals + Rockwool"

Sample Description: Double door and frame

The doors and frame from the previous test (2693-2684) were removed from the aperture and the frame then packed with Rockwool. After re-installing the frame and doors, extra seals were added. Self-adhesive foam seals with a rectangular cross-section were fitted to the first rebate (into which the door flange sat) around the frame. A second strip was added to the rebate of the door leaf where the two doors meet.

The door was opened and closed prior to testing.



Test Reference: 2693-2685

Sample Reference: "HDDD + Extra Seals"

Sample Description: Double door and frame

Using the same sample as in the previous test (2693-2684), further seals were added. A third seal was adhered to the hinge side frame against which the side edge of the door leaf would press. Self-adhesive plastic 'V' shaped seals were positioned on the top and bottom of the door leaves with the point of the 'V' towards the source room when the door was closed.

The door was opened and closed prior to testing.



Test Reference: 2693-2686

Sample Reference: "HDDD Fully Sealed"

Sample Description: Double door and frame

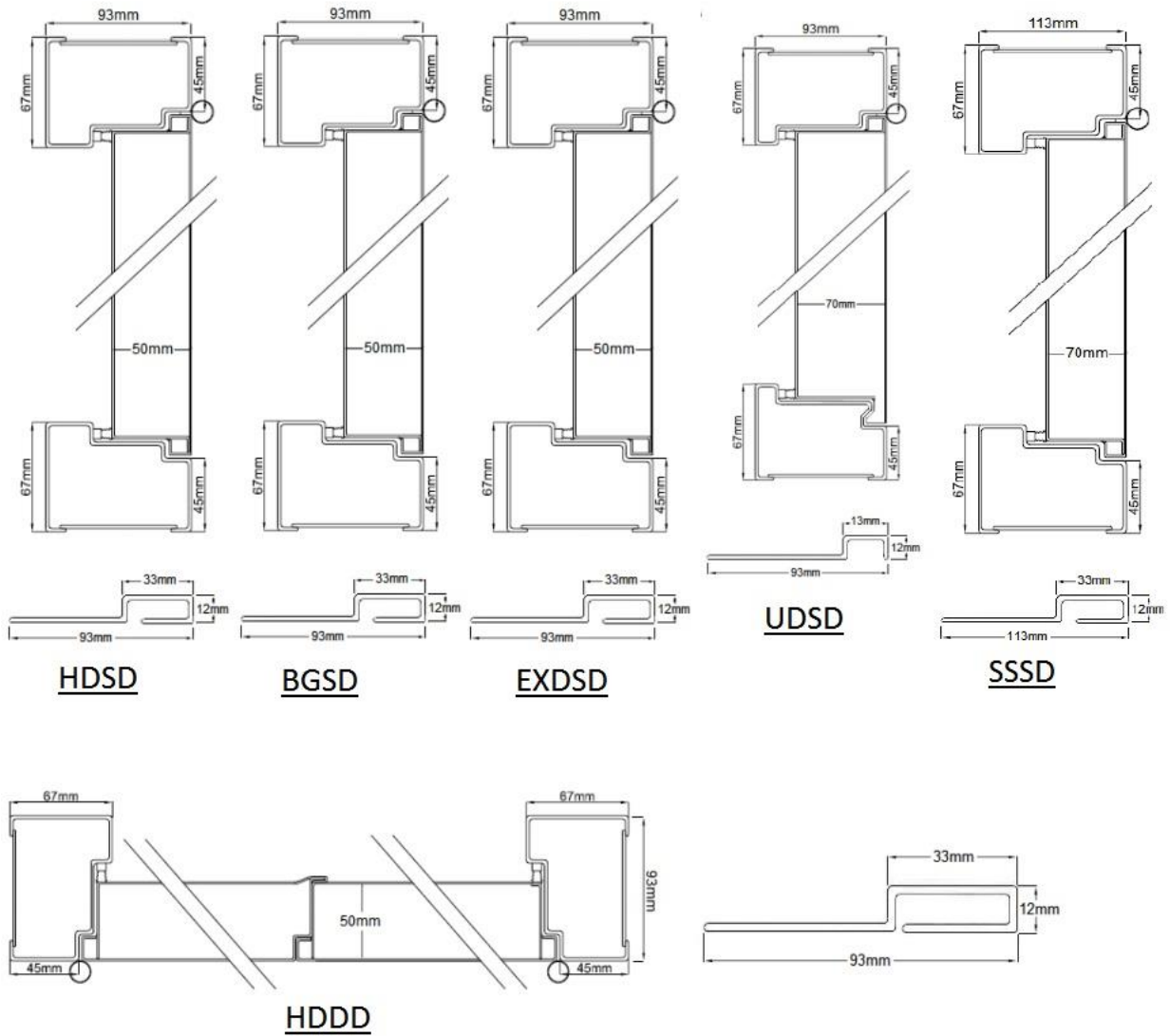
The sample from the previous test (2693-2685) was fully sealed around each of the door panels on both the source and receiver room sides using silicone sealant. The key hole was also filled with silicone.

The door was inoperable.



1.2 Sectional Drawings

Sectional drawings as provided by client can be found below.



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 15dB 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 100Hz to 5000Hz.

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 0.7m and the distances separating microphones from the sound source and the test specimen were greater than 1m.

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
2 × omni-directional broadband loudspeakers (source room)	LS10 – LS11
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, CL6
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:		136m ³
Receiving room volume:		221 m ³
Sample sizes	(single door):	1000 mm × 2025 mm
	(double door):	1800 mm × 2025 mm

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.

Environmental conditions:

Reference Number	Atmospheric Pressure (± 0.0 kPa)	Temperature (SR/RR) ($\pm 0.3^\circ\text{C}$)	Humidity (SR/RR) (± 2.0 %)	Thickness (mm)	Sample Size (mm)
2693-...					
2671	102.3	20.4/19.1	37.9/45.0	50*	1000×2025
2672	102.3	20.1/19.1	41.3/46.7	50*	1000×2025
2673	102.3	21.0/19.6	38.6/46.3	50.3	1000×2025
2674	102.4	20.7/19.5	41.7/47.9	52.4	1000×2025
2675	102.4	20.4/19.2	42.5/49.0	52.4	1000×2025
2676	102.4	20.9/19.6	42.3/47.8	68.3	1000×2025
2677	102.4	20.6/19.4	44.0/49.1	68.3	1000×2025
2678	102.4	20.4/19.4	45.3/52.0	68.9	1000×2025
2679	102.4	21.9/20.1	42.4/51.0	68.9	1000×2025
2680	102.4	21.2/19.7	44.5/53.8	68.9	1000×2025
2681	102.5	21.1/19.9	46.3/53.7	68.9	1000×2025
2682	102.5	21.1/19.9	46.5/50.9	52.4	1000×2025
2683	102.7	21.3/20.1	37.4/41.8	50.8	1800×2025
2684	102.7	21.2/20.0	39.0/44.0	50.8	1800×2025
2685	102.6	21.2/20.0	39.2/43.6	50.8	1800×2025
2686	102.6	21.2/20.1	39.7/43.4	50.8	1800×2025

“SR” Source Room; “RR” Receiver Room. *Client specified.

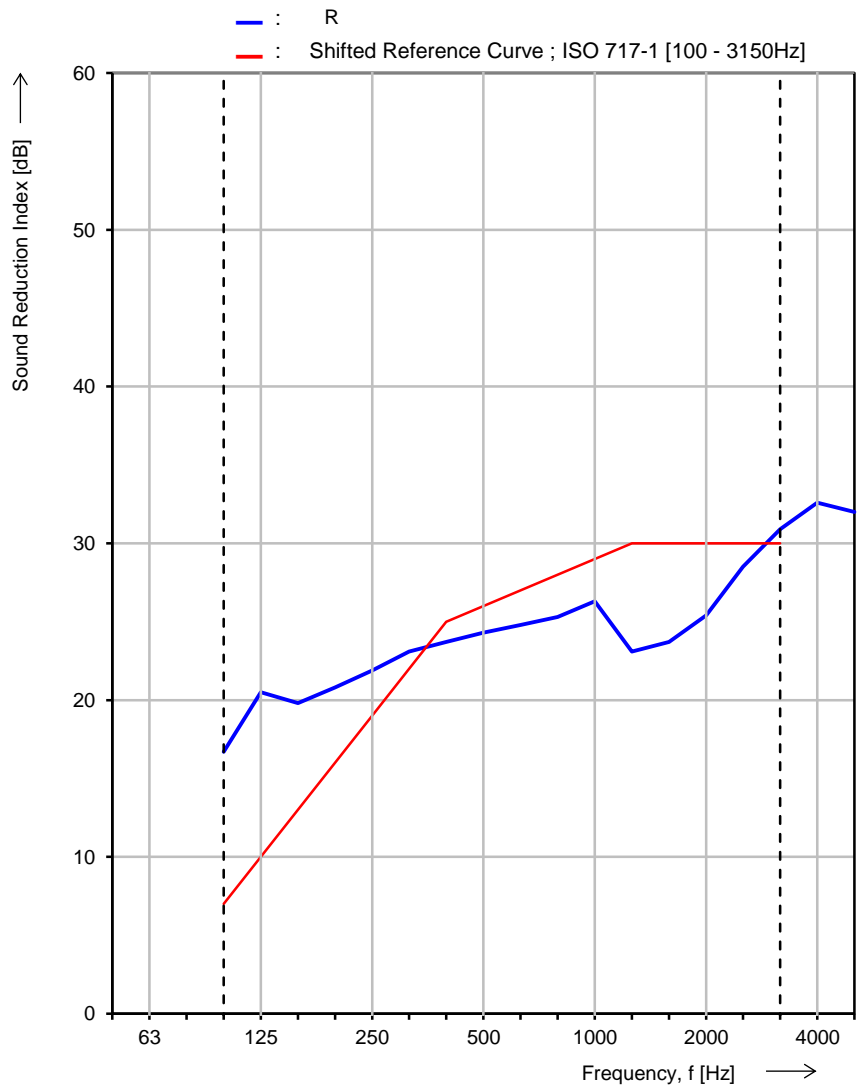
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	BGSD
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	13 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.3 kPa
Source Room Temperature:	20.4 °C	Measured Mass per unit area:	19.3 kg/m ²
Source Room Relative Humidity:	37.9 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.1 °C		
Receiving Room Relative Humidity:	45.0 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	16.7
125	20.5
160	19.8
200	20.8
250	21.9
315	23.1
400	23.7
500	24.3
630	24.8
800	25.3
1000	26.3
1250	23.1
1600	23.7
2000	25.4
2500	28.5
3150	30.9
4000	32.6
5000	32.0



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 26 (-1 ; -2) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -2 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	Signature:	
No. of test report:	2693-2671	Operator:	D. Wong-McSweeney
Date:	13/03/2017		

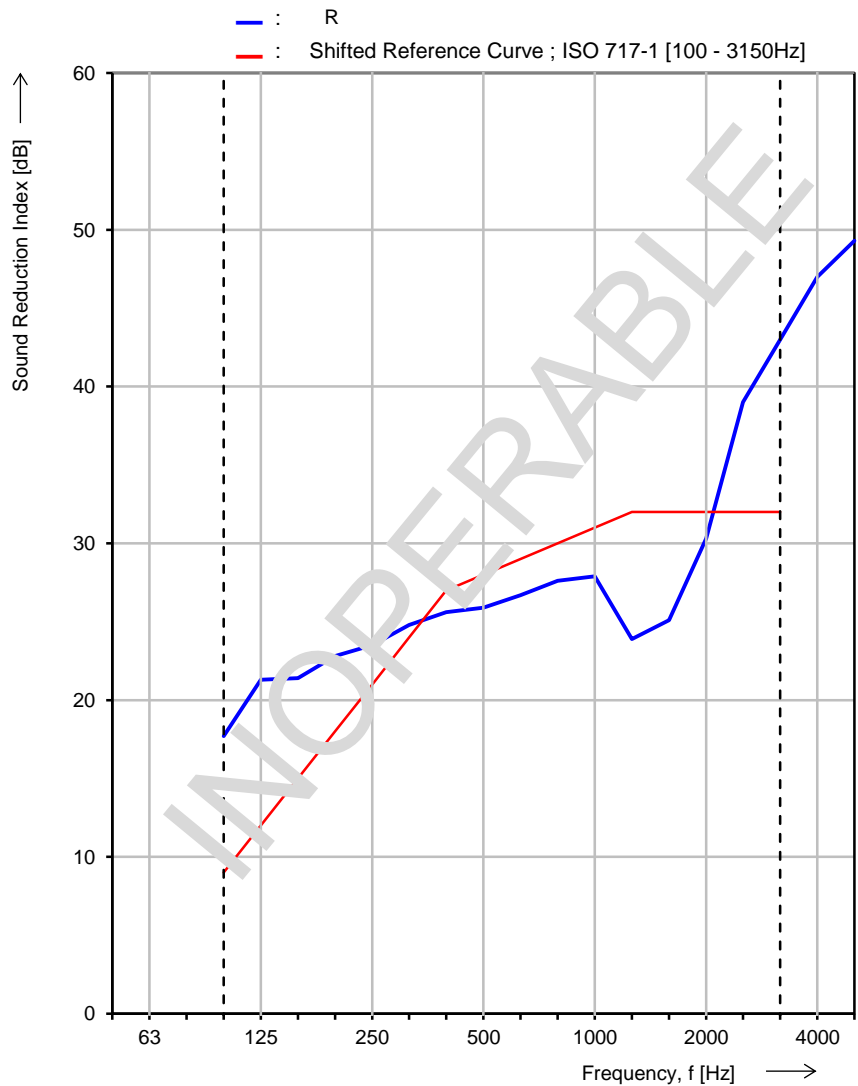
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	BGSD - Fully Sealed
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	13 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.3 kPa
Source Room Temperature:	20.1 °C	Measured Mass per unit area:	19.3 kg/m ²
Source Room Relative Humidity:	41.3 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.1 °C		
Receiving Room Relative Humidity:	46.7 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	17.7
125	21.3
160	21.4
200	22.8
250	23.5
315	24.8
400	25.6
500	25.9
630	26.7
800	27.6
1000	27.9
1250	23.9
1600	25.1
2000	30.3
2500	39.0
3150	43.0
4000	47.0
5000	49.3



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 28 (-1 ; -2) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -2 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	Signature:	
No. of test report:	2693-2672	Operator:	D. Wong-McSweeney
Date:	13/03/2017		

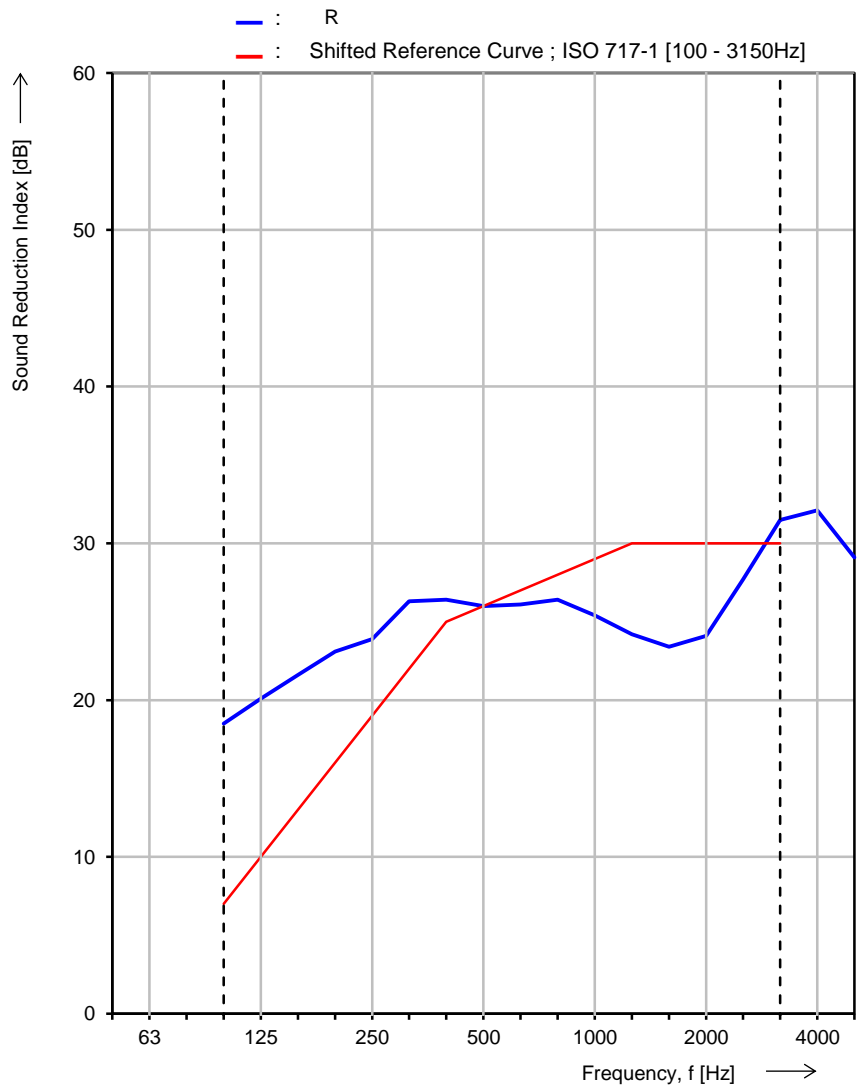
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	EXDSD
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	13 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.3 kPa
Source Room Temperature:	21.0 °C	Client Specified Mass per unit area:	26.7 kg/m ²
Source Room Relative Humidity:	38.6 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.6 °C		
Receiving Room Relative Humidity:	46.3 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	18.5
125	20.1
160	21.6
200	23.1
250	23.9
315	26.3
400	26.4
500	26.0
630	26.1
800	26.4
1000	25.4
1250	24.2
1600	23.4
2000	24.1
2500	27.7
3150	31.5
4000	32.1
5000	29.1



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 26 (-1 ; -1) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -1 dB

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

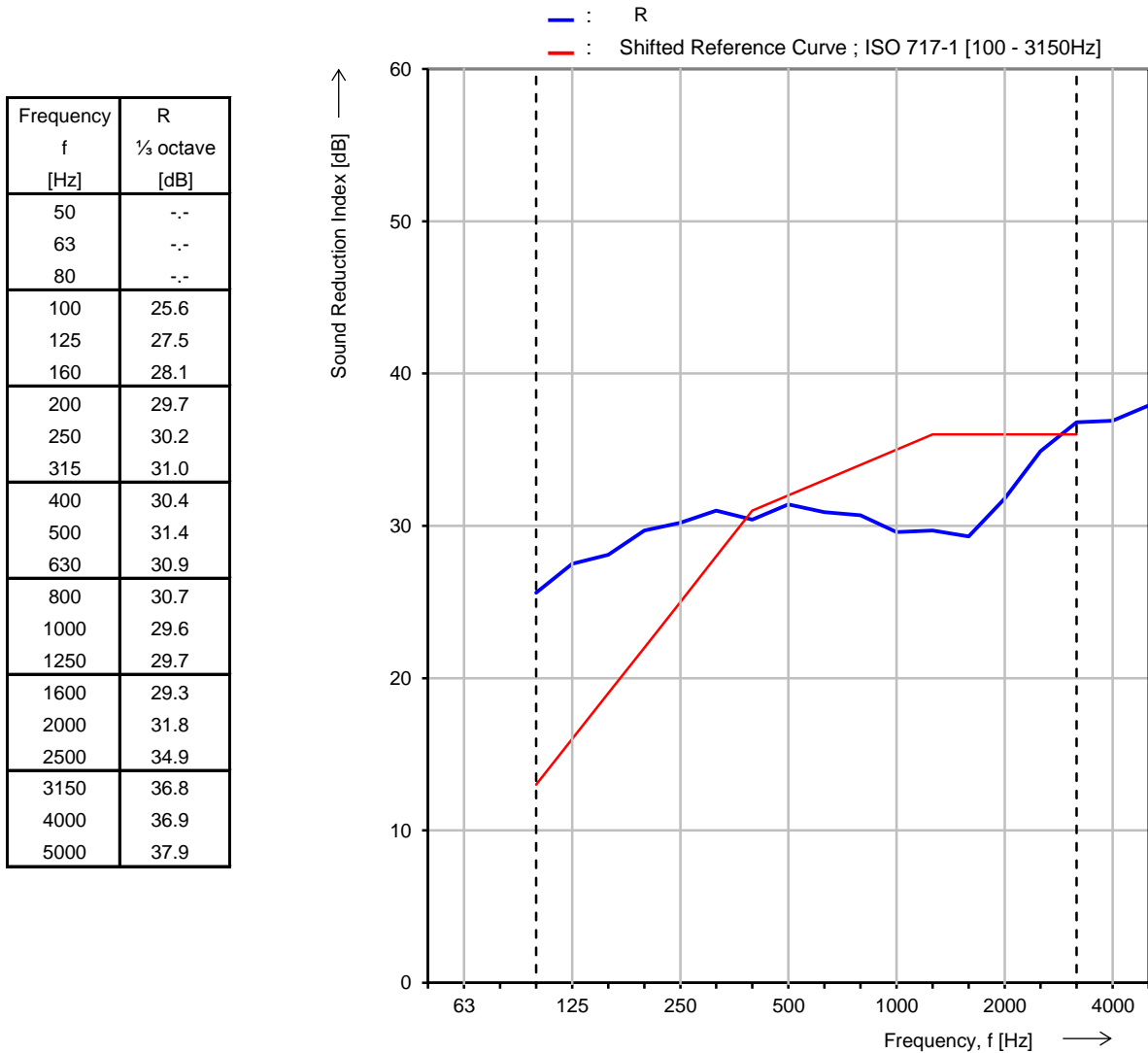
Name of test institute:	The University of Salford, Acoustic Test Laboratory	Signature:	
No. of test report:	2693-2673	Operator:	D. Wong-McSweeney
Date:	13/03/2017		

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

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	HDSD
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	13 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.4 kPa
Source Room Temperature:	20.7 °C	Measured Mass per unit area:	44.4 kg/m ²
Source Room Relative Humidity:	41.7 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.5 °C		
Receiving Room Relative Humidity:	47.9 %		



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 32 (-1 ; -2) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -2 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	Signature:	
No. of test report:	2693-2674	Operator:	D. Wong-McSweeney
Date:	13/03/2017		

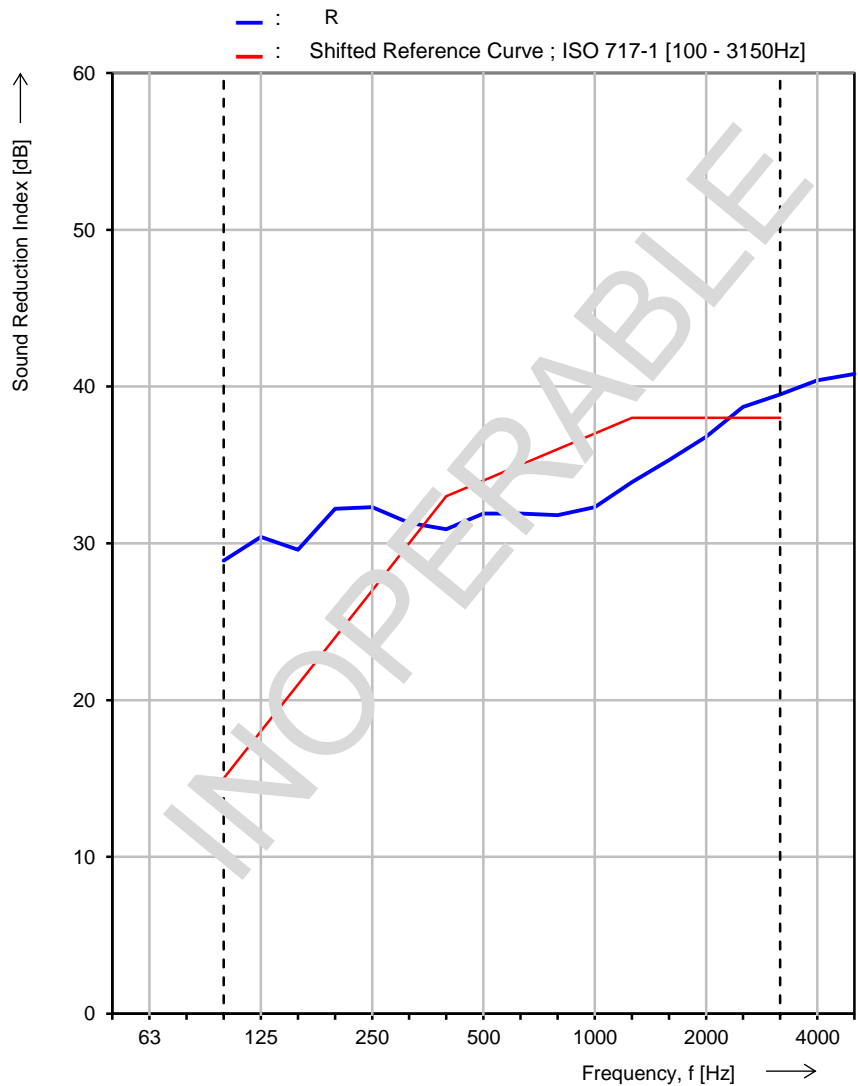
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	HDS Fully Sealed
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	13 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.4 kPa
Source Room Temperature:	20.4 °C	Measured Mass per unit area:	44.4 kg/m ²
Source Room Relative Humidity:	42.5 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.2 °C		
Receiving Room Relative Humidity:	49.0 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	28.9
125	30.4
160	29.6
200	32.2
250	32.3
315	31.3
400	30.9
500	31.9
630	31.9
800	31.8
1000	32.3
1250	33.9
1600	35.3
2000	36.8
2500	38.7
3150	39.5
4000	40.4
5000	40.8



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 34 (0 ; -1) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 1 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -1 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	Signature:	
No. of test report:	2693-2675	Operator:	D. Wong-McSweeney
Date:	13/03/2017		

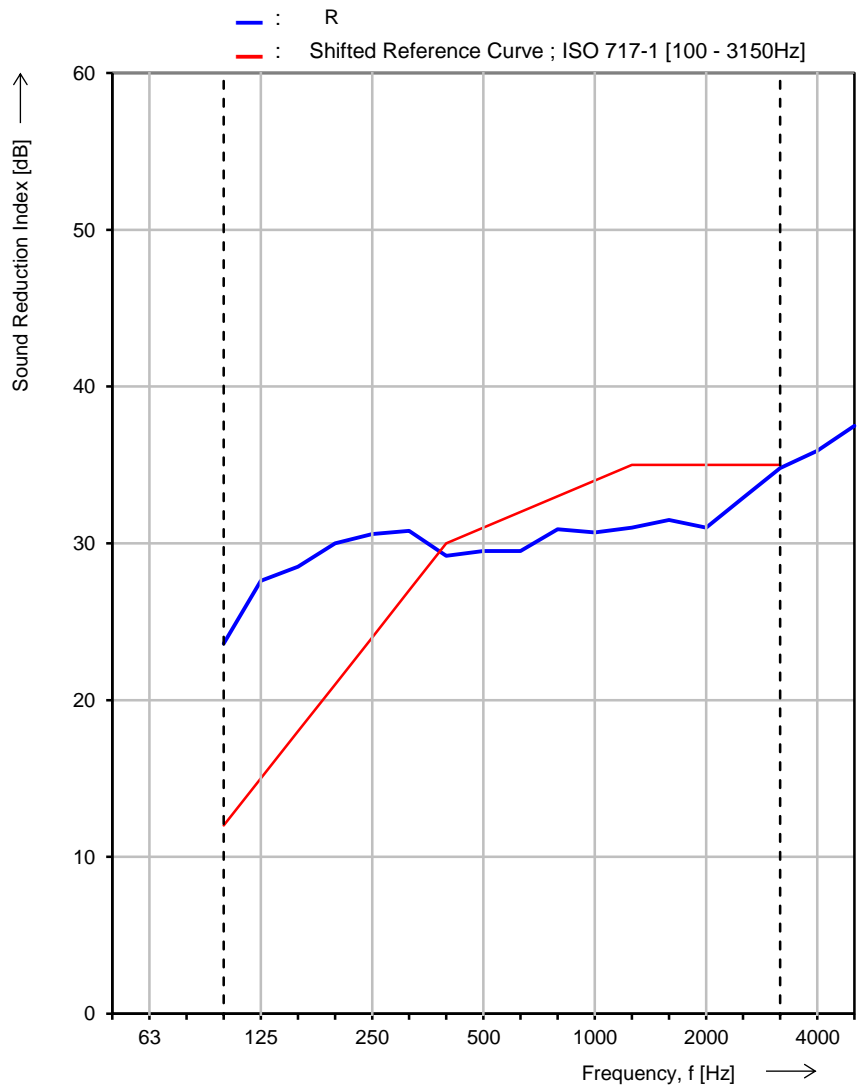
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	SSSD
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	13 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.4 kPa
Source Room Temperature:	20.9 °C	Measured Mass per unit area:	45.2 kg/m ²
Source Room Relative Humidity:	42.3 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.6 °C		
Receiving Room Relative Humidity:	47.8 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	23.6
125	27.6
160	28.5
200	30.0
250	30.6
315	30.8
400	29.2
500	29.5
630	29.5
800	30.9
1000	30.7
1250	31.0
1600	31.5
2000	31.0
2500	32.9
3150	34.8
4000	35.9
5000	37.5



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 31 (0; -1) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 1 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -1 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	Signature:	
No. of test report:	2693-2676	Operator:	D. Wong-McSweeney
Date:	13/03/2017		

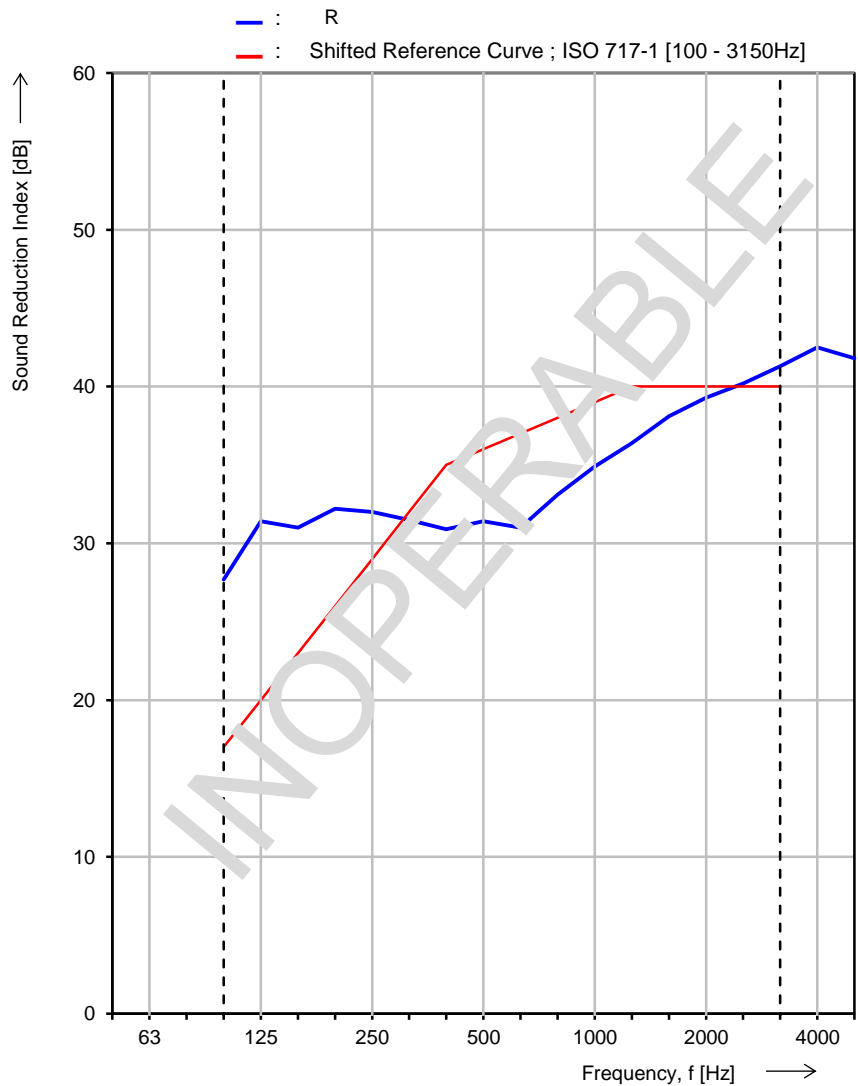
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	SSSD fully sealed
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	13 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.4 kPa
Source Room Temperature:	20.6 °C	Measured Mass per unit area:	45.2 kg/m ²
Source Room Relative Humidity:	44.0 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.4 °C		
Receiving Room Relative Humidity:	49.1 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	27.7
125	31.4
160	31.0
200	32.2
250	32.0
315	31.5
400	30.9
500	31.4
630	31.0
800	33.1
1000	34.9
1250	36.4
1600	38.1
2000	39.3
2500	40.2
3150	41.3
4000	42.5
5000	41.8



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 36 (-1 ; -2) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -2 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	Signature:	
No. of test report:	2693-2677	Operator:	D. Wong-McSweeney
Date:	13/03/2017		

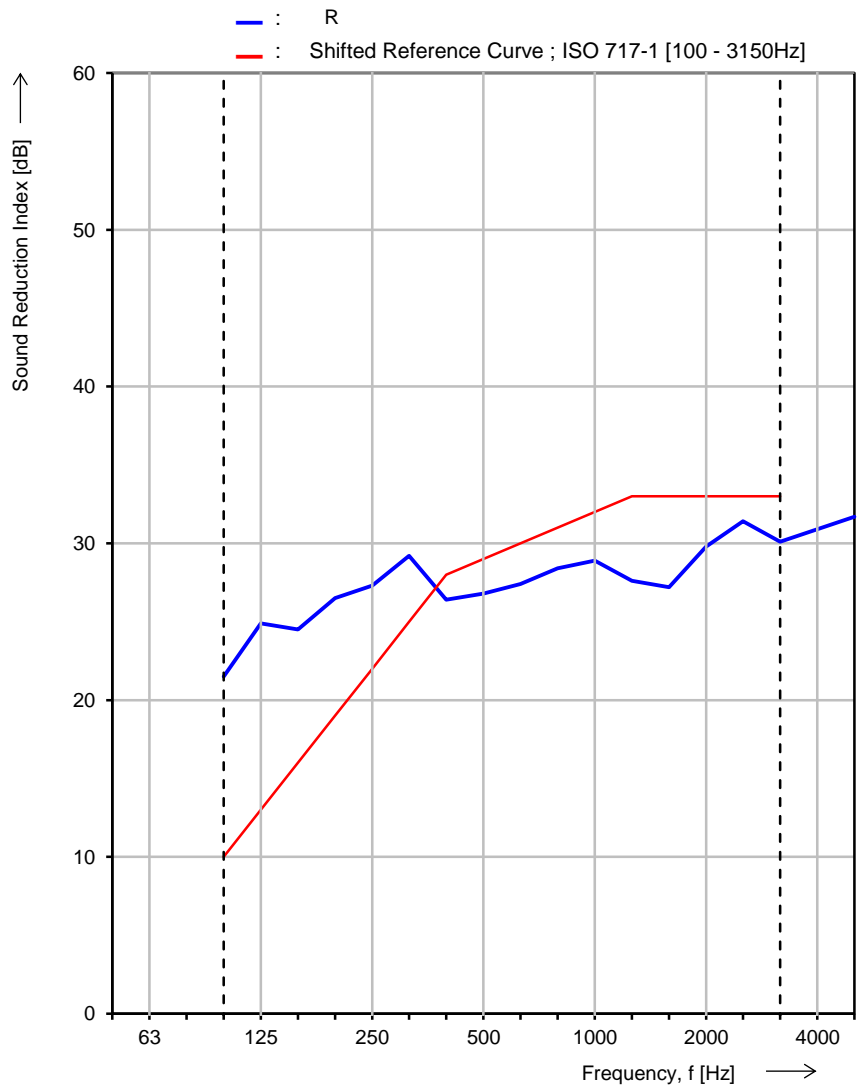
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	UDSD
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	13 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.4 kPa
Source Room Temperature:	20.4 °C	Measured Mass per unit area:	46.2 kg/m ²
Source Room Relative Humidity:	45.3 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.4 °C		
Receiving Room Relative Humidity:	52.0 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	21.5
125	24.9
160	24.5
200	26.5
250	27.3
315	29.2
400	26.4
500	26.8
630	27.4
800	28.4
1000	28.9
1250	27.6
1600	27.2
2000	29.8
2500	31.4
3150	30.1
4000	30.9
5000	31.7



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 29 (-1 ; -1) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -1 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	Signature:	
No. of test report:	2693-2678	Operator:	D. Wong-McSweeney
Date:	13/03/2017		

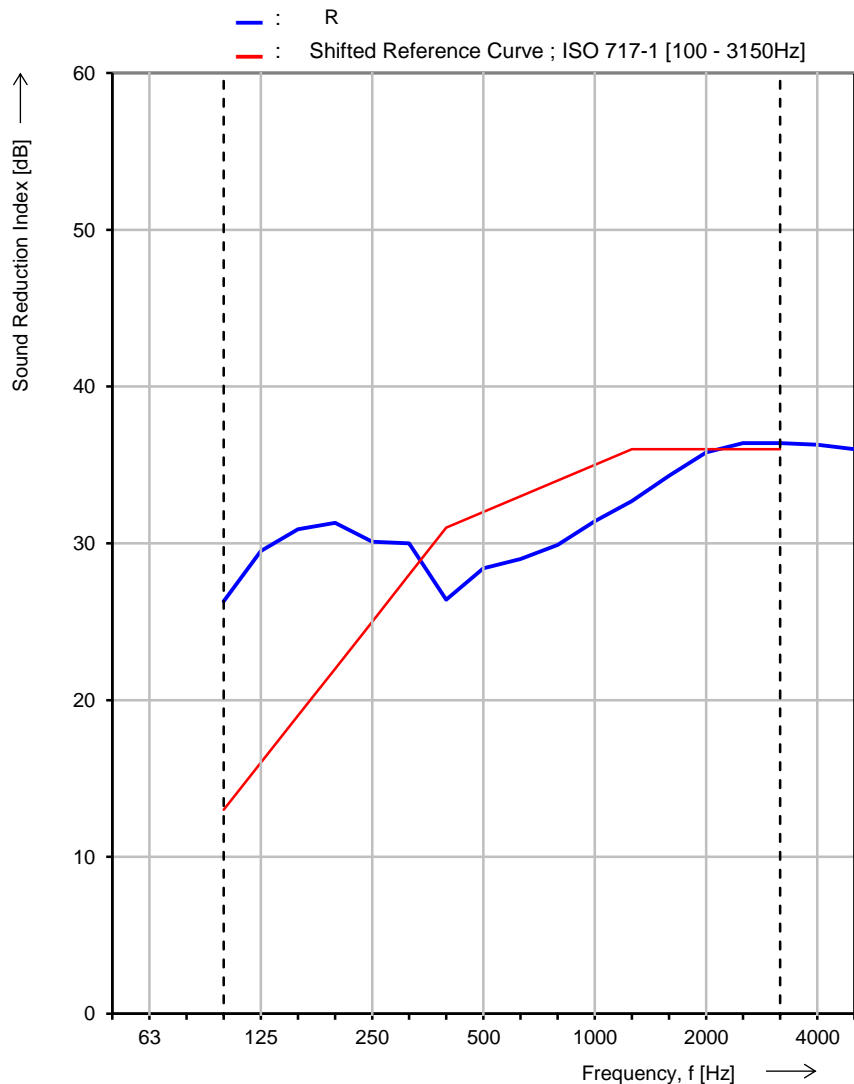
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	UDSD + D Seal + Rockwool in Frame
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	14 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.4 kPa
Source Room Temperature:	21.9 °C	Measured Mass per unit area:	46.2 kg/m ²
Source Room Relative Humidity:	42.4 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	20.1 °C		
Receiving Room Relative Humidity:	51.0 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	26.3
125	29.5
160	30.9
200	31.3
250	30.1
315	30.0
400	26.4
500	28.4
630	29.0
800	29.9
1000	31.4
1250	32.7
1600	34.3
2000	35.8
2500	36.4
3150	36.4
4000	36.3
5000	36.0



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 32 (0; -1) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 1 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -1 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	Signature:	
No. of test report:	2693-2679	Operator:	D. Wong-McSweeney
Date:	14/03/2017		

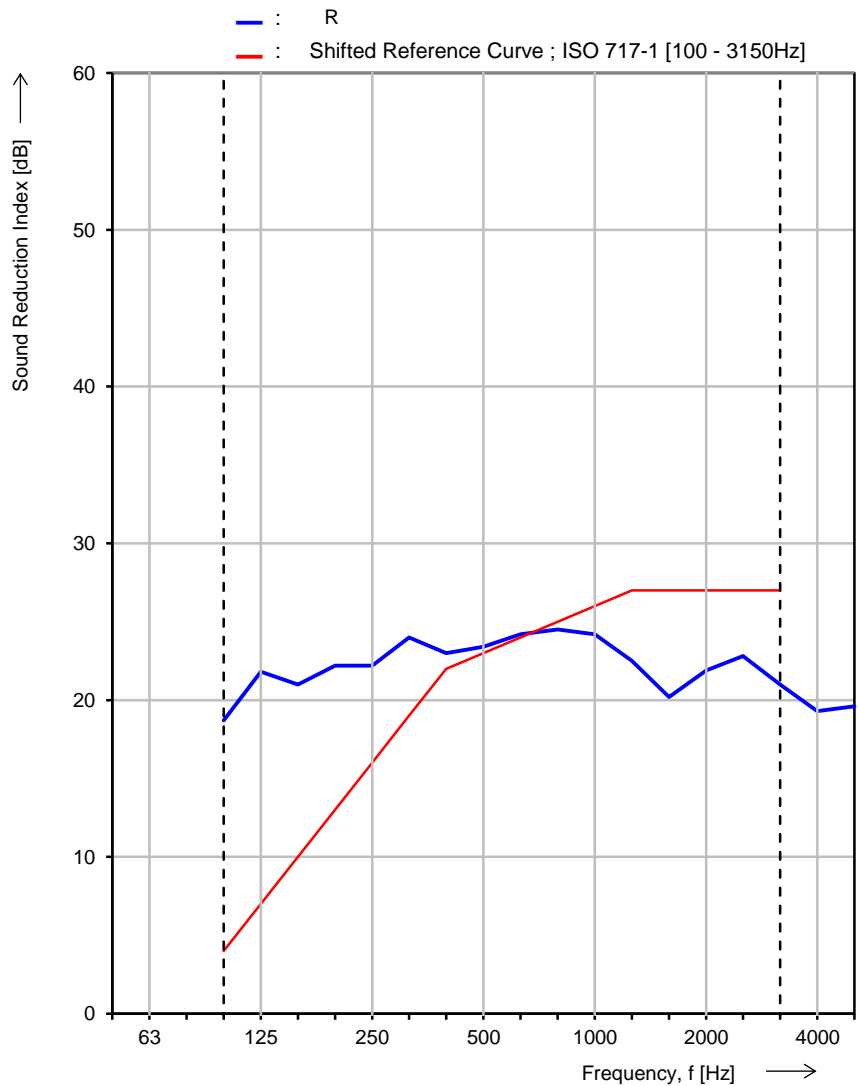
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	UDSD No Seals
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	14 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.4 kPa
Source Room Temperature:	21.2 °C	Measured Mass per unit area:	46.2 kg/m ²
Source Room Relative Humidity:	44.5 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.7 °C		
Receiving Room Relative Humidity:	53.8 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	18.7
125	21.8
160	21.0
200	22.2
250	22.2
315	24.0
400	23.0
500	23.4
630	24.2
800	24.5
1000	24.2
1250	22.5
1600	20.2
2000	21.9
2500	22.8
3150	21.0
4000	19.3
5000	19.6



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 23 (-1 ; 0) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = -1 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -1 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	Signature:	
No. of test report:	2693-2680	Operator:	D. Wong-McSweeney
Date:	14/03/2017		

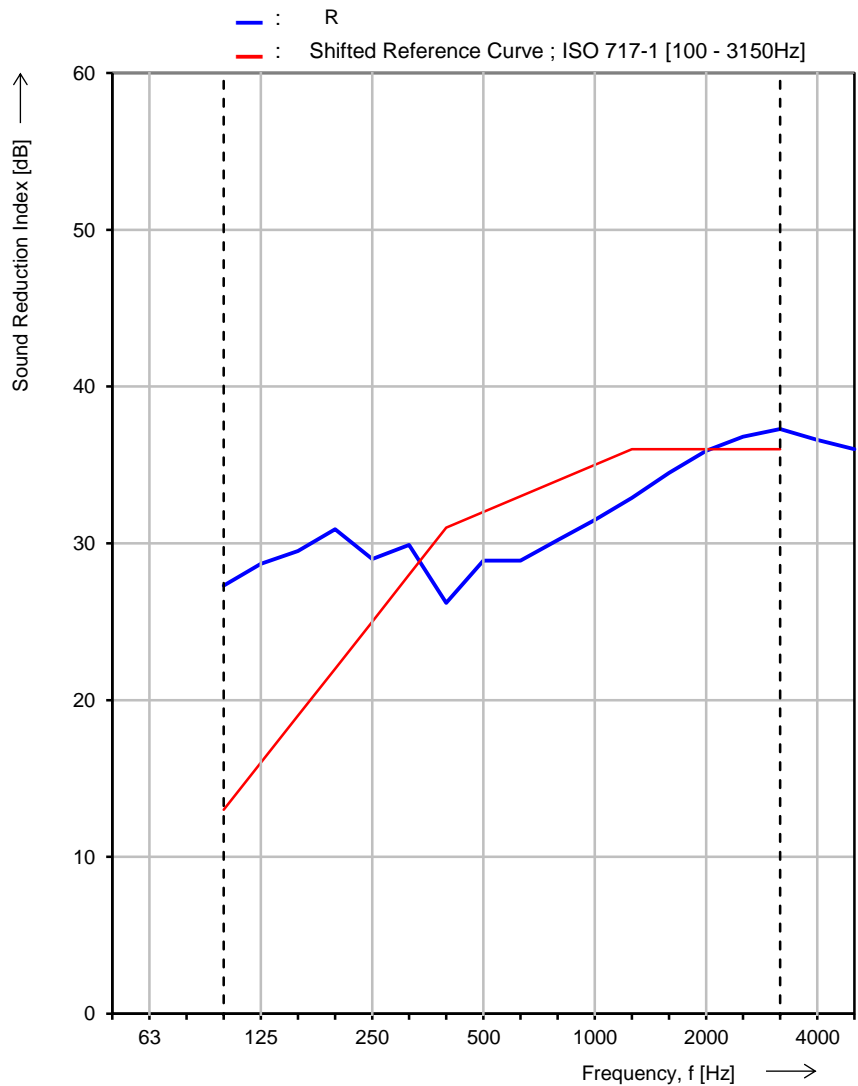
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	UDSD + Soundseal + D Seal
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	14 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.5 kPa
Source Room Temperature:	21.1 °C	Measured Mass per unit area:	46.2 kg/m ²
Source Room Relative Humidity:	46.3 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.9 °C		
Receiving Room Relative Humidity:	53.7 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	27.3
125	28.7
160	29.5
200	30.9
250	29.0
315	29.9
400	26.2
500	28.9
630	28.9
800	30.2
1000	31.5
1250	32.9
1600	34.5
2000	35.9
2500	36.8
3150	37.3
4000	36.6
5000	36.0



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 32 (0 ; -1) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 1 dB

C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -1 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: 2693-2681

Date: 14/03/2017

Signature: _____

Operator: D. Wong-McSweeney

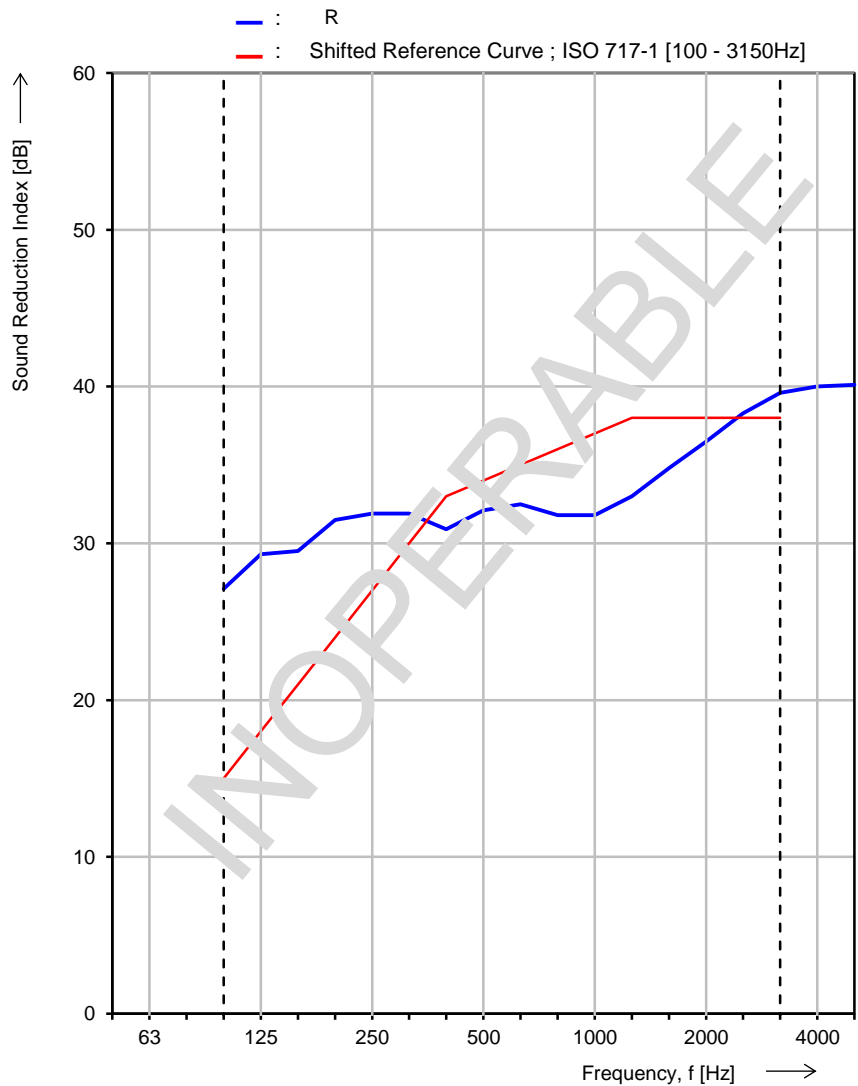
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	HDS + Soundseals
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	2.03 m ²	Date of Test:	14 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.5 kPa
Source Room Temperature:	21.1 °C	Measured Mass per unit area:	44.4 kg/m ²
Source Room Relative Humidity:	46.5 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	19.9 °C		
Receiving Room Relative Humidity:	50.9 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	27.1
125	29.3
160	29.5
200	31.5
250	31.9
315	31.9
400	30.9
500	32.1
630	32.5
800	31.8
1000	31.8
1250	33.0
1600	34.8
2000	36.5
2500	38.3
3150	39.6
4000	40.0
5000	40.1



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 34 (0 ; -1) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 1 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -1 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	Signature:	
No. of test report:	2693-2682	Operator:	D. Wong-McSweeney
Date:	14/03/2017		

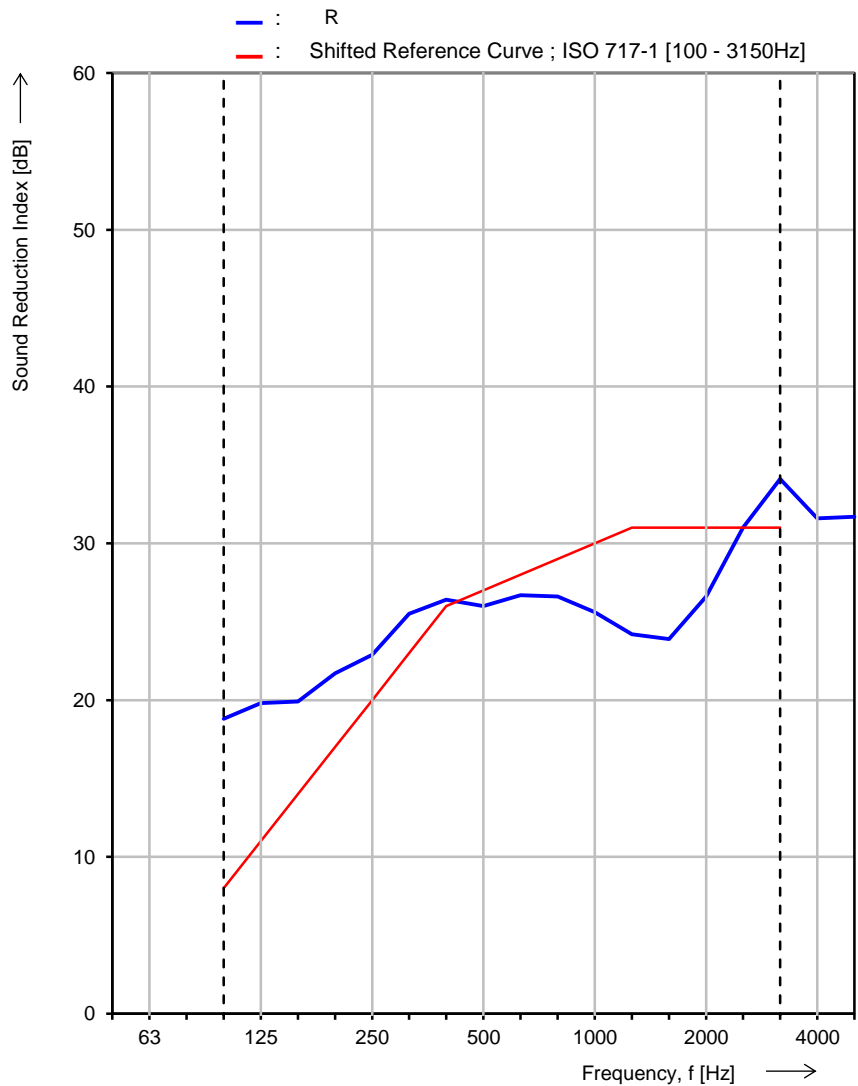
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	HDDD
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	3.65 m ²	Date of Test:	15 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.7 kPa
Source Room Temperature:	21.3 °C	Measured Mass per unit area:	18.6 kg/m ²
Source Room Relative Humidity:	37.4 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	20.1 °C		
Receiving Room Relative Humidity:	41.8 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	18.8
125	19.8
160	19.9
200	21.7
250	22.9
315	25.5
400	26.4
500	26.0
630	26.7
800	26.6
1000	25.6
1250	24.2
1600	23.9
2000	26.6
2500	31.0
3150	34.1
4000	31.6
5000	31.7



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 27 (-1 ; -2) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -2 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	Signature:	
No. of test report:	2693-2683	Operator:	D. Wong-McSweeney
Date:	15/03/2017		

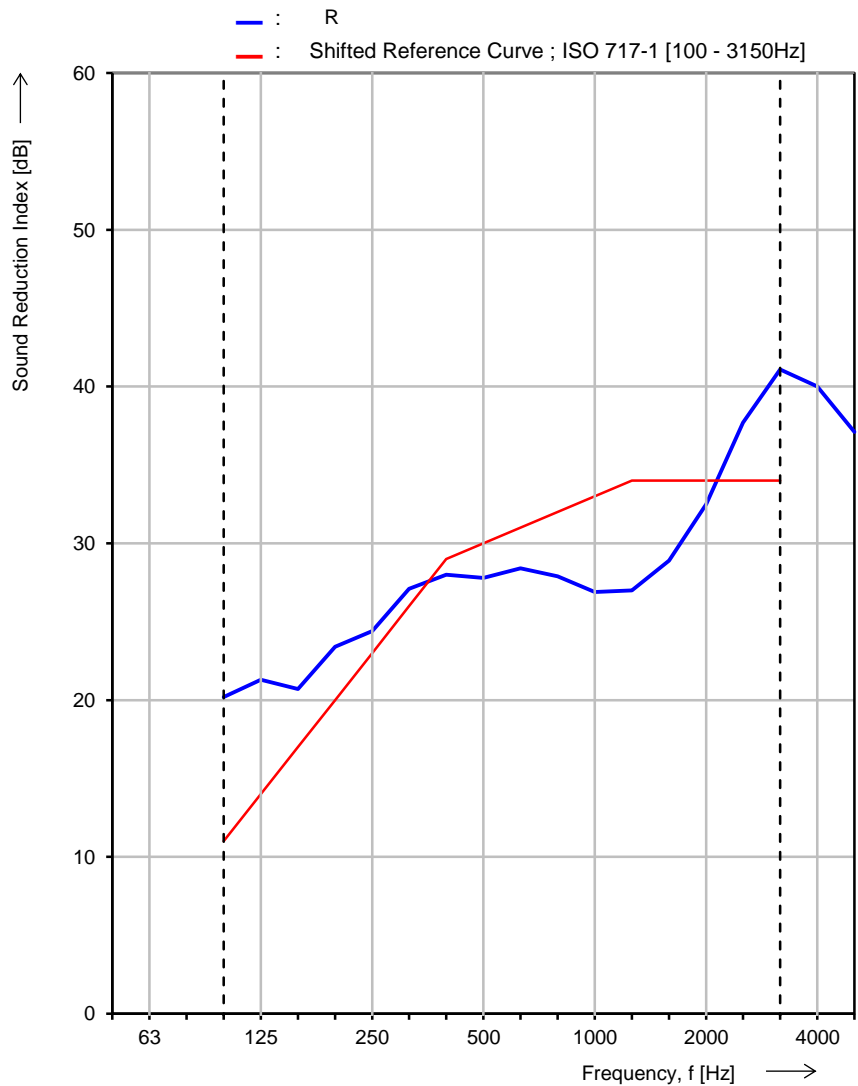
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	HDDD + Extra Seal + Rock Wool
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	3.65 m ²	Date of Test:	15 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.7 kPa
Source Room Temperature:	21.2 °C	Measured Mass per unit area:	18.6 kg/m ²
Source Room Relative Humidity:	39.0 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	20.0 °C		
Receiving Room Relative Humidity:	44.0 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	20.2
125	21.3
160	20.7
200	23.4
250	24.4
315	27.1
400	28.0
500	27.8
630	28.4
800	27.9
1000	26.9
1250	27.0
1600	28.9
2000	32.5
2500	37.7
3150	41.1
4000	40.0
5000	37.1



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 30 (-1 ; -3) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -3 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	Signature:	
No. of test report:	2693-2684	Operator:	D. Wong-McSweeney
Date:	15/03/2017		

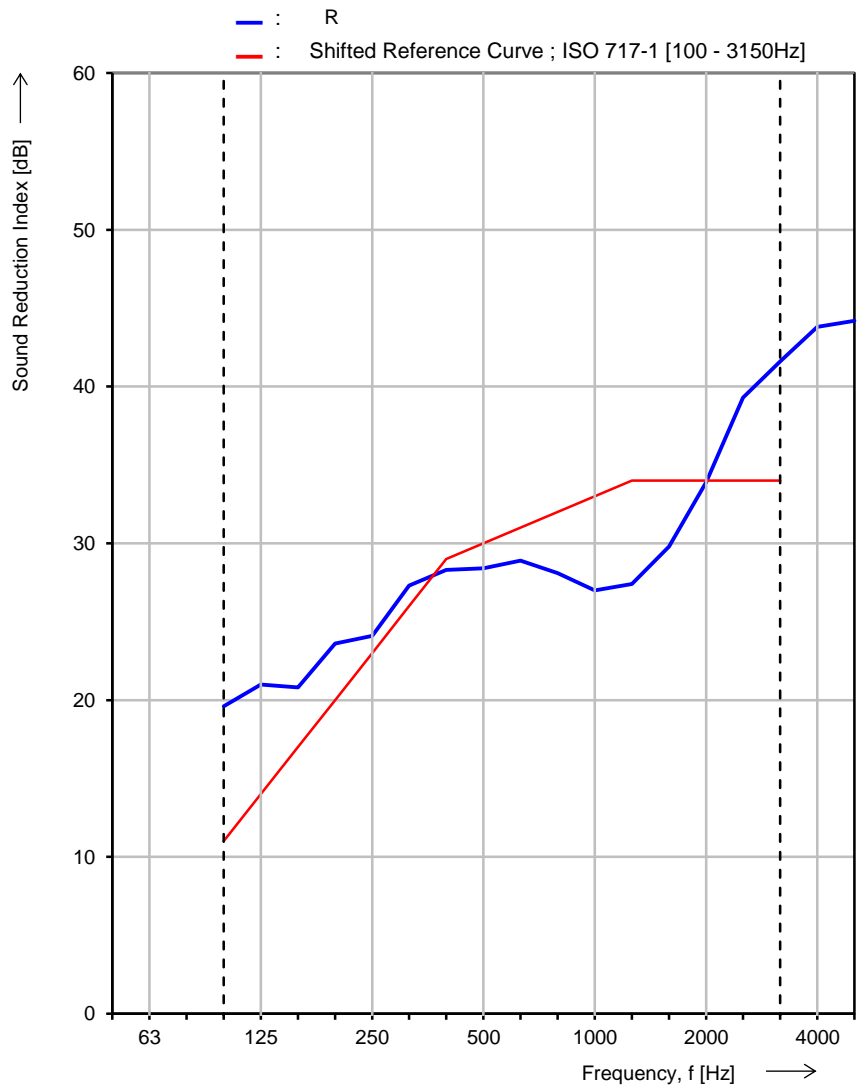
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	HDDD Extra Seals
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	3.65 m ²	Date of Test:	15 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.6 kPa
Source Room Temperature:	21.2 °C	Measured Mass per unit area:	18.6 kg/m ²
Source Room Relative Humidity:	39.2 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	20.0 °C		
Receiving Room Relative Humidity:	43.6 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	19.6
125	21.0
160	20.8
200	23.6
250	24.1
315	27.3
400	28.3
500	28.4
630	28.9
800	28.1
1000	27.0
1250	27.4
1600	29.8
2000	33.9
2500	39.3
3150	41.6
4000	43.8
5000	44.2



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 30 (-1 ; -3) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -3 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	Signature:	
No. of test report:	2693-2685	Operator:	D. Wong-McSweeney
Date:	15/03/2017		

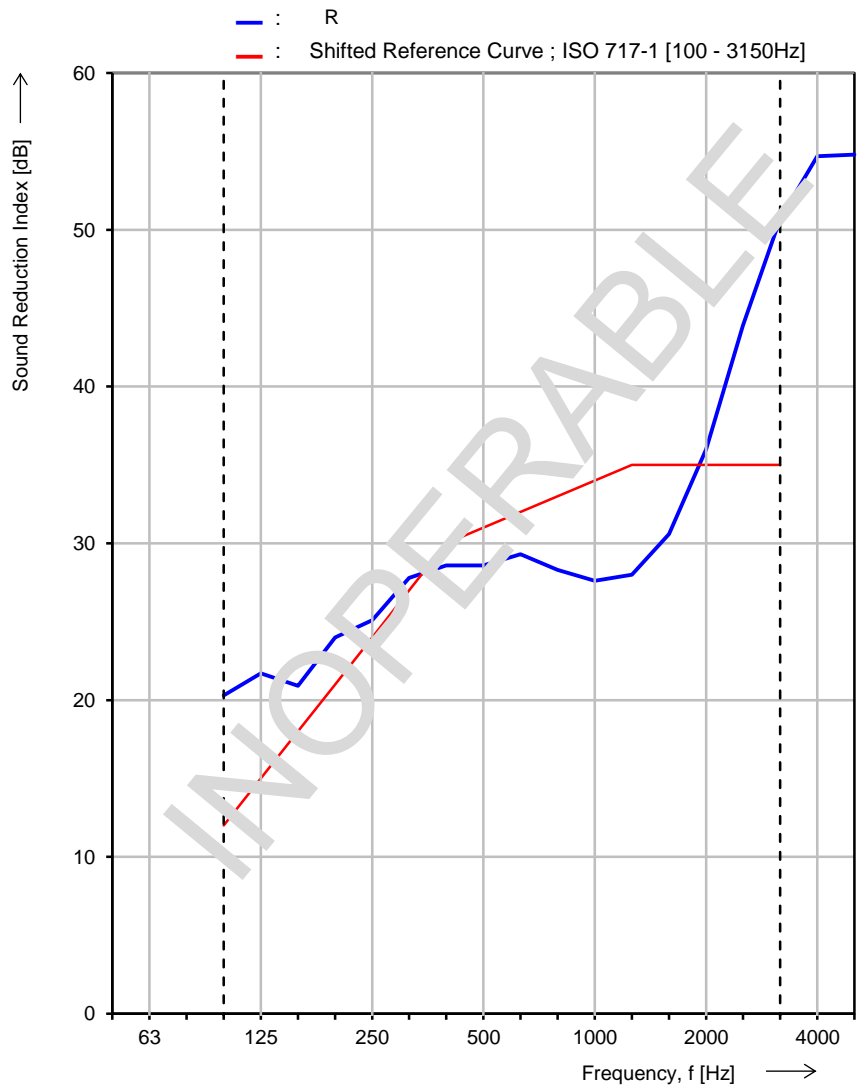
BS EN ISO 10140-2 : 2010, Sound Reduction Index

Laboratory measurement of sound insulation of building elements

Client:	Latham's Steel Security Doorsets Ltd	Product Identification:	HDDD Fully Sealed
Mounted by:	Client	Test Room Identification:	Acoustic Transmission Suite
Sample Size:	3.65 m ²	Date of Test:	15 March 2017
Manufacturer:	Client		
Description:	Door		

Source Room Volume:	136 m ³	Ambient Pressure:	102.6 kPa
Source Room Temperature:	21.2 °C	Measured Mass per unit area:	18.6 kg/m ²
Source Room Relative Humidity:	39.7 %	Curing Time:	Not Applicable
Receiving Room Volume:	221 m ³		
Receiving Room Temperature:	20.1 °C		
Receiving Room Relative Humidity:	43.4 %		

Frequency f [Hz]	R ½ octave [dB]
50	--
63	--
80	--
100	20.3
125	21.7
160	20.9
200	24.0
250	25.1
315	27.8
400	28.6
500	28.6
630	29.3
800	28.3
1000	27.6
1250	28.0
1600	30.6
2000	36.0
2500	43.9
3150	50.7
4000	54.7
5000	54.8



Rating according to BS EN ISO 717-1

R_w (C;Ctr) = 31 (-1 ; -3) dB

C₅₀₋₃₁₅₀ = -- dB ; C₅₀₋₅₀₀₀ = -- dB ; C₁₀₀₋₅₀₀₀ = 0 dB
 C_{tr,50-3150} = -- dB ; C_{tr,50-5000} = -- dB ; C_{tr,100-5000} = -3 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	Signature:	
No. of test report:	2693-2686	Operator:	D. Wong-McSweeney
Date:	15/03/2017		