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ACOUSTIC CONSULTANTS

ADVENT RESIDENTIAL BUILDING 1

FAÇADE SOUND INSULATION ASSESSMENT

ISSUE 02

REPORT REFERENCE NO. J004149-6056-MDS-02

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Document Control Sheet

Details of Assessment	
Client	Thomasons
Document Title	Advent Residential Building 1 - Façade Sound Insulation Assessment
Report Reference	J004149-6056-MDS-02

Client Address:	Company Address:
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Issue	Date	Author	Remark	Status
01	06/03/2023	Max de Salis	Initial Issue	Initial
02	05/04/2023	Max de Salis	Second Issue – Proposed timber cladding replacement system changed from cedar to Cedral Lap cement board	Second Issue

	Name	Position
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Checked By	Chris Wright BSc (Hons) MIOA	Consultant

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This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.

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1.0 SUMMARY

This report has been prepared by Philip Dunbavin Acoustics Ltd (PDA) on behalf of Thomasons to compare the predicted sound insulation performance of the proposed new façade cladding at Advent Buildings, Isaac Way Manchester to the predicted façade sound insulation of the existing / former cladding system.

The predictions in Section 3.0 give the following sound insulation performance predictions for existing and proposed cladding systems:

Table 1: Sound insulation (SI) performance predictions for existing and proposed cladding systems

SI Performance Indicator	**Render Cladding System**		**Metal Cladding System**		**Cedar Lap Cladding System**	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
R_w dB	50	53	50	50	45	49
R_w+C_{tr} dB	43	43	44	44	40	45

As shown the existing cladding sound insulation performance is met or exceeded by the proposed systems in all cases.

2.0 PLANNING CONDITIONS

Manchester City Council Environmental Health have imposed the following planning conditions on the re-cladding project at the Advent Buildings, Isaac Way, Manchester:

- Planning condition 5 (Acoustics) associated with planning permission 128772/FO/2020 Advent One CDN/22/0664

On receipt of the initial information aimed at discharging the said planning conditions, MCC Environmental Health have commented that the submitted information regarding the sound insulation properties of the proposed cladding systems have not been put this into context with the cladding that was being replaced. As such they have informed the contractor that they need to know if the new cladding is the same or better acoustically than what was originally on the building to support the laboratory testing that has been undertaken.

3.0 FAÇADE SOUND INSULATION ASSESSMENT

The assessment in the following sections is based on the following AEW Architects document, which is understood to be identical to the Advent One construction, dated 03/08/2022:

- *12151-AEW-SH-A-0004_(S5) (P03)_Condition 3; External Finishes Schedule – Advent 2&3*

3.1 Render Cladding - Existing

Existing Material

White render – Buildup below

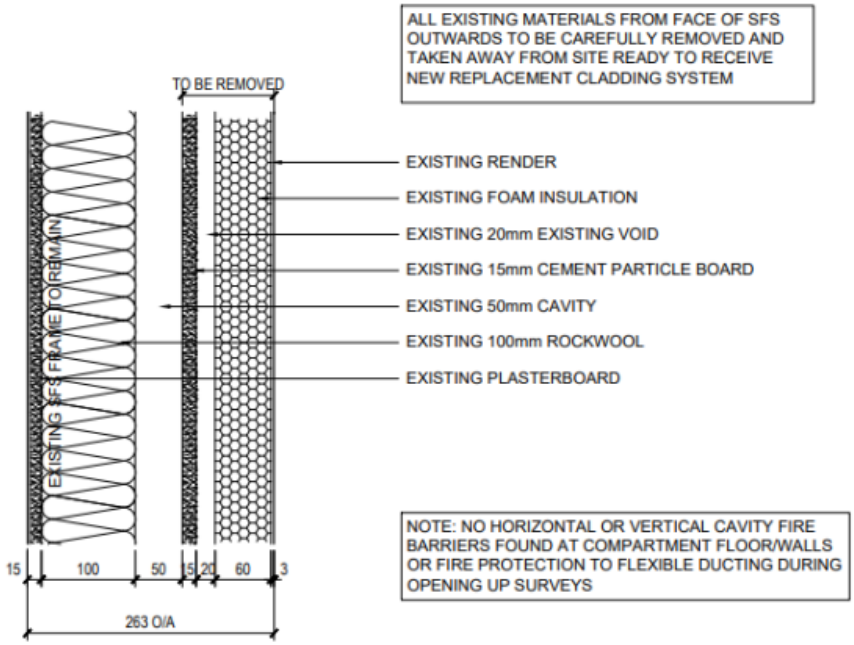


Figure 1: Existing Render Cladding System

Insul ® proprietary sound insulation prediction software has been utilised to assess the sound insulation of the said system. The system as modelled in Insul ® would be equivalent to the following:

- 15mm thick plasterboard wall board
- 150mm structural steel stud (circa 1 to 1.2mm gauge)
- Cavity containing 100mm thick mineral wool at nominal density 10kg/m3
- 15mm Cement Particle board nominal density 1200 kg/m3
- Point connections at nominal 600mm centres forming 80mm cavity.
- 60mm phenolic foam insulation in cavity nominal density circa 40 kg/m3
- 3mm Sand / Cement Render nominal density 1600 kg/m3

The performance prediction sheet is given in Appendix B1 and the overall predicted sound insulation performance given is as follows:

R_w = 50 dB

R_w+C_{tr} = 43 dB

3.2 Render Cladding - Proposed

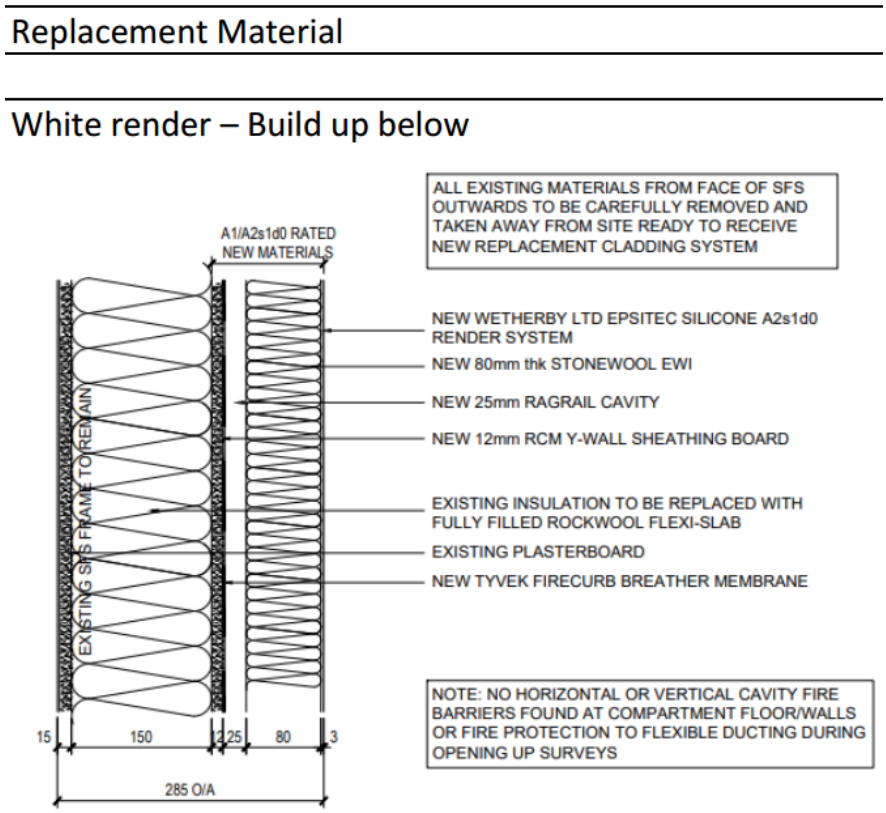


Figure 2: Proposed Render Cladding System

Insul ® proprietary sound insulation prediction software has been utilised to assess the sound insulation of the said system. The system as modelled in Insul ® would be equivalent to the following:

- 15mm thick plasterboard wall board
- 150mm structural steel stud (circa 1 to 1.2mm gauge)
- Cavity containing 150mm thick mineral wool at nominal density 10kg/m3
- 12mm Cement Particle board nominal density 1200 kg/m3
- Point connections at nominal 600mm centres forming 105mm cavity.
- Cavity containing 80mm thick mineral wool at nominal density 10kg/m3
- 3mm Sand / Cement Render nominal density 1600 kg/m3

The performance prediction sheet is given in Appendix B2 and the overall predicted sound insulation performance given is as follows:

R_w = 53 dB

R_w+C_{tr} = 43 dB

3.3 Metal Cladding - Existing

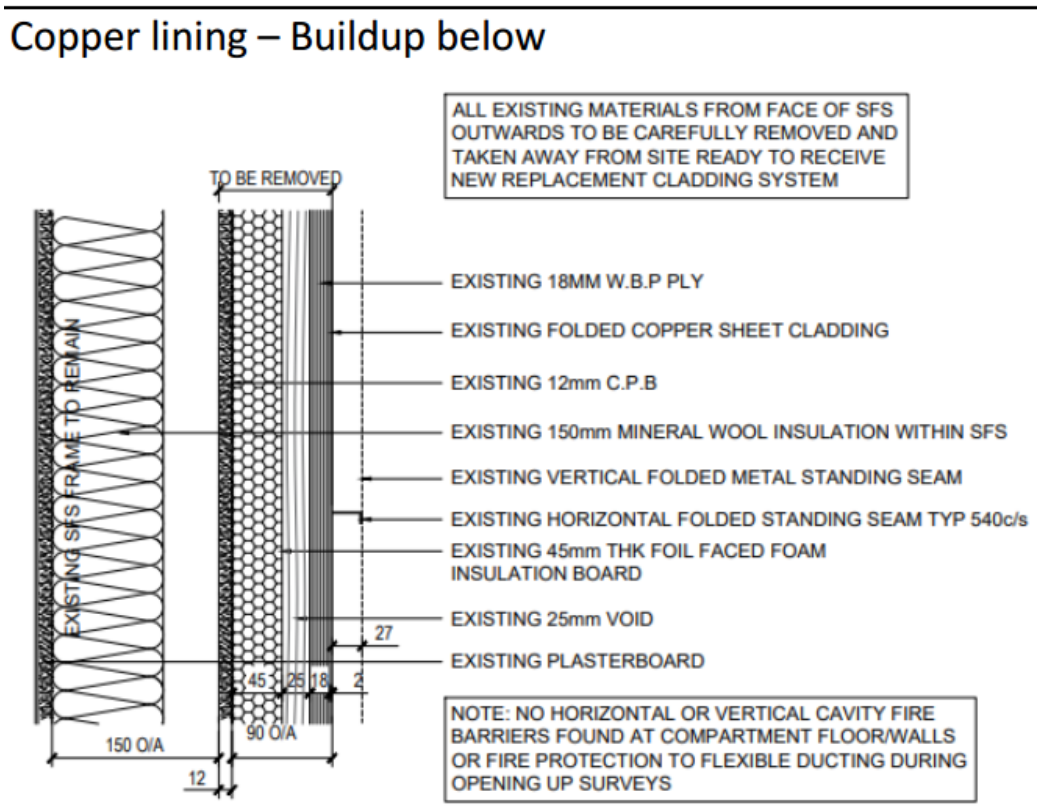


Figure 3: Existing Metal Cladding System

Insul ® proprietary sound insulation prediction software has been utilised to assess the sound insulation of the said system. The system as modelled in Insul ® would be equivalent to the following:

- 15mm thick plasterboard wall board
- 150mm structural steel stud (circa 1 to 1.2mm gauge)
- Cavity containing 100mm thick mineral wool at nominal density 10kg/m3
- 12mm Cement Particle board nominal density 1200 kg/m3
- Point connections at nominal 600mm centres forming 70mm cavity.
- 60mm[1] phenolic foam insulation in cavity nominal density circa 40 kg/m3
- 18mm plywood.
- 1mm Copper at nominal density 8,940 kg/m3

The performance prediction sheet is given in Appendix A2 and the overall predicted sound insulation performance given is as follows:

R_w = 50 dB

R_w+C_{tr} = 44 dB

[1] The actual system is 45mm but Insul only has options for 30mm and 60mm thick in this particular instance. However, there is no change in the overall performance shown between 30mm and 60mm and as such making an assumption at 60mm can be deemed acceptable.

3.4 Metal Cladding - Proposed

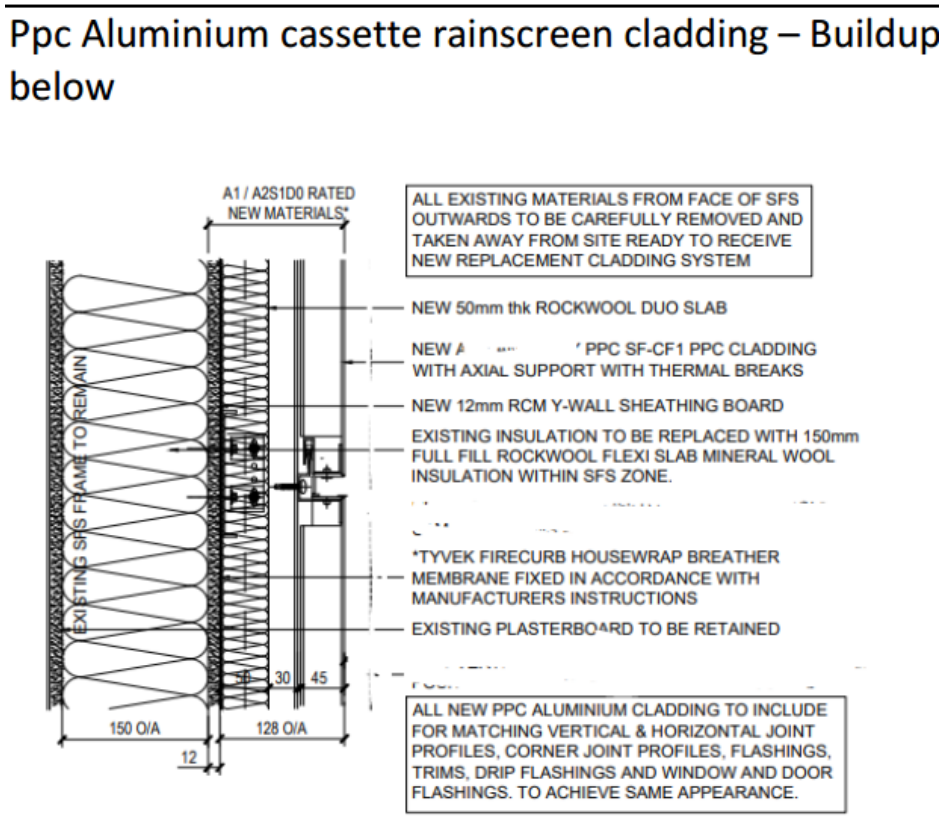


Figure 4: Proposed Metal Cladding System

Insul ® proprietary sound insulation prediction software has been utilised to assess the sound insulation of the said system. The system as modelled in Insul ® would be equivalent to the following:

- 15mm thick plasterboard wall board
- 150mm structural steel stud (circa 1 to 1.2mm gauge)
- Cavity containing 150mm thick mineral wool at nominal density 10kg/m^3.
- 12mm Cement Particle board nominal density 1200 kg/m^3.
- Point connections at nominal 600mm centres forming 125 mm cavity.
- Cavity containing 50mm thick mineral wool at nominal density 10kg/m^3.
- 2mm aluminium at nominal density 2700 kg/m^3

The performance prediction sheet is given in Appendix A2 and the overall predicted sound insulation performance given is as follows:

R_w = 50 dB

R_w+C_{tr} = 44 dB

3.5 Timber Cladding - Existing

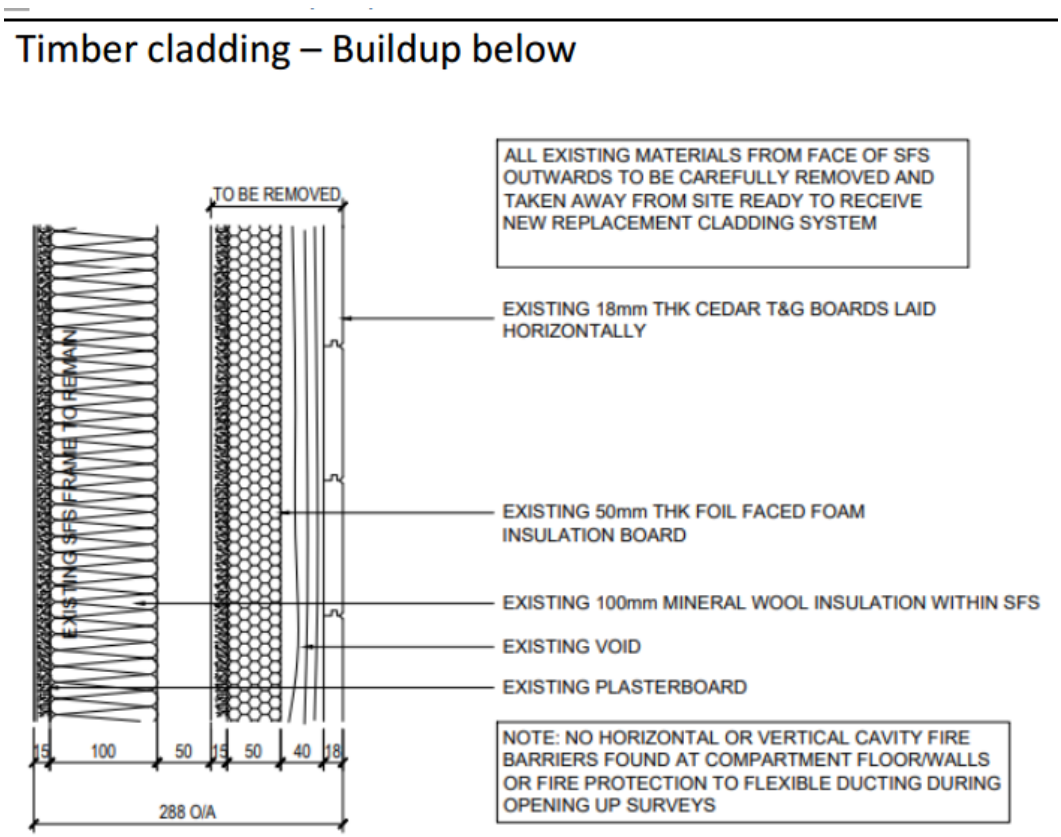


Figure 5: Existing Timber Cladding System

Insul ® proprietary sound insulation prediction software has been utilised to assess the sound insulation of the said system. The system as modelled in Insul ® would be equivalent to the following:

- 15mm thick plasterboard wall board
- 150mm structural steel stud (circa 1 to 1.2mm gauge)
- Cavity containing 150mm thick mineral wool at nominal density 10kg/m^3.
- 12mm Cement Particle board nominal density 1200 kg/m^3.
- Point connections at nominal 600mm centres forming 90mm cavity.
- 60mm[2] phenolic foam insulation in cavity nominal density circa 40 kg/m^3.
- 18mm Cedar nominal density circa 384 kg/m^3.

The performance prediction sheet is given in Appendix A2 and the overall predicted sound insulation performance given is as follows:

R_w = 45 dB

R_w+C_{tr} = 40 dB

[2] The actual system is 50mm but Insul only has options for 30mm and 60mm thick in this particular instance. However, there is no change in the overall performance shown between 30mm and 60mm and as such making an assumption at 60mm can be deemed acceptable.

3.6 Cedral Lap (Cement Board) Cladding - Proposed

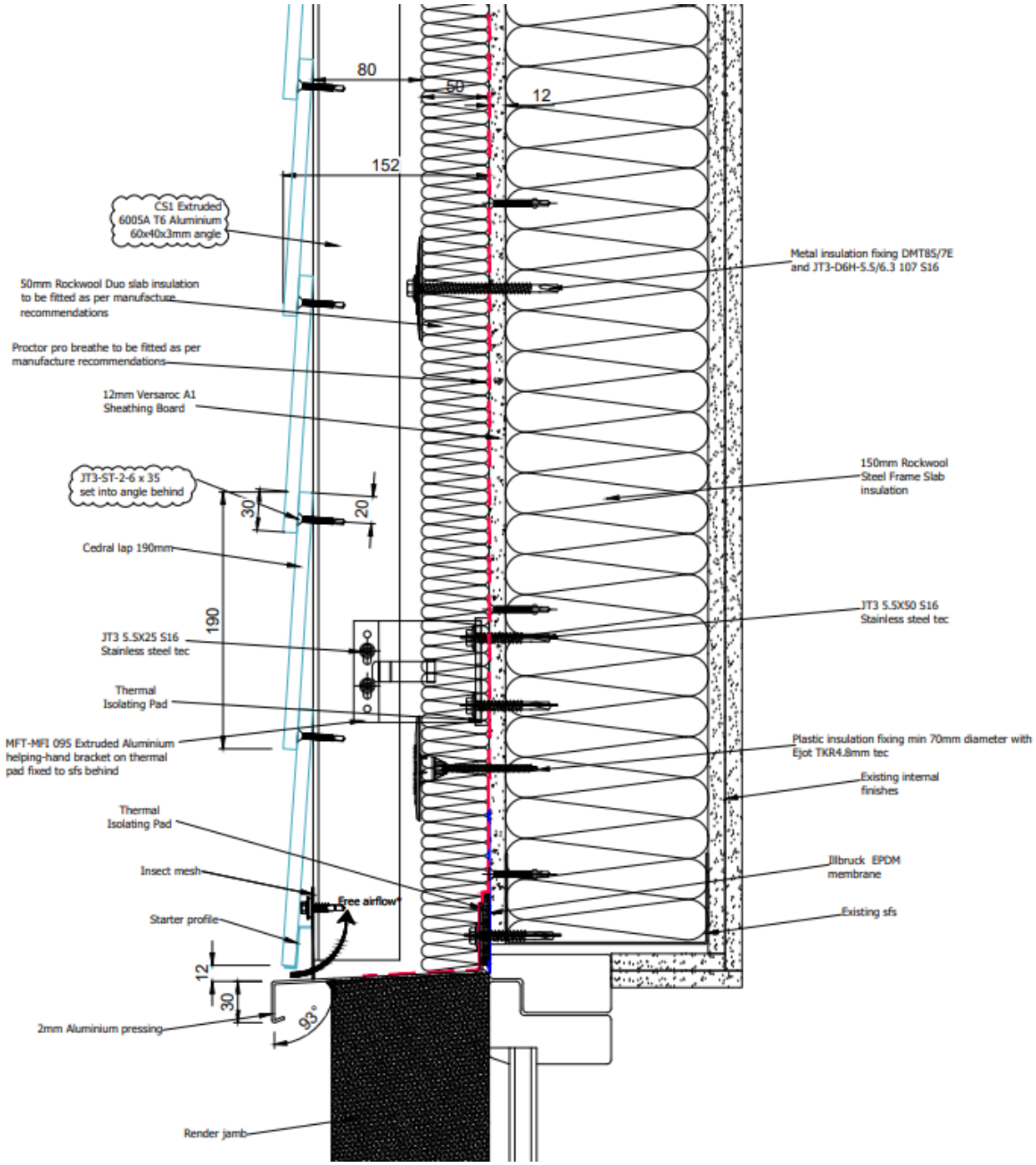


Figure 6: Proposed Timber Cladding System

Insul ® proprietary sound insulation prediction software has been utilised to assess the sound insulation of the said system. The system as modelled in Insul ® would be equivalent to the following:

- Minimum 15mm thick plasterboard wall board
- 150mm structural steel stud (circa 1 to 1.2mm gauge)
- Cavity containing 150mm thick mineral wool at nominal density 10kg/m^3

- 12mm Cement Particle board nominal density 1200 kg/m^3
- Point connections at nominal 600mm centres forming minimum 99 mm cavity.
- Cavity containing 50mm thick mineral wool at nominal density 10kg/m^3
- 10mm thick Cedral Lap cement board nominal density 1300 kg/m^3

The performance prediction sheet is given in Appendix A2 and the overall predicted sound insulation performance given is as follows:

R_w = 49 dB

R_w+C_{tr} = 45 dB

APPENDIX A – DEFINITION OF ACOUSTIC TERMS (ARCHITECTURAL)

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) Leq or 50 dB L_{Aeq}. Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and L_{eq}(s)

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq}, or for A-weighted figures dB(A) L_{eq} or dB L_{Aeq}. It can also be expressed in terms of frequency analysis (see later). L_{eq}(s) is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n, or for A-weighted figures dB(A) L_n or dB L_{An}. It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max}, dB L_{Amax}, etc. It can also be expressed in terms of frequency analysis.

Reverberation Time

This is the most common way of expressing a room's basic acoustic character. It is defined as the duration required for the space-averaged sound energy density in an enclosure to decrease by 60 dB after the source emission has stopped, denoted as RT_{60}. It is usually impractical to measure a full 60 dB dynamic range in the field; a smaller dynamic range may be used extrapolated to a decay time of 60 dB. Common derivations include a range between 5 dB and 25 dB below the initial level, which is labelled T_{20}, or the range between 5 dB and 35 dB below the initial level, labelled as T_{30}.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq}, L_{90}, L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.

Sound reduction index (R)

This is a measure in decibels (dB) of the sound insulation of a particular construction. It is a laboratory measured parameter independent of area, and of receiving room conditions. The sound reduction index is the value produced from laboratory tests on a construction. When tested in a laboratory, results of R are obtained over a range frequencies in 1/3rd and/or full octave bands. These may then be weighted in accordance with BS EN ISO 717: 1997: Part 1 to give the overall *Weighted Sound Reduction Index* R_w. Where sound reduction with respect to road traffic noise is required the frequency weighting may be adapted using the C_{tr} spectrum adaptation term. In this case the single figure value is given in terms of $R_w + C_{tr}$.

Standardised level difference (D_{nT})

This is the level difference adjusted to assume a standard reverberation time of 0.5 seconds in the receiving room so that partitions can be compared independent of the furnishing and surface finishes of the rooms. The measure is generally used in residential testing as 0.5 seconds is taken as the approximate reverberation time of a furnished living room or bedroom. The D_{nT} is usually quoted for 1/3rd octave bands between 100 Hz and 3150 Hz.

Weighted standardised level difference ($D_{nT,w}$)

The $D_{nT,w}$ is a single figure expression used to describe the sound insulation of a partition. The weighting system used to obtain the single figure $D_{nT,w}$ from the 1/3rd octave D_{nT} values is given in BS EN ISO 717: Part 1. The $D_{nT,w}$ is used for expressing sound insulation measured "in the field", and is part of the term used in Approved Document E 2003, guidance to the Building Regulations for the assessment of performance of separating elements between residences.

Spectrum adaptation terms (C, C_{tr})

These terms are single figure values which are added to a single figure R_w or D_w term to adapt the frequency weighting for different source noise spectra. Adding the C_{tr} term to a weighted parameter approximates to the human perceived sound insulation of an element when subjected to road traffic noise. The C_{tr} term may be used to determine a single figure approximation of sound insulation against road traffic noise. The C_{tr} term is part of the term used in Approved Document E: 2003 of the Building Regulations for the assessment of performance of separating elements between residences.

Flanking

Flanking is the term used to describe how sound gets from one room to another by routes other than via the wall or floor directly separating them. Such flanking paths around a party wall would be the internal leaf of the external wall or the roof void, plus any air gaps at junctions. The sound insulation of flanking paths is very important. If the insulation is poor it can result in a poor built performance in terms of sound insulation, even if the party walls or floors themselves are adequate. When a measurement of sound insulation is made in a building as opposed to an acoustic laboratory, it will include flanking sound transmission. Standards for sound insulation in residential properties now require testing of $D_{nT,w} + C_{tr}$ values which include sound transmission via flanking paths.

APPENDIX B – INSUL ® SOUND INSULATION PERFORMANCE PREDICTIONS

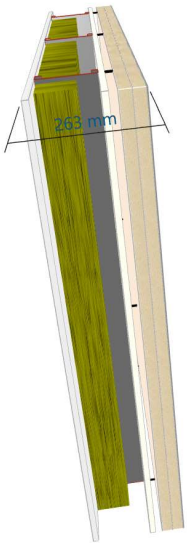
B1

INSUL ® MODEL OF EXISTING RENDER CLADDING SYSTEM

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 5527
Job Name:
Job No.: Initials:Naomi Bolton
Date:23/11/2022
File Name:Insul White Render Existing.ixl

Notes:



Rw 50 dB
C -2 dB
Ctr -7 dB

Mass-air-mass resonant frequency = =58 Hz , 212 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 37.1 kg/m²

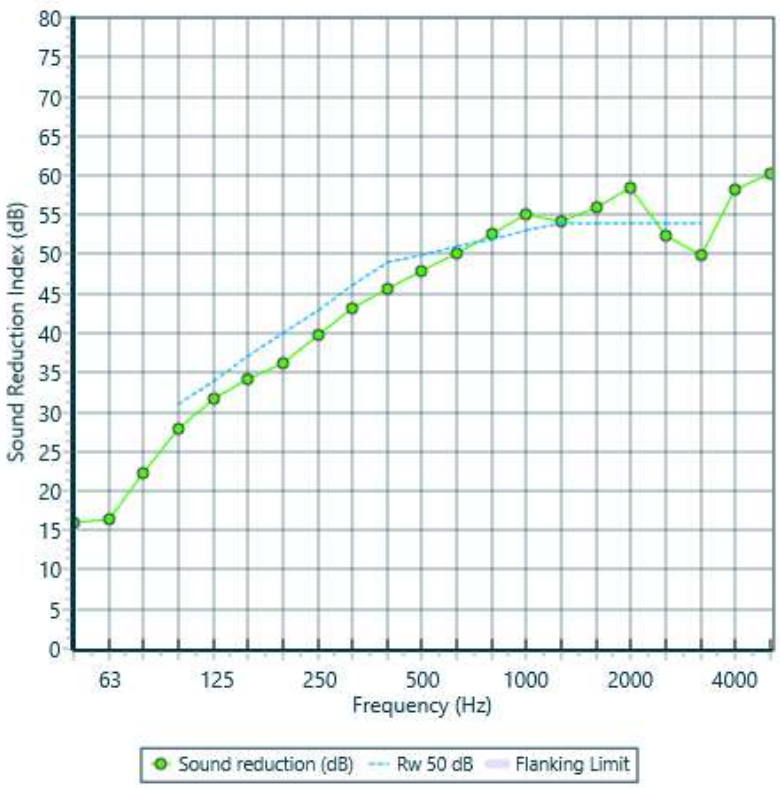
System description

Panel 1 : 1 x 15 mm Gyproc Wallboard 15mm

Frame: Steel Stud (1.0-1.6mm) (1.5E2 mm x 38 mm), Stud spacing 600 mm ; Cavity Width 150 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 100 mm ...
Panel 2 : 1 x 15 mm NuClad

Frame: Point Connection (20 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 20 mm
Panel 3 : 2 x 29.9 mm Kool Duct + 1 x 3 mm Sand/Cement render (plaster)

freq.(Hz)	R(dB)	R(dB)
50	16	
63	16	17
80	22	
100	28	
125	32	30
160	34	
200	36	
250	40	39
315	43	
400	46	
500	48	48
630	50	
800	53	
1000	55	54
1250	54	
1600	56	
2000	58	55
2500	52	
3150	50	
4000	58	54
5000	60	



B2

INSUL ® MODEL OF PROPOSED RENDER CLADDING SYSTEM

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 5527
Job Name:
Job No.: Initials:Naomi Bolton
Date:23/11/2022
File Name:Insul White Render Proposed.ixl

Notes:

Rw 53 dB
C -3 dB
Ctr -10 dB

Mass-air-mass resonant frequency = =59 Hz , 101 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 31.3 kg/m²

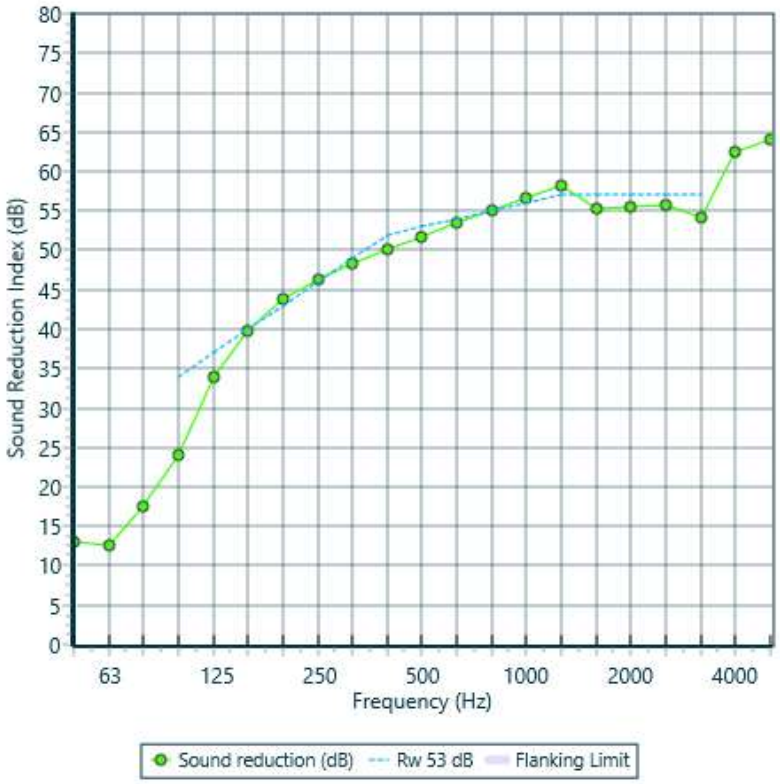
System description

Panel 1 : 1 x 15 mm Gyproc Wallboard 15mm

Frame: Steel Stud (1.0-1.6mm) (1.5E2 mm x 38 mm), Stud spacing 600 mm ; Cavity Width 150 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 150 mm ...
Panel 2 : 1 x 12 mm NuClad

Frame: Point Connection (1E2 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 105 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 80 mm
Panel 3 : 1 x 3 mm Sand/Cement render (plaster)

freq.(Hz)	R(dB)	R(dB)
50	13	
63	13	14
80	17	
100	24	
125	34	28
160	40	
200	44	
250	46	46
315	48	
400	50	
500	52	52
630	53	
800	55	
1000	57	56
1250	58	
1600	55	
2000	55	55
2500	56	
3150	54	
4000	62	58
5000	64	



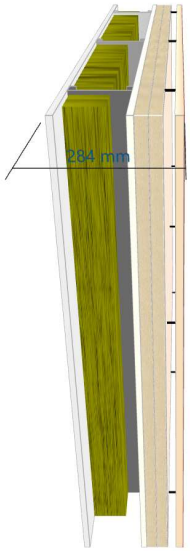
B3

INSUL ® MODEL OF EXISTING METAL CLADDING SYSTEM

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 5527
Job Name:
Job No.: Initials:Naomi Bolton
Date:23/11/2022
File Name:Insul Metal Existing.ixl

Notes:



Rw 50 dB
C -2 dB
Ctr -6 dB

Mass-air-mass resonant frequency = =54 Hz , 143 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 51.3 kg/m²

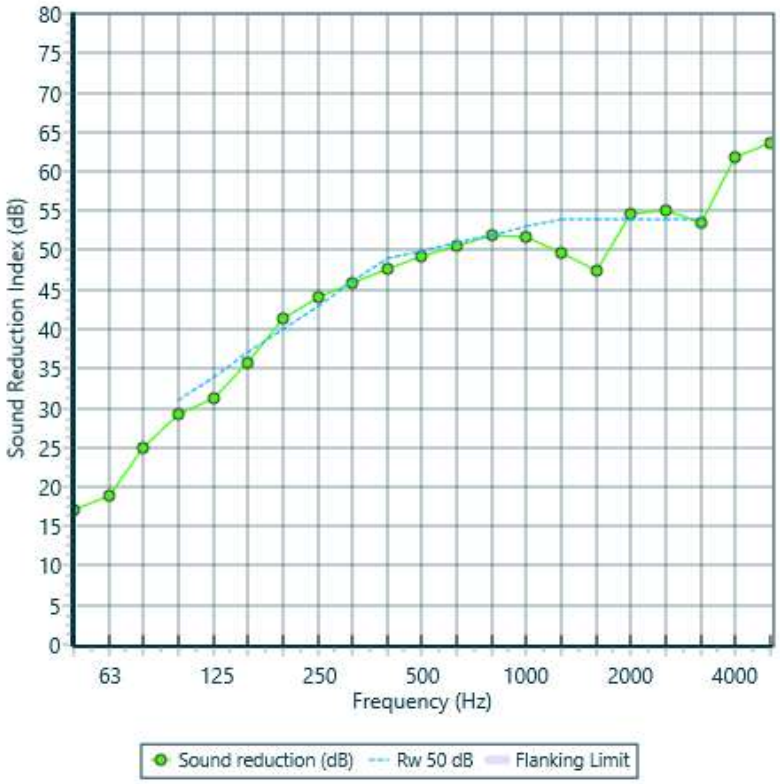
System description

Panel 1 : 1 x 15 mm Gyproc Wallboard 15mm

Frame: Steel Stud (1.0-1.6mm) (1.5E2 mm x 38 mm), Stud spacing 600 mm ; Cavity Width 150 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 100 mm ...
Panel 2 : 1 x 15 mm NuClad + 2 x 29.9 mm Kool Duct

Frame: Point Connection (25 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 25 mm
Panel 3 : 1 x 18 mm Plywood + 1 x 1 mm Copper

freq.(Hz)	R(dB)	R(dB)
50	17	
63	19	19
80	25	
100	29	
125	31	31
160	36	
200	41	
250	44	43
315	46	
400	48	
500	49	49
630	51	
800	52	
1000	52	51
1250	50	
1600	48	
2000	55	51
2500	55	
3150	54	
4000	62	57
5000	64	



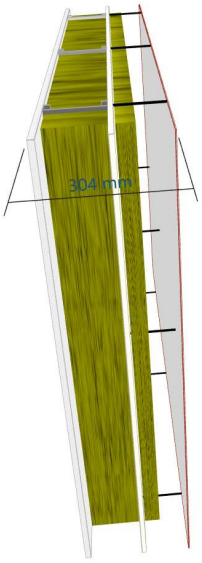
B4

INSUL ® MODEL OF PROPOSED METAL CLADDING SYSTEM

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 5527
Job Name:
Job No.: Initials:Naomi Bolton
Date:23/11/2022
File Name:Insul Metal Proposed.ixl

Notes:



Rw 50 dB
C -1 dB
Ctr -6 dB

Mass-air-mass resonant frequency = =57 Hz , 89 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 32 kg/m²

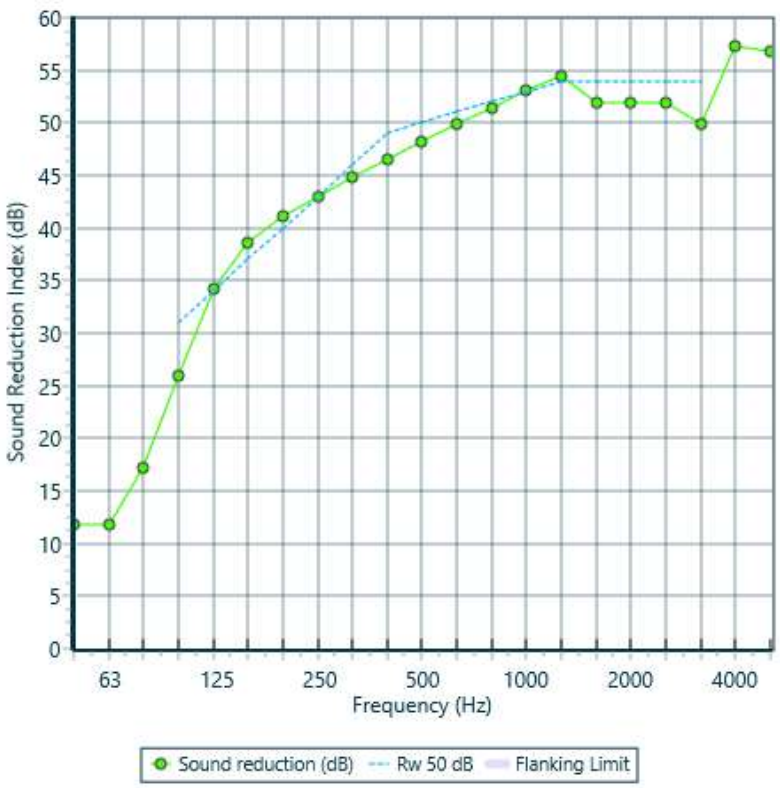
System description

Panel 1 : 1 x 15 mm Gyproc Wallboard 15mm

Frame: Steel Stud (1.0-1.6mm) (1.5E2 mm x 38 mm), Stud spacing 600 mm ; Cavity Width 150 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 150 mm ...
Panel 2 : 1 x 12 mm NuClad

Frame: Point Connection (1.3E2 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 125 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 50 mm
Panel 3 : 1 x 2 mm Aluminium

freq.(Hz)	R(dB)	R(dB)
50	12	
63	12	13
80	17	
100	26	
125	34	30
160	39	
200	41	
250	43	43
315	45	
400	46	
500	48	48
630	50	
800	51	
1000	53	53
1250	54	
1600	52	
2000	52	52
2500	52	
3150	50	
4000	57	53
5000	57	



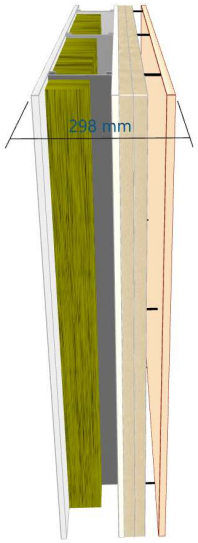
B5

INSUL ® MODEL OF EXISTING TIMBER CLADDING SYSTEM

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 5527
Job Name:
Job No.: Initials:Naomi Bolton
Date:23/11/2022
File Name:Insul Timber Existing.ixl

Notes:



Rw 45 dB
C -2 dB
Ctr -5 dB

Mass-air-mass resonant frequency = =57 Hz , 156 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 39.2 kg/m²

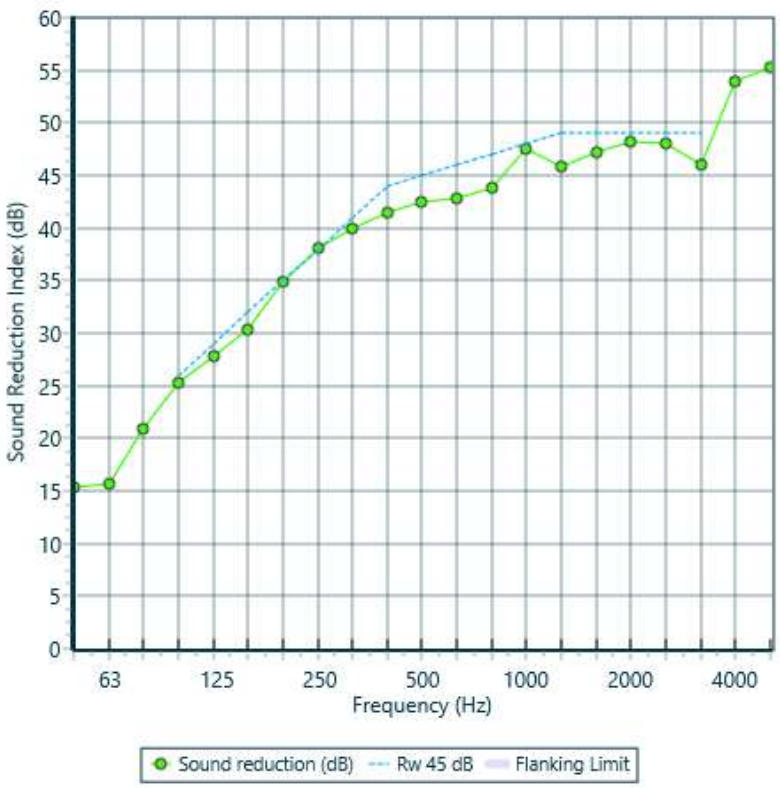
System description

Panel 1 : 1 x 15 mm Gyproc Wallboard 15mm

Frame: Steel Stud (1.0-1.6mm) (1.5E2 mm x 38 mm), Stud spacing 600 mm ; Cavity Width 150 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 100 mm ...
Panel 2 : 1 x 15 mm NuClad + 2 x 29.9 mm Kool Duct

Frame: Point Connection (40 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 40 mm
Panel 3 : 1 x 18 mm Cedar (Western Red)

freq.(Hz)	R(dB)	R(dB)
50	15	
63	16	17
80	21	
100	25	
125	28	27
160	30	
200	35	
250	38	37
315	40	
400	41	
500	43	42
630	43	
800	44	
1000	48	45
1250	46	
1600	47	
2000	48	48
2500	48	
3150	46	
4000	54	50
5000	55	



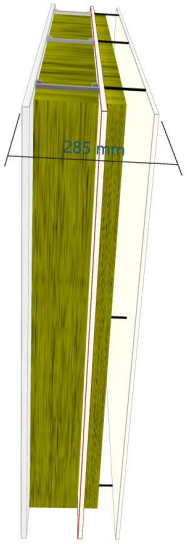
B6

INSUL ® MODEL OF PROPOSED CEDRAL LAP CLADDING SYSTEM

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 5527
Job Name:
Job No.: Initials:Naomi Bolton
Date:05/04/2023
File Name:Insul Timber Proposed.ixl

Notes:



Rw 49 dB
C -1 dB
Ctr -4 dB

Mass-air-mass resonant frequency = =51 Hz , 83 Hz

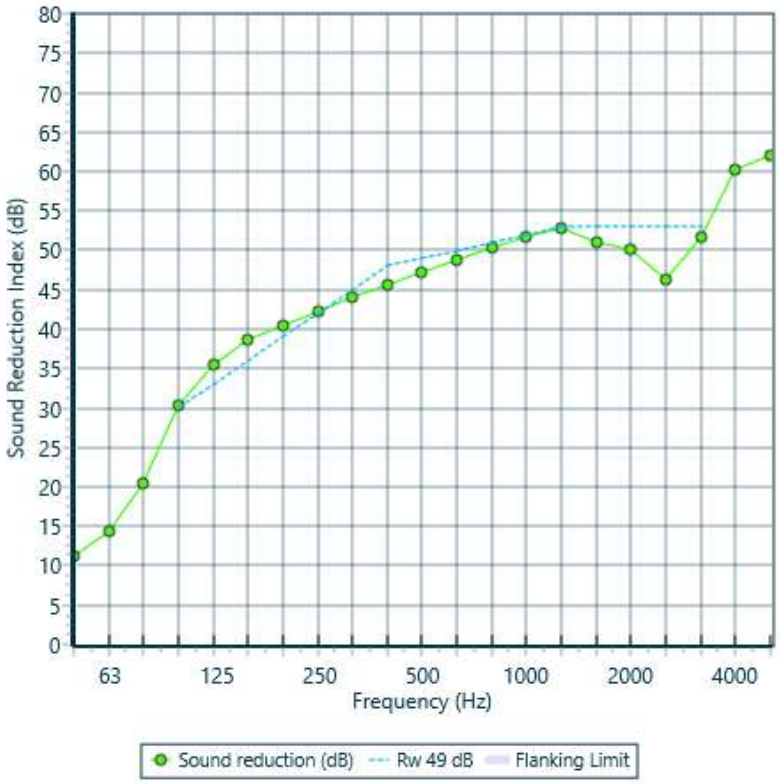
Panel Size = 2.7 m x 4.0 m

Partition surface mass = 39.1 kg/m²

System description

Panel 1 : 1 x 15 mm Gyproc Wallboard 15mm

Frame: Steel Stud (1.0-1.6mm) (1.5E2 mm x 38 mm), Stud spacing 600 mm ; Cavity Width 150 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 150 mm ...
Panel 2 : 1 x 12 mm NuClad

Frame: Point Connection (99 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 99 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 50 mm
Panel 3 : 1 x 9.5 mm WeatherPro-L

freq.(Hz)	R(dB)	R(dB)
50	11	
63	14	14
80	21	
100	30	
125	36	33
160	39	
200	41	
250	42	42
315	44	
400	46	
500	47	47
630	49	
800	50	
1000	52	52
1250	53	
1600	51	
2000	50	49
2500	46	
3150	52	
4000	60	56
5000	62