

TRINITY COURT, MANCHESTER

FAÇADE SOUND INSULATION ASSESSMENT

REPORT REFERENCE NO. J004660-7411-JW-01

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Document Control Sheet

Details of Assessment	
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Issue	Date	Author	Remark	Status
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	Name	Position
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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 Trinity Court, 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	Wall Type 1 – Brickwork		Wall Type 2 – Timber Cladding		Wall Type 3 & 4 – Fibre Cement Cladding	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
R_w dB	62	64	44	50	46	50
R_w+C_{tr} dB	56	58	36	45	38	44

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 Trinity Court Manchester:

- Planning condition 5 (acoustic installation) associated with planning permission 130444/FO/2021 Trinity Court CDN/21/0598

5) a) Before the development hereby approved commences, a scheme for acoustically insulating the residential accommodation against noise from Higher Cambridge Street shall be submitted to and approved in writing by the City Council as Local Planning Authority. The development shall only be implemented in accordance with the approved details.

b) Upon completion of the development, a verification report shall be submitted to and approved in writing by the City Council as Local Planning Authority in order to validate the works undertaken conform to the recommendations and requirements contained within the report. The report should contain details of post completion testing to confirm that the internal noise criteria has been met. Any instances of non conformity with the recommendations contained within the report shall be detailed, along with any measures required to ensure compliance with the internal noise criteria.

Reason - To safeguard the amenities of existing and future occupiers of nearby residential accommodation, pursuant to saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1 and DM1 of the Core Strategy.

However, it appears that the above planning condition must be in error as there are elements such as glazing and ventilation that the contractor will not be able to modify but which will dominate the noise transfer to the building interior. As such we understand that Manchester City Council (MCC) have given the following advice:

- We would ask that the applicant submits a note (not necessarily a full report) from an acoustician to just confirm that the proposed cladding provides the same or better sound insulation than the cladding being replaced.

3.0 FAÇADE SOUND INSULATION ASSESSMENT

The assessment is based on section drawings provided by Buttress Architects Ltd. The drawings used are as follows:

- 9028 (04) 002- WT1 - Brickwork - Floor slab edge detail
- 9028 (08) 002- WT1 - Brickwork - Floor slab edge detail
- 9028 (04) 005- WT2 - Timber - Typical window cill detail
- 9028 (08) 005- WT2 - Timber - Typical window cill detail
- 9028 (04) 009- WT3 and 4 - Floor slab edge detail
- 9028 (08) 009 -T2 - WT3 and 4 - Floor slab edge detail-(04)001

3.1 Wall Type 1 Brickwork Wall - Existing

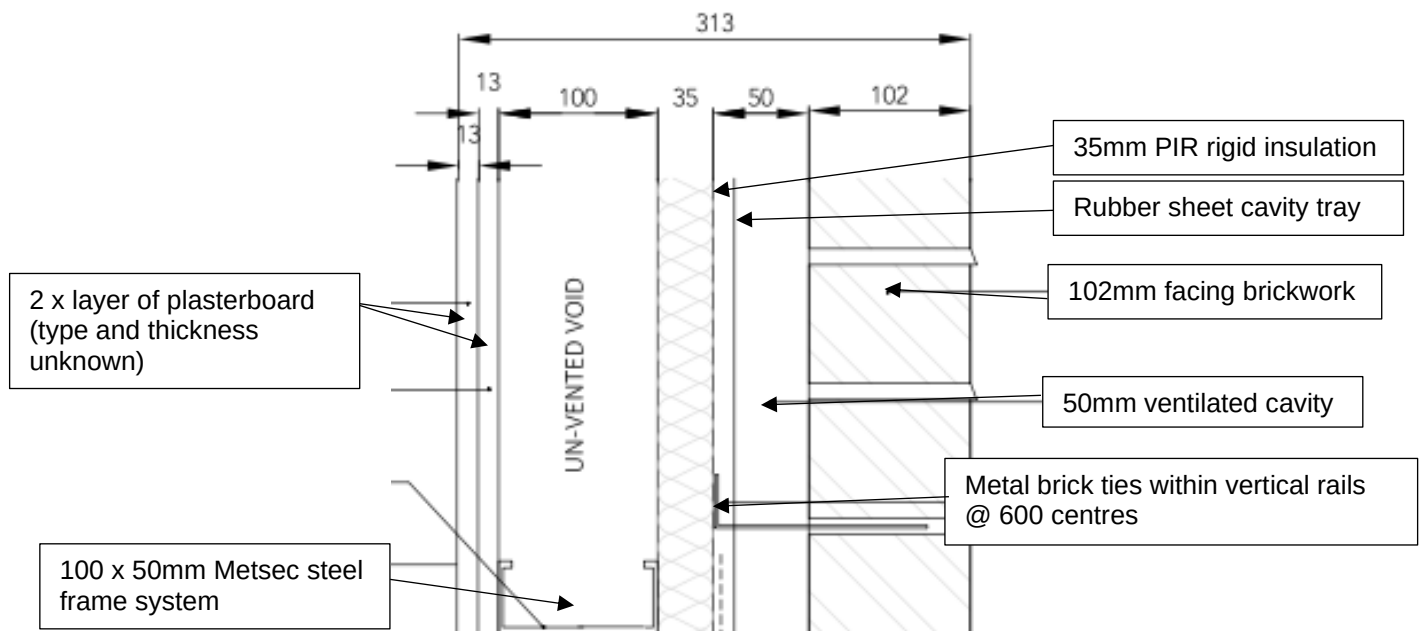


Figure 1: Existing Brickwork Wall System

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:

- 102mm facing brickwork
- 50 x 45mm point connections 600mm stud spacing in 50mm cavity
- 35mm PIR rigid insulation
- 100mm structural steel stud (circa 1 to 1.2mm gauge)
- 2 x 12.5mm layer so of Gyproc wallboard 640 kg/m3

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

$R_w = 62 \text{ dB}$

$R_w + C_{tr} = 56 \text{ dB}$

3.2 Wall Type 1 Brickwork Wall - Proposed

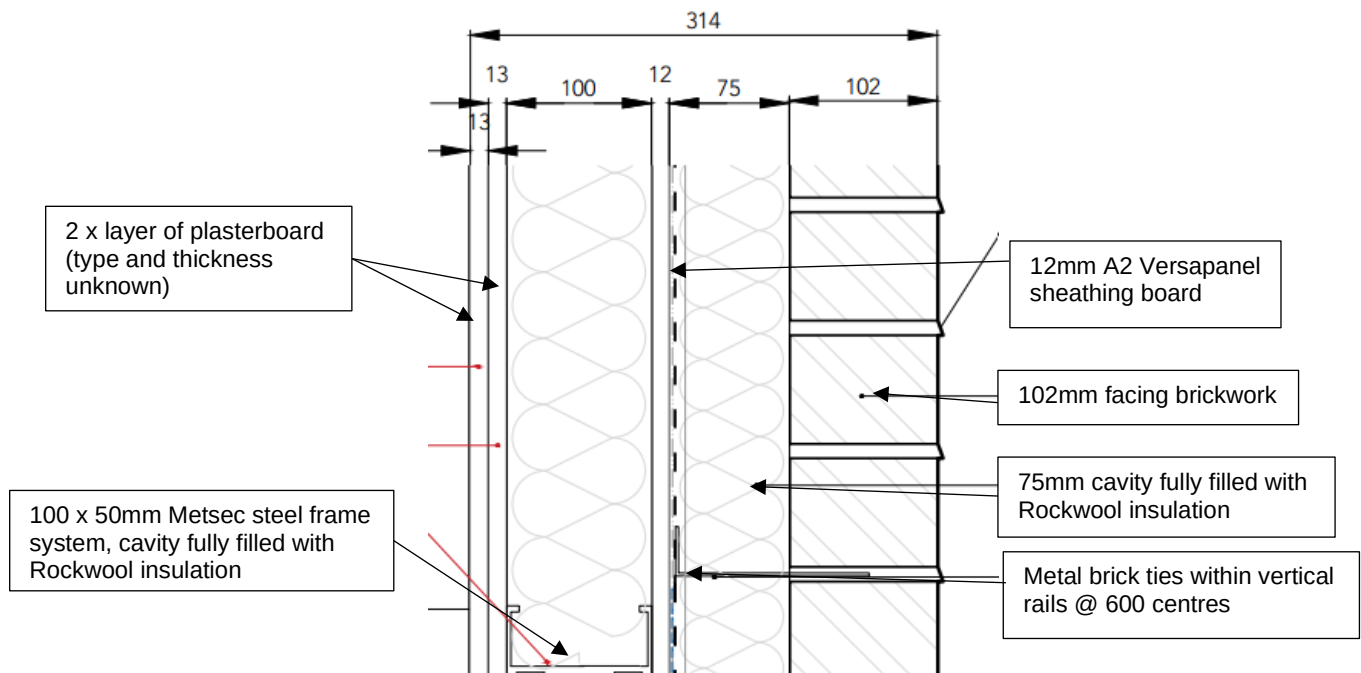


Figure 2: Proposed Brickwork Wall System

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:

- 102mm facing brickwork
- 75 x 45mm point connections 600mm stud spacing in 75mm cavity
- Cavity containing 75mm thick mineral wool at nominal density 10kg/m³
- 12mm Cement Particle board nominal density 1200 kg/m³.
- 100mm structural steel stud (circa 1 to 1.2mm gauge)
- Cavity containing 100mm thick mineral wool at nominal density 10kg/m³
- 2 x 12.5mm layer so of Gyproc wallboard 640 kg/m³

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

$R_w = 64 \text{ dB}$

$R_w + C_{tr} = 58 \text{ dB}$

3.3 Wall Type 2 Timber Cladding - Existing

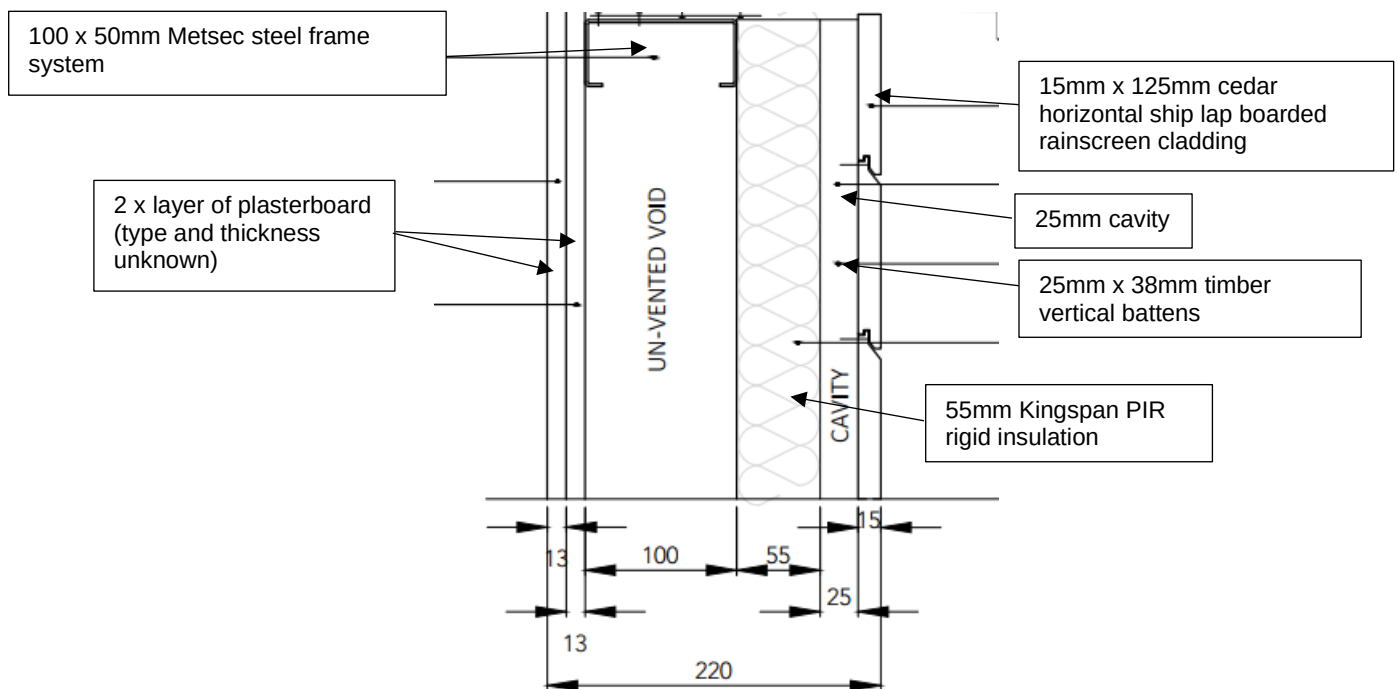


Figure 3: Existing Timber Cladding System

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 plywood 560 kg/m³
- Point connections at nominal 600mm centres forming 25 mm cavity¹
- 55mm PIR rigid insulation 60 kg/m³
- 100mm structural steel stud (circa 1 to 1.2mm gauge)
- 2 x 12.5mm layer so of Gyproc wallboard 640 kg/m³

The performance prediction sheet is given in Appendix B3 and the overall predicted sound insulation performance given is as follows:

$R_w = 44 \text{ dB}$

$R_w + C_{tr} = 36 \text{ dB}$

¹ This vertical timber battens could be considered as representing line connections which would give poorer sound insulation performance, but actually they are point fixed through the PIR insulation to the Metsec Steel Frame. As such point connections are used to give a best case scenario for sound insulation for comparison to the proposed system.

3.4 Wall Type 2 Cedral Click Cladding - Proposed

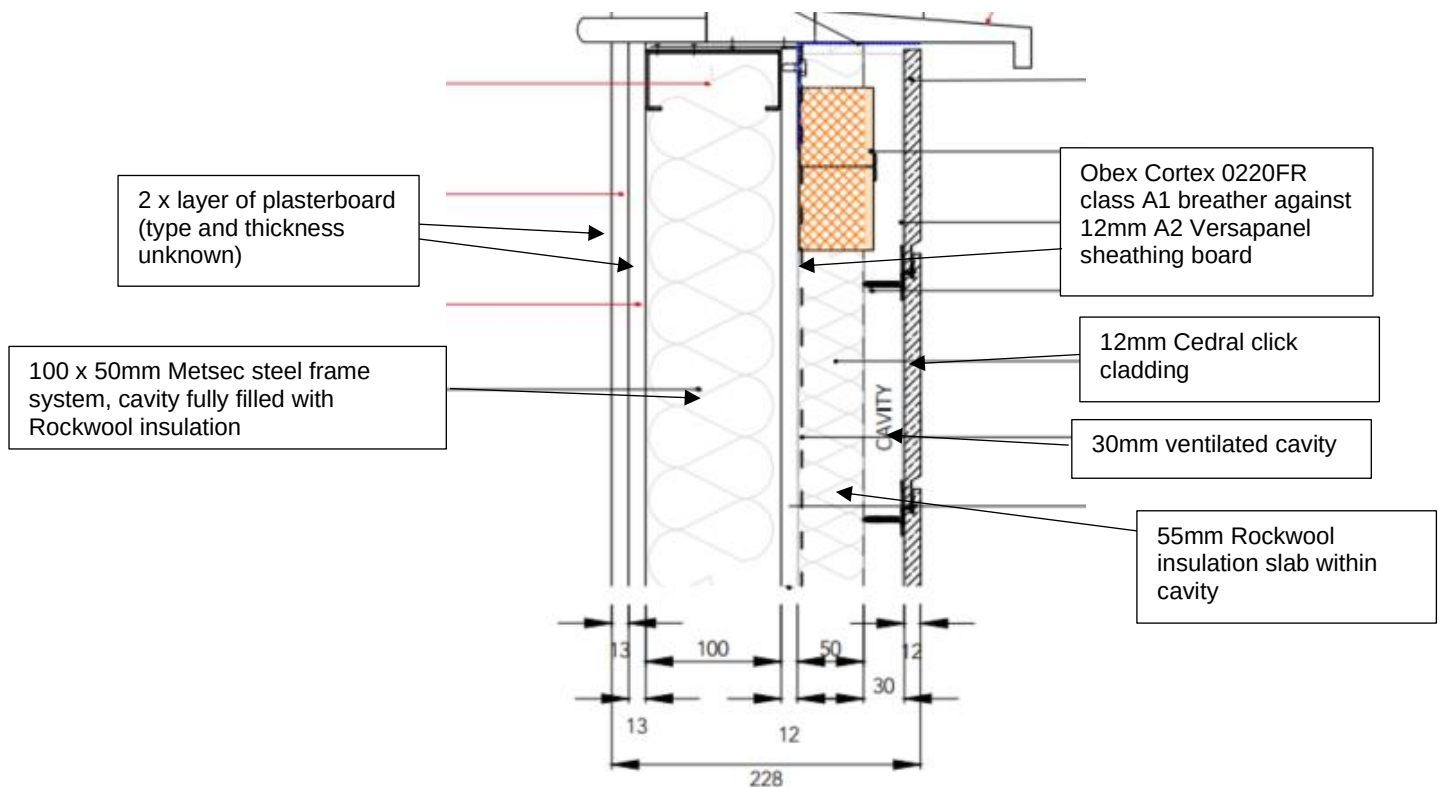


Figure 4: Proposed Cedral Click Cladding System

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:

- 12mm fibre cement board 1100 kg/m³
- Point connections at nominal 600mm centres forming 80mm cavity
- Cavity containing 55mm thick mineral wool at nominal density 10kg/m³
- 12mm Cement Particle board nominal density 1200 kg/m³.
- 100mm structural steel stud (circa 1 to 1.2mm gauge)
- Cavity containing 1000mm thick mineral wool at nominal density 10kg/m³
- 2 x 12.5mm layer so of Gyproc wallboard 640 kg/m³

The performance prediction sheet is given in Appendix B4 and the overall predicted sound insulation performance given is as follows:

$R_w = 50 \text{ dB}$

$R_w + C_{tr} = 45 \text{ dB}$

3.5 Wall Typer 3 & 4 Fibre Cement Cladding - Existing

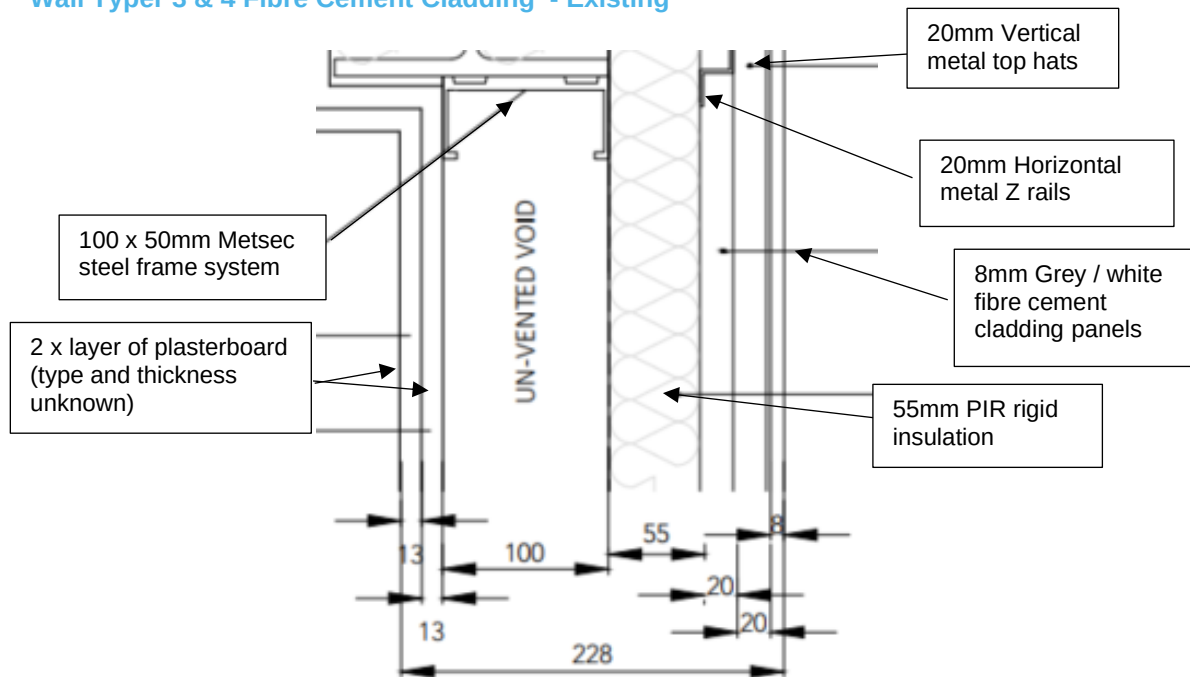


Figure 5: Existing Fibre Cement Cladding System

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:

- 8mm fibre cement board 1100 kg/m³
- Point connections at nominal 600mm centres forming 40 mm cavity
- 55mm PIR rigid insulation 60 kg/m³
- 100mm structural steel stud (circa 1 to 1.2mm gauge).
- 2 x 12.5mm layer so of Gyproc wallboard 640 kg/m³

The performance prediction sheet is given in Appendix B5 and the overall predicted sound insulation performance given is as follows:

R_w = 46 dB

R_w+C_{tr} = 38 dB

3.6 Wall Typer 3 & 4 Rockpanel Cladding – Proposed

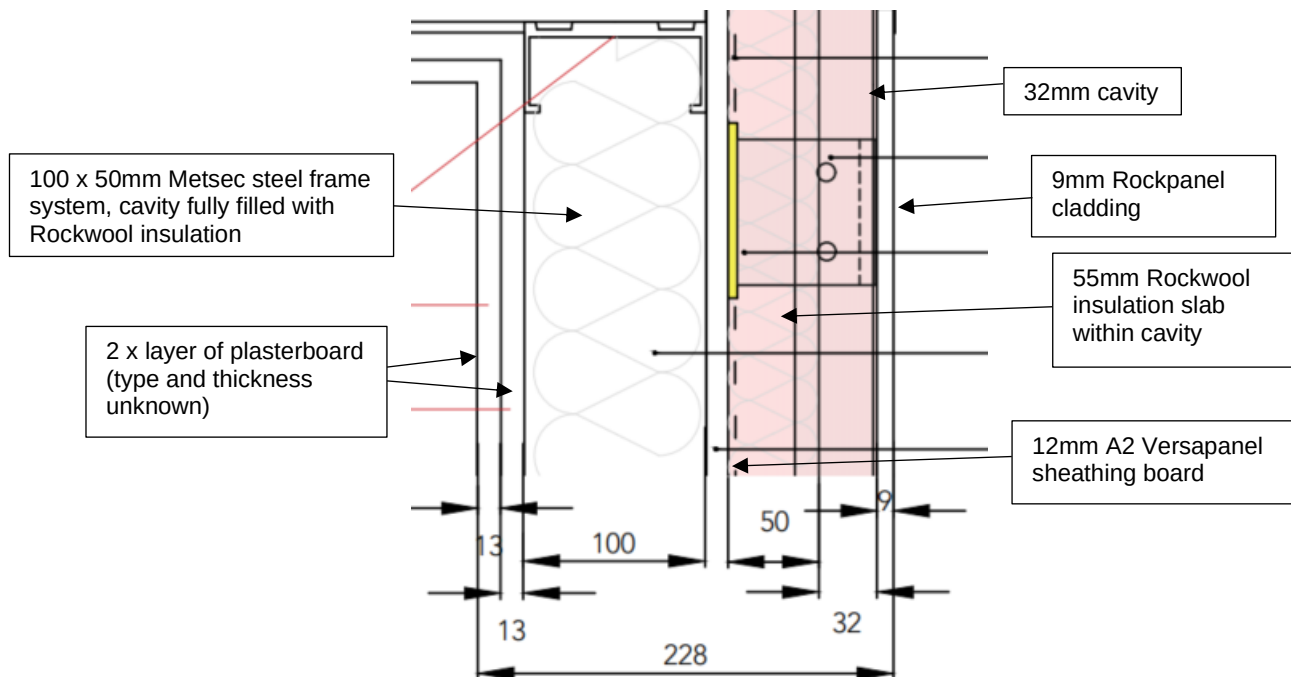


Figure 6: Proposed Rockpanel Cladding System

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:

- 9mm fibre cement board 1100 kg/m³
- Point connections at nominal 600mm centres forming 82 mm cavity
- Cavity containing 50 mm thick mineral wool at nominal density 10kg/m³.
- 12mm Cement Particle board nominal density 1200 kg/m³.
- 100mm structural steel stud (circa 1 to 1.2mm gauge).
- Cavity containing 1000mm thick mineral wool at nominal density 10kg/m³
- 2 x 12.5mm layer so of Gyproc wallboard 640 kg/m³

The performance prediction sheet is given in Appendix B6 and the overall predicted sound insulation performance given is as follows:

R_w = 50 dB

R_w+C_{tr} = 44 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) L_{eq} 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 PREDICTION SHEETS

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017

Margin of error is generally within $R_w \pm 3$ dB

- Key No. 5527

Job Name:

Job No.:

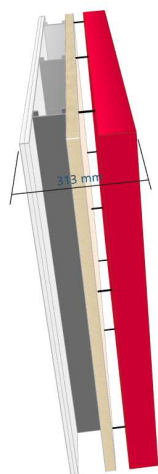
Initials:Naomi Bolton

Date:09/11/2023

File Name:Existing Brick Wall Type 1.ixl



Notes:



R_w 62 dB

C -2 dB

Ctr -6 dB

Mass-air-mass resonant frequency = 48 Hz , 271 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 181 kg/m²

System description

Panel 1 : 1 x 12.5 mm Gyproc Wallboard 12.5mm

+ 1 x 12.5 mm Gyproc Wallboard 12.5mm

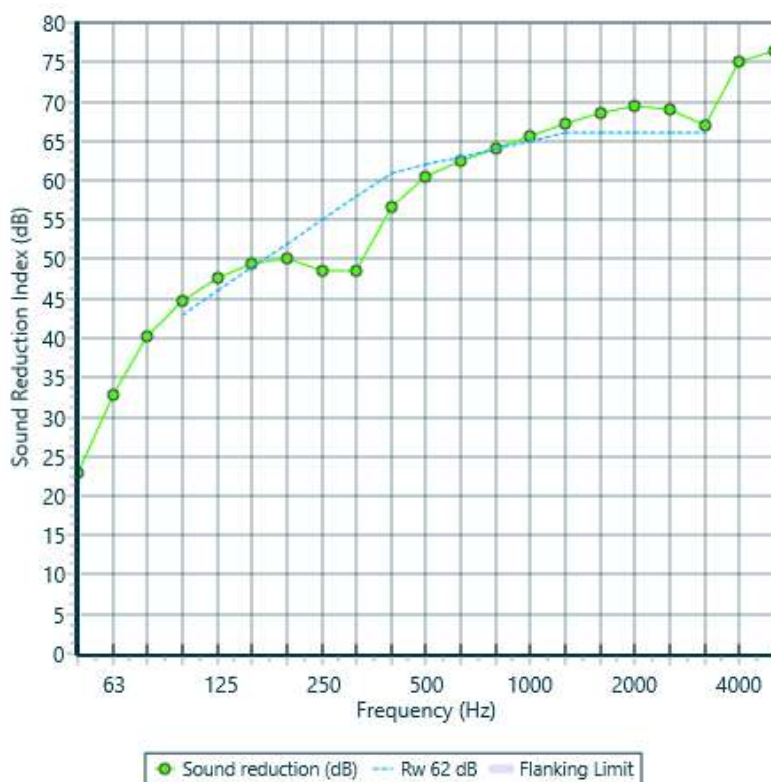
Frame: Steel Stud (1.0-1.6mm) (1E2 mm x 50 mm), Stud spacing 600 mm ; Cavity Width 100 mm

Panel 2 : 1 x 36 mm Kool Duct

Frame: Point Connection (50 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 50 mm

Panel 3 : 1 x 102 mm Brick

freq.(Hz)	R(dB)	R(dB)
50	23	
63	33	27
80	40	
100	45	
125	48	47
160	49	
200	50	
250	49	49
315	48	
400	57	
500	60	59
630	62	
800	64	
1000	66	65
1250	67	
1600	69	
2000	69	69
2500	69	
3150	67	
4000	75	71
5000	76	



Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017

Margin of error is generally within $R_w \pm 3$ dB

- Key No. 5527

Job Name:

Job No.:

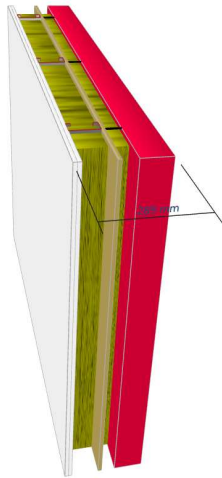
Initials:Naomi Bolton

Date:09/11/2023

File Name:Proposed Brick Wall Type 1.ixl



Notes:



R_w 64 dB

C -2 dB

Ctr -6 dB

Mass-air-mass resonant frequency = 39 Hz, 91 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 196 kg/m²

System description

Panel 1 : 1 x 12.5 mm Gyproc Wallboard 12.5mm

+ 1 x 12.5 mm Gyproc Wallboard 12.5mm

Frame: Steel Stud (1.0-1.6mm) (1E2 mm x 50 mm), Stud spacing 600 mm; Cavity Width 100 mm, 1 x Fibreglass (10kg/m³) 60mm Thickness 100 mm

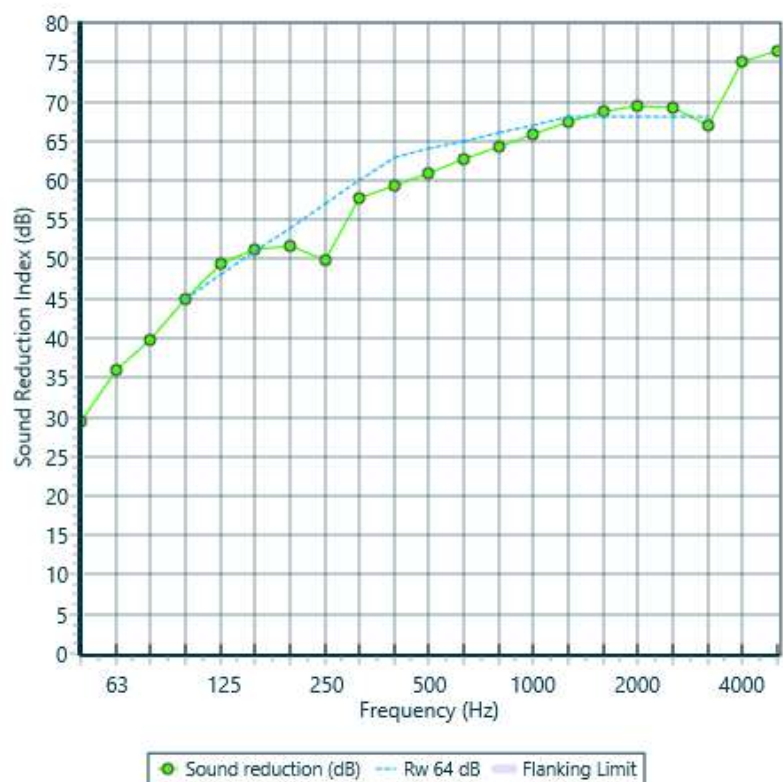
Panel 2 : 1 x 12 mm RCM CemBoard (cement particle board)

...

Frame: Point Connection (50 mm x 45 mm), Stud spacing 600 mm; Cavity Width 50 mm, 1 x Fibreglass (10kg/m³) 60mm Thickness 50 mm

Panel 3 : 1 x 102 mm Brick

freq.(Hz)	R(dB)	R(dB)
50	29	
63	36	33
80	40	
100	45	
125	49	48
160	51	
200	52	
250	50	52
315	58	
400	59	
500	61	61
630	63	
800	64	
1000	66	66
1250	67	
1600	69	
2000	69	69
2500	69	
3150	67	
4000	75	71
5000	76	



Sound Insulation Prediction (v9.0.24)

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Margin of error is generally within $R_w \pm 3$ dB

- Key No. 5527

Job Name:

Job No.:

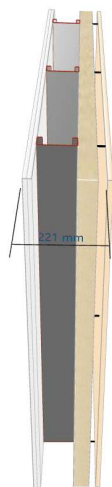
Initials:Naomi Bolton

Date:09/11/2023

File Name:Existing Timber Insul Wall Type 2.ixl



Notes:



R_w 44 dB

C -2 dB

Ctr -8 dB

Mass-air-mass resonant frequency = 81 Hz , 311 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 27.7 kg/m²

System description

Panel 1 : 2 x 12.5 mm Gyproc Wallboard 12.5mm

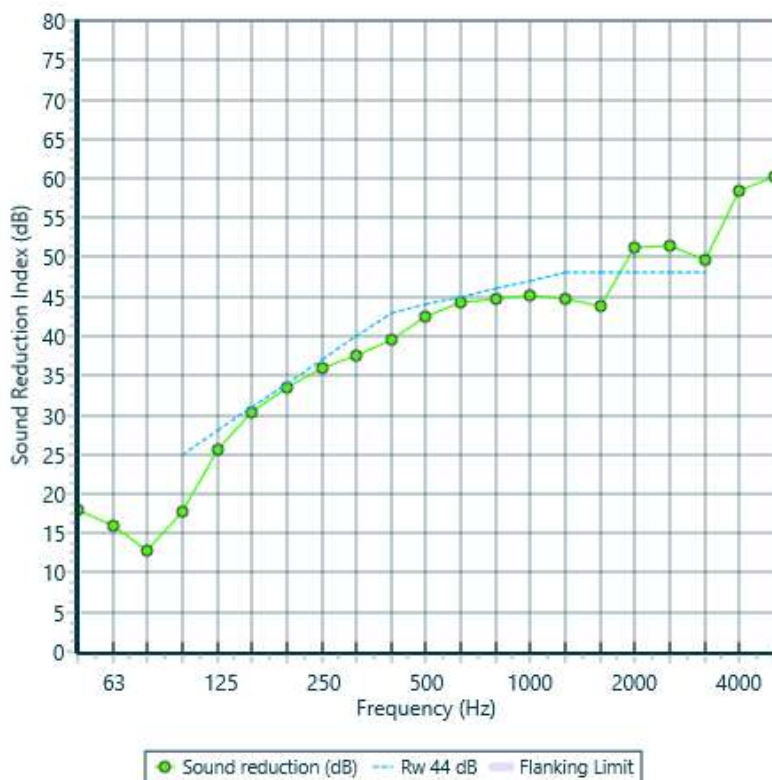
Frame: Steel Stud (1.0-1.6mm) (1.2E2 mm x 50 mm), Stud spacing 600 mm ; Cavity Width 100 mm

Panel 2 : 1 x 56 mm Kool Duct

Frame: Point Connection (25 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 25 mm

Panel 3 : 1 x 15 mm Plywood

freq.(Hz)	R(dB)	R(dB)
50	18	
63	16	15
80	13	
100	18	
125	26	22
160	30	
200	34	
250	36	35
315	38	
400	40	
500	42	42
630	44	
800	45	
1000	45	45
1250	45	
1600	44	
2000	51	47
2500	51	
3150	50	
4000	58	54
5000	60	



Sound Insulation Prediction (v9.0.24)

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Margin of error is generally within $R_w \pm 3$ dB

- Key No. 5527

Job Name:

Job No.:

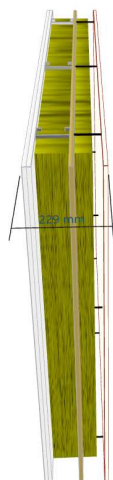
Initials:Naomi Bolton

Date:09/11/2023

File Name:Proposed Timber Wall Tpe 2.ixl



Notes:



R_w 50 dB

C -1 dB

Ctr -5 dB

Mass-air-mass resonant frequency = 52 Hz, 91 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 46.1 kg/m²

System description

Panel 1 : 2 x 12.5 mm Gyproc Wallboard 12.5mm

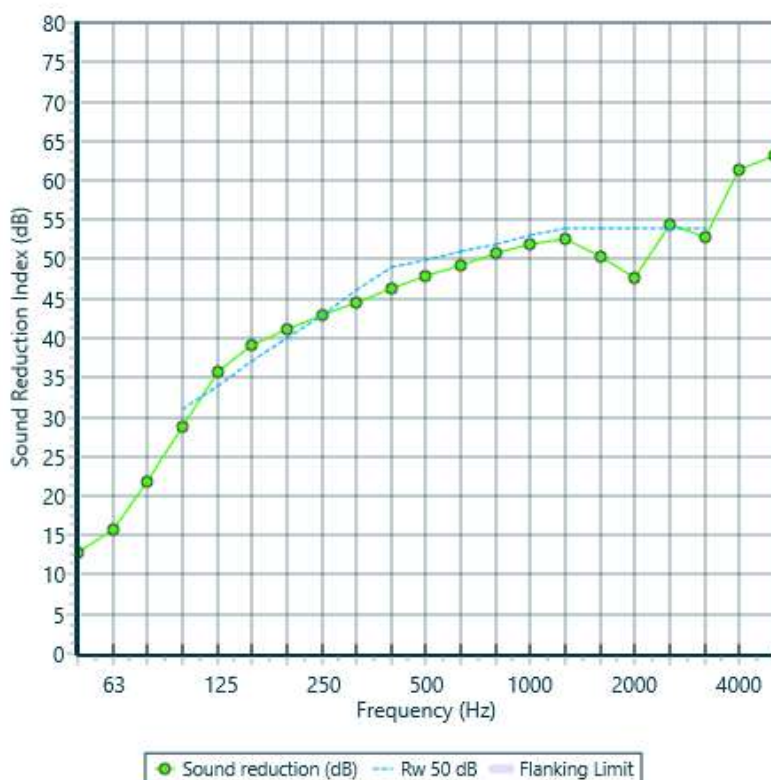
Frame: Steel Stud (1.0-1.6mm) (1E2 mm x 50 mm), Stud spacing 600 mm ; Cavity Width 100 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 100 mm

Panel 2 : 1 x 12 mm RCM CemBoard (cement particle board)

Frame: Point Connection (80 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 80 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 55 mm

Panel 3 : 1 x 12 mm PROMATECT® 50

freq.(Hz)	R(dB)	R(dB)
50	13	
63	16	15
80	22	
100	29	
125	36	32
160	39	
200	41	
250	43	43
315	45	
400	46	
500	48	48
630	49	
800	51	
1000	52	52
1250	53	
1600	50	
2000	48	50
2500	54	
3150	53	
4000	61	57
5000	63	



Sound Insulation Prediction (v9.0.24)

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Margin of error is generally within $R_w \pm 3$ dB

- Key No. 5527

Job Name:

Job No.:

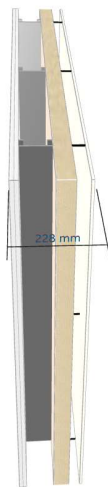
Initials:Naomi Bolton

Date:09/11/2023

File Name:Existing Fibre Cement Wall Type 3 & 4.ixl



Notes:



R_w 46 dB

C -3 dB

Ctr -8 dB

Mass-air-mass resonant frequency = 77 Hz , 257 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 28 kg/m²

System description

Panel 1 : 2 x 12.5 mm Gyproc Wallboard 12.5mm

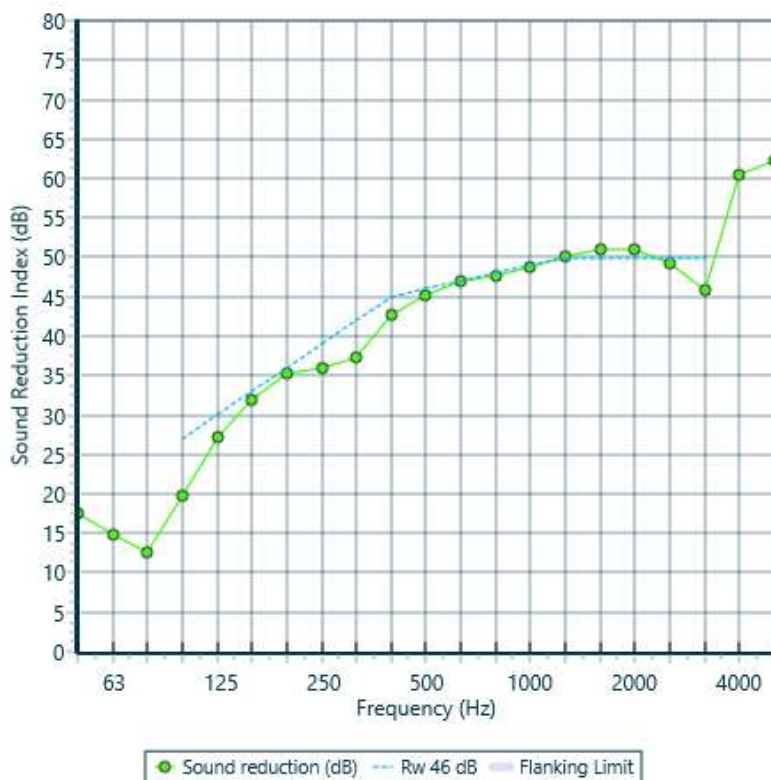
Frame: Steel Stud (1.0-1.6mm) (1E2 mm x 38 mm), Stud spacing 600 mm ; Cavity Width 100 mm

Panel 2 : 1 x 55 mm Kool Duct

Frame: Point Connection (40 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 40 mm

Panel 3 : 1 x 8 mm PROMATECT® 50

freq.(Hz)	R(dB)	R(dB)
50	18	
63	15	15
80	13	
100	20	
125	27	24
160	32	
200	35	
250	36	36
315	37	
400	43	
500	45	45
630	47	
800	48	
1000	49	49
1250	50	
1600	51	
2000	51	50
2500	49	
3150	46	
4000	60	50
5000	62	



Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017

Margin of error is generally within $R_w \pm 3$ dB

- Key No. 5527

Job Name:

Job No.:

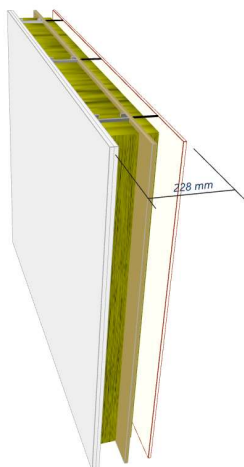
Initials:Naomi Bolton

Date:09/11/2023

File Name:Proposed Fibre Cement Wall Type 3 & 4.ixl



Notes:



R_w 50 dB

C -2 dB

Ctr -6 dB

Mass-air-mass resonant frequency = 55 Hz, 94 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 42.7 kg/m²

System description

Panel 1 : 2 x 12.5 mm Gyproc Wallboard 12.5mm

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

Panel 2 : 1 x 12 mm RCM CemBoard (cement particle board)

Frame: Point Connection (82 mm x 45 mm), Stud spacing 600 mm; Cavity Width 82 mm, 1 x Fibreglass (10kg/m³) 60mm Thickness 50 mm

Panel 3 : 1 x 9 mm PROMATECT® 50

freq.(Hz)	R(dB)	R(dB)
50	13	
63	14	15
80	20	
100	27	
125	35	31
160	39	
200	41	
250	43	43
315	45	
400	46	
500	48	48
630	50	
800	51	
1000	53	52
1250	54	
1600	52	
2000	51	49
2500	47	
3150	52	
4000	61	56
5000	63	

