



ResCom MgO Wall System Acoustics

Acoustic Engineering Report

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Prepared for:

KHS Capital Management Fund Limited t/a
ResCom Fire Wall
Level 13, 114 William Street
Melbourne VIC 3000

Prepared by:

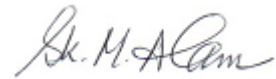
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Revision History

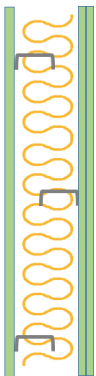
Rev.	Date	Purpose	Prepared by:	Reviewed by:
0	08-03-2018	Not for construction	Mahbub Sheikh	Andrew Mitchell
1	09-03-2018	Amend Terminology	Mahbub Sheikh	Andrew Mitchell
2	03-09-2018	For Construction	Mahbub Sheikh	Andrew Mitchell

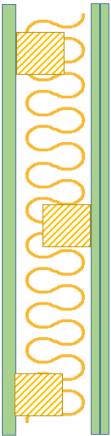
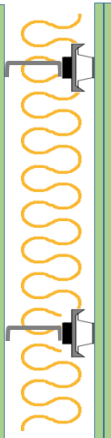
Executive Summary

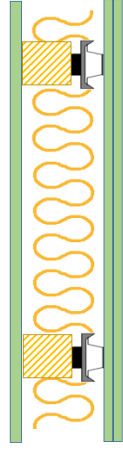
KHS Capital Management Fund Limited t/a ResCom Fire Wall has appointed Cogent Acoustics Pty Ltd to evaluate the acoustic performance of various wall assemblies using ResCom MgO board wall linings, and provide advice in relation to compliance with the sound insulation requirements of the Building Code of Australia 2016 (BCA) (ABCD-Volume 1, 2016) (ABCD-Volume 2, 2016).

Eight non-discontinuous construction configurations and twelve discontinuous construction configurations using ResCom MgO boards are evaluated in this report. Acoustic performances of these systems which comply with BCA sound insulation requirements are summarised in the following tables.

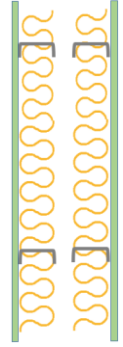
NON-DISCONTINUOUS CONSTRUCTION CONFIGURATIONS

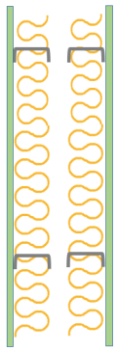
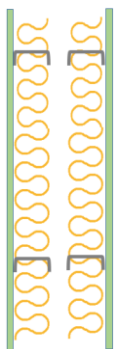
System No.	Wall System	Wall Linings	Cavity Depth (mm)		
			Stud Depth/BMT (mm)		
			R _w	R _w + C _{tr}	
5		Side One: <ul style="list-style-type: none"> 1 x 14mm ResCom MgO Fire-rated Wall board Side Two: <ul style="list-style-type: none"> 2 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 75mm Mineral Wool (32Kg/m³) Stud Details: <ul style="list-style-type: none"> 64mm Staggered Steel Stud at 600mm centres each side. Studs restrained in track or angle at top and bottom with minimum 22mm clearance between stud and opposing lining. Cavity Depth 92mm. 	92	64/0.5
			60	51	
			Minimum Wall Thickness (mm)		130
			BCA Compliance		
			R _w ≥ 50		✓
			R _w + C _{tr} ≥ 50		✓
			Discontinuous		✗

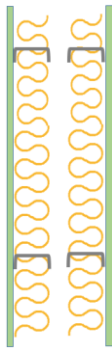
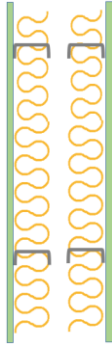
System No.	Wall System	Wall Linings	Plate Width (mm)	90	
			Framing Details	R _w	R _w + C _{tr}
6		<p>Side One:</p> <ul style="list-style-type: none"> 1 x 16mm ResCom MgO Fire-rated Wall board. <p>Side Two:</p> <ul style="list-style-type: none"> 2 x 12mm ResCom MgO Fire-rated Wall board. 	<p>Cavity Insulation:</p> <ul style="list-style-type: none"> 75mm Mineral Wool (32Kg/m³) <p>Stud Details:</p> <ul style="list-style-type: none"> 70mm Staggered Timber Stud at 600mm centres each side. Minimum 20mm clearance between stud and opposing lining. 	57	50
			Minimum Wall Thickness (mm)	130	
			BCA Compliance		
			R _w ≥ 50	✓	
R _w + C _{tr} ≥ 50	✓				
Discontinuous	✗				
7		<p>Side One:</p> <ul style="list-style-type: none"> 1 x 14mm ResCom MgO Fire-rated Wall board. <p>Side Two:</p> <ul style="list-style-type: none"> 2 x 12mm ResCom MgO Fire-rated Wall board. 	<p>Cavity Insulation:</p> <ul style="list-style-type: none"> 75mm Mineral Wool (32Kg/m³) <p>Stud Details:</p> <ul style="list-style-type: none"> 64mm Steel Stud at 600mm centres. Resilient mounts (Rondo STWC or equivalent) screw fixed to one side of the steel stud. Furring channel (Rondo N°129 or equivalent) clipped to resilient mounts. 	61	52
			Minimum Wall Thickness (mm)	142	
			BCA Compliance		
			R _w ≥ 50	✓	
R _w + C _{tr} ≥ 50	✓				
Discontinuous	✗				

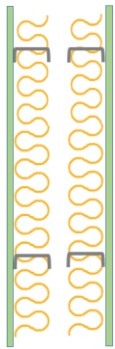
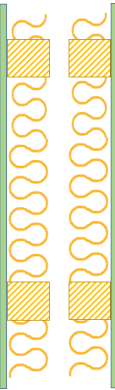
System No.	Wall System	Wall Linings	Stud Depth (mm)	70	
			Framing Details	R _w	R _w
8		<p>Side One:</p> <ul style="list-style-type: none"> 1 x 14mm ResCom MgO Fire-rated Wall board. <p>Side Two:</p> <ul style="list-style-type: none"> 2 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 75mm Mineral Wool (32Kg/m³) Stud Details: <ul style="list-style-type: none"> 70mm Timber Stud at 600mm centres. Resilient mounts (Rondo STWC or equivalent) screw fixed to one side of the timber stud. Furring channel (Rondo N°129 or equivalent) clipped to resilient mounts. 	61	53
			Minimum Wall Thickness (mm)		
			BCA Compliance		
			R _w ≥ 50	✓	
			R _w + C _{tr} ≥ 50	✓	
			Discontinuous	✗	

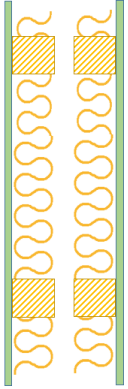
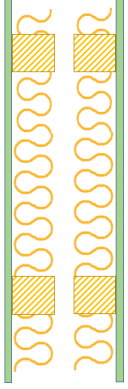
DISCONTINUOUS CONSTRUCTION CONFIGURATIONS

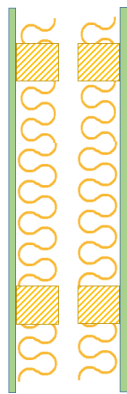
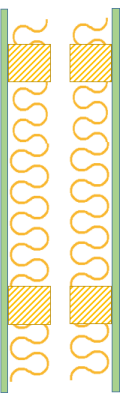
System No.	Wall System	Wall Linings	Cavity Width (mm)	200	
			Stud Depth/BMT (mm)	90/0.5	
			Framing Details	R _w	R _w + C _{tr}
1		<p>Both Sides:</p> <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Glasswool (11kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 450mm centres with minimum 20mm gap. 	61	50
			Minimum Wall Thickness (mm)		
			BCA Compliance		
			R _w ≥ 50	✓	
			R _w + C _{tr} ≥ 50	✓	
			Discontinuous	✓	

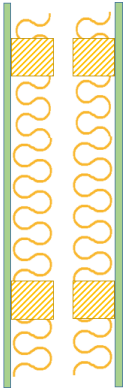
System No.	Wall System	Wall Linings	Cavity Width (mm)		
			200		
			Stud Depth/BMT (mm)		
		90/0.5			
			Framing Details		
			R _w	R _w + C _{tr}	
2		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral wool R2.0 (32kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 450mm centres with minimum 20mm gap. 	59	49
			Minimum Wall Thickness (mm)		220
			BCA Compliance		
			R _w ≥ 50	✓	
			R _w + C _{tr} ≥ 50	✗	
			Discontinuous	✓	
System No.	Wall System	Wall Linings	Cavity Width (mm)		
			230		
			Stud Depth/BMT (mm)		
		90/0.5			
			Framing Details		
			R _w	R _w + C _{tr}	
3		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Glasswool (11kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 450mm centres with minimum 50mm gap. 	62	51
			Minimum Wall Thickness (mm)		250
			BCA Compliance		
			R _w ≥ 50	✓	
			R _w + C _{tr} ≥ 50	✓	
			Discontinuous	✓	

System No.	Wall System	Wall Linings	Cavity Width (mm)	
			Stud Depth/BMT (mm)	
			R _w	R _w + C _{tr}
4		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral wool R2.0 (32kg/m³). 	
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 450mm centres with minimum 50mm gap. 	
			60	50
			Minimum Wall Thickness (mm)	
			BCA Compliance	
			R _w ≥ 50	✓
			R _w + C _{tr} ≥ 50	✓
			Discontinuous	✓
System No.	Wall System	Wall Linings	Cavity Width (mm)	
			Stud Depth/BMT (mm)	
			R _w	R _w + C _{tr}
5		Both Sides: <ul style="list-style-type: none"> 1 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral Wool (32Kg/m³). 	
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 600mm centres with minimum 20mm gap. 	
			61	51
			Minimum Wall Thickness (mm)	
			BCA Compliance	
			R _w ≥ 50	✓
			R _w + C _{tr} ≥ 50	✓
			Discontinuous	✓

System No.	Wall System	Wall Linings	Cavity Width (mm)					
			Stud Depth/BMT (mm)					
			Framing Details					
			R_w	$R_w + C_{tr}$				
6		Both Sides: <ul style="list-style-type: none"> 1 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral Wool (32Kg/m³). 		62	52		
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 600mm centres with minimum 20mm gap. 					
			Minimum Wall Thickness (mm)				224	
			BCA Compliance					
			$R_w \geq 50$				✓	
$R_w + C_{tr} \geq 50$		✓						
Discontinuous		✓						
System No.	Wall System	Wall Linings	Stud Depth (mm)					
			Framing Details					
			R_w	$R_w + C_{tr}$				
7		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Glasswool (11kg/m³). 		61	50		
			Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 450mm centres with minimum 20mm gap. 					
			Minimum Wall Thickness (mm)				220	
			BCA Compliance					
			$R_w \geq 50$				✓	
$R_w + C_{tr} \geq 50$		✓						
Discontinuous		✓						

System No.	Wall System	Wall Linings	Stud Depth (mm)	90			
			Framing Details	R _w	R _w + C _{tr}		
8		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral wool R2.0 (32kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 450mm centres with minimum 20mm gap. 	59	49		
						Minimum Wall Thickness (mm)	220
						BCA Compliance	
						R _w ≥ 50	✓
						R _w + C _{tr} ≥ 50	✗
Discontinuous	✓						
System No.	Wall System	Wall Linings	Stud Depth (mm)	90			
			Framing Details	R _w	R _w + C _{tr}		
9		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Glasswool (11kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 450mm centres with minimum 50mm gap. 	62	51		
						Minimum Wall Thickness (mm)	250
						BCA Compliance	
						R _w ≥ 50	✓
						R _w + C _{tr} ≥ 50	✓
Discontinuous	✓						

System No.	Wall System	Wall Linings	Stud Depth (mm)						
			Framing Details	90					
			R_w	$R_w + C_{tr}$					
10		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral wool R2.0 (32kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 450mm centres with minimum 50mm gap. 	60	50				
						Minimum Wall Thickness (mm)		250	
						BCA Compliance			
						$R_w \geq 50$		✓	
						$R_w + C_{tr} \geq 50$		✓	
Discontinuous		✓							
System No.	Wall System	Wall Linings	Stud Depth (mm)						
			Framing Details	70					
			R_w	$R_w + C_{tr}$					
11		Both Sides: <ul style="list-style-type: none"> 1 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral Wool (32Kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 600mm centres with minimum 20mm gap. 	61	50				
						Minimum Wall Thickness (mm)		184	
						BCA Compliance			
						$R_w \geq 50$		✓	
						$R_w + C_{tr} \geq 50$		✓	
Discontinuous		✓							

System No.	Wall System	Wall Linings	Stud Depth (mm)		
			Framing Details	90	
			R _w	R _w + C _{tr}	
12		Both Sides: <ul style="list-style-type: none"> 1 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral Wool (32Kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 600mm centres with minimum 20mm gap. 	62	52
			Minimum Wall Thickness (mm)	224	
			BCA Compliance		
			R _w ≥ 50	✓	
			R _w + C _{tr} ≥ 50	✓	
			Discontinuous	✓	

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1 Introduction

1.1 Purpose

KHS Capital Management Fund Limited t/a ResCom Fire Wall has appointed Cogent Acoustics Pty Ltd to evaluate the acoustic performance of various wall assemblies (single stud framed assembly and double stud framed assembly) using ResCom MgO board wall linings.

This report evaluates the acoustic performances of the proposed wall assemblies and provides advice in relation to design modifications to the proposed wall assemblies that are required to achieve compliance with the sound insulation requirements prescribed by the Building Code of Australia 2016 (BCA) (ABCD-Volume 1, 2016) (ABCD-Volume 2, 2016).

1.2 Reference Documentation

This report is based on information contained in the following documents and drawings:

Table 1 Reference Documentation

Document	Prepared by	Issue
ResCom Wall Systems Drawings	KHS Capital Management Fund Limited t/a ResCom Fire Wall	24/01/2018
Email Correspondence: Re: Density To: Andrew Mitchell (Cogent)	Cleve Snary KHS Capital Management Fund Limited t/a ResCom Fire Wall	19/01/2018
Acoustic Test Data of XCL001 Wall (Report No: 05112013/ct/01)	Acoustic Lab, Banyo QLD, Australia	05/11/2013
Acoustic Test Data of XCL002 Wall (Report No: 05112013/ct/02)	Acoustic Lab, Banyo QLD, Australia	05/11/2013
Acoustic Test Data of XCL003 Wall (Report No: 06112013/ct/01)	Acoustic Lab, Banyo QLD, Australia	06/11/2013
Acoustic Test Data of XCL004 Wall (Report No: 06112013/ct/02)	Acoustic Lab, Banyo QLD, Australia	06/11/2013

1.3 Report Limitations

The following limitations are applicable with respect to the acoustic advice presented in this report:

- This report is only to be used for the ResCom MgO wall system, with the design as described in the referenced documentation. The report is not to be used to support any other design scheme as changes to the design may affect the evaluation. Cogent Acoustics Pty Ltd takes no responsibility for any issues associated with the misuse of this report.
- Cogent Acoustics has prepared this document for the sole use of the Client and for the specific purpose expressly stated in the document. No other party should rely on this document without the prior written consent of Cogent Acoustics. Cogent Acoustics undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document.
- The information contained in this document provides advice in relation to acoustics and vibration only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics and vibration engineering including and not limited to structural integrity, fire rating, architectural buildability and fitness-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.
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- In preparing this document Cogent Acoustics may have relied upon information provided by the client and other third parties, some of which may not have been verified. Cogent Acoustics accepts no responsibility or liability for any errors or omissions which may be incorporated into this document as a result.
- The recommendations, data and methodology documented in this assessment are based on the listed reference documentation. The recommendations apply specifically to the project under consideration, and must not be utilised for any other purpose. Any modifications or changes to the project from that described in the listed reference documentation may invalidate the advice provided in this document, necessitating a revision.
- Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

2 Building Code of Australia Requirements

The Building Code of Australia 2016 (ABCD-Volume 1, 2016) (ABCD-Volume 2, 2016) prescribes the minimum mandatory Performance Requirements which must be complied with in the design of the building. Volume 1, Part F5 of the BCA prescribes the relevant Performance Requirements for sound insulation in Class 2, 3 and 9c buildings. Volume 2, Part 2.4.6 prescribes the relevant Performance Requirements for sound insulation in Class 1 buildings. The intent of the BCA is to provide sufficient insulation against the transmission of airborne and impact sound to prevent illness or loss of amenity to building occupants.

The requirements of the BCA can be satisfied by using sound insulation solutions that have been demonstrated to comply with prescribed Deemed-to-Satisfy (DTS) Provisions by way of laboratory testing or other documentary evidence. Alternatively, the requirements can be satisfied by a Performance Solution, which is a design that has not been demonstrated to comply with the DTS Provisions but is shown to comply with the Performance Requirements of the BCA by way of an evaluation.

Table 2 presents the BCA Sound Insulation Performance Requirements for the internal walls of Class 1 buildings separating Sole Occupancy Units (SOUs) from other SOUs.

Table 2 NCC Sound Insulation Requirements for Walls in Class 1 Buildings

Space Type 1	Space Type 2	BCA Sound Insulation Requirement (dB)	
		Airborne	Impact
Habitable room of a sole occupancy unit	Habitable room of adjoining sole occupancy unit	$R_w + C_{tr} \geq 50$	-
Bathroom, sanitary compartment, laundry or kitchen of a sole occupancy unit	Bathroom, sanitary compartment, laundry or kitchen of adjoining sole occupancy unit	$R_w + C_{tr} \geq 50$	-
Habitable room of a sole occupancy unit	Bathroom, sanitary compartment, laundry or kitchen of adjoining sole occupancy unit	$R_w + C_{tr} \geq 50$	Discontinuous construction

Table 3 below presents the BCA Deemed-to-Satisfy (DTS) sound insulation performance requirements for party walls, and walls between a corridor and an apartment in Class 2 and 3 buildings.

Table 3 BCA DTS Sound Insulation Requirements for Walls in Class 2 and 3 Buildings

Space Type in Sole Occupancy Unit	Space Type in Adjoining Part of Building	BCA DTS Requirement	
		Airborne	Impact
Habitable room	Habitable room	$R_w + C_{tr} \geq 50$	-
Bathroom, sanitary compartment, laundry or kitchen	Bathroom, sanitary compartment, laundry or kitchen	$R_w + C_{tr} \geq 50$	-
Habitable room	Bathroom, sanitary compartment, laundry or kitchen	$R_w + C_{tr} \geq 50$	Discontinuous construction*
Any room	Stairway, public corridor, public lobby or the like, or parts of a different classification	$R_w \geq 50$	-
Any room	Plant room or lift shaft	$R_w \geq 50$	Discontinuous construction*

* For the purpose of the BCA, discontinuous construction is defined as a wall having a minimum 20 mm cavity between two separate leaves, and (i) for masonry, where wall ties are required to connect leaves, the ties are of the resilient type; and (ii) for other masonry, there is no mechanical linkage between leaves except at the periphery.

3 Laboratory Test Results of ResCom MgO Wall Assemblies

Laboratory acoustic tests have previously been conducted (by others) to measure sound transmission loss of four different ResCom MgO wall system configurations. A summary of the previously tested wall systems and their tested sound transmission loss ratings are presented in Table 4 below. Detail test results of these systems are presented in Appendix B.

Table 4 Calculated Sound Transmission Loss of the Proposed Single Stud Wall Systems

Type of Wall System	Wall Description	Sound Transmission Loss, dB	
		R _w	R _w + C _{tr}
Single Stud Wall (Steel Stud) Non-Discontinuous	The wall composed of 12mm Magnesium Oxide Board Corporation ResCom - 75mm steel studs filled with 24kg/m ³ glasswool R2.0 Bradford Mineral wool - 12mm Magnesium Oxide Board Corporation ResCom. The internal frame was made of a single stud frame composed of 75mm (1mm thick) steel studs with 600mm centres and noggins at 1208.5mm from ground.	47	38
Double Stud Wall (Steel Stud) Discontinuous	The wall composed of 12mm Magnesium Oxide Board Corporation ResCom - 75mm steel studs filled with 24kg/m ³ glasswool R2.0 Bradford Mineral wool - 20mm air gap - 75mm steel studs filled with 24kg/m ³ glasswool R2.0 Bradford Mineral wool - 12mm Magnesium Oxide Board Corporation ResCom. The internal frame was made of a double stud frame composed of 75mm (1mm thick) steel studs with 600mm centres and noggins at 1208.5mm from ground.	60	51
Double Stud Wall (Steel Stud) Discontinuous	The wall composed of 12mm Magnesium Oxide Board Corporation ResCom - 75mm steel studs filled with 24kg/m ³ glasswool R2.0 Bradford Mineral wool - 25mm air gap - 200mm steel studs - 18mm Magnesium Oxide Board Corporation ResCom. The internal frame was made of a double stud frame composed of 75mm (1mm thick) steel studs with 600mm centers and noggins at 1208.5mm from ground and 200mm (1.9mm thick) steel studs with 450mm centres.	62	55
Double Stud Wall (Steel Stud) Discontinuous	The wall composed of 12mm Magnesium Oxide Board Corporation ResCom - 75mm steel studs filled with 24kg/m ³ glasswool R2.0 Bradford Mineral wool - 20mm air gap - 75mm steel studs filled with 24kg/m ³ glasswool R2.0 Bradford Mineral wool - 2 layers of 12mm Magnesium Oxide Board Corporation ResCom. The internal frame was made of a double stud frame composed of 75mm (1mm thick) steel studs with 600mm centres and noggins at 1208.5mm from ground.	64	55

4 Acoustic Evaluation

4.1 Method of Assessment

Sound transmission loss modelling has been undertaken to calculate the acoustic performance of a range of additional wall assembly configurations using ResCom MgO board.

The airborne sound transmission loss of the recommended wall systems has been calculated based on the methods of (Sharp, B. H., 1978), (Fahy, F., 1985), (Cremer, L., Heckel, M., & Ungar, E. E., 1988) and (Rindel, J. H. Rindel, J. H., 1995), as implemented by Insul V8 Sound Insulation Modelling Software.

The acoustic model has been calibrated based on the laboratory transmission loss test results presented in Section 3.

The following subsections present modelling input parameters, the evaluated wall systems, and the calculated airborne sound transmission loss ratings.

4.2 Input Parameters

The following physical characteristics determine sound transmission loss of a wall:

- Panel mass and stiffness;
- Framing stiffness and configuration;
- The depth of air spaces between panels / leaves;
- The presence or absence of sound absorbing material in the wall cavity, the thickness and density of such material;
- The degree of mechanical coupling between layers;

Acoustic Modelling has been based on the material properties presented in Table 5.

Table 5 Material Properties


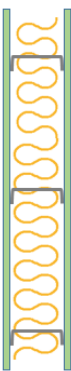
Description of the Floor-Ceiling Assembly	Components of Proposed Wall System	Modelled Material Properties
Wall Linings	ResCom MgO Panels (10mm, 12mm, 14mm and 16mm) (Density 1.25 g/cm ³)	Density: 1250 kg/m ³ Mod. Of Elasticity: 5.91 GPa
Framing	70mm and 90mm Timber stud at 600mm Centres	70mm and 90mm Timber Stud at 600mm Centres
	64mm, 76mm and 90mm Steel stud at 600mm Centres	64mm, 76mm and 90mm Steel stud at 600mm Centres
	64mm, 76mm and 90mm Steel Stud	Steel Stud 0.55mm BMT
Insulation	Fire-rated acoustic insulation (32Kg/m ³)	Material Type: Mineral Wool Thickness: 75mm Density: 32kg/m ³

4.3 Calculated Sound Transmission Loss Ratings

4.3.1 Non-Discontinuous Construction Configurations

The sound transmission loss ratings of 8 different types of non-discontinuous construction wall designs have been evaluated and their acoustic performance in relation to BCA sound insulation requirements is summarised below.

Table 6 Acoustic Performances of Single Stud Wall Systems

System No.	Wall System	Wall Linings	Stud Depth (mm)	90	
			Stud BMT (mm)	0.5	
			Framing Details	R _w	R _w + C _{tr}
1		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 75mm Glasswool (11kg/m³) Stud Details: <ul style="list-style-type: none"> 90mm Steel Stud at 450mm centres. 	48	37
			Minimum Wall Thickness (mm)	110	
			BCA Compliance		
			R _w ≥ 50	✗	
			R _w + C _{tr} ≥ 50	✗	
			Discontinuous	✗	
System No.	Wall System	Wall Linings	Stud Depth (mm)	90	
			Stud BMT (mm)	0.5	
			Framing Details	R _w	R _w + C _{tr}
2		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 75mm Mineral wool R2.0 (32kg/m³) Stud Details: <ul style="list-style-type: none"> 90mm Steel Stud at 450mm centres. 	48	36
			Minimum Wall Thickness (mm)	110	
			BCA Compliance		
			R _w ≥ 50	✗	
			R _w + C _{tr} ≥ 50	✗	
			Discontinuous	✗	

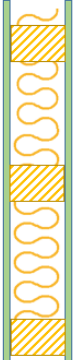

System No.	Wall System	Wall Linings	Stud Depth (mm)	90			
			Framing Details	R _w	R _w + C _{tr}		
3		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 75mm Glasswool (11kg/m³) Stud Details: <ul style="list-style-type: none"> 90mm Timber Stud at 450mm centres. 	41	30		
						Minimum Wall Thickness (mm)	110
						BCA Compliance	
						R _w ≥ 50	✗
						R _w + C _{tr} ≥ 50	✗
Discontinuous	✗						
System No.	Wall System	Wall Linings	Stud Depth (mm)	90			
			Framing Details	R _w	R _w + C _{tr}		
4		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 75mm Mineral wool R2.0 (32kg/m³) Stud Details: <ul style="list-style-type: none"> 90mm Steel Stud at 450mm centres. 	40	29		
						Minimum Wall Thickness (mm)	110
						BCA Compliance	
						R _w ≥ 50	✗
						R _w + C _{tr} ≥ 50	✗
Discontinuous	✗						

Table 7 Acoustic Performances of Staggered Stud Wall Systems

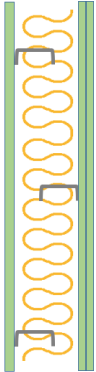

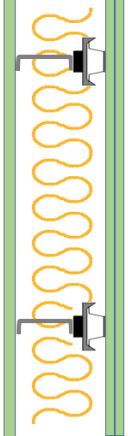
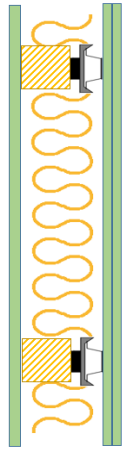
System No.	Wall System	Wall Linings	Cavity Depth (mm)	92	
			Stud Depth/BMT (mm)	64/0.5	
			Framing Details	R _w	R _w + C _{tr}
5		<p>Side One:</p> <ul style="list-style-type: none"> 1 x 14mm ResCom MgO Fire-rated Wall board <p>Side Two:</p> <ul style="list-style-type: none"> 2 x 12mm ResCom MgO Fire-rated Wall board. 	<p>Cavity Insulation:</p> <ul style="list-style-type: none"> 75mm Mineral Wool (32Kg/m³) <p>Stud Details:</p> <ul style="list-style-type: none"> 64mm Staggered Steel Stud at 600mm centres each side. Studs restrained in track or angle at top and bottom with minimum 22mm clearance between stud and opposing lining. Cavity Depth 92mm. 	60	51
			Minimum Wall Thickness (mm)	130	
			BCA Compliance		
			R _w ≥ 50	✓	
			R _w + C _{tr} ≥ 50	✓	
			Discontinuous	✗	
System No.	Wall System	Wall Linings	Plate Width (mm)	90	
			Framing Details	R _w	R _w + C _{tr}
			6		<p>Side One:</p> <ul style="list-style-type: none"> 1 x 16mm ResCom MgO Fire-rated Wall board. <p>Side Two:</p> <ul style="list-style-type: none"> 2 x 12mm ResCom MgO Fire-rated Wall board.
			Minimum Wall Thickness (mm)	130	
			BCA Compliance		
			R _w ≥ 50	✓	
			R _w + C _{tr} ≥ 50	✓	
			Discontinuous	✗	

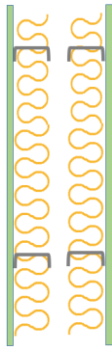
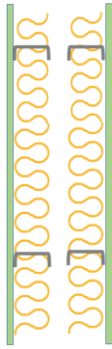
Table 8 Acoustic Performances of Resilient Mount Wall Systems

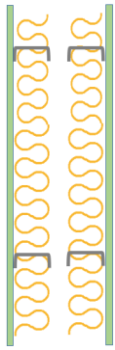
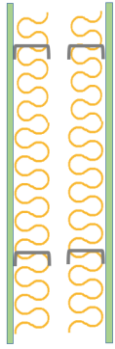
System No.	Wall System	Wall Linings	Stud Depth (mm)	64						
			Stud BMT (mm)	0.5						
			Framing Details	R _w	R _w + C _{tr}					
7		<p>Side One:</p> <ul style="list-style-type: none"> 1 x 14mm ResCom MgO Fire-rated Wall board. <p>Side Two:</p> <ul style="list-style-type: none"> 2 x 12mm ResCom MgO Fire-rated Wall board. 	<p>Cavity Insulation:</p> <ul style="list-style-type: none"> 75mm Mineral Wool (32Kg/m³) <p>Stud Details:</p> <ul style="list-style-type: none"> 64mm Steel Stud at 600mm centres. Resilient mounts (Rondo STWC or equivalent) screw fixed to one side of the steel stud. Furring channel (Rondo N^o129 or equivalent) clipped to resilient mounts. 	61	52					
						Minimum Wall Thickness (mm)	142			
						BCA Compliance				
						R _w ≥ 50				✓
						R _w + C _{tr} ≥ 50				✓
Discontinuous				✗						
System No.	Wall System	Wall Linings	Stud Depth (mm)	70						
			Framing Details	R _w	R _w					
8		<p>Side One:</p> <ul style="list-style-type: none"> 1 x 14mm ResCom MgO Fire-rated Wall board. <p>Side Two:</p> <ul style="list-style-type: none"> 2 x 12mm ResCom MgO Fire-rated Wall board. 	<p>Cavity Insulation:</p> <ul style="list-style-type: none"> 75mm Mineral Wool (32Kg/m³) <p>Stud Details:</p> <ul style="list-style-type: none"> 70mm Timber Stud at 600mm centres. Resilient mounts (Rondo STWC or equivalent) screw fixed to one side of the timber stud. Furring channel (Rondo N^o129 or equivalent) clipped to resilient mounts. 	61	53					
						Minimum Wall Thickness (mm)	148			
						BCA Compliance				
						R _w ≥ 50				✓
						R _w + C _{tr} ≥ 50				✓
Discontinuous				✗						

4.4 Discontinuous Construction Configurations

The sound transmission loss rating of 12 different types of discontinuous construction wall designs have been evaluated and their acoustic performances in relation to BCA compliance is summarised below.

Table 9 Acoustic Performances of Double Steel Stud Wall Systems

System No.	Wall System	Wall Linings	Cavity Width (mm)					
			200					
			Stud Depth/BMT (mm)					
			90/0.5					
			Framing Details					
			R _w	R _w + C _{tr}				
1		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Glasswool (11kg/m³). 		61	50		
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 450mm centres with minimum 20mm gap. 					
			Minimum Wall Thickness (mm)				220	
			BCA Compliance					
			R _w ≥ 50				✓	
R _w + C _{tr} ≥ 50		✓						
Discontinuous		✓						
System No.	Wall System	Wall Linings	Cavity Width (mm)					
			200					
			Stud Depth/BMT (mm)					
			90/0.5					
			Framing Details					
			R _w	R _w + C _{tr}				
2		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral wool R2.0 (32kg/m³). 		59	49		
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 450mm centres with minimum 20mm gap. 					
			Minimum Wall Thickness (mm)				220	
			BCA Compliance					
			R _w ≥ 50				✓	
R _w + C _{tr} ≥ 50		✗						
Discontinuous		✓						

System No.	Wall System	Wall Linings	Cavity Width (mm)			
			Stud Depth/BMT (mm)			
			Framing Details	R _w	R _w + C _{tr}	
3		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Glasswool (11kg/m³). 			
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 450mm centres with minimum 50mm gap. 		62	51
			Minimum Wall Thickness (mm)		250	
			BCA Compliance			
			R _w ≥ 50		✓	
R _w + C _{tr} ≥ 50		✓				
Discontinuous		✓				
System No.	Wall System	Wall Linings	Cavity Width (mm)			
			Stud Depth/BMT (mm)			
			Framing Details	R _w	R _w + C _{tr}	
4		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral wool R2.0 (32kg/m³). 			
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 450mm centres with minimum 50mm gap. 		60	50
			Minimum Wall Thickness (mm)		250	
			BCA Compliance			
			R _w ≥ 50		✓	
R _w + C _{tr} ≥ 50		✓				
Discontinuous		✓				

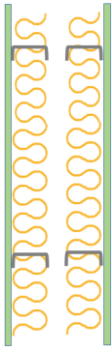
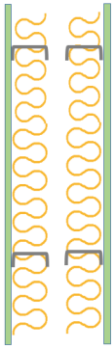
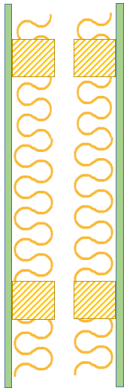
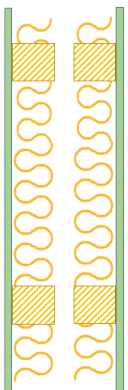
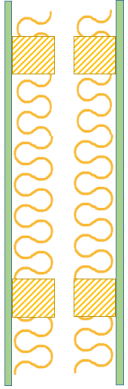
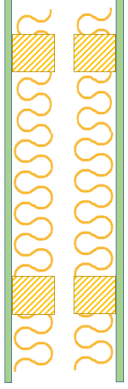
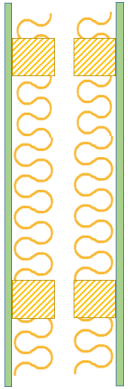
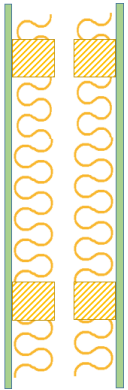
System No.	Wall System	Wall Linings	Cavity Width (mm)					
			Stud Depth/BMT (mm)					
			Framing Details					
			R_w	$R_w + C_{tr}$				
5		Both Sides: <ul style="list-style-type: none"> 1 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral Wool (32Kg/m³). 		61	51		
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 600mm centres with minimum 20mm gap. 					
			Minimum Wall Thickness (mm)				196	
			BCA Compliance					
			$R_w \geq 50$		✓			
			$R_w + C_{tr} \geq 50$		✓			
			Discontinuous		✓			
System No.	Wall System	Wall Linings	Cavity Width (mm)					
			Stud Depth/BMT (mm)					
			Framing Details					
			R_w	$R_w + C_{tr}$				
6		Both Sides: <ul style="list-style-type: none"> 1 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral Wool (32Kg/m³). 		62	52		
			Stud Details: <ul style="list-style-type: none"> Two rows of Steel Studs at 600mm centres with minimum 20mm gap. 					
			Minimum Wall Thickness (mm)				224	
			BCA Compliance					
			$R_w \geq 50$		✓			
			$R_w + C_{tr} \geq 50$		✓			
			Discontinuous		✓			

Table 10 Acoustic Performances of Double Timber Stud Wall Systems

System No.	Wall System	Wall Linings	Stud Depth (mm)	90			
			Framing Details	R _w	R _w + C _{tr}		
7		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Glasswool (11kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 450mm centres with minimum 20mm gap. 	61	50		
						Minimum Wall Thickness (mm)	220
			BCA Compliance				
			R _w ≥ 50				✓
			R _w + C _{tr} ≥ 50				✓
Discontinuous				✓			
System No.	Wall System	Wall Linings	Stud Depth (mm)	90			
			Framing Details	R _w	R _w + C _{tr}		
8		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral wool R2.0 (32kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 450mm centres with minimum 20mm gap. 	59	49		
						Minimum Wall Thickness (mm)	220
			BCA Compliance				
			R _w ≥ 50				✓
			R _w + C _{tr} ≥ 50				✗
Discontinuous				✓			

System No.	Wall System	Wall Linings	Stud Depth (mm)							
			Framing Details	90						
			R _w	R _w + C _{tr}						
9		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Glasswool (11kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 450mm centres with minimum 50mm gap. 	62	51					
						Minimum Wall Thickness (mm)		250		
						BCA Compliance				
						R _w ≥ 50			✓	
						R _w + C _{tr} ≥ 50			✓	
Discontinuous			✓							
System No.	Wall System	Wall Linings	Stud Depth (mm)							
			Framing Details	90						
			R _w	R _w + C _{tr}						
10		Both Sides: <ul style="list-style-type: none"> 1 x 10mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral wool R2.0 (32kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 450mm centres with minimum 50mm gap. 	60	50					
						Minimum Wall Thickness (mm)		250		
						BCA Compliance				
						R _w ≥ 50			✓	
						R _w + C _{tr} ≥ 50			✓	
Discontinuous			✓							

System No.	Wall System	Wall Linings	Stud Depth (mm)					
			Framing Details	70				
			R _w	R _w + C _{tr}				
11		Both Sides: <ul style="list-style-type: none"> 1 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral Wool (32Kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 600mm centres with minimum 20mm gap. 	61	50			
						Minimum Wall Thickness (mm)		184
						BCA Compliance		
						R _w ≥ 50		✓
						R _w + C _{tr} ≥ 50		✓
Discontinuous		✓						
System No.	Wall System	Wall Linings	Stud Depth (mm)					
			Framing Details	90				
			R _w	R _w + C _{tr}				
12		Both Sides: <ul style="list-style-type: none"> 1 x 12mm ResCom MgO Fire-rated Wall board. 	Cavity Insulation: <ul style="list-style-type: none"> 2 x 75mm Mineral Wool (32Kg/m³). Stud Details: <ul style="list-style-type: none"> Two rows of Timber Studs at 600mm centres with minimum 20mm gap. 	62	52			
						Minimum Wall Thickness (mm)		224
						BCA Compliance		
						R _w ≥ 50		✓
						R _w + C _{tr} ≥ 50		✓
Discontinuous		✓						

5 Conclusion

Eight non-discontinuous construction configurations and twelve discontinuous construction configurations using ResCom MgO boards have been evaluated in this report. Calculated acoustic performance of these systems and comparison with BCA sound insulation requirements are presented in Section 4.3 of this report.

It is calculated that four non-discontinuous construction walls among the eight wall assemblies evaluated achieve the BCA airborne sound insulation requirements of R_w 50 dB and R_w+C_{tr} 50 dB. The non-discontinuous construction configurations that achieves the BCA requirements are Systems 5, 6 7 and 8.

Among the twelve discontinuous construction walls evaluated, it is calculated that except for the System 2 and System 8, rest of the wall assemblies achieve the BCA airborne sound insulation requirements of R_w 50 dB and R_w+C_{tr} 50 dB. However, System 2 and System 8 achieve the BCA airborne sound insulation requirements of R_w 50 dB.

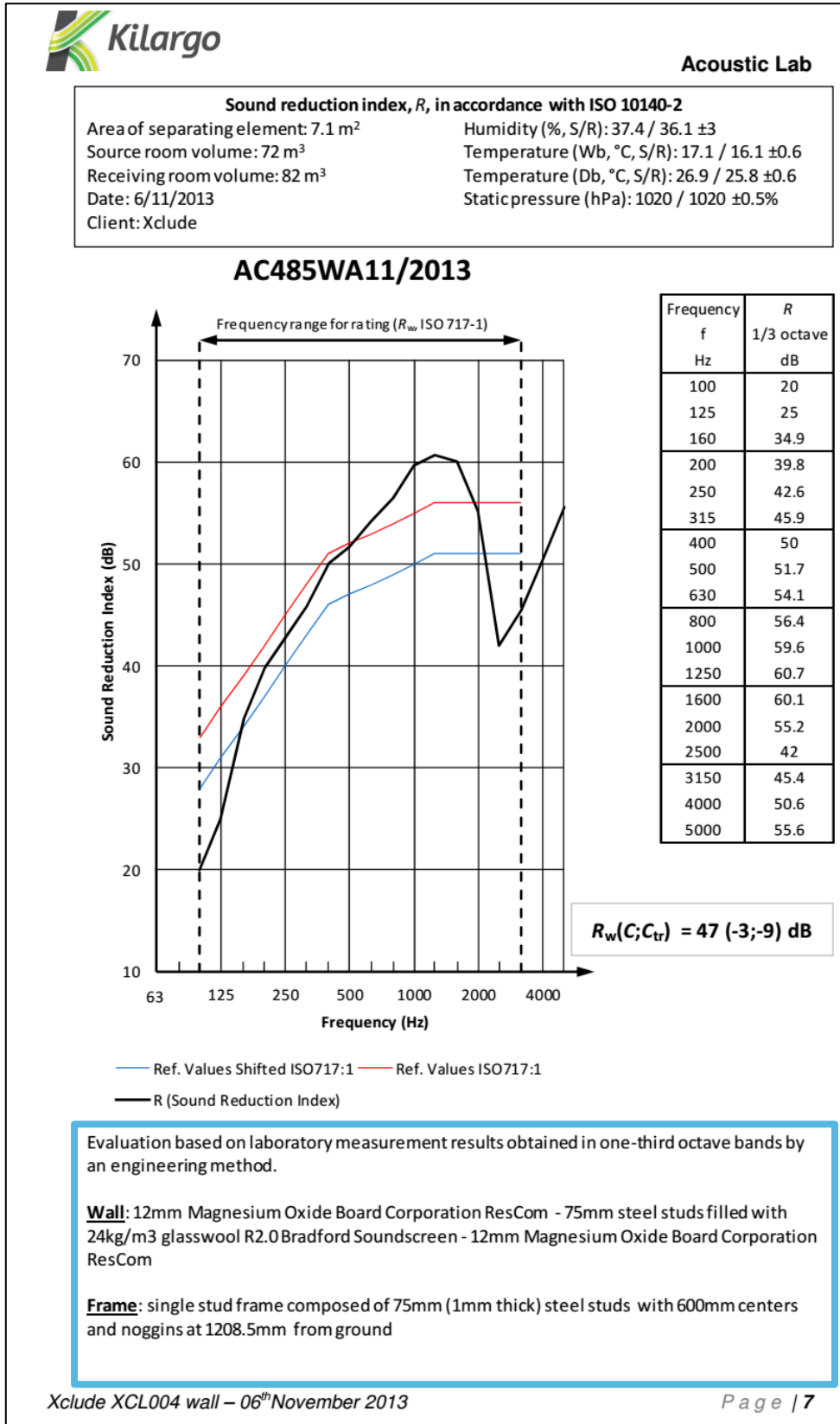
6 References

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- Cremer, L., Heckel, M., & Ungar, E. E. (1988). *Structureborne Sound*. pringer Verlag.
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Appendix A Glossary of Acoustic Terms

- C_{tr} A spectrum adaptation term, commonly used with R_w and D_{nTW} . C_{tr} adjusts the sound insulation ratings to better describe the performance of the particular construction under consideration when subject to low frequency noise, such as noise from heavy vehicle traffic or subwoofers. [Unit: dB]
- R_w Weighted Sound Reduction Index. A single number rating of the airborne sound insulation performance of a specific building element in the absence of flanking transmission. A higher R_w value indicates better airborne sound insulation. [Unit: dB]

Appendix B Laboratory Test Data of Different ResCom MgO Systems

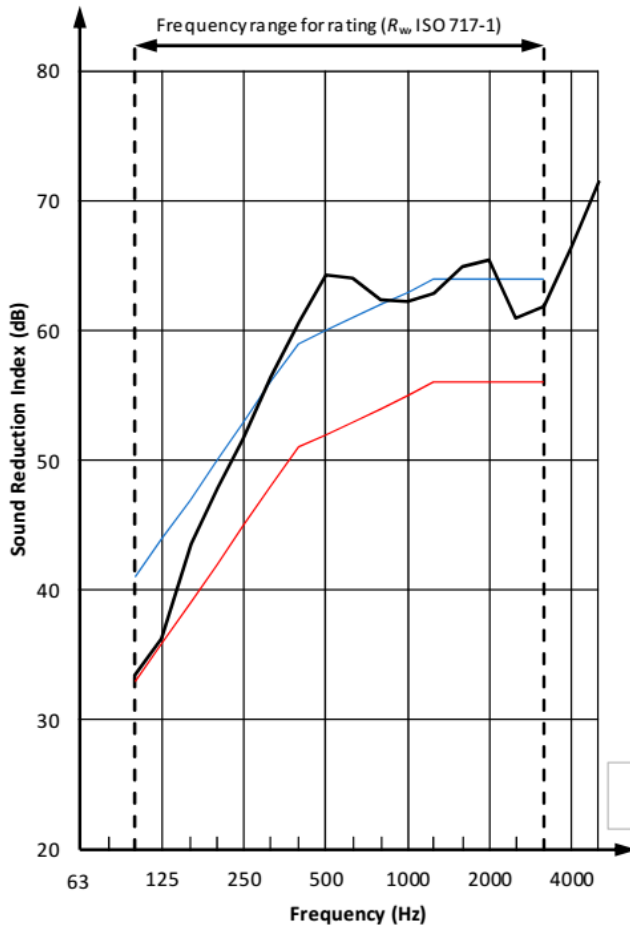




Acoustic Lab

Sound reduction index, R , in accordance with ISO 10140-2
 Area of separating element: 7.1 m² Humidity (% S/R): 45.2 / 46.1 ±3
 Source room volume: 72 m³ Temperature (Wb, °C, S/R): 16.4 / 16.3 ±0.6
 Receiving room volume: 82 m³ Temperature (Db, °C, S/R): 24.1 / 23.9 ±0.6
 Date: 5/11/2013 Static pressure (hPa): 1021 / 1021 ±0.5%
 Client: Xclude

AC482WA11/2013



Frequency f Hz	R 1/3 octave dB
100	≥ 33.5 [‡]
125	≥ 36.2 [‡]
160	≥ 43.5 [‡]
200	≥ 47.9 [‡]
250	≥ 51.6 [‡]
315	≥ 56.5 [‡]
400	≥ 60.7 [‡]
500	≥ 64.3 [‡]
630	≥ 64 [‡]
800	≥ 62.4 [‡]
1000	≥ 62.2 [‡]
1250	62.9
1600	64.9
2000	65.5
2500	61
3150	61.9
4000	66.6
5000	≥ 71.4 [‡]

‡ : See report for details

$R_w(C;C_{tr}) = 60 (-3;-9)$ dB

— Ref. Values Shifted ISO717:1 — Ref. Values ISO717:1
 — R (Sound Reduction Index)

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

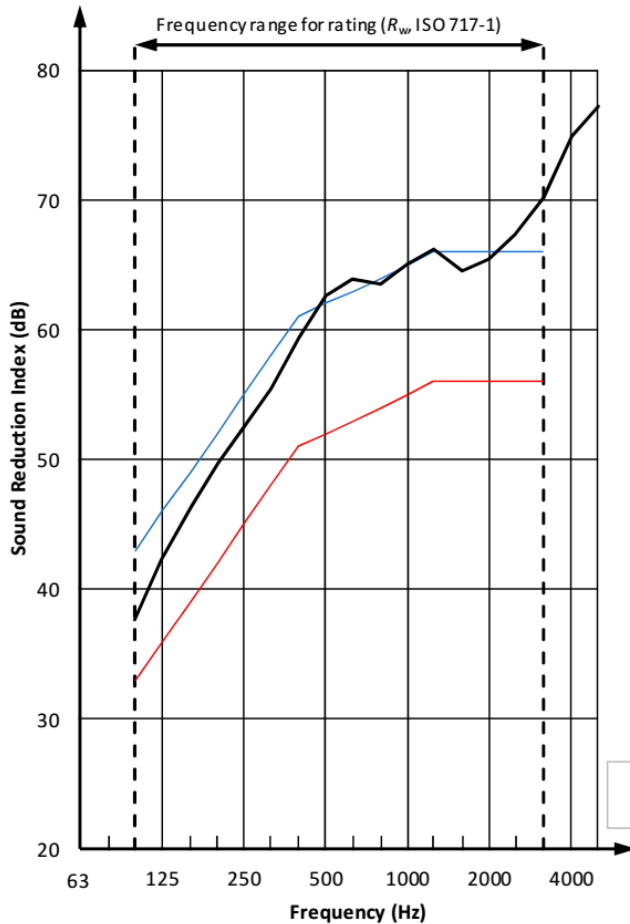
Wall: 12mm Magnesium Oxide Board Corporation ResCom - 75mm steel studs filled with 24kg/m³ glasswool R2.0 Bradford Soundscreen - 20mm air gap - 75mm steel studs filled with 24kg/m³ glasswool R2.0 Bradford Soundscreen - 12mm Magnesium Oxide Board Corporation ResCom

Frame: double stud frame composed of 75mm (1mm thick) steel studs with 600mm centers and noggins at 1208.5mm from ground

Sound reduction index, R , in accordance with ISO 10140-2

Area of separating element: 7.1 m² Humidity (% S/R): 39.9 / 39.0 ±3
 Source room volume: 72 m³ Temperature (Wb, °C, S/R): 16.3 / 16.2 ±0.6
 Receiving room volume: 82 m³ Temperature (Db, °C, S/R): 25.3 / 25.2 ±0.6
 Date: 6/11/2013 Static pressure (hPa): 1022 / 1022 ±0.5%
 Client: Xclude

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Frequency f Hz	R 1/3 octave dB
100	≥ 37.7 [‡]
125	≥ 42.3 [‡]
160	≥ 46.4 [‡]
200	≥ 49.7 [‡]
250	≥ 52.4 [‡]
315	≥ 55.4 [‡]
400	≥ 59.4 [‡]
500	≥ 62.6 [‡]
630	≥ 63.9 [‡]
800	≥ 63.5 [‡]
1000	≥ 65.1 [‡]
1250	≥ 66.2 [‡]
1600	64.5
2000	65.5
2500	67.4
3150	≥ 70.2 [‡]
4000	≥ 74.9 [‡]
5000	≥ 77.2 [‡]

[‡] : See report for details

$R_w(C;C_{tr}) = 62 (-2;-7) \text{ dB}$

— Ref. Values Shifted ISO717:1 — Ref. Values ISO717:1
 — R (Sound Reduction Index)

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

Wall: From receiving to source room: 12mm Magnesium Oxide Board Corporation ResCom - 75mm steel studs filled with 24kg/m³ glasswool R2.0 Bradford Soundscreen - 25mm air gap - 200mm steel studs - 18mm Magnesium Oxide Board Corporation ResCom

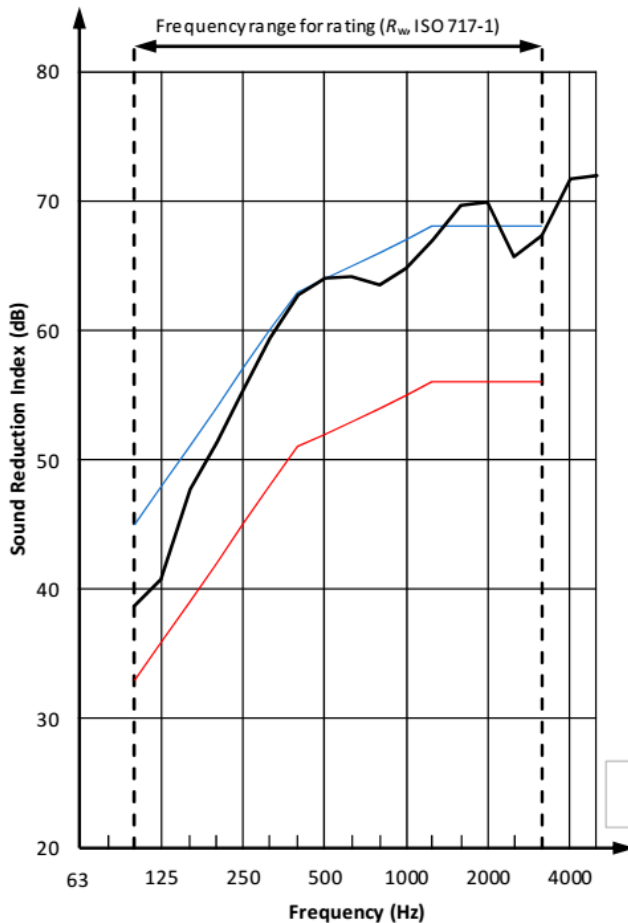
Frame: double stud frame composed of 75mm (1mm thick) steel studs with 600mm centers and noggins at 1208.5mm from ground and 200mm (1.9mm thick) steel studs with 450mm centers



Sound reduction index, R, in accordance with ISO 10140-2

Area of separating element: 7.1 m² Humidity (% S/R): 50.9 / 48.4 ±3
 Source room volume: 72 m³ Temperature (Wb, °C, S/R): 17.1 / 16.4 ±0.6
 Receiving room volume: 82 m³ Temperature (Db, °C, S/R): 23.9 / 23.6 ±0.6
 Date: 5/11/2013 Static pressure (hPa): 1021 / 1021 ±0.5%
 Client: Xclude

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Frequency f Hz	R 1/3 octave dB
100	≥ 38.7 [‡]
125	≥ 40.8 [‡]
160	≥ 47.8 [‡]
200	≥ 51.4 [‡]
250	≥ 55.2 [‡]
315	≥ 59.4 [‡]
400	≥ 62.7 [‡]
500	≥ 64 [‡]
630	≥ 64.1 [‡]
800	≥ 63.5 [‡]
1000	≥ 64.8 [‡]
1250	≥ 67 [‡]
1600	≥ 69.6 [‡]
2000	69.9
2500	65.7
3150	67.4
4000	≥ 71.7 [‡]
5000	≥ 72 [‡]

‡ : See report for details

$R_w(C;C_{tr}) = 64 (-3;-9)$ dB

— Ref. Values Shifted ISO717:1 — Ref. Values ISO717:1
 — R (Sound Reduction Index)

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

Wall: From receiving to source room: 12mm Magnesium Oxide Board Corporation ResCom - 75mm steel studs filled with 24kg/m³ glasswool R2.0 Bradford Soundscreen - 20mm air gap - 75mm steel studs filled with 24kg/m³ glasswool R2.0 Bradford Soundscreen - 2 layers of 12mm Magnesium Oxide Board Corporation ResCom

Frame: double stud frame composed of 75mm (1mm thick) steel studs with 600mm centers and noggins at 1208.5mm from ground