



ResCom MgO Wall System Acoustics

Acoustic Engineering Report

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Acoustic Engineering Report

Prepared for:

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

Prepared by:

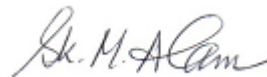
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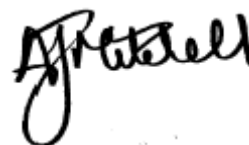
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Revision History

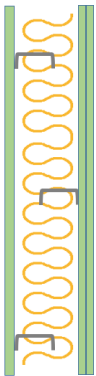
| Rev. | Date | Purpose | Prepared by: | Reviewed by: |
|------|------------|--|---------------|-----------------|
| 0 | 08-03-2018 | Not for construction | Mahbub Sheikh | Andrew Mitchell |
| 1 | 09-03-2018 | Amend Terminology | Mahbub Sheikh | Andrew Mitchell |
| 2 | 03-09-2018 | For Construction | Mahbub Sheikh | Andrew Mitchell |
| 3 | 29-10-2018 | Revise Discontinuous Construction System 5 | Mahbub Sheikh | Andrew Mitchell |
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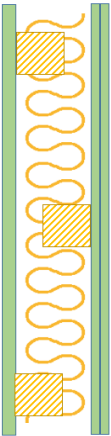
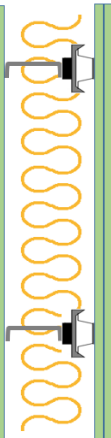
Executive Summary

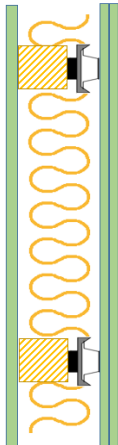
KHS Capital Management Fund Limited t/a ResCom Fire Wall has appointed Cogent Acoustics Pty Ltd to evaluate the acoustic performance of various wall assemblies using ResCom MgO board wall linings, and provide advice in relation to compliance with the sound insulation requirements of the Building Code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

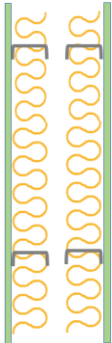
NON-DISCONTINUOUS CONSTRUCTION CONFIGURATIONS

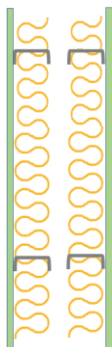
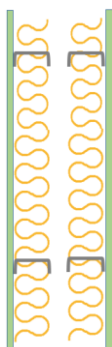
| System No. | Wall System | Wall Linings | Cavity Depth (mm) | 92 | |
|------------|--|--|---|----------------|----------------------------------|
| | | | Stud Depth/BMT (mm) | 64/0.5 | |
| | | | Framing Details | R _w | R _w + C _{tr} |
| 5 |  | Side One: <ul style="list-style-type: none"> 1 x 14mm 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. | 60 | 51 |
| | | | Minimum Wall Thickness (mm) | 130 | |
| | | | BCA Compliance | | |
| | | | R _w ≥ 50 | ✓ | |
| | | | R _w + C _{tr} ≥ 50 | ✓ | |
| | | | Discontinuous | ✗ | |

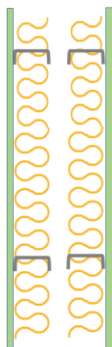
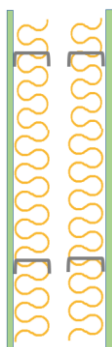
| System No. | Wall System | Wall Linings | Plate Width (mm) | 90 | |
|------------|---|---|---|-------|----------------|
| | | | Framing Details | R_w | $R_w + C_{tr}$ |
| 6 |  | <p>Side One:</p> <ul style="list-style-type: none"> 1 x 16mm ResCom MgO Fire-rated Wall board. <p>Side Two:</p> <ul style="list-style-type: 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 | | |
| | | | $R_w \geq 50$ | ✓ | |
| | | | $R_w + C_{tr} \geq 50$ | ✓ | |
| | | | Discontinuous | ✗ | |
| | | | Stud Depth (mm) | 64 | |
| | | | Stud BMT (mm) | 0.5 | |
| System No. | Wall System | Wall Linings | 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°129 or equivalent) clipped to resilient mounts. | 61 | 52 |
| | | | Minimum Wall Thickness (mm) | 142 | |
| | | | BCA Compliance | | |
| | | | $R_w \geq 50$ | ✓ | |
| | | | $R_w + C_{tr} \geq 50$ | ✓ | |
| | | | Discontinuous | ✗ | |

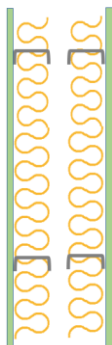
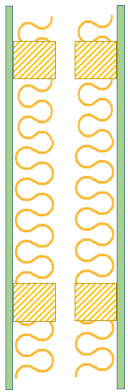
| System No. | Wall System | Wall Linings | Stud Depth (mm) | 70 | | | |
|---------------------------------------|---|---|--|----------------|----------------|-----|--|
| | | | Framing Details | R _w | R _w | | |
| 8 |  | <p>Side One:</p> <ul style="list-style-type: none">1 x 14mm ResCom MgO Fire-rated 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 №129 or equivalent) clipped to resilient mounts. | 61 | 53 | | |
| | | | Minimum Wall Thickness (mm) | | | 148 | |
| | | | BCA Compliance | | | | |
| | | | R _w ≥ 50 | | | ✓ | |
| R _w + C _{tr} ≥ 50 | | ✓ | | | | | |
| Discontinuous | | ✗ | | | | | |

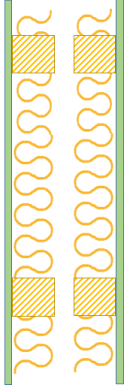
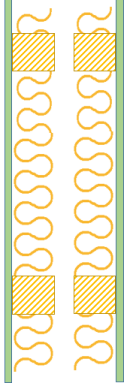
DISCONTINUOUS CONSTRUCTION CONFIGURATIONS

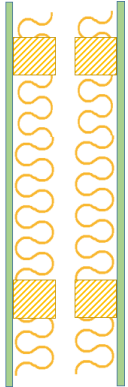
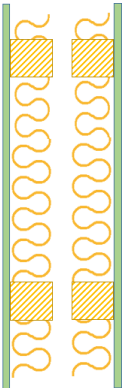
| System No. | Wall System | Wall Linings | Cavity Width (mm) | 200 | | |
|------------|---|---|---|----------------|----------------------------------|-----|
| | | | Stud Depth/BMT (mm) | 90/0.5 | | |
| | | | Framing Details | R _w | R _w + C _{tr} | |
| 1 |  | <p>Both Sides:</p> <ul style="list-style-type: none">1 x 10mm ResCom MgO Fire-rated Wall board. | <p>Cavity Insulation:</p> <ul style="list-style-type: none">2 x 75mm Glasswool (11kg/m³). <p>Stud Details:</p> <ul style="list-style-type: none">Two rows of Steel 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 | | ✓ | |

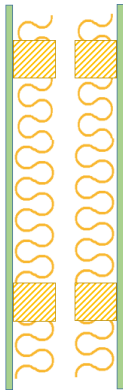
| System No. | Wall System | Wall Linings | Cavity Width (mm) | 200 | |
|------------|---|--|--|----------------|----------------------------------|
| | | | Stud Depth/BMT (mm) | 90/0.5 | |
| | | | Framing Details | R _w | R _w + C _{tr} |
| 2 |  | Both Sides: <ul style="list-style-type: none">1 x 10mm 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) | | |
| | | | 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) | | |
| | | | 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} |
| 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) | 202 | |
| | | | Stud Depth/BMT (mm) | 64/0.75 | |
| | | | 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 (27Kg/m³). Stud Details: <ul style="list-style-type: none">Two rows of Steel Studs at 600mm centres with minimum 50mm gap. | 62 | 52 |
| | | | 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} | | |
| 6 |  | <p>Both Sides:</p> <ul style="list-style-type: none">1 x 12mm ResCom MgO Fire-rated Wall board. | <p>Cavity Insulation:</p> <ul style="list-style-type: none">2 x 75mm Mineral Wool (32Kg/m³). <p>Stud Details:</p> <ul style="list-style-type: none">Two rows of Steel 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 | | | ✓ | | | | |
| System No. | Wall System | Wall Linings | Stud Depth (mm) | 90 | | | |
| | | | Framing Details | R _w | R _w + C _{tr} | | |
| 7 |  | <p>Both Sides:</p> <ul style="list-style-type: none">1 x 10mm ResCom MgO Fire-rated Wall board. | <p>Cavity Insulation:</p> <ul style="list-style-type: none">2 x 75mm Glasswool (11kg/m³). <p>Stud Details:</p> <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 | | |
| | | | $R_w \geq 50$ | ✓ | |
| 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 | | |
| | | | $R_w \geq 50$ | ✓ | |
| | | | $R_w + C_{tr} \geq 50$ | ✗ | |
| | | | Discontinuous | ✓ | |
| | | | BCA Compliance | | |
| | | | $R_w \geq 50$ | ✓ | |
| | | | $R_w + C_{tr} \geq 50$ | ✓ | |
| | | | Discontinuous | ✓ | |
| | | | BCA Compliance | | |
| | | | $R_w \geq 50$ | ✓ | |

| System No. | Wall System | Wall Linings | Stud Depth (mm) | 90 | | |
|---------------|---|---|---|----------------|----------------------------------|--|
| | | | Framing Details | R _w | R _w + C _{tr} | |
| 10 |  | <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 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) | 70 | | |
| | | | Framing Details | R _w | R _w + C _{tr} | |
| 11 |  | <p>Both Sides:</p> <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) | 90 | | |
|------------|---|---|---|----------------|----------------------------------|-----|
| | | | Framing Details | R _w | R _w + C _{tr} | |
| 12 |  | <p>Both Sides:</p> <ul style="list-style-type: none">1 x 12mm ResCom MgO Fire-rated Wall board. | <p>Cavity Insulation:</p> <ul style="list-style-type: none">2 x 75mm Mineral Wool (32Kg/m³). <p>Stud Details:</p> <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 | ✓ | | | |

Contents

| | | |
|------------|---|----|
| 1 | Introduction | 1 |
| 1.1 | Purpose | 1 |
| 1.2 | Reference Documentation | 1 |
| 1.3 | Report Limitations..... | 2 |
| 2 | Building Code of Australia Requirements | 3 |
| 3 | Laboratory Test Results of ResCom MgO Wall Assemblies | 5 |
| 4 | Acoustic Evaluation..... | 6 |
| 4.1 | Method of Assessment | 6 |
| 4.2 | Input Parameters | 6 |
| 4.3 | Calculated Sound Transmission Loss Ratings..... | 8 |
| 4.4 | Discontinuous Construction Configurations | 12 |
| 5 | Conclusion..... | 18 |
| 6 | References | 19 |
| Appendix A | Glossary of Acoustic Terms | 20 |
| Appendix B | Laboratory Test Data of Different ResCom MgO Systems..... | 21 |

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.
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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: ▪ 1 x 10mm ResCom MgO Fire-rated wall board. | Cavity Insulation: ▪ 75mm Glasswool (11kg/m ³) Stud Details: ▪ 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: ▪ 1 x 10mm ResCom MgO Fire-rated wall board. | Cavity Insulation: ▪ 75mm Mineral wool R2.0 (32kg/m ³) Stud Details: ▪ 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 | | |
| | | | $R_w \geq 50$ | ✗ | |
| | | | $R_w + C_{tr} \geq 50$ | ✗ | |
| | | | Discontinuous | ✗ | |
| System No. | Wall System | Wall Linings | Stud Depth (mm) | 90 | |
| | | | Framing Details | R_w | $R_w + C_{tr}$ |
| 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 | | |
| | | | $R_w \geq 50$ | ✗ | |
| | | | $R_w + C_{tr} \geq 50$ | ✗ | |
| | | | Discontinuous | ✗ | |

Table 7 Acoustic Performances of Staggered Stud Wall Systems

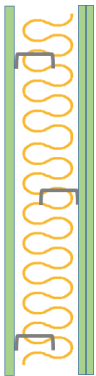

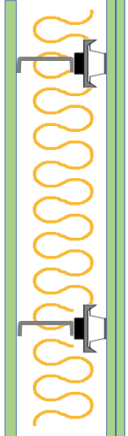
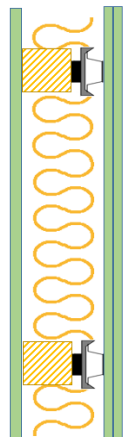
| System No. | Wall System | Wall Linings | Cavity Depth (mm) | 92 | |
|------------|---|---|---|--------|----------------|
| | | | Stud Depth/BMT (mm) | 64/0.5 | |
| | | | Framing Details | R_w | $R_w + C_{tr}$ |
| 5 |  | <p>Side One:</p> <ul style="list-style-type: none"> 1 x 14mm ResCom MgO Fire-rated 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 | | |
| | | | $R_w \geq 50$ | ✓ | |
| | | | $R_w + C_{tr} \geq 50$ | ✓ | |
| | | | 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 | | |
| | | | $R_w \geq 50$ | ✓ | |
| | | | $R_w + C_{tr} \geq 50$ | ✓ | |
| | | | Discontinuous | ✗ | |

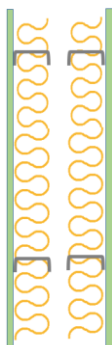
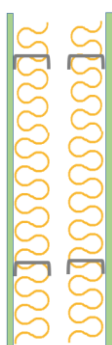
Table 8 Acoustic Performances of Resilient Mount Wall Systems

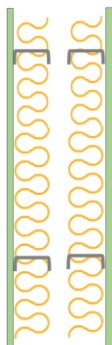
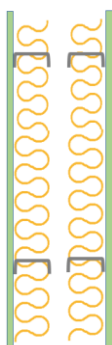
| System No. | Wall System | Wall Linings | Stud Depth (mm) | 64 | | | |
|------------|---|---|---|----------------|----------------------------------|---------------------------------------|---|
| | | | Stud BMT (mm) | 0.5 | | | |
| | | | Framing Details | R _w | R _w + C _{tr} | | |
| 7 |  | <p>Side 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. | Cavity Insulation: <ul style="list-style-type: none">75mm Mineral Wool (32Kg/m³) Stud Details: <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) | | | 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). 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) | | | 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). 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 |  | <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 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) | 230 | | |
| | | | Stud Depth/BMT (mm) | 90/0.5 | | |
| | | | Framing Details | R _w | R _w + C _{tr} | |
| 4 |  | <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 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 | ✓ | | |

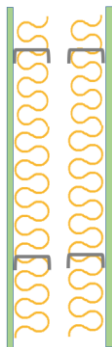
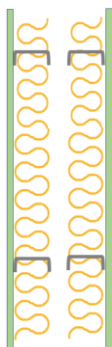
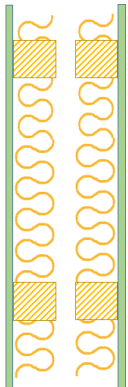
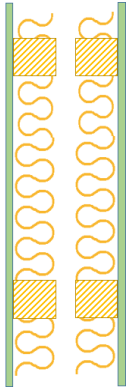
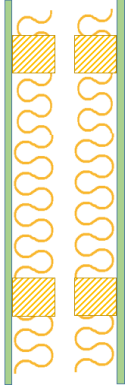
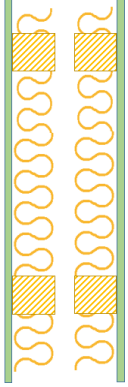
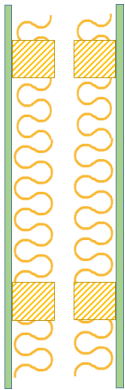
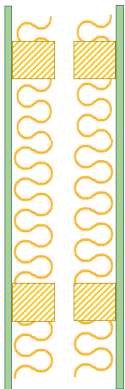
| System No. | Wall System | Wall Linings | Cavity Width (mm) | 202 | |
|------------|---|--|---|----------------|----------------------------------|
| | | | Stud Depth/BMT (mm) | 64/0.75 | |
| | | | Framing Details | R _w | R _w + C _{tr} |
| 5 |  | Both Sides: <ul style="list-style-type: none">1 x 12mm ResCom MgO Fire-rated Wall board. | Cavity Insulation: <ul style="list-style-type: none">2 x 75mm Mineral Wool (27Kg/m³). Stud Details: <ul style="list-style-type: none">Two rows of Steel Studs at 600mm centres with minimum 50mm gap. | 62 | 52 |
| | | | 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} |
| 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). Stud Details: <ul style="list-style-type: none">Two rows of Steel Studs at 600mm centres with minimum 20mm gap. | 62 | 52 |
| | | | Minimum Wall Thickness (mm) | | |
| | | | BCA Compliance | | |
| | | | R _w ≥ 50 | ✓ | |
| | | | R _w + C _{tr} ≥ 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) | | |
| | | | | | |
| | | | 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) | | |
| | | | | | |
| | | | 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 | | |
| | | | $R_w \geq 50$ | ✓ | |
| 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 | ✓ | |
| | | | BCA Compliance | | |
| | | | $R_w \geq 50$ | ✓ | |
| | | | $R_w + C_{tr} \geq 50$ | ✓ | |
| | | | Discontinuous | ✓ | |
| | | | BCA Compliance | | |
| | | | $R_w \geq 50$ | ✓ | |

| System No. | Wall System | Wall Linings | Stud Depth (mm) | 70 | |
|------------|---|--|---|-------|----------------|
| | | | Framing Details | 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) | | |
| | | | BCA Compliance | | |
| | | | $R_w \geq 50$ | | |
| | | | $R_w + C_{tr} \geq 50$ | | |
| 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) | | |
| | | | BCA Compliance | | |
| | | | $R_w \geq 50$ | | |
| | | | $R_w + C_{tr} \geq 50$ | | |

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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- Rindel, J. H. Rindel, J. H. (1995). *Sound Radiation from Building Structures and Acoustical Properties of Thick Plates*. Grenoble. France: CSTB.
- Sharp, B. H. (1978). Prediction Methods for the Sound Transmission of Building Elements. *Noise Control Engineering*, 11.

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

Source room volume: 72 m³

Receiving room volume: 82 m³

Date: 6/11/2013

Client: Xclude

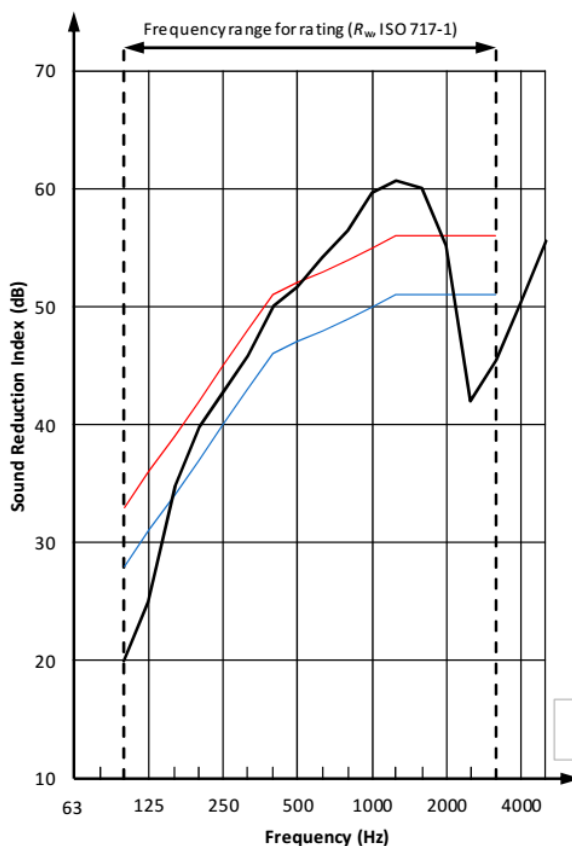
Humidity (% S/R): 37.4 / 36.1 ±3

Temperature (Wb, °C, S/R): 17.1 / 16.1 ±0.6

Temperature (Db, °C, S/R): 26.9 / 25.8 ±0.6

Static pressure (hPa): 1020 / 1020 ±0.5%

AC485WA11/2013



| Frequency f Hz | R 1/3 octave dB |
|----------------------|-----------------------|
| 100 | 20 |
| 125 | 25 |
| 160 | 34.9 |
| 200 | 39.8 |
| 250 | 42.6 |
| 315 | 45.9 |
| 400 | 50 |
| 500 | 51.7 |
| 630 | 54.1 |
| 800 | 56.4 |
| 1000 | 59.6 |
| 1250 | 60.7 |
| 1600 | 60.1 |
| 2000 | 55.2 |
| 2500 | 42 |
| 3150 | 45.4 |
| 4000 | 50.6 |
| 5000 | 55.6 |

$$R_w(C;C_{tr}) = 47 (-3;-9) \text{ dB}$$

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 - 12mm Magnesium Oxide Board Corporation ResCom

Frame: single 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): 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

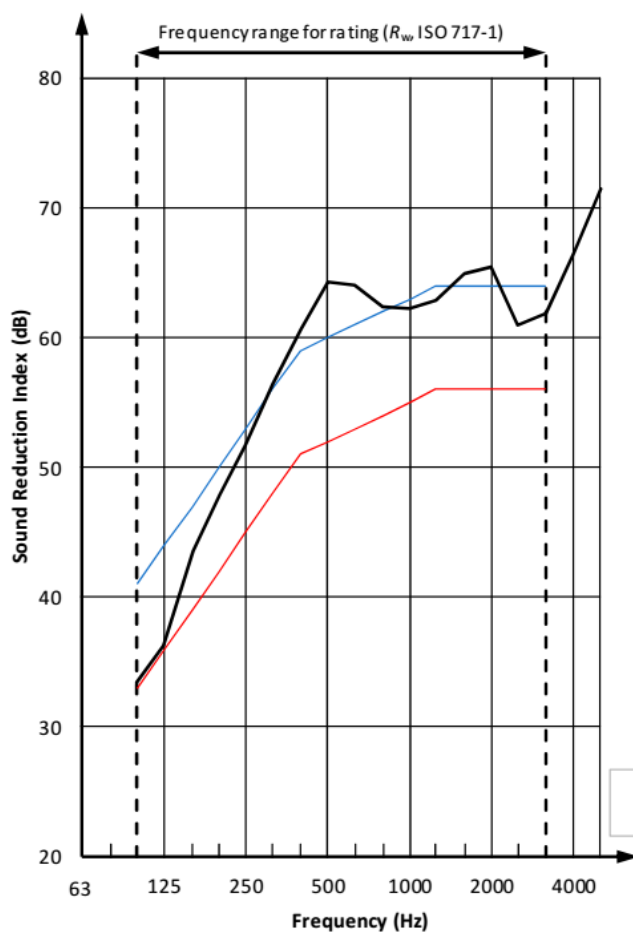
Temperature (Db, °C S/R): 24.1 / 23.9 ±0.6

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

Source room volume: 72 m³

Receiving room volume: 82 m³

Date: 6/11/2013

Client: Xclude

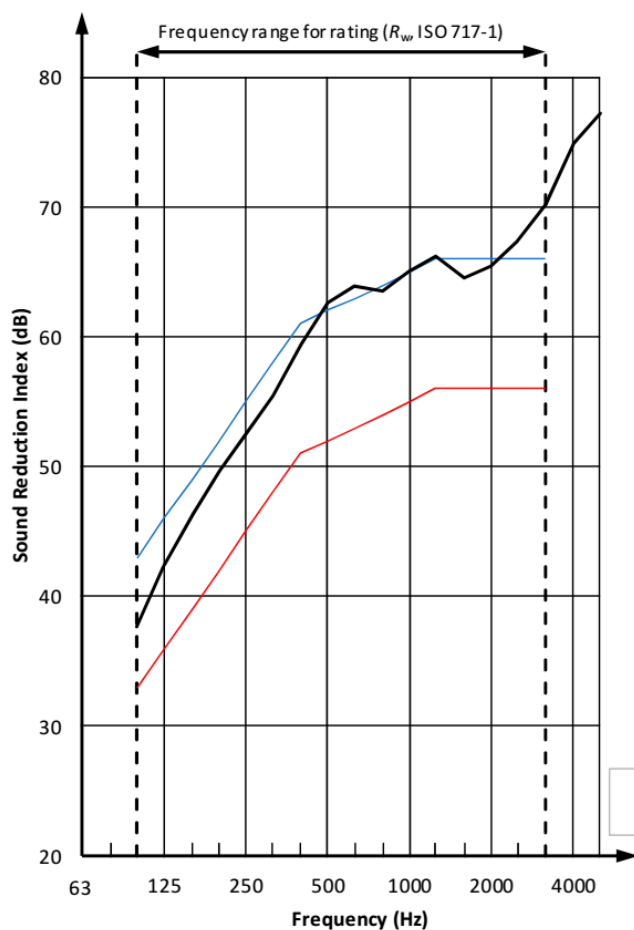
Humidity (% S/R): 39.9 / 39.0 ±3

Temperature (Wb, °C, S/R): 16.3 / 16.2 ±0.6

Temperature (Db, °C, S/R): 25.3 / 25.2 ±0.6

Static pressure (hPa): 1022 / 1022 ±0.5%

AC484WA11/2013



| 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

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

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

Source room volume: 72 m³

Receiving room volume: 82 m³

Date: 5/11/2013

Client: Xclude

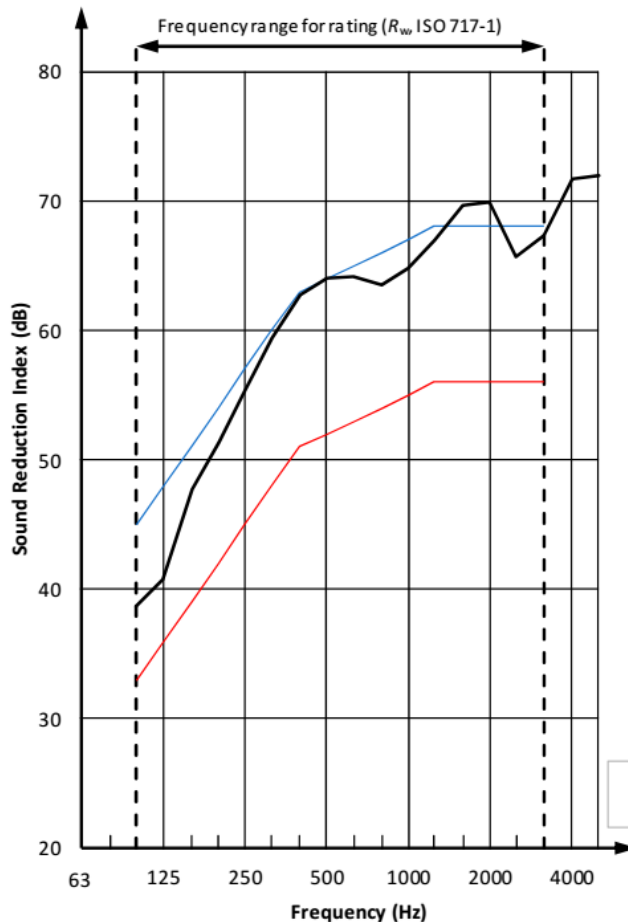
Humidity (% S/R): 50.9 / 48.4 ±3

Temperature (Wb, °C, S/R): 17.1 / 16.4 ±0.6

Temperature (Db, °C, S/R): 23.9 / 23.6 ±0.6

Static pressure (hPa): 1021 / 1021 ±0.5%

AC483WA11/2013



| 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