



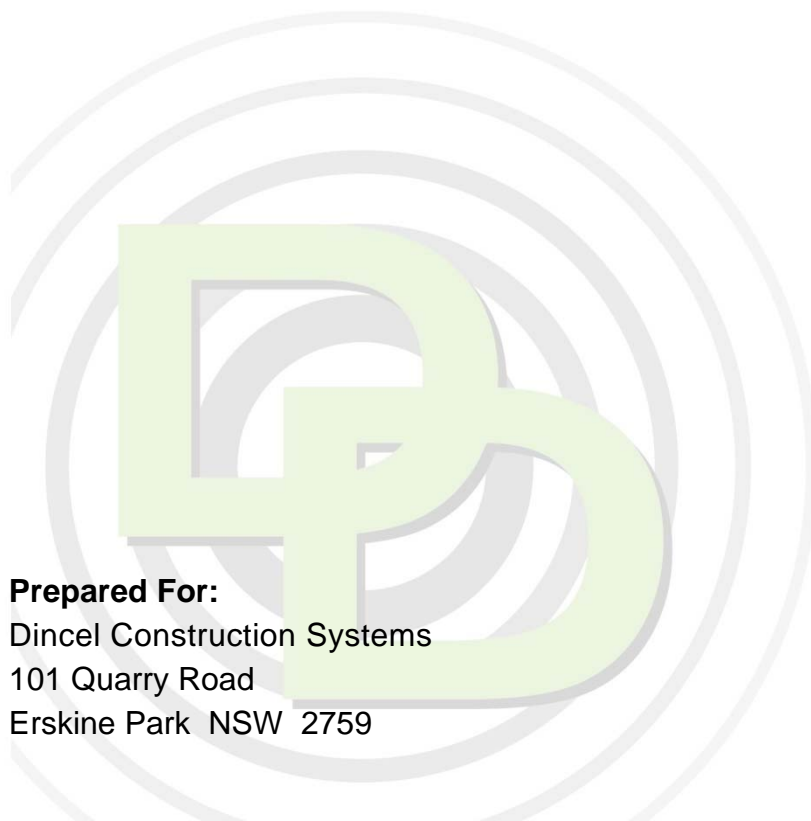
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# Acoustic Opinion

## Dincol 200 mm Wall Systems

REPORT No  
**5880-3.1R Rev B**

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**Prepared For:**  
Dincol Construction Systems  
101 Quarry Road  
Erskine Park NSW 2759



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Document R\5880-3.1R REV B, 17 pages plus attachments

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**Acoustic Opinion****1.0 CONSULTING BRIEF**

Day Design Pty Ltd was engaged by Dincel Construction Systems to provide Acoustic Opinions on the  $R_w$  and  $R_w + C_{tr}$  ratings for a range of walls constructed using their DCS 200 wall system. The objective is to provide acoustical data useful to building designers for inclusion in technical publications.

**Scope of Work:**

- Review the results of systems incorporating the DCS 200 wall tested at NAL Chatswood provided by Dincel.
- Model basic wall systems using acoustic modelling software.
- Compare the  $R_w$  and  $R_w + C_{tr}$  predictions with test results.
- Provide Acoustic Opinions on the  $R_w$  and  $R_w + C_{tr}$  ratings for a range of DCS 200 systems to meet the Deemed-to-Satisfy Provisions in the BCA.
- Prepare an Acoustical Opinion Report.

**2.0 PREDICTION OF  $R_w$  AND  $C_{TR}$** 

$R_w$  (weighted sound reduction index) provides an acoustic rating of the sound insulation of walls and partitions due to airborne sound of the human voice. Sound insulation varies with frequency and is dependent on the type of wall construction, however, the  $R_w$  provides a convenient method of rating sound insulation using a single number. The higher the  $R_w$  rating the better the sound insulation provided by the partition.

$C_{tr}$  is a correction factor to account for the sound insulation performance in the lower frequencies. The  $C_{tr}$  factor is added to the  $R_w$  rating to get an overall  $R_w + C_{tr}$  airborne rating. For masonry walls, the  $C_{tr}$  factor is typically between  $-5$  and  $-3$  while for plasterboard walls the factor may often be as low as  $-12$ , depending on the construction type.

The Acoustic Opinions expressed in this report are based firstly on calculations made using the Marshall Day Acoustics 'Insul' software and secondly by comparison with Sound Transmission Loss tests for similar plasterboard constructions. Acoustic opinions are then provided in the light of our general acoustic experience. Factors taken into account in our calculations include: the surface mass of the plasterboard, Young's Modulus, the critical frequency and speed of sound in plasterboard, the effect of air cavities and acoustic insulation between studs.

We are of the opinion that using the 'Insul' software and making corrections based on comparison with test results that our prediction accuracy is in the order of  $\pm 2$  dB.

Because of the complexity of such calculations, approved laboratory test results (in accordance with Australian Standard AS1191:2002 and AS/NZS1276.1:1999) are always preferred.



**Acoustic Opinion****3.0 MATERIALS USED FOR SOUND REDUCTION****3.1 Dincel Wall Systems**

The Dincel wall systems in this report have specifications as detailed in Table 1 below:

**Table 1 Dincel Wall**

Product Name	Thickness (mm)	Finished Bulk Density (kg/m <sup>3</sup> )
DCS 200	200	2,350

**3.2 Plasterboard**

In compiling this schedule of acoustic ratings for various plasterboard constructions Dincel has worked closely with Knauf Plasterboard. The density of the plasterboard used for the tested systems and the plasterboard used in the recommended wall systems are shown in Table 2 below.

**Table 2 Plasterboard Densities**

Product Name	Thickness (mm)	Bulk Density (kg/m <sup>3</sup> )
Gyprock*	10	650
MastaShield*	10	640
	13	623
FireShield*	16	766

\* Similar or higher density plasterboard may also be used.

**3.3 Insulation**

Acoustic insulation specified have bulk densities as follows:

**Table 3 Knauf's Insulation Densities**

Product Name	Thickness (mm)	Approx Bulk Density (kg/m <sup>3</sup> )
Glasswool	25	24
Earthwool	50	11

Thicker or higher density of the same bulk insulation may be substituted for wall systems in this report.

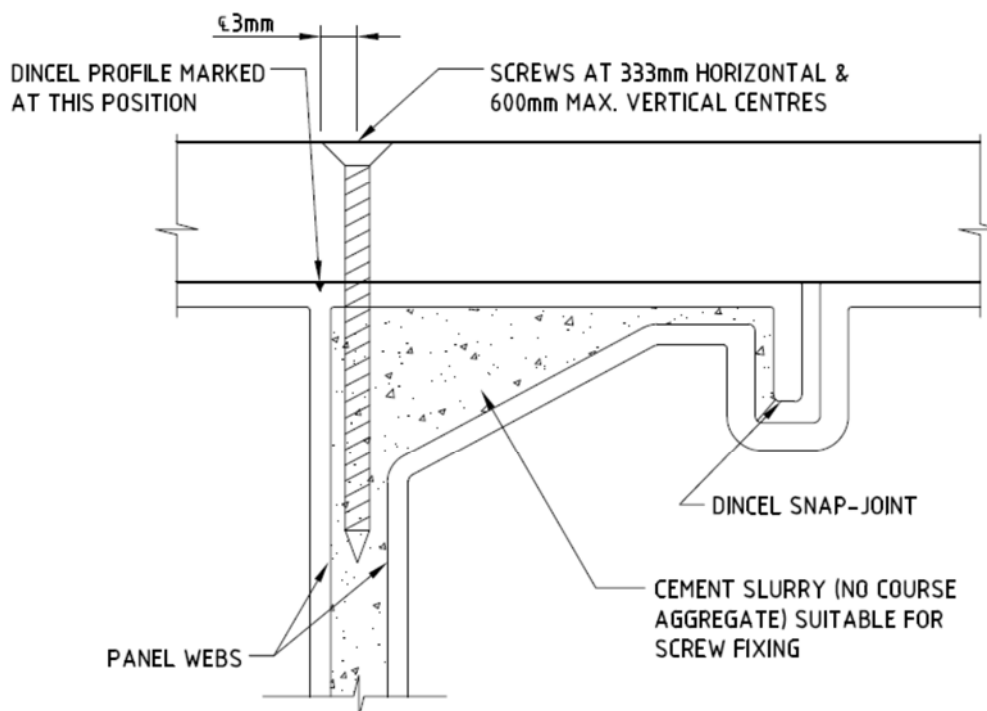
**3.4 Studs**

All systems with a separate steel stud leaf include an option for 51 mm or 64 mm steel studs.



**Acoustic Opinion****3.5 Direct Fixing to Dincel**

Plasterboard can be direct fixed to Dincel either by screwing or a combination of gluing and screwing. The following diagram indicates how conventional screwing can be used with the Dincel wall.

**DIRECT FIXING DETAIL OF PLASTERBOARD  
AT EACH FACE OF DINCEL****3.6 Electrical Services within the Dincel Wall**

Where electrical cabling is proposed to be provided within the 200 mm thick Dincel wall, we recommend a 20 mm conduit be placed in the wall prior to concrete being poured. It is essential that only one conduit is provided at any cross-section of the wall.

In accordance with the Building Code of Australia, services must not be chased into sound rated Dincel walls.



**Acoustic Opinion****4.0 BUILDING CODE OF AUSTRALIA – ACOUSTIC REQUIREMENTS**

The information in this section is extracted from the Building Code of Australia (BCA), which is now part of the National Construction Code (NCC), Part F5 “Sound Transmission and Insulation”. The acoustic requirements and the building solutions in this report are based on the Deemed-to-Satisfy Provisions of the BCA.

The *Objective* of this Part is to safeguard occupants from illness or loss of amenity as a result of undue sound being transmitted -

- (a) between adjoining *sole-occupancy units*; and
- (b) from common spaces to *sole-occupancy units*; and
- (c) from parts of different classifications to *sole-occupancy units*.

The Objective only applies to a Class 2 or 3 building or a Class 9c *aged care building*.

**4.1 F5.5 Sound insulation rating of walls – Class 2 and 3**

A wall in a Class 2 or 3 building must -

- (i) have an  $R_w + C_{tr}$  (airborne) not less than 50, if it separates *sole-occupancy units*; and
- (ii) have an  $R_w$  (airborne) not less than 50, if it separates *sole-occupancy unit* from a plant room, lift *shaft*, stairway, *public corridor*, public lobby or the like, or parts of a different classification; and
- (iii) be of discontinuous construction if it separates -
  - (A) a bathroom, *sanitary* compartment, laundry or kitchen in one *sole-occupancy unit* from a *habitable room* (other than a kitchen) in an adjoining unit; or
  - (B) a *sole-occupancy unit* from a plant room or lift *shaft*.

Discontinuous construction means a wall having a minimum 20 mm cavity between 2 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 than masonry, there is no mechanical linkage between leaves except at the periphery.

A door may be incorporated in a wall in a Class 2 building that separates a *sole-occupancy unit* from a stairway, *public corridor*, public lobby or the like, provided the door assembly has an  $R_w$  not less 30.



**Acoustic Opinion**

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Where a wall *required* to have sound insulation has a floor above, the wall must continue to -

- (i) the underside of the floor above; or
- (ii) a ceiling that provides the sound insulation *required* for the wall.

Where a wall *required* to have sound insulation has a roof above, the wall must continue to -

- (i) the underside of the roof above; or
- (ii) a ceiling that provides the sound insulation *required* for the wall.

**4.2 F5.5 Sound insulation rating of walls – Class 9(c)**

(c) A wall in a Class 9c *aged care building* must have an  $R_w$  not less than 45 if it separates -

- (i) *sole-occupancy units*; or
- (ii) A *sole-occupancy unit* from a kitchen, bathroom, *sanitary compartment* (not being an associated ensuite), laundry, plant room or utilities room.

(d) In addition to (c), a wall separating a *sole-occupancy unit* in a Class 9c *aged care building* from a kitchen or laundry, plant must comply with F5.3(b).

(e) Where a wall *required* to have sound insulation has a floor above, the wall must continue to -

- (i) the underside of the floor above; or
- (ii) a ceiling that provides the sound insulation *required* for the wall.

(f) Where a wall *required* to have sound insulation has a roof above, the wall must continue to -

- (i) the underside of the roof above; or
- (ii) a ceiling that provides the sound insulation *required* for the wall.

**4.3 F5.6 Sound insulation rating of services**

(a) If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one *sole-occupancy unit*, the duct or pipe must be separated from the rooms of any *sole-occupancy unit* by construction with an  $R_w + C_{tr}$  (airborne) not less than -

- (i) 40 if the adjacent room is a *habitable room* (other than a kitchen); or
- (ii) 25 if the adjacent room is a kitchen or *non-habitable room*.

(b) If a storm water pipe passes through a *sole-occupancy unit* it must be separated in accordance with (a)(i) and (ii).



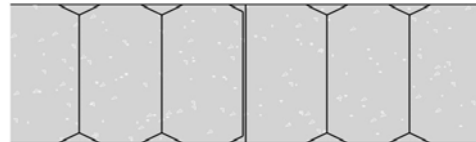


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**5.0 DINCEL WALL SYSTEMS – LABORATORY TESTED**

Several systems incorporating the Dintel Construction System 200 mm wall have been tested at the National Acoustic Laboratories in Chatswood NSW.

**5.1 DCS 200-1**

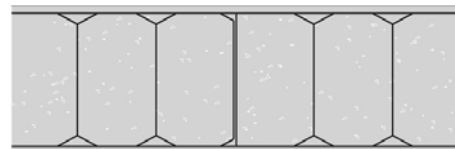


**Laboratory Tested System**

200 mm Dintel Wall

Wall Width (mm)	Laboratory Tested $R_w (R_w + C_{tr})$
200	53 (48)

**5.2 DCS 200-2**



**Laboratory Tested System**

10 mm Gyprock plasterboard, screw fixed

200 mm Dintel Wall

10 mm Gyprock plasterboard, screw fixed

Wall Width (mm)	Laboratory Tested $R_w (R_w + C_{tr})$
220	51 (46)



**Acoustic Opinion****6.0 200 DINCEL WALL – RECOMMENDED WALL SYSTEMS**

The acoustic opinions below are based on comparable tests, Marshall Day Acoustics 'Insul' software as well as our own experience.

**6.1  $R_w+C_{tr}$  40 – Service Riser Wall****Laboratory Tested System**

200 mm Dintel Wall



Wall Width (mm)	Laboratory Tested $R_w (R_w + C_{tr})$
200	53 (48)

**6.2  $R_w+C_{tr}$  40 – Service Riser Wall****Acoustic Opinion**

10 mm Knauf MastaShield plasterboard, direct fix

200 mm Dintel Wall



Wall Width (mm)	$R_w (R_w + C_{tr})$
210	51 (46)

**6.3  $R_w$  45 - Class 9(c) Wall**

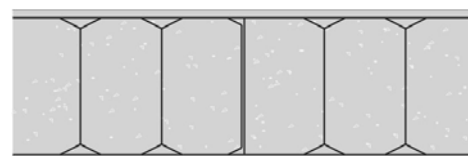
No services on the wall

**Laboratory Tested System**

10 mm Knauf MastaShield plasterboard, direct fix

200 mm Dintel Wall

10 mm Knauf MastaShield plasterboard, direct fix

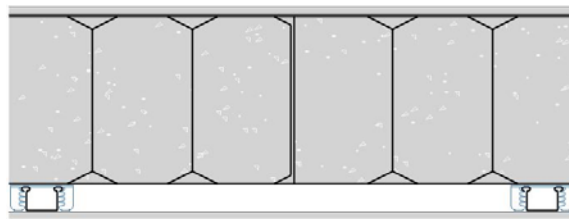


Wall Width (mm)	$R_w (R_w + C_{tr})$
220	51 (46)



**Acoustic Opinion****6.4 Rw 45 – Class 9(c) Wall**

Cavity on one side

**Acoustic Opinion**

10 mm Knauf MastaShield plasterboard, direct fix

200 mm Dintel Wall

28 mm furring channel @ 600 mm centres, 30 mm cavity

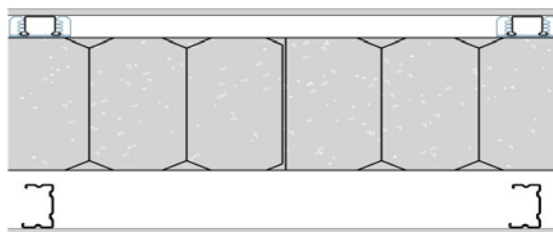
No insulation

10 mm Knauf MastaShield plasterboard, screw fixed to furring channel

Wall Width (mm)	R <sub>w</sub> (R <sub>w</sub> + C <sub>tr</sub> )
250	53 (46)

**6.5 Rw 45 – Class 9(c) Wall - Discontinuous**

Cavity on both sides

**Acoustic Opinion**

10 mm Knauf Mastashield plasterboard, screw fixed

28 mm furring channel @ 600 mm centres, 30 mm cavity

No insulation

200 mm Dintel Wall

51/64 mm steel studs @ 600 mm centres, overall 71/84 mm cavity

No insulation

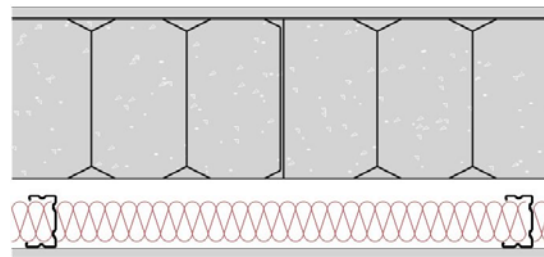
10 mm Knauf Mastashield plasterboard, screw fixed to studs

Wall Width (mm)	R <sub>w</sub> (R <sub>w</sub> + C <sub>tr</sub> )
321 with 51 mm steel studs	55 (46)
334 with 64 mm steel studs	55 (47)



**Acoustic Opinion****6.6  $R_w + C_{tr} - 50$  - Intertenancy Wall (Discontinuous)**

Discontinuous wall  
Cavity on one side

**Acoustic Opinion**

10 mm Knauf MastaShield plasterboard, direct fix

200 mm Dincel Wall

20 mm air gap

51/64 mm steel studs @ 600 mm centres, overall 71/84 mm cavity

50 mm Knauf Earthwool insulation in the cavity

10 mm Knauf MastaShield plasterboard, screw fixed to studs

Wall Width (mm)	$R_w (R_w + C_{tr})$
291 with 51 mm steel studs	61 (53)
304 with 64 mm steel studs	62 (54)

**6.7  $R_w 50$  - Corridor Wall**

No cavity

**Laboratory Tested System**

10 mm Knauf MastaShield plasterboard, direct fix

200 mm Dincel Wall

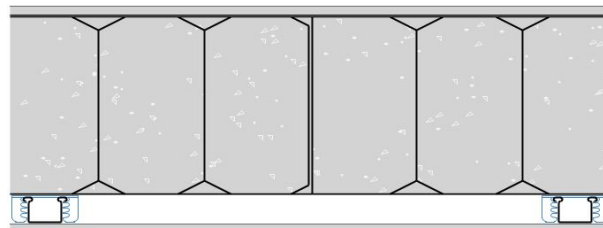
10 mm Knauf MastaShield plasterboard, direct fix

Wall Width (mm)	$R_w (R_w + C_{tr})$
220	51 (46)



**Acoustic Opinion****6.8 R<sub>w</sub> 50 – Corridor Wall**

Cavity on one side

**Acoustic Opinion**

10 mm Knauf MastaShield plasterboard, direct fix

200 mm Dintel Wall

28 mm furring channel @ 600 mm centres, 30 mm cavity

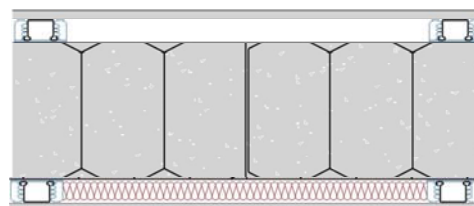
No insulation in cavity

10 mm Knauf Mastashield plasterboard, screw fixed to furring channel

Wall Width (mm)	R <sub>w</sub> (R <sub>w</sub> + C <sub>tr</sub> )
250	53 (46)

**6.9 R<sub>w</sub> 50 - Corridor Wall**

Cavity on both sides

**Acoustic Opinion**

10 mm Knauf MastaShield plasterboard screw fixed to furring channel

No insulation

28 mm furring channel @ 600 mm centres, 30 mm cavity

200 mm Dintel wall

28 mm furring channel @ 600 mm centres, 30 mm cavity

25 mm glasswool insulation in cavity

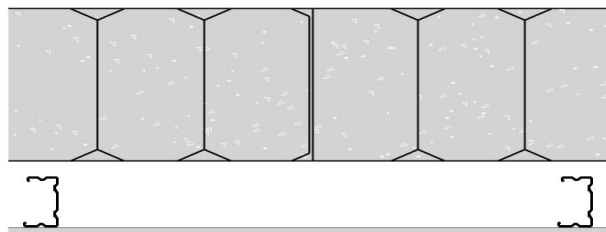
10 mm Knauf MastaShield plasterboard screw fixed to furring channel

Wall Width (mm)	R <sub>w</sub> (R <sub>w</sub> + C <sub>tr</sub> )
280	53 (39)



**Acoustic Opinion****6.10  $R_w$  50 - Lift Shaft or Plant Room Wall (Discontinuous)**

Discontinuous wall  
Cavity on one side

**Acoustic Opinion**

200 mm Dincel Wall

20 mm air gap

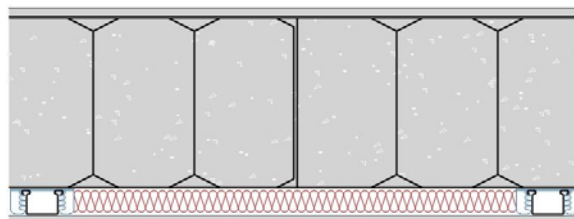
51/64 mm steel studs @ 600 mm centres, overall 71/84 mm cavity

10 mm Knauf MastaShield plasterboard fixed to studs

Wall Width (mm)	$R_w$ ( $R_w + C_{tr}$ )
281 with 51 mm steel studs	57 (47)
294 with 64 mm steel studs	58 (48)

**6.11  $R_w + C_{tr}$  - 50 - Intertenancy Wall**

Cavity on one side

**Acoustic Opinion**

10 mm Knauf MastaShield plasterboard, direct fix

200 mm Dincel Wall

28 mm furring channel @ 600 mm centres, 30 mm cavity

25 mm glasswool insulation in cavity

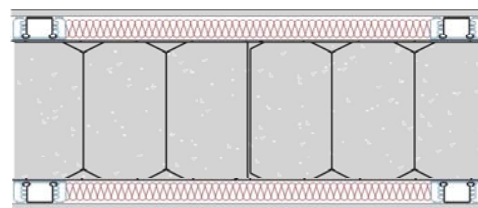
10 mm Knauf MastaShield plasterboard, screw fixed to furring channel

Wall Width (mm)	$R_w$ ( $R_w + C_{tr}$ )
250	57 (50)



**Acoustic Opinion****6.12  $R_w + C_{tr} - 50$  – Intertenancy Wall**

Cavity on both sides

**Acoustic Opinion**

16 mm Knauf FireShield plasterboard screw fixed to furring channel

25 mm glasswool insulation in cavity

28 mm furring channel @ 600 mm centres, 45 mm cavity

200 mm Dincel wall

28 mm furring channel @ 600 mm centres, 45 mm cavity

25 mm glasswool insulation in cavity

16 mm Knauf FireShield plasterboard screw fixed to furring channel

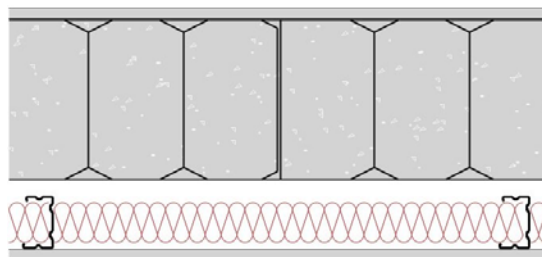
Wall Width (mm)	$R_w (R_w + C_{tr})$
322	68 (54)

**6.13  $R_w + C_{tr} - 55$  – Intertenancy Wall (Discontinuous)**

Superior acoustic performance

Discontinuous wall

Cavity on one side

**Acoustic Opinion**

13 mm Knauf MastaShield plasterboard, direct fix

200 mm Dincel Wall

20 mm air gap

51/64 mm steel studs @ 600 mm centres, overall 71/84 mm cavity

50 mm Knauf Earthwool insulation in cavity

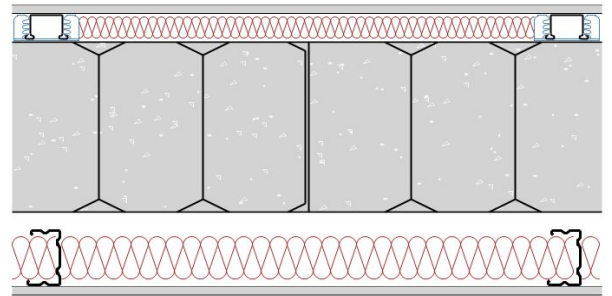
13 mm Knauf MastaShield plasterboard, screw fixed to studs

Wall Width (mm)	$R_w (R_w + C_{tr})$
297 with 51 mm steel studs	65 (56)
310 with 64 mm steel studs	66 (57)



**Acoustic Opinion****6.14  $R_w + C_{tr} - 50$  - Intertenancy Wall (Discontinuous)**

Superior acoustic performance  
 Discontinuous wall  
 Cavity on both sides

**Acoustic Opinion**

Knauf FireShield plasterboard, screw fixed to furring channel  
 28 mm furring channel @ 600 mm centres, 30 mm cavity  
 25 mm glasswool insulation in the cavity  
 200 mm Dintel Wall  
 20 mm air gap  
 51/64 mm steel studs @ 600 mm centres, overall 71/84 mm cavity  
 50 mm Knauf Earthwool insulation in the cavity  
 Knauf FireShield plasterboard, screw fixed to studs

Wall Width (mm)	Plasterboard Thickness (mm)	$R_w$ ( $R_w + C_{tr}$ )
327 with 51 mm steel studs	13 mm	68 (53)
340 with 64 mm steel studs	13 mm	69 (55)
333 with 51 mm steel studs	16 mm	70 (56)
346 with 64 mm steel studs	16 mm	71 (58)





**Acoustic Opinion****7.0 STATEMENT OF EFFECT**

We are confident that provided the walls are built of the materials specified in a workmanlike manner in accordance with the manufacturer's instructions (taking due care to seal all joints and use constructions that will avoid flanking transmission problems), they will provide the sound insulation ratings listed in the Acoustic Opinions section of this report.



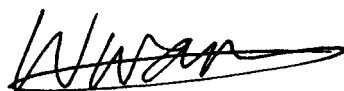
**Stephen Gauld**, BE (Mech), MEngSc (Noise and Vibration), MIEAust, MAAS  
Principal Acoustical Engineer  
for and on behalf of Day Design Pty Ltd

**Attachments:**

- Summary of DCS200 Dincel Wall Systems



The undersigned hereby certifies that this Report has been checked and approved in accordance with our Quality Management System.


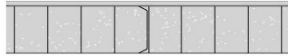


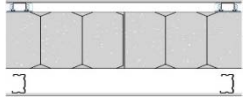
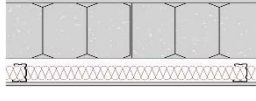

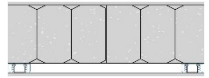



Date: 23/1/18



# Acoustic System Summary – 200mm Dintel Wall


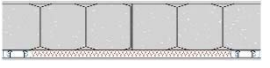
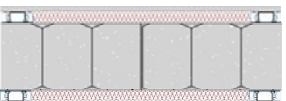
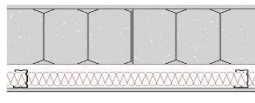
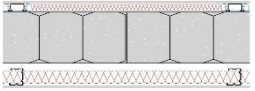


System N <sup>o</sup> R <sub>w</sub> /R <sub>w</sub> +C <sub>tr</sub>	WALL LINING SIDE 1	200 mm DINCEL WALL CONCRETE DENSITY 2,350 kg/m <sup>3</sup>	WALL LINING SIDE 2
200-6.1 53 / 48	Nil, painted or rendered	Wall width: 200mm 	Nil, painted or rendered
200-6.2 51 / 46	10mm Knauf MastaShield plasterboard, direct fix	Wall width: 210mm 	Nil, painted or rendered
200-6.3 51 / 46	10mm Knauf MastaShield plasterboard, direct fix	Wall width: 220mm 	10mm Knauf MastaShield plasterboard, direct fix
200-6.4 53 / 46	10mm Knauf MastaShield plasterboard, direct fix	Wall width: 250mm 	10mm Knauf MastaShield plasterboard, screw fixed to 28mm furring channel at 600mm cts 30mm cavity
200-6.5 55 / 46 <sup>1</sup> 55 / 47 <sup>2</sup>	10mm Knauf MastaShield plasterboard, screw fixed to 28mm furring channel at 600mm cts 30mm cavity	Wall width: 321mm <sup>1</sup> 334mm <sup>2</sup> 	10mm Knauf MastaShield plasterboard, screw fixed to studs at 600mm cts 20mm air gap (71 <sup>1</sup> /84 <sup>2</sup> mm cavity)
200-6.6 61 / 53 <sup>1</sup> 62 / 54 <sup>2</sup>	10mm Knauf MastaShield plasterboard, direct fix	Wall width: 291mm <sup>1</sup> 304mm <sup>2</sup> 	10mm Knauf MasterShield plasterboard, screw fixed to studs at 600mm cts 20mm air gap (71 <sup>1</sup> /84 <sup>2</sup> mm cavity) 50mm Knauf Earthwool in cavity
200-6.7 51 / 46	10mm Knauf MastaShield plasterboard, direct fix	Wall width: 220mm 	10mm Knauf MastaShield plasterboard, direct fix
200-6.8 53 / 46	10mm Knauf MastaShield plasterboard, direct fix	Wall width: 250mm 	10mm Knauf MastaShield plasterboard, screw fixed to 28mm furring channel at 600mm cts 30mm cavity
200-6.9 53 / 39	10mm Knauf MastaShield plasterboard, screw fixed to 28mm furring channel at 600mm cts 30mm cavity	Wall width: 280mm 	10mm Knauf MastaShield plasterboard, screw fixed to 28mm furring channel at 600mm cts 30mm cavity 25mm glasswool in cavity



# Acoustic System Summary – 200mm Dintel Wall



System N <sup>o</sup> R <sub>w</sub> /R <sub>w</sub> +C <sub>tr</sub>	WALL LINING SIDE 1	200 mm DINCEL WALL CONCRETE DENSITY 2,350 kg/m <sup>3</sup>	WALL LINING SIDE 2
<b>200-6.10</b>  57 / 47 <sup>1</sup> 58 / 48 <sup>2</sup>	Nil, painted or rendered	Wall width: 281mm <sup>1</sup> 294mm <sup>2</sup> 	10mm Knauf MastaShield plasterboard, screw fixed to studs at 600mm cts 20mm air gap (71 <sup>1</sup> /84 <sup>2</sup> mm cavity)
<b>200-6.11</b>  57 / 50	10mm Knauf MastaShield plasterboard, direct fix	Wall width: 250mm 	10mm Knauf MastaShield plasterboard, screw fixed to 28mm furring channel at 600mm cts, 30mm cavity 25mm glasswool in cavity
<b>200-6.12</b>  68 / 54	16mm Knauf Fireshield plasterboard, screw fixed to 28mm furring channel at 600mm cts, 45mm cavity 25mm glasswool in cavity	Wall width: 322mm 	16mm Knauf Fireshield plasterboard, screw fixed to 28mm furring channel at 600mm cts, 45mm cavity 25mm glasswool in cavity
<b>200-6.13</b>  65 / 56 <sup>1</sup> 66 / 57 <sup>2</sup>	13mm Knauf MastaShield plasterboard, direct fix	Wall width: 297mm <sup>1</sup> 310mm <sup>2</sup> 	13mm Knauf plasterboard, screw fixed to studs at 600mm cts 20mm air gap (71 <sup>1</sup> /84 <sup>2</sup> mm cavity) 50mm Knauf Earthwool in cavity
<b>200-6.14</b>  68 / 53 <sup>3</sup> 69 / 55 <sup>4</sup> 70 / 56 <sup>5</sup> 71 / 58 <sup>6</sup>	Knauf MasterShield plasterboard, screw fixed to 28mm furring channel at 600mm cts 30mm cavity 25mm glasswool in cavity	Wall width: 327mm, 340mm, 333mm, 346mm <sup>3-6</sup> 	Knauf MasterShield plasterboard, screw fixed to studs at 600mm cts 20mm air gap (71 <sup>1</sup> /84 <sup>2</sup> mm cavity) 50mm Knauf Earthwool in cavity

<sup>1</sup> 51 mm steel studs    <sup>3</sup> 51 mm steel studs, 13 mm plasterboard    <sup>5</sup> 51 mm steel studs, 16 mm plasterboard  
<sup>2</sup> 64 mm steel studs    <sup>4</sup> 64 mm steel studs, 13 mm plasterboard    <sup>6</sup> 64 mm steel studs, 16 mm plasterboard

The acoustic ratings provided above are opinions based on test data of comparable laboratory tests and acoustic modelling carried out by Day Design acoustic consultants.

