

Thursday, 17 January 2019

Sample Office

Sample location  
Brisbane  
Qld 4000

Attention: The office manager

Proposal – Design of Acoustic Treatment and Isolation for Sample Office – Brisbane offices.

Please find following our report on the design of acoustic treatment at Sample Office, Brisbane.

Regards,

A handwritten signature in black ink, appearing to read 'Andrew Steel', with a long horizontal stroke extending to the right.

Andrew Steel

## **Part A - Design of Acoustic Treatment**

### **Office Projects**

#### **Objectives:**

Calculate the acoustic properties of the office space in terms of reverberation time (RT60) and isolation  $D_{nT,w}$  where appropriate, design and specify suitable acoustic treatments.

#### **Statement of Work:**

Acoustic properties relevant to office spaces will be calculated and reported to AS/NZS 2107:2000 and ISO 3382 as relevant/required. Calculations will be performed to determine location and type of acoustic treatment. 3D acoustic modelling will not be used.

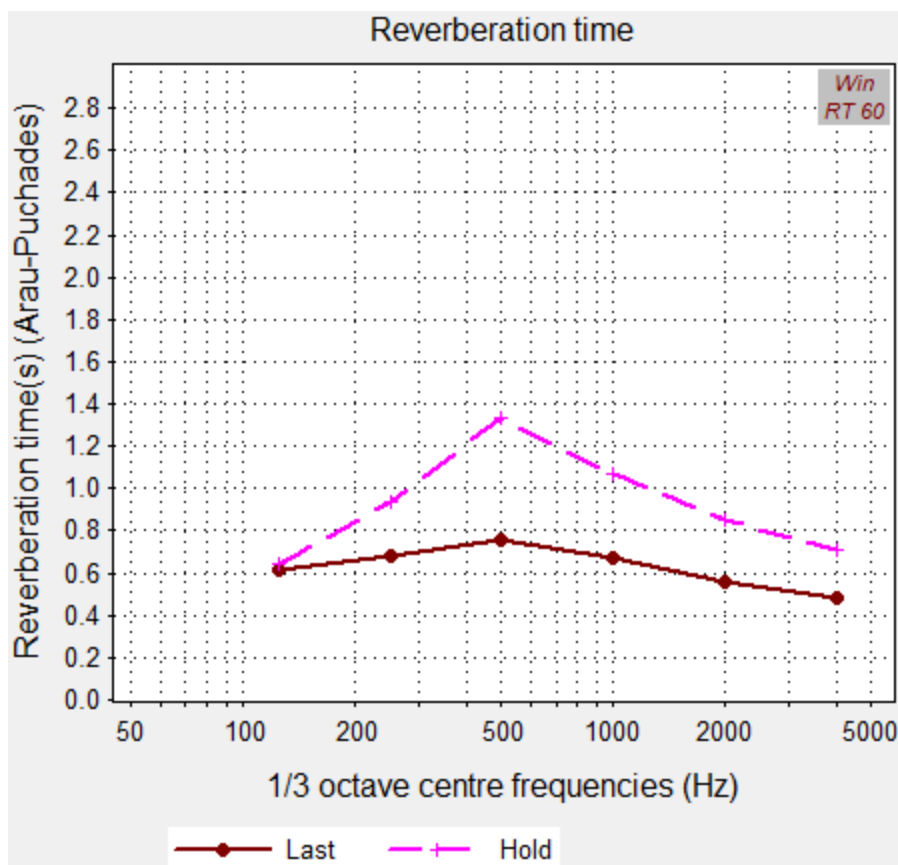
It is understood that this work is a precursor to works aimed at improving the acoustic performance of the office and will be undertaken with that in mind. It will offer recommendations regarding the acoustic performance.

## Boardroom

Tabulated results of calculation

1/3 Octave Band Frequency (Hz)	Reverberation Time RT60(s)	
	Untreated	Treated
125	0.65	0.61
250	0.94	0.69
500	1.34	0.76
1000	1.07	0.67
2000	0.85	0.56
4000	0.71	0.48

Graphical result of calculation



### DATA FOR THE ROOM

Room volume: 69 m<sup>3</sup>

Temperature: 23 deg.C

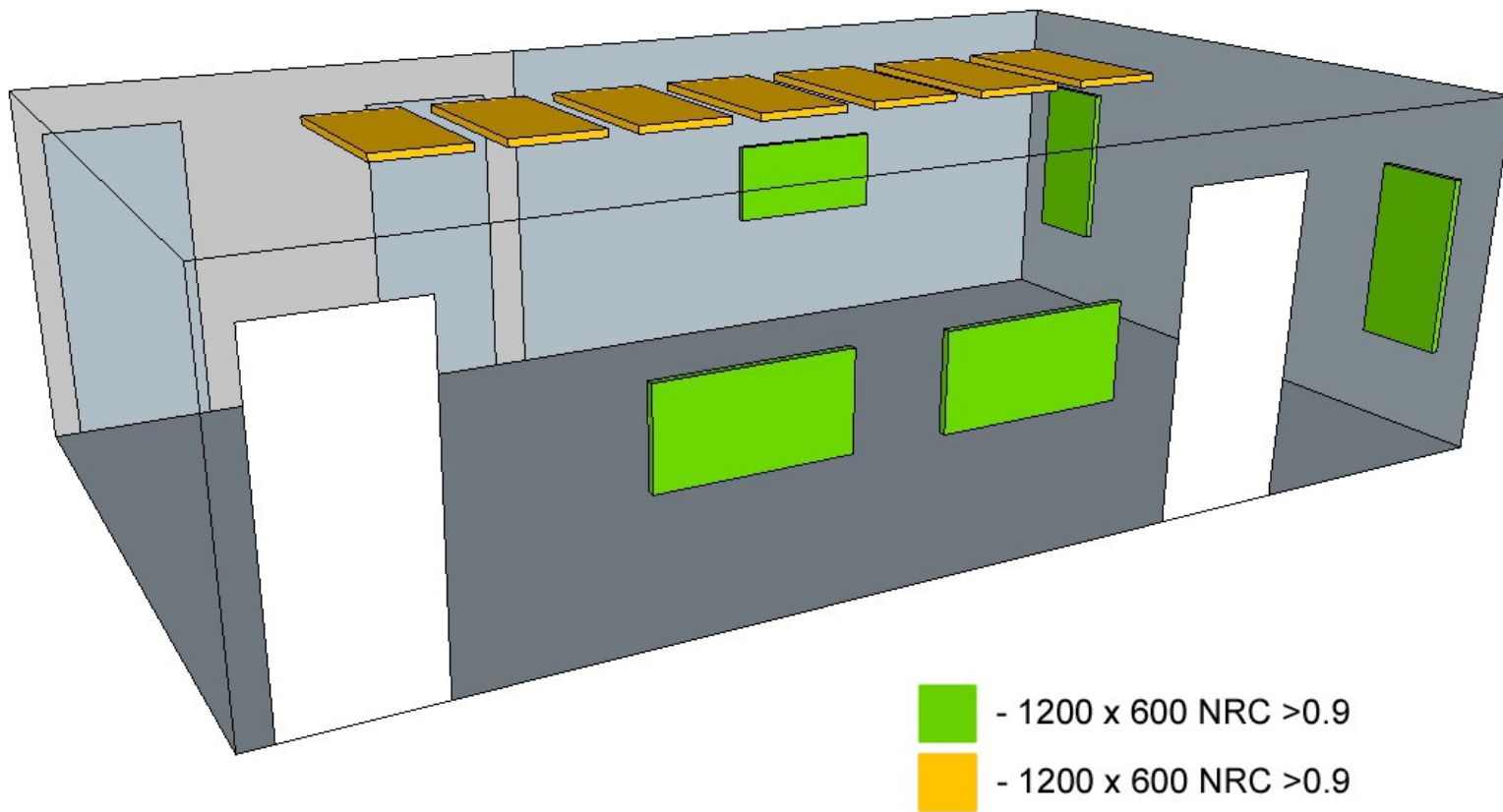
Rel. humidity: 55 %

Untreated room – carpet, plasterboard, glass, wooden door.

Treated room – carpet, plasterboard, glass, wooden door, **8 square metres of absorption with NRC 0.9 applied to ceiling and any two adjacent walls.**

Occupants may reduce the overall RT60 slightly.

Example layout;

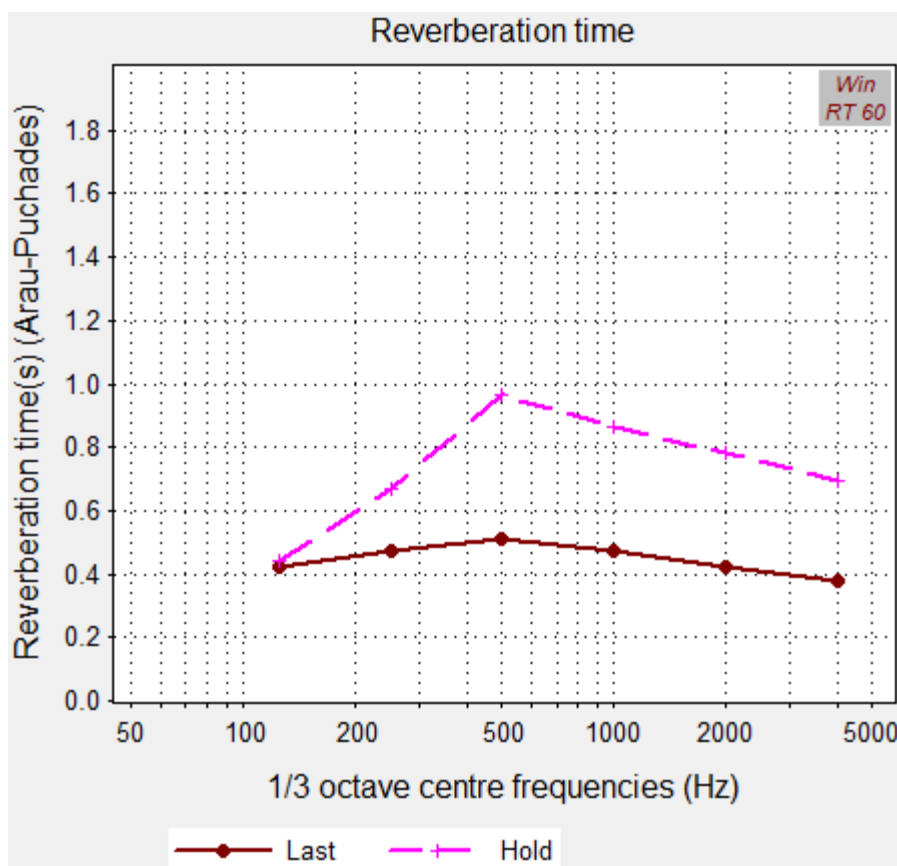


**Meeting Rooms M2,M3**

Tabulated results of calculation

1/3 Octave Band Frequency (Hz)	Reverberation Time RT60(s)	
	Untreated	Treated
125	0.44	0.42
250	0.67	0.47
500	0.97	0.51
1000	0.87	0.47
2000	0.78	0.42
4000	0.69	0.38

Graphical result of calculation



**DATA FOR THE ROOM**

Room volume: 36 m<sup>3</sup>

Temperature: 23 deg.C

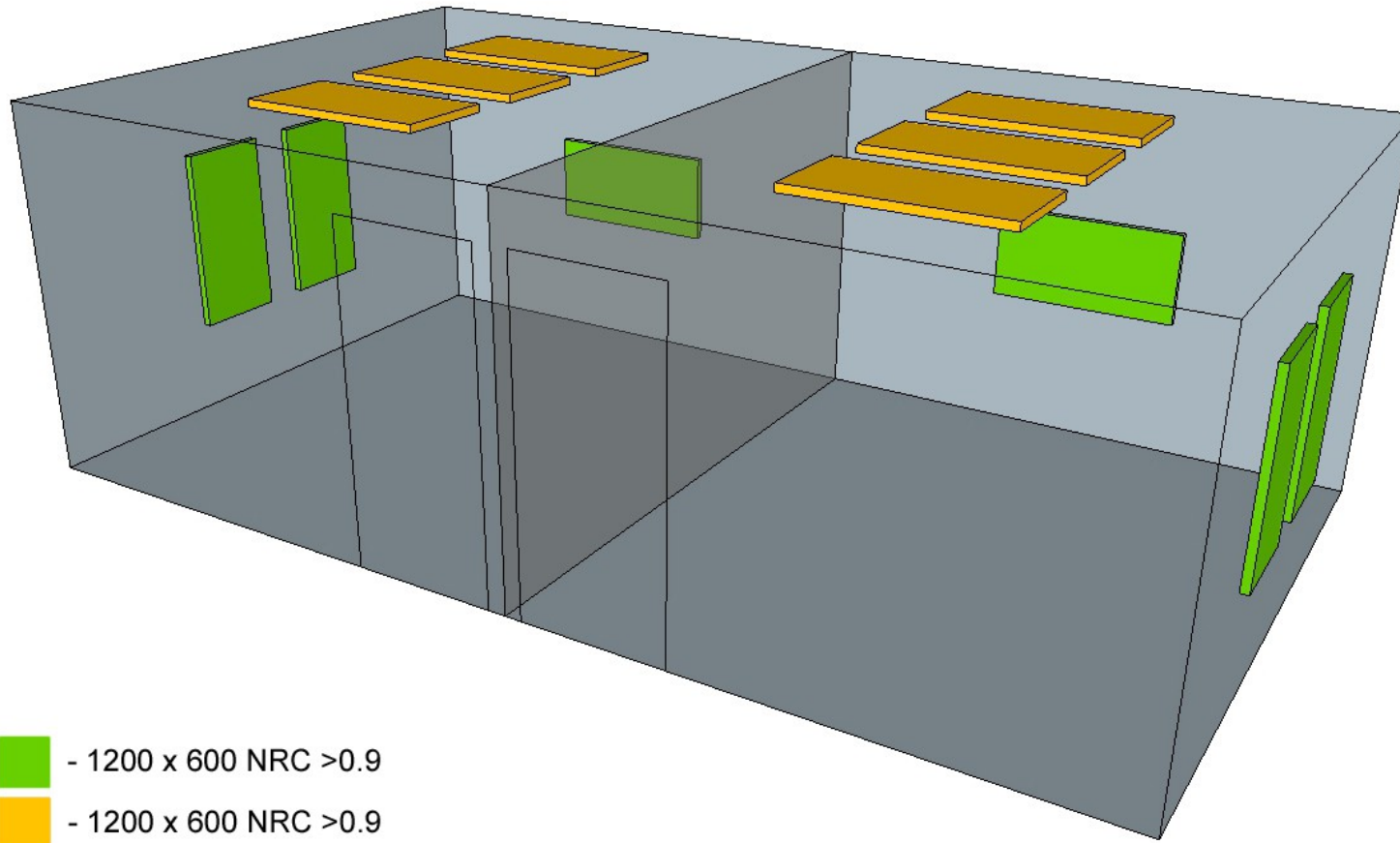
Rel. humidity: 55 %

Untreated room – carpet, plasterboard, glass, wooden door.

Treated room – carpet, plasterboard, glass, wooden door, **4 square metres of absorption with NRC 0.9 applied to ceiling and any two adjacent walls.**

Occupants may reduce the overall RT60 slightly.

Example layout;

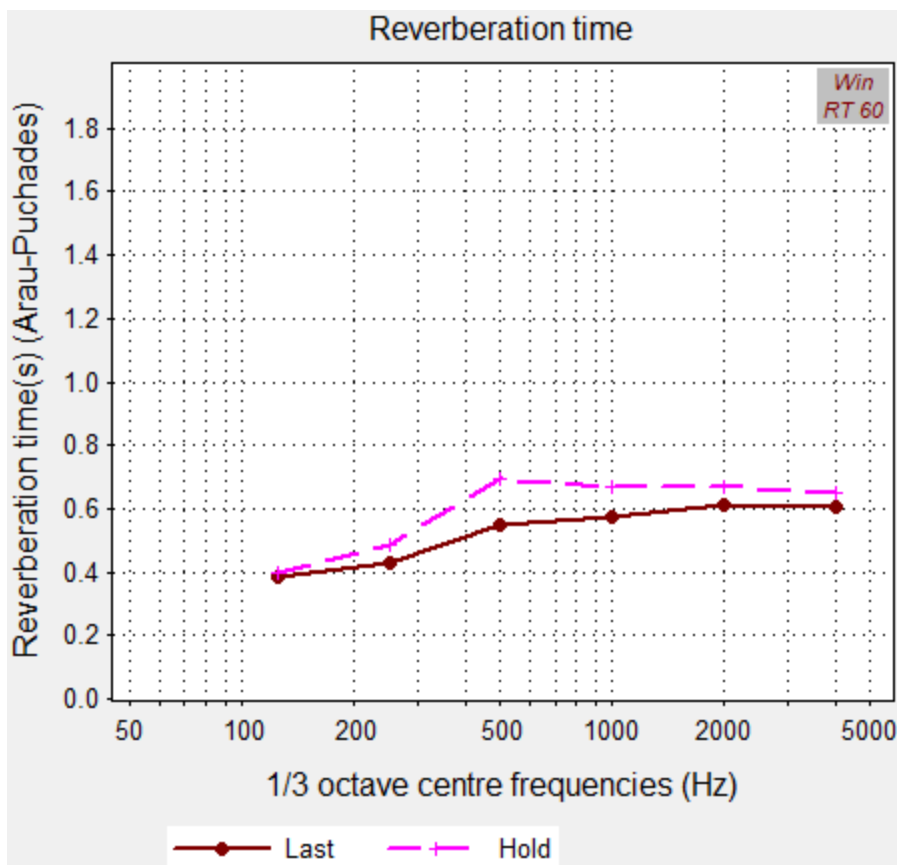


## Meeting Room M4

Tabulated results of calculation

1/3 Octave Band Frequency (Hz)	Reverberation Time RT60(s)	
	Untreated	Treated
125	0.4	0.39
250	0.49	0.43
500	0.69	0.55
1000	0.67	0.57
2000	0.67	0.61
4000	0.65	0.61

Graphical result of calculation



### DATA FOR THE ROOM

Room volume: 33 m<sup>3</sup>

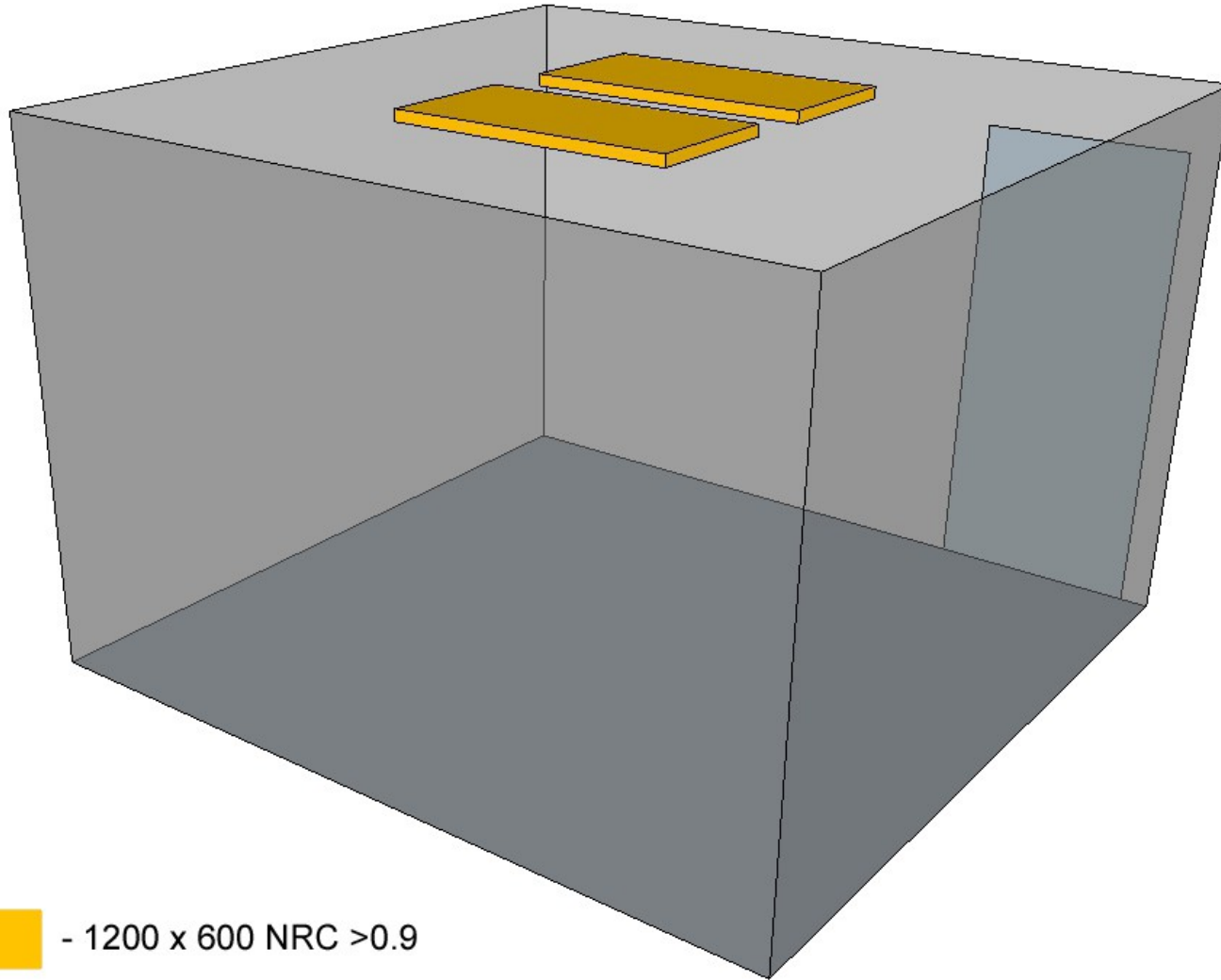
Temperature: 23 deg.C


Rel. humidity: 55 %

Untreated room – carpet, plasterboard, glass, wooden door.

Treated room – carpet, plasterboard, glass, wooden door, **1 square metre of absorption with NRC 0.9 applied to the ceiling**. Some treatment of the glass may be necessary to reduce direct reflections. One option is to use roll down semi transparent blinds at least 100mm from the glass. Occupants may reduce the overall RT60 slightly.

## Example Layout



 - 1200 x 600 NRC >0.9

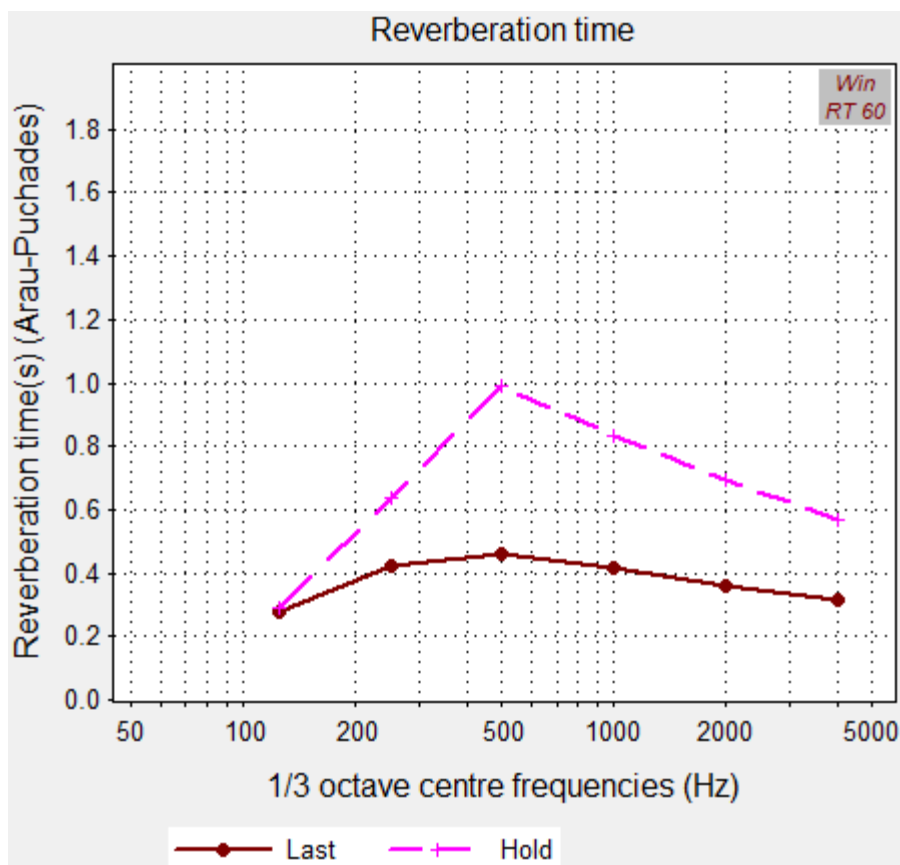


## Meeting Room M5

Tabulated results of calculation

1/3 Octave Band Frequency (Hz)	Reverberation Time RT60(s)	
	Untreated	Treated
125	0.29	0.28
250	0.64	0.42
500	0.99	0.46
1000	0.83	0.42
2000	0.69	0.36
4000	0.57	0.32

Graphical result of calculation



### DATA FOR THE ROOM

Room volume: 22 m<sup>3</sup>

Temperature: 23 deg.C

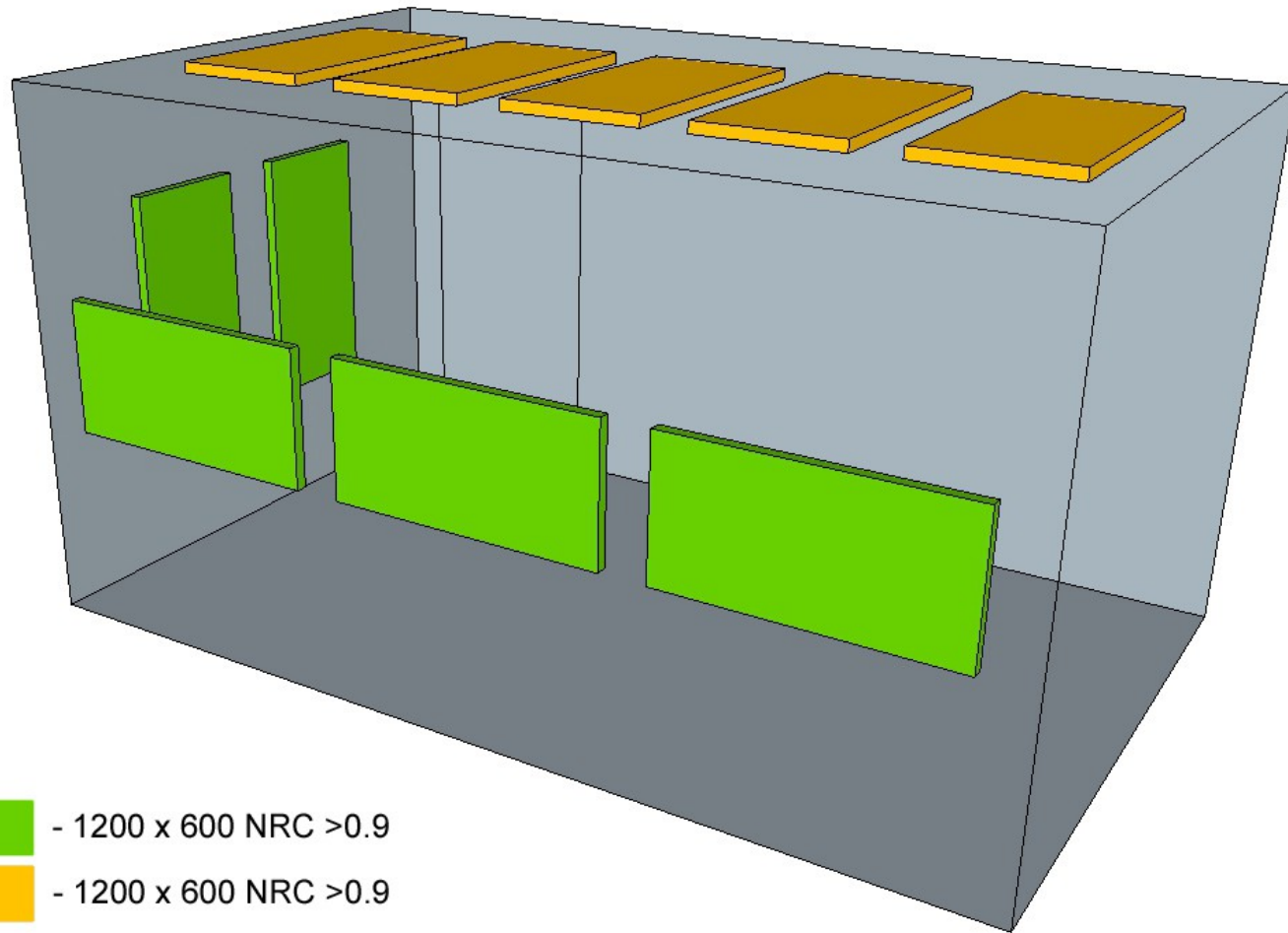
Rel. humidity: 55 %

Untreated room – carpet, plasterboard, glass, wooden door.

Treated room – carpet, plasterboard, glass, wooden door, **4 square metres of absorption with NRC 0.9 applied to ceiling and any two adjacent walls.**

Occupants may reduce the overall RT60 slightly.

## Example Layout

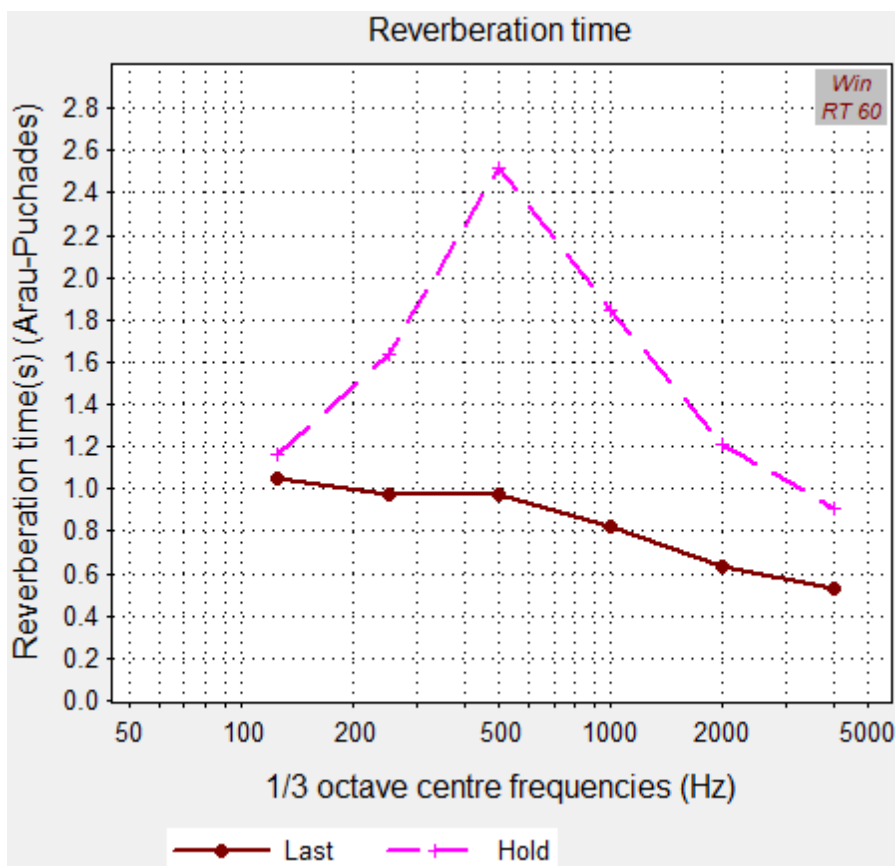


## Call Centre/General Office

Tabulated results of calculation

1/3 Octave Band Frequency (Hz)	Reverberation Time RT60(s)	
	Untreated	Treated
125	1.16	1.05
250	1.63	0.97
500	2.52	0.98
1000	1.85	0.82
2000	1.21	0.64
4000	0.91	0.53

Graphical result of calculation



### DATA FOR THE ROOM

Room volume: 600 m<sup>3</sup>

Temperature: 23 deg.C

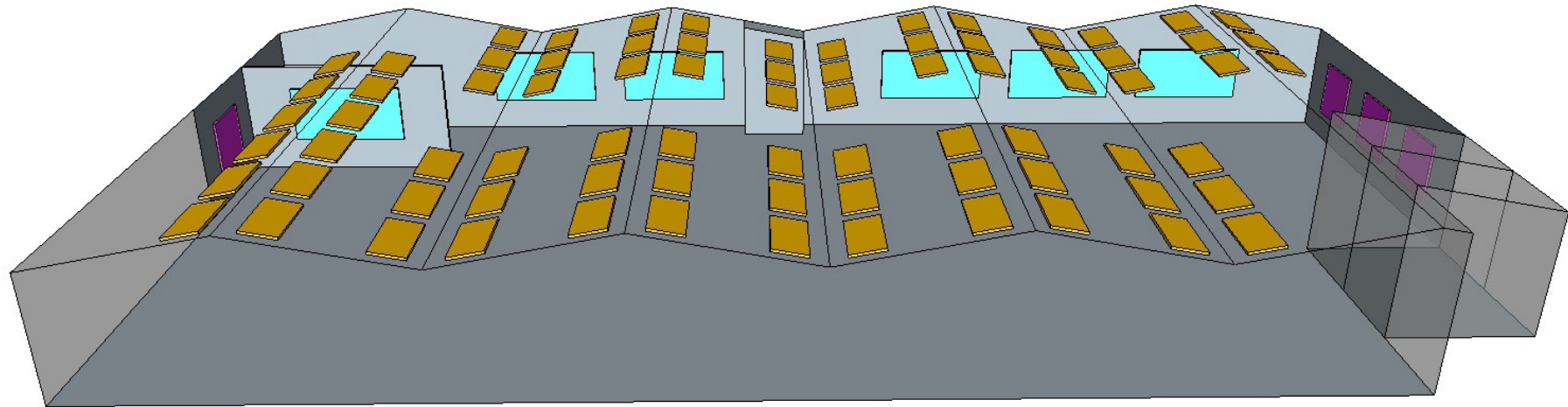
Rel. humidity: 55 %




Untreated room – carpet/hard floor, plasterboard, glass, wooden doors.

Treated room – carpet, plasterboard, glass, wooden door, **101 square metres of absorption with NRC 0.9 applied to ceiling and any two adjacent walls.**

**Occupants may reduce the overall RT60 slightly.**

## Example Layout



-  - 1200 x 600 NRC>0.9
-  - 1200 x 1200 NRC>0.9
-  - 2400 x 1200 NRC>0.9

## ***Rooms requiring higher privacy***

### **Criteria**

Internal acoustic criteria for the proposed office refurbishment is taken from AS2107:2000. This report assesses noise between two spaces and internal reverberation time.

**Table 2:** Recommended interior noise levels - AS2107:2000

<b>Room Type</b>	<b><math>L_{eq, 15 \text{ min}}</math> dB(A)</b>
Office General	40
Office Reception	45
Board and Conference room	35

**Table 3:** Recommended reverberation time – AS2107:2000

<b>Room Type</b>	<b>RT</b>
Office General	0.4 – 0.6 sec
Office Reception	Minimise as much as possible
Office Meeting Room	0.6 – 0.8 sec

The privacy between two adjoining spaces depends on two main parameters:

- The sound reduction between the spaces ( $R_w$  /  $D_{ntw}$ )
- The source room activity noise.

The AAC guideline for commercial building acoustics sets  $R_w$  ratings for walls based on the receiver tolerance for noise versus the source room activity noise. The applicable ratings are summarised in Table 4 below:

**Table 4:** AAC Guideline to Building Acoustics Sound Ratings

Noise Tolerance in Receiving Room	Source Room Activity Noise			
	Low	Average	High	Very High
High	$R_w$ 35	$R_w$ 40	$R_w$ 45	$R_w$ 50
Medium	$R_w$ 40	$R_w$ 45	$R_w$ 50	$R_w$ 55
Low	$R_w$ 45	$R_w$ 50	$R_w$ 55	$R_w$ 60
Very Low	$R_w$ 50	$R_w$ 55	$R_w$ 60	$R_w$ 65

From Table 4 above, it is proposed that the meeting rooms are deemed “low tolerance” and the source room activity noise for the reception and kitchen are “High” and therefore the dividing wall between these spaces should be designed to **Rw 55**.

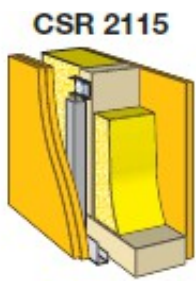
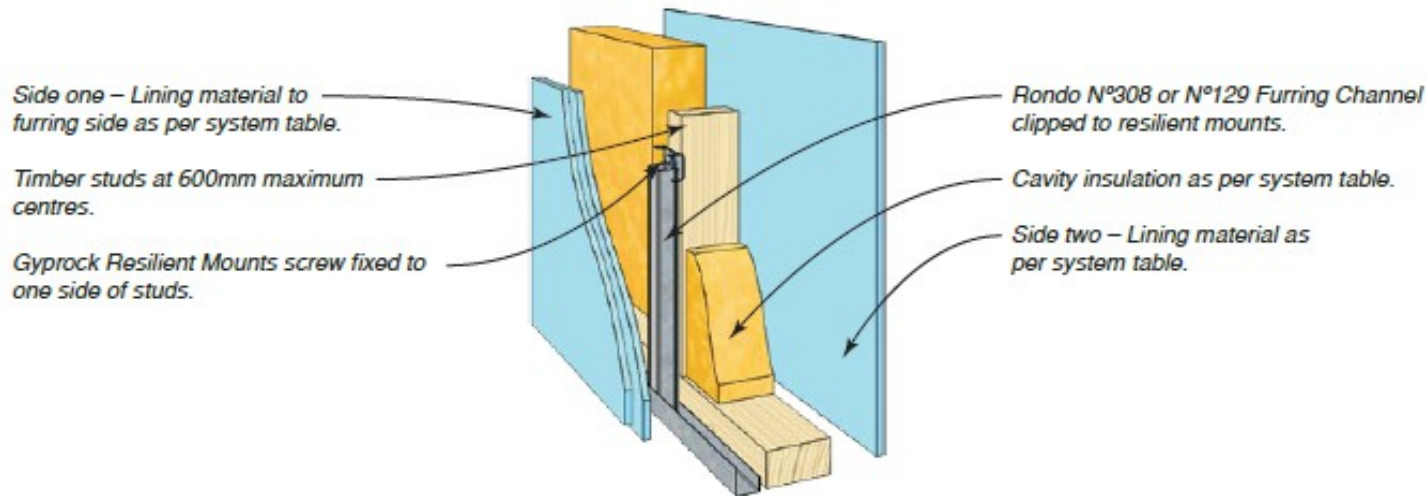
The dividing wall between the meeting rooms and general office area could be defined as “average noise” and therefore the dividing wall between these spaces should be designed to **Rw 50**.

Subject to appropriate design considerations and acoustic treatments as outlined in this Report, it is the opinion of this consultancy that the proposed development can generally comply with the proposed internal sound level guidelines. Where strict compliance is considered impractical, the design has been to meet criteria as close as reasonable, while recognising existing acoustic limitations.

For example, it is not practical for a glass partition to achieve the recommended wall transmission loss criteria of  $R_w 50$ . So in this case a balanced and practical approach is taken for that wall and because the glass wall acoustic performance is reduced, so to is the entry door requirement relaxed so its acoustic performance is in balance with the limiting element, the glass partition.

Wall construction to meet Dw 50 (Rw55+Ctr45) include Autex™ Baffle block (compressed to 30% of its open height) should be installed in any space above the wall and around services. The proposed wall design achieves Rw 50 however other wall elements such as glass and doors will degrade this walls performance.

**SYSTEM SPECIFICATIONS** Timber Frame Internal Wall Systems – Single Stud with Resilient Mount



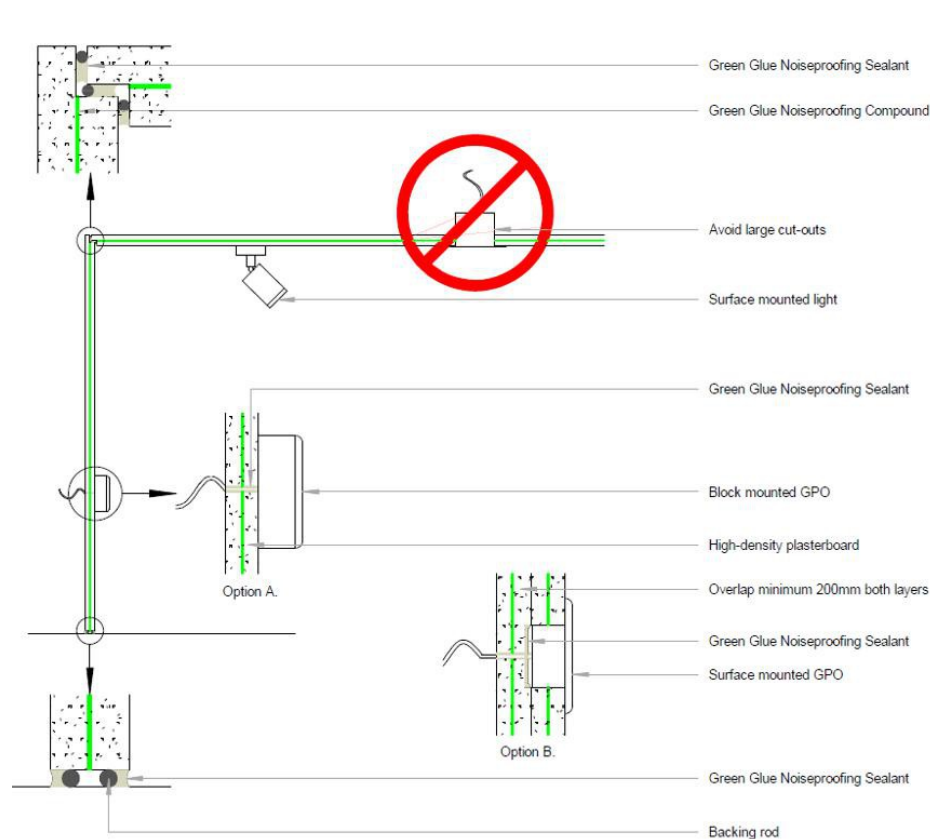
<p><b>CSR 2115</b></p> <p><b>SIDE ONE</b></p> <ul style="list-style-type: none"> <li>• 2 x 10mm Gyprock Soundchek Plasterboard.</li> </ul> <p><b>SIDE TWO</b></p> <ul style="list-style-type: none"> <li>• 1 x 10mm Gyprock Soundchek Plasterboard.</li> </ul>	(a) Nil	44/37	45/38	47/40	47/41
	(b) 75 Gold Batts 1.5	52/43	53/44	55/46	54/46
	(c) 70 Soundscreen 2.0	54/44	55/45	56/46	56/47
	(d) MSB3 Polyester	48/40	49/41	50/42	50/43
	Wall Thickness mm	128	148	178	198

Wall Thickness 148 mm (c) 70 Soundscreen 2.0 or equivalent from CSR2115



Wall construction to meet RW 50 Wall Thickness to include Autex™ Baffle block (compressed to 30% of its open height) should be installed in any space above the wall and around services. The proposed wall design achieves Rw 50 however other wall elements such as glass and doors will degrade this walls performance.

128 mm (c) 75 Gold Batts or equivalent from CSR2115



Green Glue Noise Proofing Sealant to be used on both layers at all joins and penetrations.

Surface mounted lights (ceiling or wall) are a preferred option to downlights.

GPO or other wall mounted connections to be mounted on a mounting block (See Option A.). Alternatively, add 2 layers of plasterboard with Green Glue Noiseproofing Compound and stick behind the Surface Mounted GPO overlapping with a minimum of 200mm. (See Option B.). Option A. is preferred.

Patch Bays should be surface mounted

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## **Doors**

Solid core doors with no penetrations and door seals.

The doors should be rated as close to Rw 45 as practical. This is less than the design goals but a practical compromise for entry doors. A proposed suitable door is presented below:

Door Seals Australia 49mm Rw 44 with the following seals:

### **DSA Class 44 STC- Rw Acoustic Systems Component**

- **DS20-24** head and jamb seal
- **S9168** head and jamb seal
- **DRS1530** automatic door bottom seal
- **DST77** threshold + **S6620** Seal (optional)
- **DS20-24** threshold (optional)
- **DS30** head and jamb seal + **S6577** for a timber frame
- **DST66** threshold for carpeted floor (optional) - refer to pages 27 & 29
- **DBS1230** automatic door bottom seal (optional seal carrier for fire doors)
  
- Standard silver anodised aluminium finish
- Seal material, TPE thermoplastic, (black)

### ***Ceiling Noise Control***

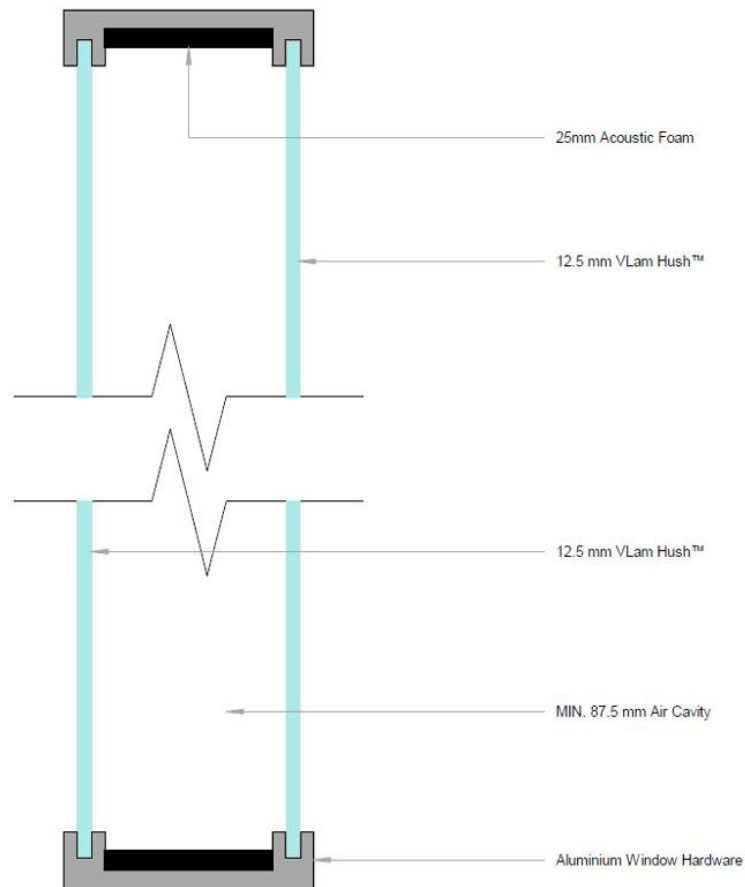
The meeting rooms ceilings should match the wall acoustic criteria but this is not practical given the existing mechanical services and budget constraints and limitations to entry door and glass partition acoustic performance. Therefore it is proposed that the ceiling should match the acoustic performance of the entry doors (Rw 45). The ceiling tile acoustic rating term is CAC.

A suitable ceiling tile is the USG / Boral ceiling tile Radar Ceramic Climaplus™ with a CAC 42 and NRC 0.82. Autex Baffle block (compressed to 30% of its open height) should be installed in the space above the wall and around services as described in the wall sections above.

## Glazing

The partitons that are glazed should match the wall isolation to maintain the privacy level.

SoundOUT™ FrontGLAZE™ from Architectural Window Systems or equivalent - 12.50mm VLam Hush™ / 87.5Air /12.50mm VLam Hush Rw + C, +Ctr 51 (-2,-6) is slightly under performance. It could be increased to similar to the require Rw55 with a wider cavity and/or absorption in the cavity.



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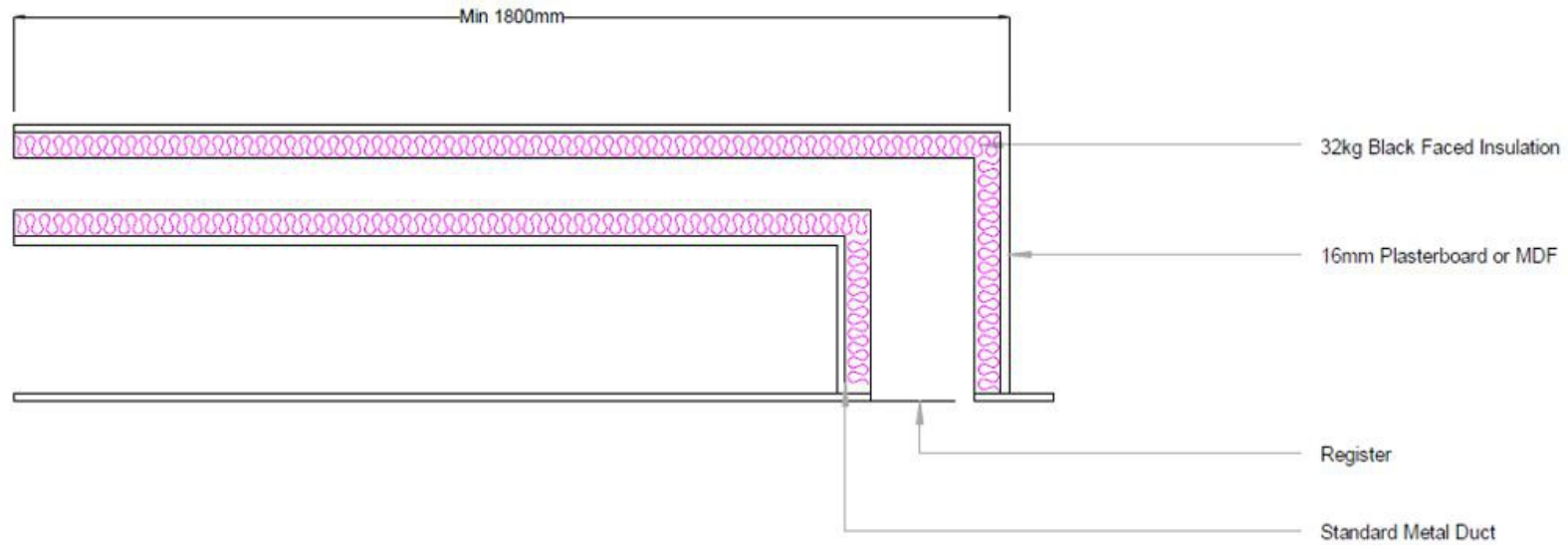
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## ***Air conditioning***

For all rooms requiring privacy, ducted supply and return air must be used. Door grilles are not suitable.

- Mechanical plant noise should meet the requirements of Table 2 above.
- Note: To be able to carry out this assessment in detail we require the mechanical services duct layout drawings, selection of mechanical plant or at least static pressure drop and air volume rates.
- However we understand mechanical plant noise levels will not be altered as part of the refurbishment and as such mechanical plant noise is not considered further in this report.

Suggested attenuator construction;



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