Apartment Acoustics

MARSHALL DAY
Acoustics

Apartment Buildings

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Acoustic Design Criteria

- Building Code of Australia:
  - Intertenancy walls and floors
  - Corridor walls and doors
  - Floor impact isolation
  - Lift, stair and core walls
  - Hydraulic services and risers
  - Electrical services and access panels
- AS2107
  - Traffic and building services noise criteria
- Other standards
  - AAAC Star Rating System
  - Green Star
  - Marketing and Body Corporate requirements
  - Planning permits and Planning Overlays

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Inter-tenancy walls

- Building Code of Australia
  - Inter-tenancy walls (R_w+C_{tr} 50)
  - Corridor walls (R_w 50)
  - Doors (R_w 30)
  - Lift, stair and core walls (R_w 50)

- DISCONTINUOUS CONSTRUCTION!!!
  - Defined as a clear 20mm clear gap (not resilient mounts)
  - Wet areas adjacent to habitable (kitchens can be habitable or wet areas)
  - Required where hydraulic services located within wall
  - Required adjacent to lift shafts and plant rooms

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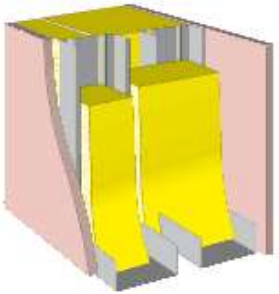
Inter-tenancy walls

SYSTEM N	WALL LININGS	CAVITY WIDTH mm	2x64 studs + 44 gap = 172
		CAVITY INFILL (Refer to Section 'A')	**R_w / R_w+C_{tr}**
CSR 216 	*Side One* • 1 x 13mm GYPROCK FYRCHEK Plasterboard. *Side Two* • 1 x 16mm GYPROCK FYRCHEK Plasterboard.	(a) 165 GW Partition – 11kg + 50 GW Partition 11kg	55/**50** ①
		WALL THICKNESS mm	201

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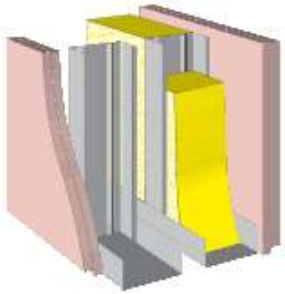
Inter-tenancy walls

SYSTEM N	WALL LININGS	CAVITY WIDTH mm	148	200	250	300
		CAVITY INFILL (Refer to Section 'A')	**R_w / R_w+C_{tr}**			
CSR 275 	*Both Sides* • 2 x 13mm GYPROCK FYRCHEK plasterboard	(a) Nil	50/44	51/45	52/46	53/47
		(b) 50 GW Partition 11kg	58/**50**	59/**51**	60/**52**	61/**53**
		(c) 75 GW Partition 11kg	60/**52**	60/**52**	61/**53**	62/**54**
		(d) TSB3/ASB3 Polyester	57/**51**	58/**52**	59/**53**	60/**54**
		(e) 60 Soundscreen™ 1.6	59/**50**	60/**51**	61/**52**	62/**53**
		WALL THICKNESS mm	200	252	302	352

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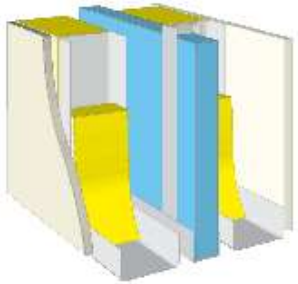
Inter-tenancy walls

CSR 100 	*Both Sides* • 2 x 10mm GYPROCK Plasterboard CD.	(a) 75 GW Partition 14kg	60/48	61/49
		(b) 110 GW Partition 11kg	62/**50**	62/**50**
		(c) 88 RW Soundscreen R2.5	61/49	62/**50**
		MINIMUM WALL THICKNESS mm	257	289

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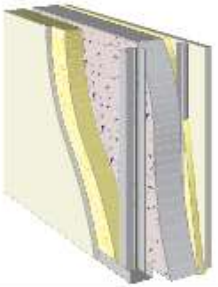
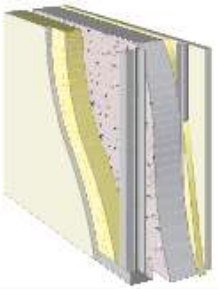
Inter-tenancy walls

SYSTEM N	WALL LININGS	STUD DEPTH (mm)		64	92
		STUD CAVITY INFILL (Refer to Section A)	FURRING CAVITY INFILL (Refer to Section A)	R_w / R_w+C_{tr}	
CSR 549 	*Both Sides* • 1 x 10mm GYPROCK plasterboard CD.	(a) 50 GW Partition 11kg	(a) 50 GW Partition 11kg	61/48	63/**51**
		(b) 75 GW Partition 11kg	(b) 50 GW Partition 14kg	63/**50**	65/**53**
		(c) TSB4/ASB4 Polyester	(c) TBL1025	59/46	61/49
		ADDITIONAL WALL THICKNESS mm		136	164
CSR 544 	*Both Sides* • 1 x 13mm GYPROCK plasterboard CD.	(a) 50 GW Partition 11kg	(a) 50 GW Partition 11kg	62/**50**	64/**52**
		(b) 75 GW Partition 11kg	(b) 50 GW Partition 11kg	63/**51**	65/**53**
		(c) TSB4/ASB4 Polyester	(c) TBL1025	60/48	62/**50**
		ADDITIONAL WALL THICKNESS mm		142	170

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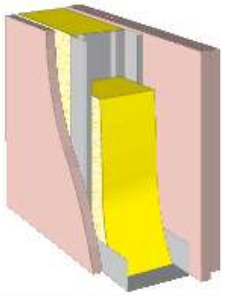
Corridor walls

CSR 040						
	*Side One* • 1 x 13mm GYPROCK FYRCHEK Plasterboard. *Side Two* • 2 x 13mm GYPROCK FYRCHEK Plasterboard.	(a) Nil	40/33	42/35	43/36	44/37	47/41
		(b) 50 GW Partition 11kg	45/36	47/38	48/39	49/40	51/43
		(c) 75 GW Partition 14kg	–	50/41	50/41	51/42	53/45
		(d) TSB3/ASB3 Polyester	45/38	46/39	47/40	48/41	50/44
		(e) 60 Soundscreen™ 1.6	–	48/38	49/39	50/40	52/43
		WALL THICKNESS mm	90	103	115	131	189

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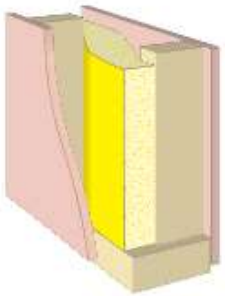
Corridor walls

CSR 450 	*Both Sides* • 1 x 13mm GYPROCK FYRCHEK plasterboard.	(a) Nil	41/34	44/37	44/38
		(b) 75 Gold Batts™ 1.5	50/41	53/44	53/45
		(c) 75 Soundscreen™ 2.0	51/41	54/44	54/45
		(d) TSB3/ASB3 Polyester	48/41	50/43	50/44
		WALL THICKNESS mm	116	146	166

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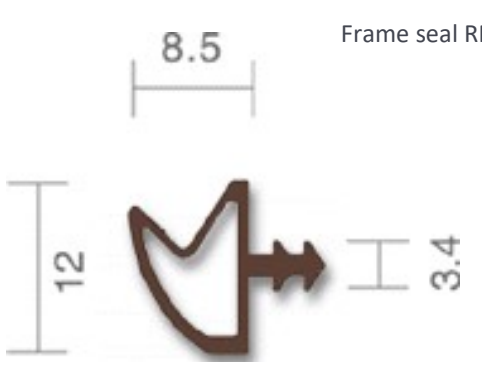
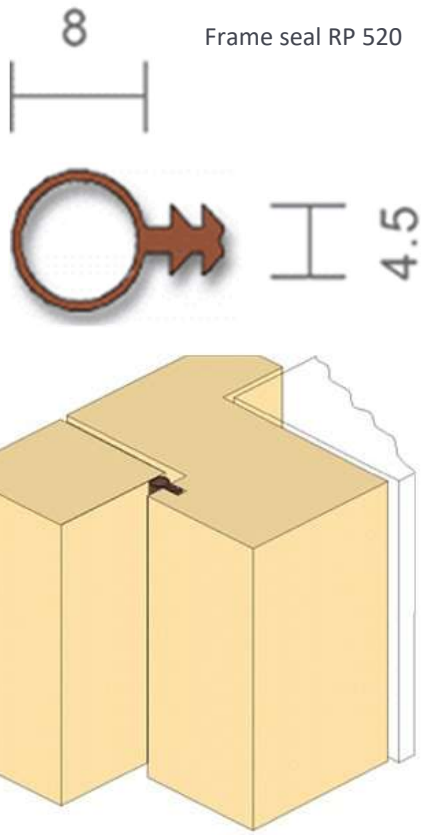
Doors

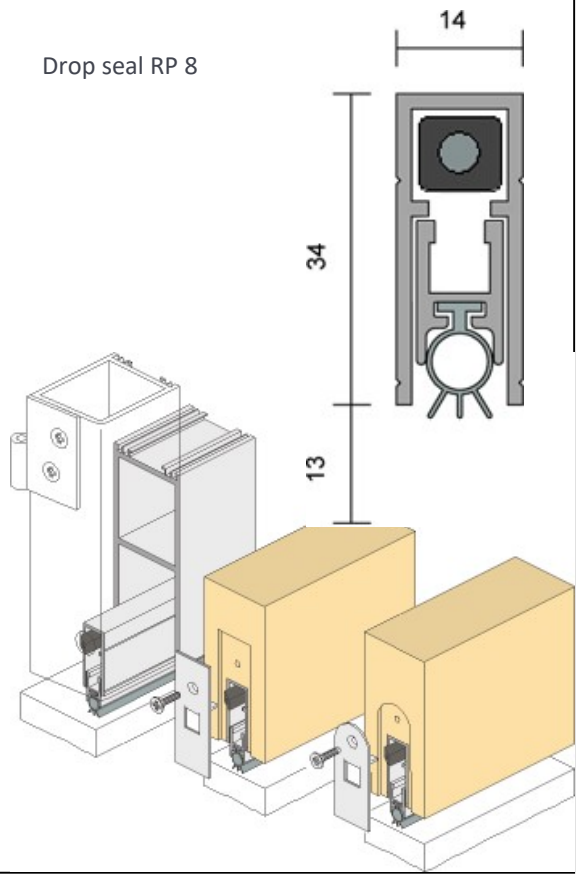
Frame seal RP 500



Frame seal RP 520



Drop seal RP 8



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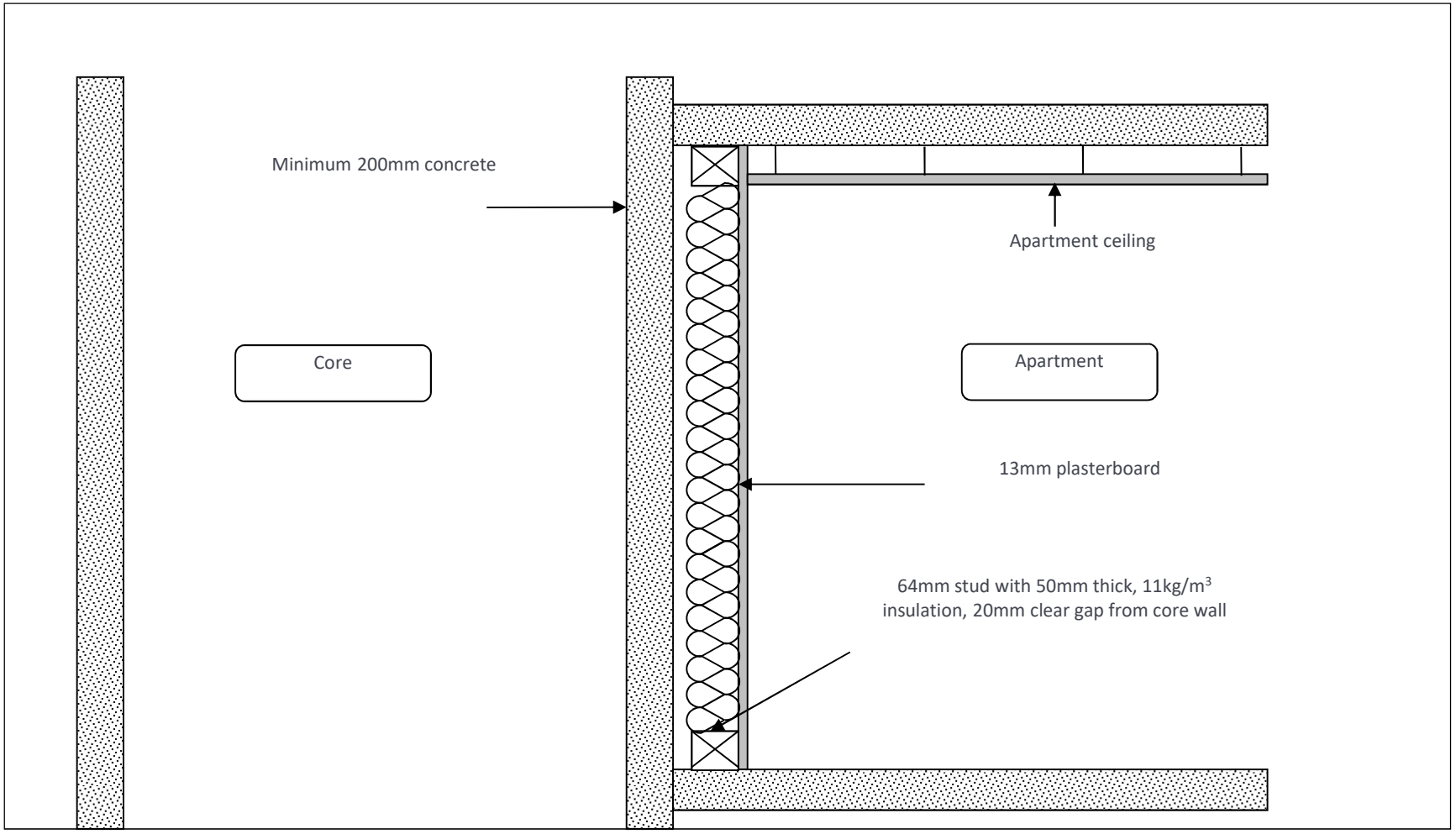
Lift and Plantroom walls



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Floor/Ceiling systems

- Airborne sound insulation
  - Inter-tenancy floors/ceilings (R_w+C_{tr} 50)
  - Minimum 200mm thick concrete with no ceiling
  - Concrete slabs can be thinner if suspended ceiling included
  - Concrete slabs less than 150mm will require ceiling cavity insulation
  - Light-weight construction requires great care

- Floor Impact isolation
  - BCA criteria ($L_{n,w}$+C_1 $\leq$ 62)
  - Minimum BCA Standard is poor and can be achieved by bare concrete
  - Minimum recommended $L_{n,W}$ 55 (requires acoustic underlay)
  - Light-weight construction a big problem due to low frequency “thumps”

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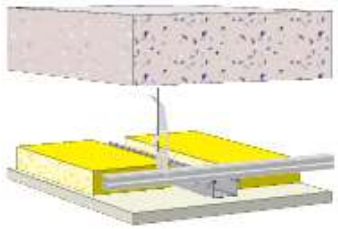
Floors

CSR 458 	• 1 x 13mm GYPROCK Plasterboard CD.	(a) Nil	61/**54**	65-70	**40-45**
		(b) 50 GW Partition 11kg	66/**59**	60-65	**40-45**
		(c) 75 GW Partition 11kg	67/**60**	60-65	**40-45**
		(d) TSB4/ASB4 Polyester	66/**59**	60-65	**40-45**

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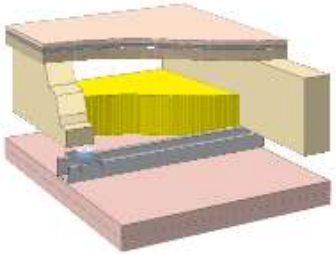
Floors

CSR 822 	• 2 x 13mm GYPROCK FYRCHEK plasterboard.	(a) Nil	50/44	70 – 75	**50 – 55**
		(b) 90 Gold Batts™ 2.0	59/**51**	60 – 65	**45 – 50**
		(c) 75 Soundscreen™ 2.0	58/48	60 – 65	**45 – 50**

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Resilient Underlay
(moderate performance)

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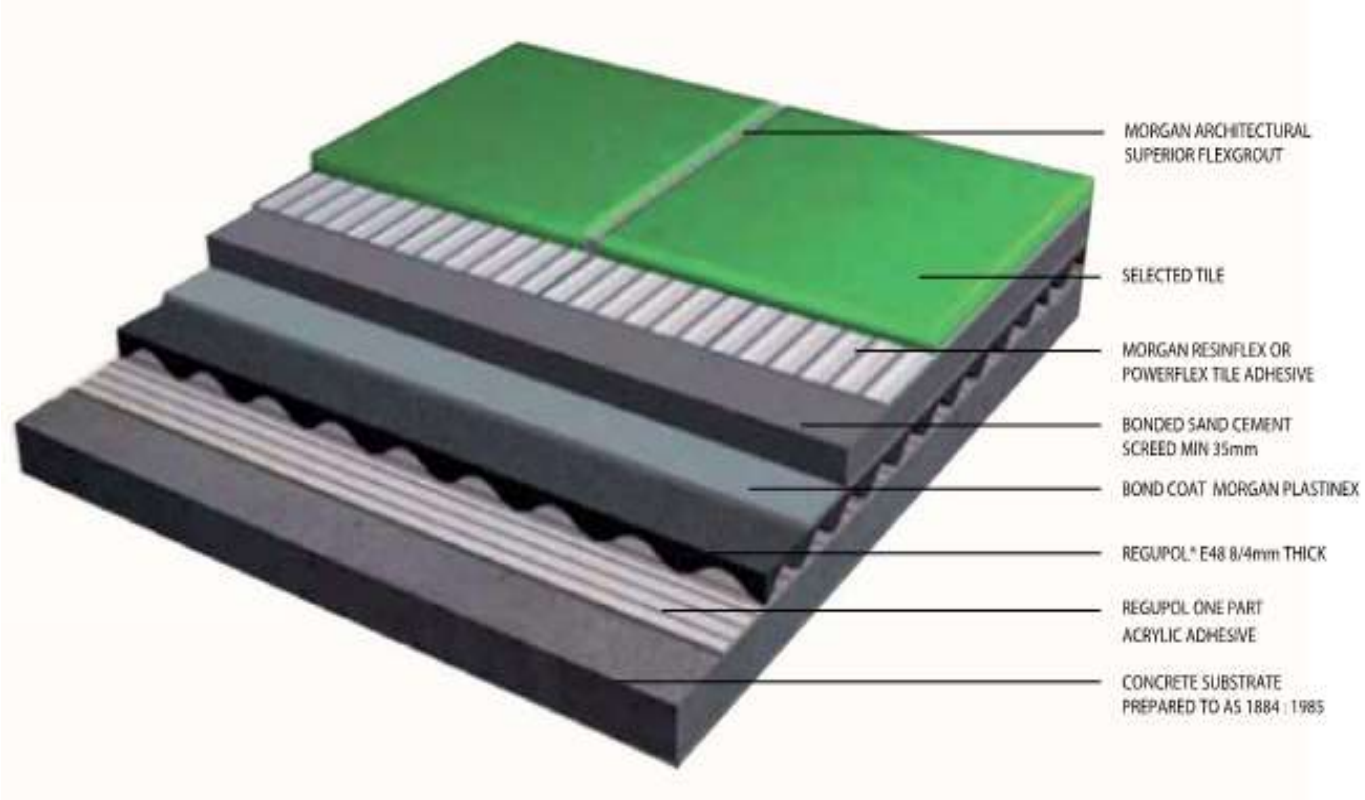
Resilient Underlay (high performance)



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Hydraulic Services

- Acoustic separation
  - The BCA requires that hydraulic services pipes must be separated from the rooms of a sole-occupancy unit by construction with the following acoustic performance:
    - R_w+C_{tr} 40 if the room is a habitable room
    - R_w+C_{tr} 25 if the room is a non-habitable room (wet area)
  - The above requires the use of appropriate construction of ceilings and risers.
  - The acoustic performance of ceilings and risers can be reduced by the use if pipe lagging and acoustic insulation
  - Plastic water supply pipe also significantly reduces the required performance of risers and wall linings
  - Water supply pipes must technically be located within a cavity of discontinuous construction

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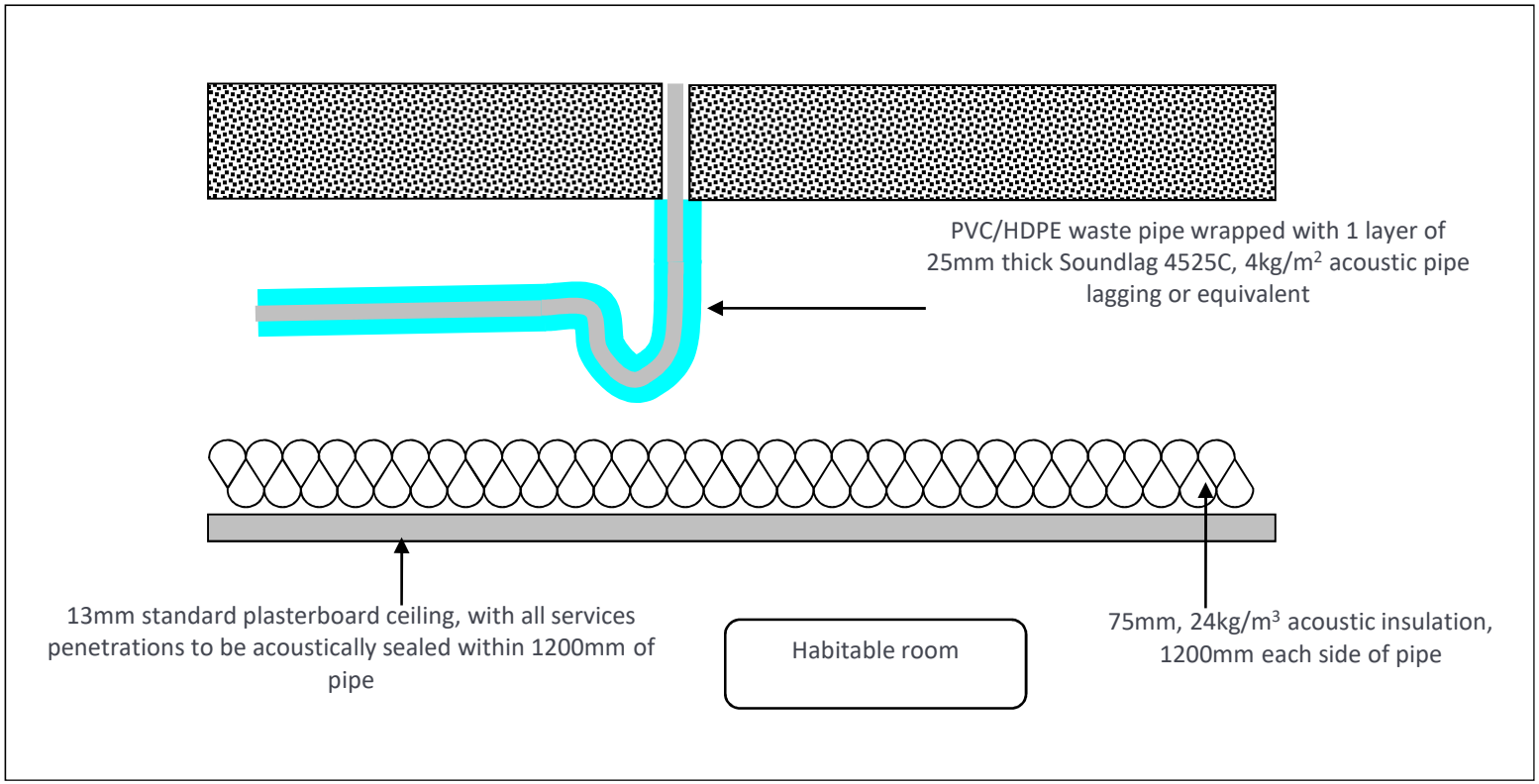
Hydraulic Services - above ceilings (habitable)



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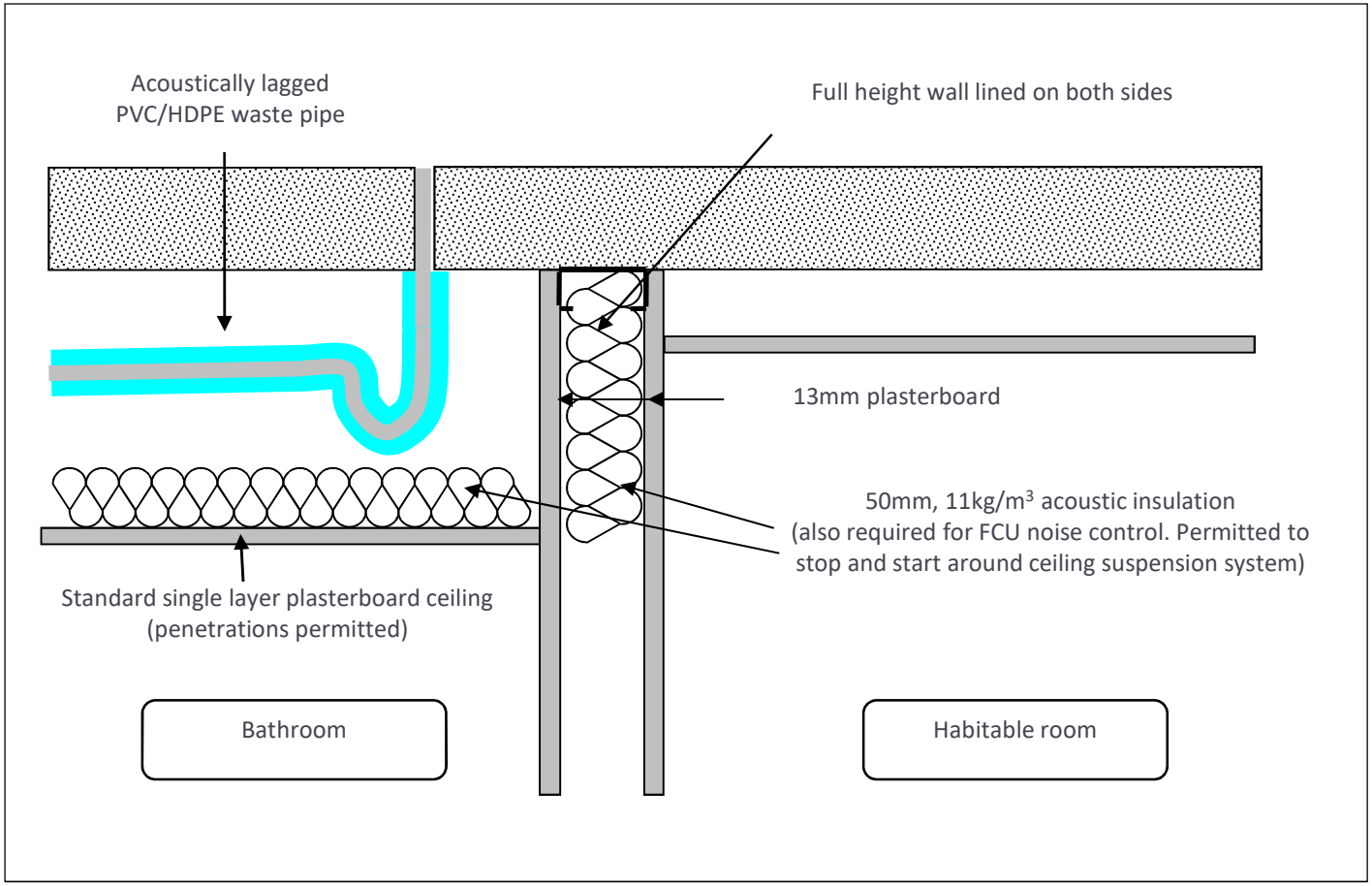
Hydraulic Services - above ceilings (wet area)



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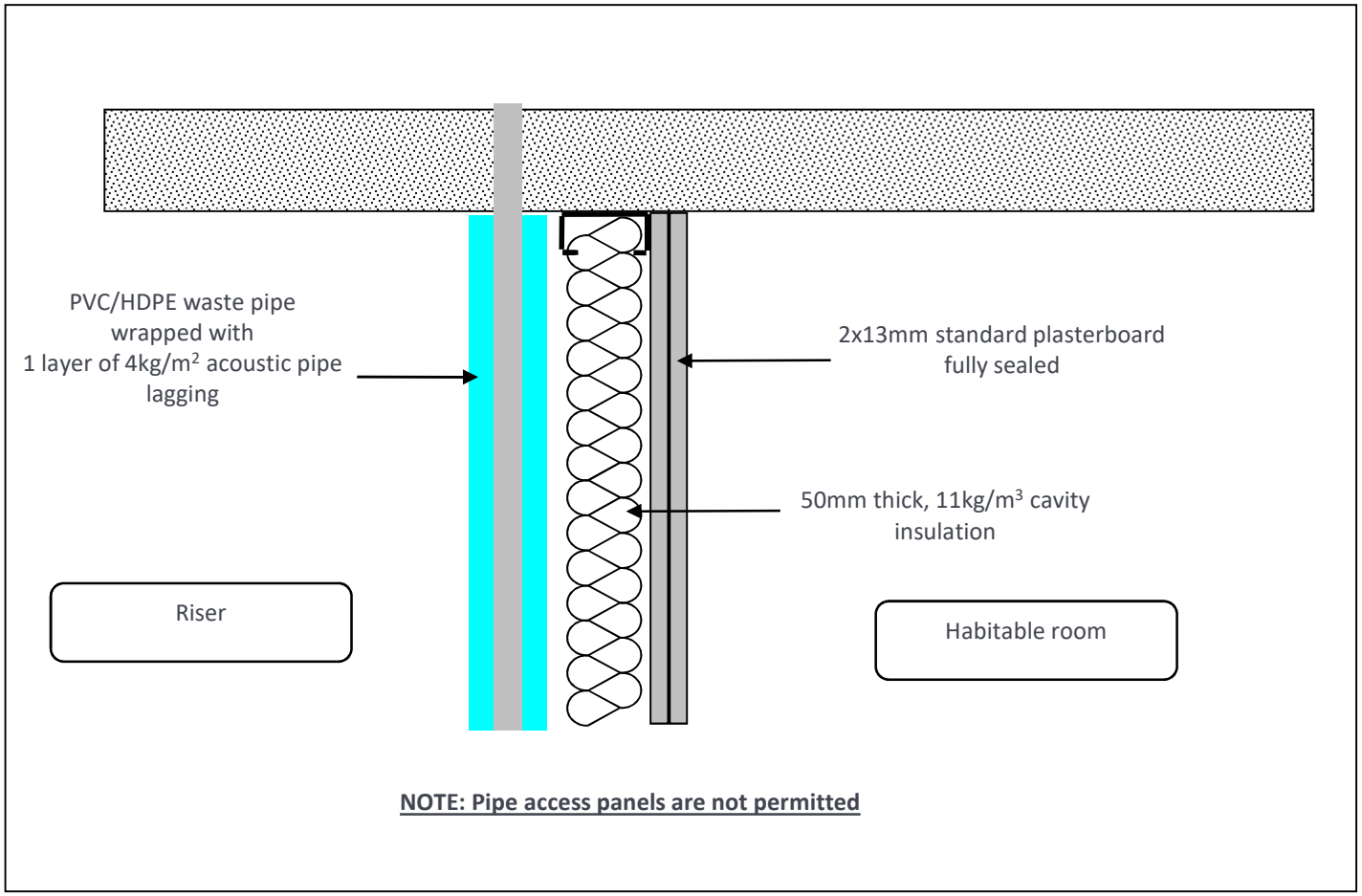
Hydraulic Services – risers (habitable)



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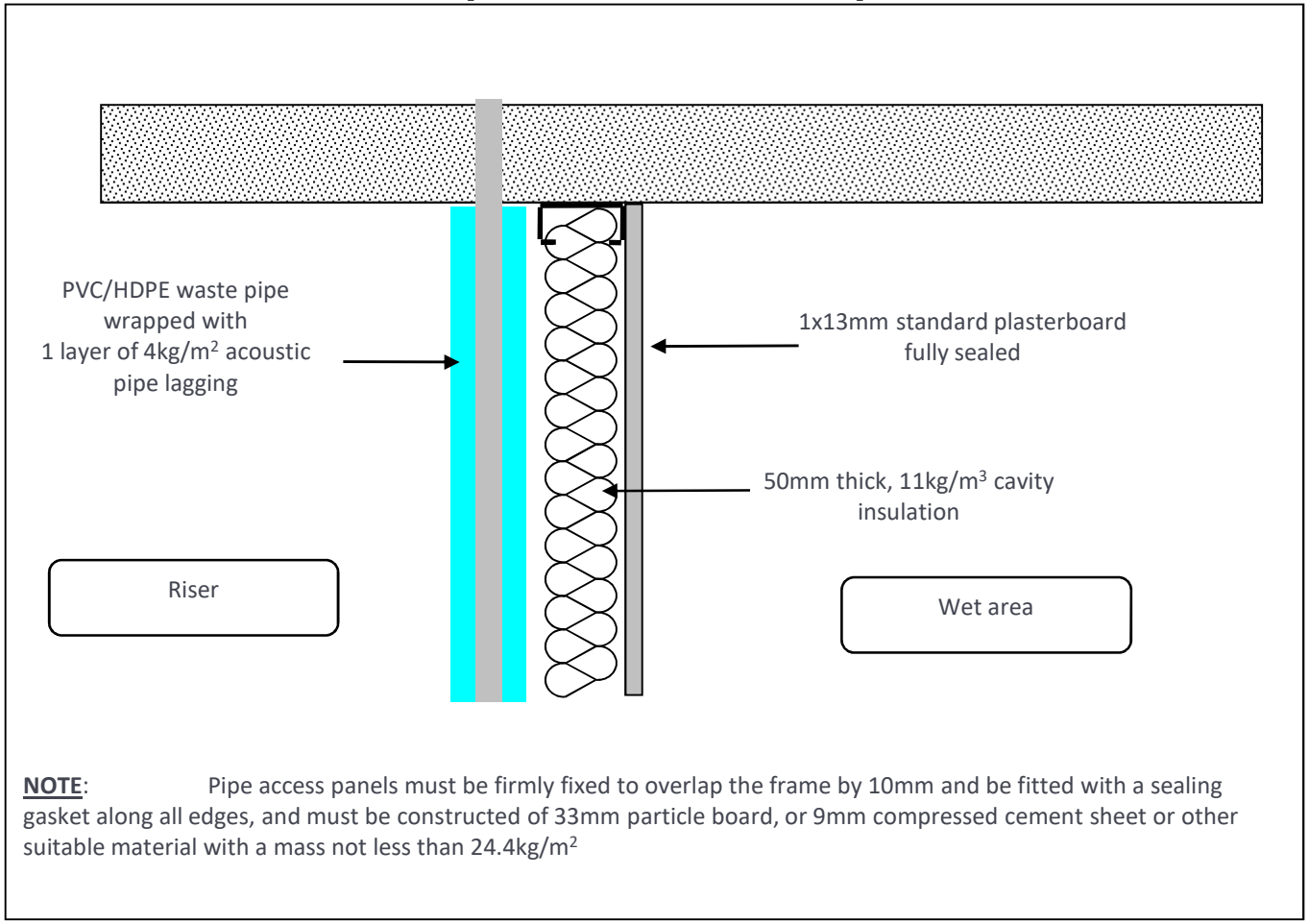
Hydraulic Services – risers (wet area)



NOTE: Pipe access panels must be firmly fixed to overlap the frame by 10mm and be fitted with a sealing gasket along all edges, and must be constructed of 33mm particle board, or 9mm compressed cement sheet or other suitable material with a mass not less than 24.4kg/m²

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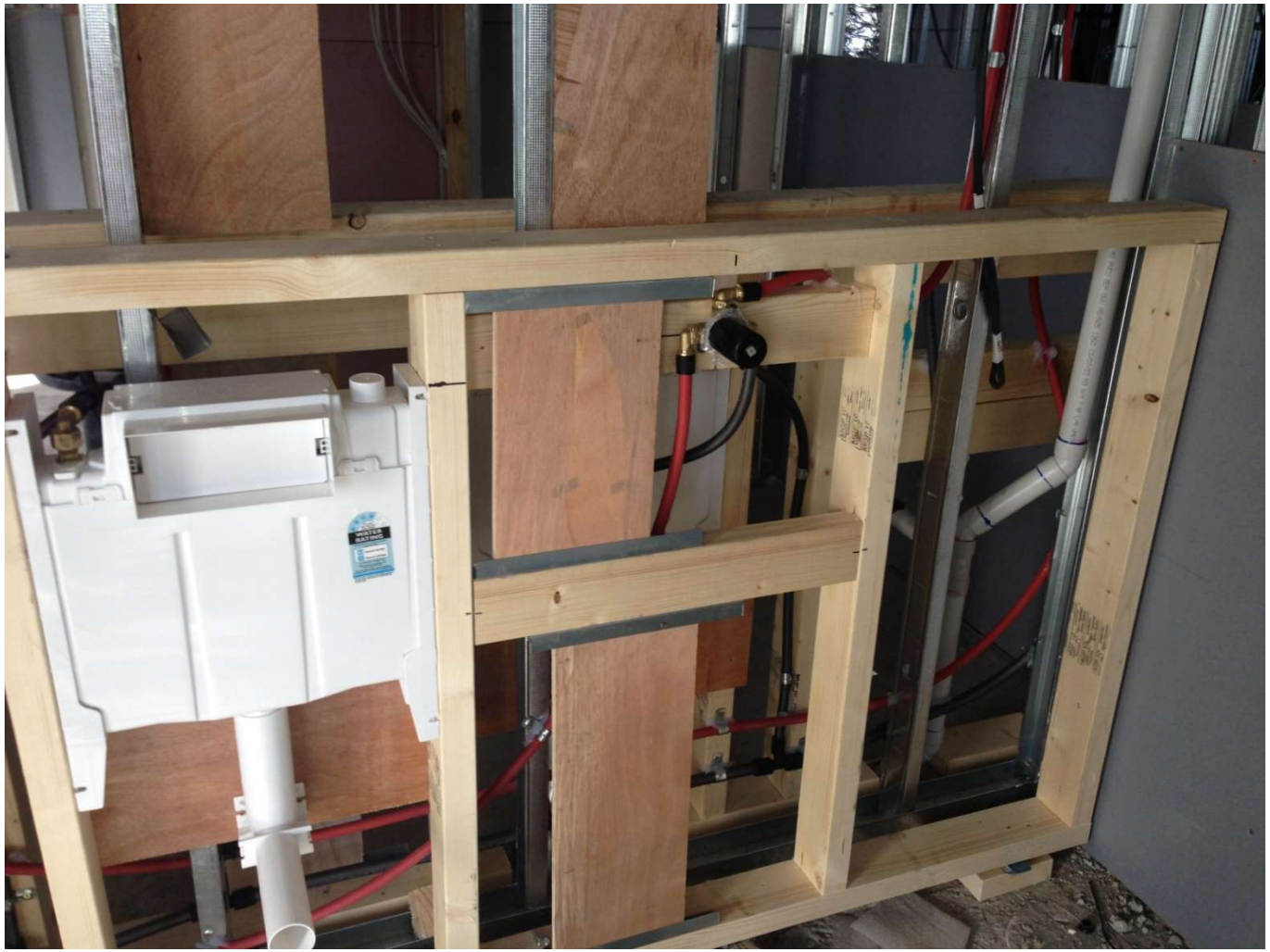
Hydraulic Services – Water Supply



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Electrical Services

- BCA requires that when electrical outlets are mounetd within inter-tenancy walls:

They must be off-set from each other –

- (A) in masonry walling, not less than 100mm
- (B) in timber or steel framed walling, not less than 300mm

If the above cannot be achieved, then an acoustically rated electrical wall box can be installed to allow back-to-back installation.

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External sound insulation

- No applicable BCA criteria (yet!!)
- AS2107 provides recommended noise levels for building interiors
- Higher quality usually requires lower noise levels
- Some danger in making rooms too quiet
- Double glazing not always better.
- Single laminated glass often preferred due to better low frequency performance
- Window seals critical
- Awning windows better than sliding or sash windows
- Treatment to ventilation paths and facade construction also important
- Wintergardens required in extreme circumstances

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Building Services

- No applicable BCA criteria
- AS2107 provides recommended noise levels for building interiors
- Environmental noise emissions must comply with EPA Guidelines and Stage Government Legislation
- Ducted ceiling mounted units require careful design
- Toilet and kitchen exhaust fans ducted to facade
- External condensing units require screening
- Central plant such as car park exhaust fans may need silencers

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Other considerations

- Site Inspections
- Vibration
- Acoustic sealing of penetrations
- Balconies/Terraces
- Garbage chutes
- Carparks and garage doors
- Junction details critical
- Building isolation to control vibration is near railway lines etc
- Swimming pools and associated plant require isolation
- Gymnasiums
- Lobby acoustics (reverberation)
- Mixed-use – cafeterias, retail or commercial interface
- Existing commercial neighbours
- Existing entertainment venues

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