AVAILABLE FROM POTTER INTERIOR SYSTEMS

RONDO QUIET STUD® ACOUSTIC STUD SYSTEM

SUMMARY

Rondo QUIET STUD® is a major breakthrough in acoustic control. Its unique design, combined with appropriate lining board systems, forms an effective buffer against unwanted noise and a cost-effective solution to Australia's acoustic control provisions.

Fast and simple to install, it leaves more usable floor space in a similar footprint and is almost exactly the same as standard drywall construction, resulting in lower installation costs and virtual fail-safe acoustic wall system.

CONTENTS:

SUITABLE FOR:

- Acoustic control provisions
- Acoustic wall system
- Non-Fire Rated Systems
- Fire Rated Systems
- Inter-tenancy walls

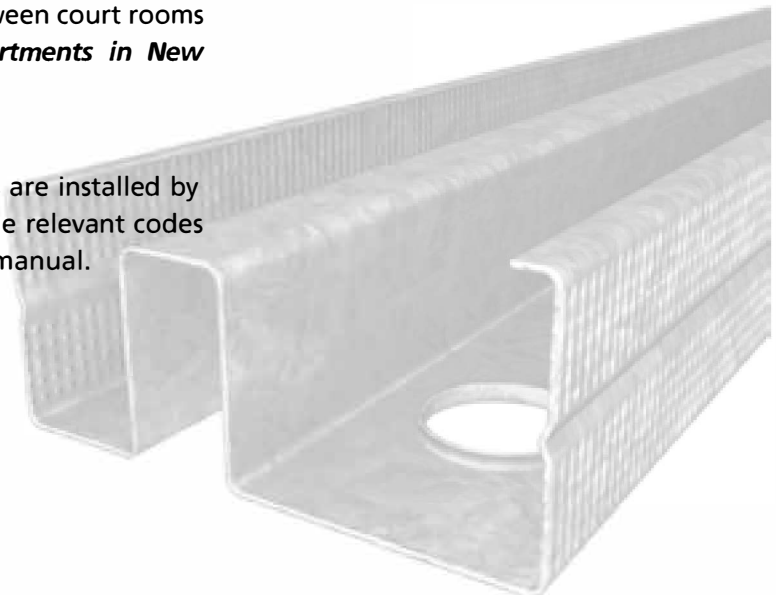
SPECIAL FEATURES

- Achieves superior performance in a smaller footprint, leaving more floor space
- Quick installation as it is virtually the same as standard drywall construction, resulting in lower labour costs
- Single profile; no need for staggered stud method of installation
- Utilises standard Rondo 92mm top and bottom wall tracks
- Bell-mouthed service holes for electrical cabling
- Studs are designed for a friction fit into top & bottom wall track
- Manufactured with a minimum coating of Z275

IN PRACTICE

The Rondo QUIET STUD® system has been used in a range of projects, including apartments, hotel refurbishments, schools, universities, hospitals and offices. At the ***District Law Court in Western Australia***, Rondo QUIET STUD® was used as an effective buffer against unwanted noise between court rooms and at the recent ***Clyde Quay Wharf Apartments in New Zealand***, between the inter-tenancy walls.

IMPORTANT NOTE:
Rondo recommends its products and systems are installed by a qualified tradesperson and according to the relevant codes and standards outlined on page 256 of this manual.



RONDO QUIET STUD® COMPONENTS

QUIET STUD

RQST	92mm x 45mm x 0.55bmt

WALL TRACK

250	92mm x 28mm x 0.50bmt with hem

DEFLECTION HEAD TRACK

499	92mm x 50mm x 0.70bmt Deflection Head Track

QUIET STUD

RQST

WALL TRACK

250

DEFLECTION HEAD TRACK

499

SOUND ISOLATION DESIGN FOR WALLS

Good acoustic control begins with good acoustic design.

In the case of adjoining dwellings that have a common inter-tenancy wall, noise intrusion can be limited by considering a range of factors including:

- Plan quiet areas in one unit adjacent to quiet areas in the adjoining unit.
- Plan quiet areas that are not immediately adjacent to plumbing, sanitary services or similar.
- Design walls to be full-height, to underside of soffit or roof above.
- Use high quality acoustic-grade insulation in the wall cavity.
- Use high quality, durable acoustic sealant at wall, floor or ceiling intersections and around penetrations.
- Minimise penetrations in sound-rated walls and ensure that power outlets and light switches are not installed back-to-back.
- Minimise the incidents of other flanking paths (ie; doors next to other doors etc).
- Use quieter pipe constructions to reduce noise generated by pipes and other services.
- Use Rondo QUIET STUD®

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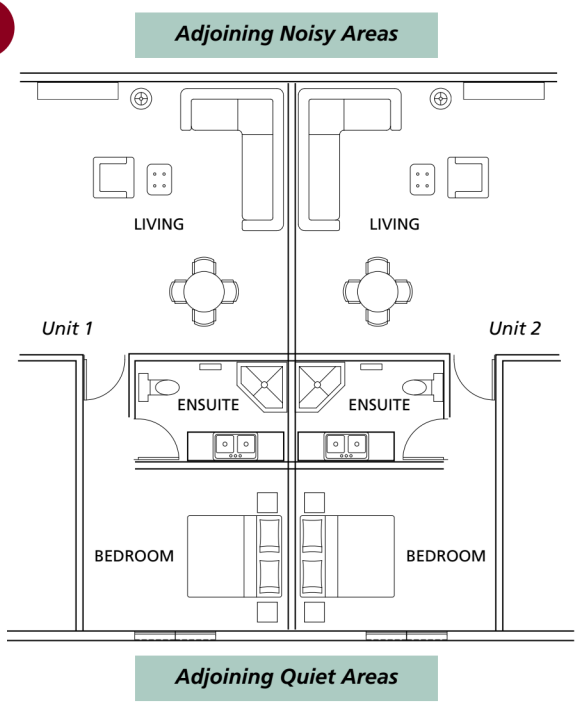

■ EXAMPLE OF GOOD ACOUSTIC DESIGN PRACTICE

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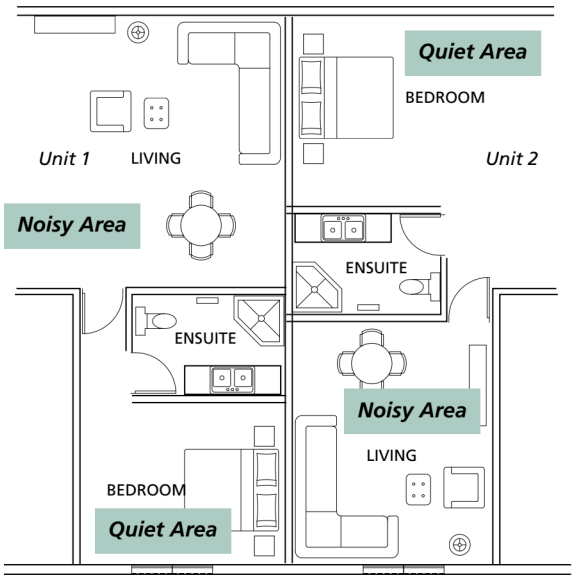

■ EXAMPLE OF BAD ACOUSTIC DESIGN PRACTICE

SOUND ISOLATION DESIGN FOR WALLS (continued)

Good acoustic design practice takes into account the noise generated in a building space and ensures that, where possible, like areas in adjacent units are designed and constructed back-to-back *(refer Figure 1)*.

Noisy areas should be grouped together and sharing common walls where possible, i.e. wet areas, toilets, etc. in adjacent units should be designed and constructed back-to-back. This can also assist with reducing the ultimate construction cost of the building.

Another good acoustic design practice is to maximise the distance between access doors or external windows of adjoining units. This will limit potential flanking paths.

There are many other design issues that need to be taken into consideration to ensure good acoustic performance in walls and ceilings, including design of penetrations, plumbing and waste pipe services, hydraulic and mechanical services, acoustic sealants, door and window openings to name just a few. Rondo recommends that the user examine various publications such as those provided by the leading plasterboard manufacturers as well as the ABCB Sound Insulation 2004 Guideline available from the Australian Building Codes Board.

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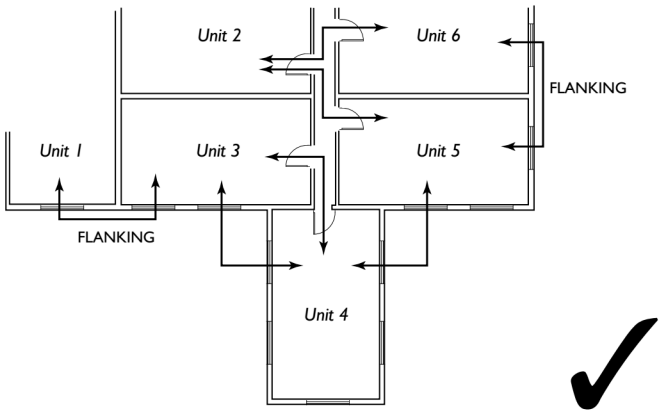

EXAMPLE OF GOOD ACOUSTIC DESIGN PRACTICE TO MINIMISE FLANKING PATHS

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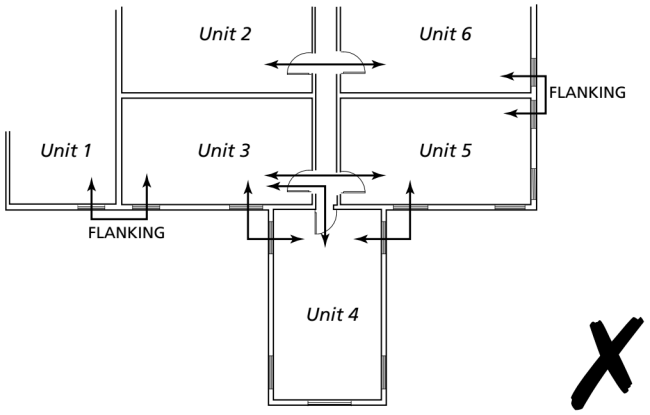

EXAMPLE OF BAD ACOUSTIC DESIGN PRACTICE AS FLANKING PATHS ARE DIRECTLY ADJACENT TO ONE ANOTHER

SOUND ISOLATION PROVISIONS

BUILDING CLASSES

Way back in 2004 the Building Code of Australia (BCA) was amended in response to mounting evidence that the existing sound insulation code was not meeting community expectations.

The purpose of these amendments was to reduce noise transmission between attached dwellings (high-rise and multi residential apartments etc) and between dwellings and units and other areas within a building such as common amenities, corridors and stairwells.

Table 1 refers to the classes of building covered by these amendments as categorised by the BCA.

PROVISIONS

The BCA deals only with sound insulation between dwellings and does not address issues such as external noises or noise transfer from within a unit to outside of the building.

The provisions deal with both wall & floor/ceiling requirements but it is only wall requirements that we are concerned with in this specific document.

To meet the new code requirements, manufacturers have three basic ways to satisfy the BCA sound insulation requirements:

- *Prescriptive Approach* – Laboratory Tested Systems
- *Performance Approach* – Conduct a Field Test specified in the Verification Method of the BCA
- *Performance Approach* – Use Expert Judgement or Opinion that the systems meet Deemed-to-Satisfy levels.

The current BCA minimum requirements for sound insulation are as shown in Table 2.

TABLE 1: BUILDING CLASSES

CLASS 1*	One or more attached dwellings separated by a fire-resisting wall (ie; terrace, villa, row house etc) or a small boarding house, guest house, hostel or similar less than 300m^2 and one which more than 12 persons would not ordinarily be resident.
CLASS 2	A building containing two or more sole-occupancy units each being a separate dwelling (ie; flats, apartments, units etc).
CLASS 3	A residential building other than Class 1 or 2 such as a large boarding house, back-packers accommodation, residential part of a hotel/school/detention centre or health-care building etc.
CLASS 9C	Aged care building.

*NOTE: * The BCA sound insulation provisions Volume One, Part F5 only apply to Building Classes 2, 3 & 9c. The provisions of Volume Two, Parts 2.4 & 3.8.6 apply to Class 1 buildings. Refer to the BCA for exact definitions.*

TABLE 2: SOUND INSULATION PROVISIONS OF THE BCA

CLASS	WALLS SEPARATING	R_w & C_{tr}	R_w	DISCONTINUOUS CONSTRUCTION
1	Habitable rooms (other than kitchens) of one building from a bathroom, laundry, kitchen, etc in another Class 1 building	50	–	Yes
	Rooms between Class 1 buildings other than above	50	–	No
2&3	Habitable rooms (other than kitchens) of one SOU from a bathroom, laundry, kitchen etc in another SOU	50	–	Yes
	Rooms between SOU's other than above	50		No
	SOU's from public corridor, stairway etc	–	50	No
	SOU's from plant room or lift shaft	–	50	Yes
9C	SOU's from a kitchen or laundry	–	45	Yes
	SOU's from other SOU's (other than above), or from a sanitary compartment, bathroom, plant room etc.	–	45	No

NOTE: SOU = Sole-occupancy Unit

SOUND ISOLATION PROVISIONS (continued)

Definitions

IMPACT NOISE

At the same time as sound insulation requirements were modified, the BCA also made changes to the provisions dealing with impact noise.

Impact noise occurs in adjoining tenancies and occurs on the floor or wall of that tenancy. In the case of walls, a typical source of impact is the slamming of doors on cupboards mounted on the common wall between tenancies.

The amendments also try and deal with audible noise which is generated by vibrations in the structure (structure-borne noise) which could come from mechanical equipment or vibrations from plumbing services or similar.

To deal with this particular issue of impact noise the BCA added further detail in relation to walls which separate:

(a) a bathroom, sanitary compartment, laundry or kitchen in one SOU from a habitable room (other than a kitchen) in an adjoining unit; or

(b) a SOU from a plant room or lift shaft.

The Clause states that a wall in a building required to have an impact sound insulation rating must-

(i) for a Class 2 or 3 building be of discontinuous construction; and

(ii) for a Class 9c aged care building, must-

(a) for other than masonry, be two or more separate leaves without rigid mechanical connection except at the periphery; or

(b) be identical with a prototype that is no less resistant to the transmission of impact sound when tested in accordance with… *(various specifications referred to further in the BCA)*.

IMPORTANT:

As potentially alterations to these provisions can be made from year to year reference should always be made to the current BCA Volume One Part 5 Sound Transmission and Insulation "Deemed-to-Satisfy Provisions" for up to date information.

GLOSSARY OF TERMS

R_w

The Weighted Sound Reduction Index refers to the airborne sound insulating rating of a particular building element. This value is measured in a laboratory environment and is applied to walls, ceilings/floors, ceilings/roofs as well as to doors and windows.

The higher the numerical rating the greater the sound insulating value of the relevant building element.

$R_w + C_{tr}$

The addition of the C_{tr} refers to a spectrum adaptation term for a rating which adds a correction for the effects of low frequency sound. The use of the term $R_w + C_{tr}$ has been necessary due to the increase in low frequency sound sources such as surround sound systems, traffic and aircraft noise as well as some musical instruments, the "doof, doof" factor if you will?

Two walls might have the same R_w rating but not the same resistance to low frequency sound therefore it may be necessary to adjust the design of the wall which is likely to be affected by the low frequency sound

Discontinuous Construction

The BCA states that discontinuous construction means having a 20mm cavity between 2 separate leaves, i.e. a double steel stud wall or similar with a 20mm cavity between the studs.

Sources and further recommended reading:

It is important to keep up with current guidelines in respect to the important issue of sound insulation. Rondo recommends that if unsure reference should be made to the major plasterboard manufacturer's literature as well as to current ACBC – Australian Building Code Board publications.

NOTE:
The result of the impact sound insulation requirements is that the Rondo QUIET STUD® cannot be used as a single leaf construction where impact sound insulation is required. However, this should only be in isolated cases in apartments as good design practice will ensure mirrored image layouts where habitable rooms are immediately adjacent to one another and non-habitable rooms likewise *(see page 151)*.

RONDO QUIET STUD® ACOUSTIC SYSTEM

PERFORMANCE COMPARISON

To fully understand how innovative the Rondo QUIET STUD® performs as an acoustic solution, comparison tests were conducted using the exact same configuration of plasterboard lining, insulation, sealants and installation details on both a standard Rondo 92mm x 0.55bmt lipped C Steel Stud and the Rondo 92mm x 0.55bmt QUIET STUD® to compare performance.

As can be seen from the results shown in Table 3, the Rondo QUIET STUD® had a significant increase in performance both in the R_w value (5dB better performance) and the combined $R_w + C_{tr}$ value (8dB better performance) when compared to the standard Rondo lipped C Steel Stud section. Even better performance can be expected when compared to timber stud framing of equal width.

Comparison tests were also performed using the exact same plasterboard, insulation and sealant configuration, but using staggered 64mm x 32mm x 0.50bmt lipped C steel studs in a 92mm track.
The Rondo QUIET STUD® system achieved the same $R_w + C_{tr}$ performance as the staggered stud systems, yet is a much simpler system to install.

TABLE 3: PERFORMANCE COMPARISON WITH TRADITIONAL LIPPED C STUD

STUD	BOARD LININGS	INSULATION	R_W	C_{TR}	R_W+C_{TR}	CSIRO TEST NO.	
Rondo 92mm x 0.55bmt lipped steel stud	2x13mm Fire-Rated plasterboard (mass 21kg/m²) both sides	TAC100	52	(-9)	43	TL434a	
Rondo 92mm x 0.55bmt QUIET STUD®	2x13mm Fire-Rated plasterboard (mass 21kg/m²) both sides	TAC100	57	(-6)	51	TL434d	

NOTES: 1. Insulation used was 100mm polyester infill, 14 kg/m3 manufactured by Tontine Fibres.
2. Tests conducted and verified at CSIRO laboratories, Highett, Melbourne in February/March 2005.

ACOUSTIC PERFORMANCE

Rondo QUIET STUD® has been subject to rigorous acoustic testing at both CSIRO Acoustic Laboratory in Melbourne and Auckland University Acoustic Laboratory using a variety of plasterboard linings. The suggested Noise Control Systems listed on the following page are the results of such testing. However, the respective plasterboard manufacturer should be contacted to determine the final acoustic specification as they may hold more recent test data than those suggested systems listed. They can also determine fire resistance of the nominated system where this is applicable.

FIRE RATING

QUIET STUD® will behave in a similar way to traditional lipped steel studs in a fire*.
For full fire rating information contact your respective plasterboard manufacturer.
**NB: QUIET STUD® has been the subject of BRANZ Report FAR 2521 to determine fire resistance.*

PLASTERBOARD (AND OTHER LINING BOARDS)

Rondo QUIET STUD® has been developed in conjunction with Australasia's leading plasterboard manufacturers. These manufacturers each make a range of Fire-Rated and Sound-Rated plasterboard linings and they can quickly determine the optimum configuration to achieve the desired level of performance using the Rondo QUIET STUD® .
Test certifications or expert opinions based on the original test results can be supplied. Rondo recommends that prior to specifying or installing QUIET STUD®, your respective plasterboard manufacturer be contacted to provide the final, optimal design.
Rondo QUIET STUD® could be installed using other wallboard linings (fibre cement sheet etc) but it is best to contact the lining board manufacturer for an opinion on acoustic performance.

INSULATION (SOUND CONTROL INFILL)

Insulation or sound control infill plays an integral part in the performance of the acoustic wall system. It is therefore most important that the insulation used on your project is of equal or better acoustic performance to that used in our various tested systems on the following page. The respective insulation or plasterboard system manufacturer can easily and quickly verify acoustic performance.

FIRE/ACOUSTIC SEALANT

Acoustic performance of a stud wall system is severely degraded by the presence of gaps in the constructed system. These can occur around penetrations or perimeters. To maintain acoustic performance, it is therefore critical to ensure that all perimeters and penetration gaps are carefully sealed using high-quality acoustic sealant to make construction virtually air-tight. Please refer to the respective plasterboard manufacturer for their acoustic sealant specification. If the system is required to be fire-rated, then the sealant will also need to be fire-rated.

DIFFERENCE BETWEEN LABORATORY & ON-SITE RESULTS

The ratings and values stated on the following page have been achieved through testing and calculation with precise techniques and equipment under ideal controlled conditions.
To attain optimum performance on-site, careful attention to detail in the design and construction is paramount. If the basic principles of good acoustic design and construction practice are ignored, the performance of the system can be jeopardised. It is therefore most important that the specifications of the plasterboard manufacturers are strictly followed on site.
Based on industry advice, the BCA allows a concession of up to 5dB in performance when tested on-site where measurement sometimes is not ideal *(i.e. background noise or the size/volume of the tested room can affect results, etc.).*
As a consequence, Rondo cannot guarantee that the results on the following page will be matched on-site but with careful attention to detail during the erection of the stud wall system, and by strictly following the installation details of the plasterboard manufacturers, the assembly should produce a result closely comparable with the tested or estimated values.

SUGGESTED NOISE CONTROL SYSTEMS (WHERE C_{TR} VALUE NOT TAKEN INTO CONSIDERATION)

It must be noted that some Australian states have not yet adopted current BCA sound provisions for Class 1, 2, 3 & 9c buildings. In some cases, only an R_w rating value is required.
This is equally so for non-residential buildings which are not so affected by the low bass-type frequencies from electronic sound equipment. Rondo QUIET STUD® is just as effective in helping reduce noise transmission from room to room in non-residential buildings *(i.e. offices, schools, universities, hospitals, etc.).* Table 5 shows indicative R_w values only using QUIET STUD® and various plasterboard configurations.

TABLE 4: QUIET STUD ACOUSTIC SYSTEMS – CLASS 1, 2, 3 & 9C RESIDENTIAL BUILDINGS

STUD	BOARD LININGS	INSULATION	R_W	C_{TR}	R_W+C_{TR}	CSIRO TEST NO.	
Rondo 92mm x 0.55bmt QUIET STUD®	10mm Sound-Rated plasterboard (mass 8.2kg/m²) + 13mm Fire-rated plasterboard (mass 10.5kg/m2) 1 side 1 x 13mm Fire-rated plasterboard (mass 10.5kg/m²) other side	TAC100 100mm polyester 14kg/m³	53	(-9)	44	TL434e	
Rondo 92mm x 0.55bmt QUIET STUD®	2x13mm Fire-Rated plasterboard (mass 21kg/m²) 1 side 1 x 13mm Fire-rated plasterboard (mass 10.5kg/m²) other side	100NCB 100mm glass wool 14kg/m³	55	(-7)	48	TL434c	
Rondo 92mm x 0.55bmt QUIET STUD®	2x13mm Fire-Rated plasterboard (mass 21kg/m²) both sides	TAC100 100mm polyester 14kg/m³	57	(-6)	51	TL434d	
Rondo 92mm x 0.55bmt QUIET STUD®	2x13mm Fire-Rated plasterboard (mass 21kg/m²) both sides	100NCB 100mm glass wool 14kg/m³	57	(-5)	52	TL434b	

NOTES: 1. Insulation: TAC100 = 100mm polyester infill, 14 kg/m³ manufactured by Tontine Fibres or equal equivalent.
100NCB = 100mm glass wool Noise Control Batts, 14 kg/m³ manufactured by Insulation Solutions or equal equivalent.
2. Rondo 92mm x 0.55bmt QUIET STUD® friction fit to track @ 600mm centres.
3. Tests conducted and verified at CSIRO laboratories, Highett, Melbourne in February/March 2005.
4. Consult with your plasterboard manufacturer/supplier to verify their particular brand of plasterboard and accompanying system will achieve at least equal results to those above.

TABLE 5: QUIET STUD NOISE CONTROL SYSTEMS – NON-RESIDENTIAL BUILDINGS

STUD	BOARD LININGS	INSULATION	R_W RATING	
Rondo 92mm x 0.55bmt QUIET STUD®	1x13mm Fire-Rated plasterboard (mass 10.5kg/m²) both sides.	Either TAC100 or 100NCB (14kg/m3)	50 ± 1 dB	
Rondo 92mm x 0.55bmt QUIET STUD®	2x13mm Fire-Rated plasterboard (mass 21kg/m²) 1 side 1 x 13mm Fire-rated plasterboard (mass 10.5kg/m²) other side	Either TAC100 or 100NCB (14kg/m3)	55 (CSIRO test TL434c with glass wool)	
Rondo 92mm x 0.55bmt QUIET STUD®	2x13mm Fire-Rated plasterboard (mass 21kg/m²) 1 side, 3x13mm Fire-Rated plasterboard (mass 31.5kg/m²) other side.	Either TAC100 or 100NCB (14kg/m3)	60 ± 1 dB	

NOTES: 1. Calculations based on systems tested at CSIRO laboratories, Highett, Melbourne.
2. Insulation: TAC100 = 100mm polyester infill, 14 kg/m3 manufactured by Tontine Fibres or equal equivalent.
100NCB = 100mm glass wool Noise Control Batts, 14 kg/m³ manufactured by Insulation Solutions or equal equivalent.
3. Consult with your plasterboard manufacturer/supplier to verify their particular brand of plasterboard and accompanying system will achieve at least equal results to those above.

INSTALLATION DETAILS

STRUCTURAL DESIGN

• All walls in this brochure using QUIET STUD® have been designed as internal, non-loadbearing walls.
• These walls have been designed for lateral loads only using the composite action of the studs and sheeting.
• The walls have been designed to meet the design pressure of ultimate 0.375kPa and serviceability 0.25kPa. Deflection has been limited to height/240 *(based on BCA Specification C1.8 – Structural Tests for Lightweight Construction)*.
• For walls with higher wind loadings or for enquiries outside the scope of this document, please contact your specialist Rondo Technical Representative.

FRAMING

• Rondo 92mmx32mmx0.55bmt steel top & bottom wall track nominally fixed at 600mm centre maximum spacings to floor and ceiling and within 100mm of end of track section or,
• If a Deflection Head is required or the wall is above 4800mm in height, install Rondo 92mmx50mmx0.70bmt deflection head track at top of frame.
• QUIET STUD® 92mmx45mmx0.55bmt nominal with a 6mm return installed @ 600mm maximum centre spacings *(or as specified – refer to Table 6 Maximum Wall Heights on Page 159)*.
• Studs should be a friction fit installation to track section to allow an approx 15mm expansion gap at the top of the frame (20mm where a deflection head detail is required or as nominated by the structural engineer).
• First and end studs may be fixed to the track section with #8g Metal Tek screws for extra rigidity.
• Ensure studs are aligned in the same direction except for end stud.
• Studs may be boxed around door or window openings for added rigidity.
• No Noggings are required in QUIET STUD® applications providing walls are lined both sides of the stud frame in accordance with plasterboard manufacturers' specifications.
• To maintain the integrity of the acoustic wall system, try and avoid heavyweight fixtures from being attached to the stud wall frame. Where this is unavoidable, Rondo can provide specialist advice through our Technical Representatives *(phone 1300 367 663)*.
For lightweight fixtures such as towel rails, taps, etc., a timber Nogging/batten may be installed between the studs with one of the studs being installed the reverse way so that the web of the two studs are facing each other. Ensure that acoustic or fire sealant, as recommended by the lining board manufacturer, is used around any penetrations to maintain integrity of the wall frame.

LINING BOARD: INSTALLATION, FIXING, FINISHING & JOINTING

• Please refer to the respective plasterboard or other lining board manufacturer for their complete lining and finishing specifications.
• Rondo recommends that the lining board be installed as per the requirements of Australia/New Zealand Standard AS/NZS 2589.1:2007
– *"Gypsum linings in residential and light commercial construction – application and finishing"*

SOUND CONTROL INFILL

• Rondo has conducted thorough acoustic testing of various QUIET STUD® wall systems using several insulation types. To ensure a fail-safe acoustic control system Rondo recommends using high quality acoustic insulation either as per our Noise Control Systems listed on page 157 or that equal in performance through verification from the insulation manufacturer or the plasterboard system manufacturer.
• Fit insulation between QUIET STUD® at nominated centres.

ACOUSTIC SEALANT & CAULKING

• To attain specified acoustic performance (and FRL performance where nominated) it is essential that high quality fire and acoustic rated sealant be used at all perimeter gaps and around all penetrations.
• Please refer to the respective plasterboard or other lining board manufacturer for their complete specifications on the installation of acoustic sealant and caulking.

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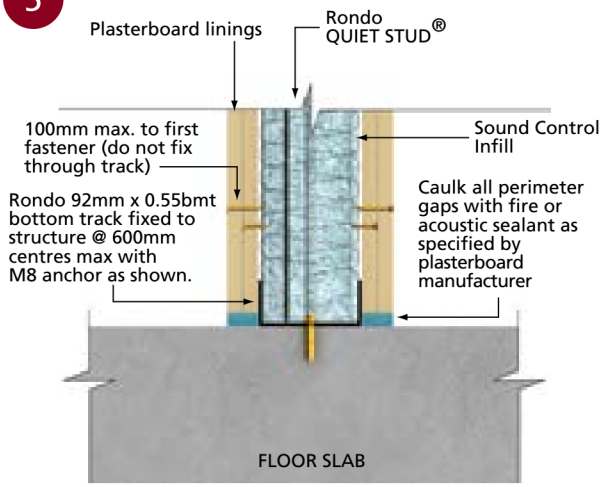

■ WALL BASE DETAIL

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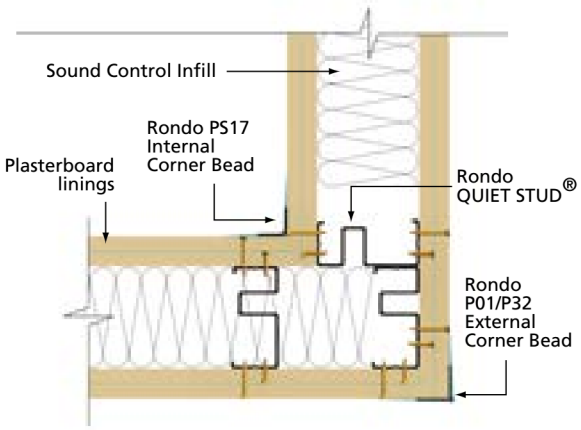

■ CORNER DETAIL

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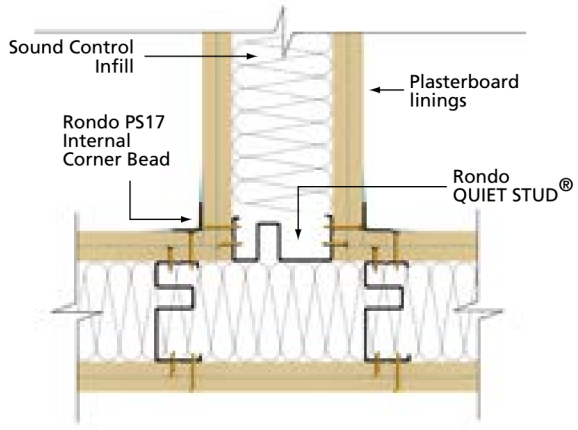

■ 'T' INTERSECTION DETAIL

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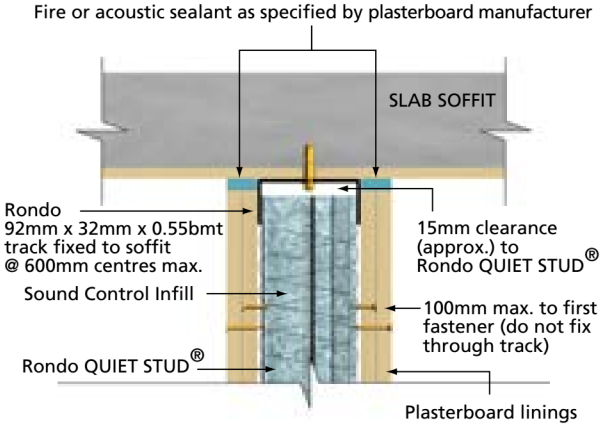

■ WALL HEAD DETAIL (FRICTION FIT HEAD)

TABLE 6: MAXIMUM WALL HEIGHTS

PLASTERBOARD	STUD CENTRES	
	600	450
1 x 10mm Both Sides	3700	4020
1 x 13mm Both Sides	4130	4410
1 x 16mm Both Sides	4300	4580
2 x 10mm Both Sides	3700	4020
2 x 13mm Both Sides	4130	4410
2 x 16mm Both Sides	4300	4580

NOTES:
1. Lateral pressure is 0.25kPa in accordance with the BCA Specification C1.8.
2. Deflection limited to span/240
3. All walls above contain NO Nogging

IMPORTANT
It is critical that the correct size fastener is chosen when fixing plasterboard sheets to Rondo QUIET STUD®.
The screws must NOT penetrate through the stud flange into the return leg of Rondo QUIET STUD® which is 24mm from the stud flange in one direction.
Typically, a 25mm long 'Type S' needle point screw is ideal for fixing the first layer of plasterboard. Clarification should be sought from the respective plasterboard manufacturer for fixing subsequent layers of plasterboard.