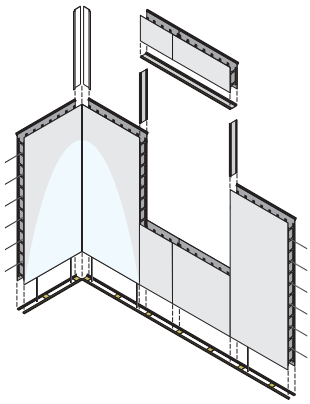
Ritek® James Hardie Systems

Design, Detailing & Installation Guide

Ritek® XL Wall® and XL Thermal Wall® Systems

Version 2015.01



An innovative pre-fabricated permanent formwork wall solution; factory made to suit your building requirements.

CodeMark™ CM40087 (REV3)

25 YEAR WARRANTY*

ENVIRONMENTAL BENEFIT

BCA COMPLIANT FIRE RATED

HIGH RITEK XL THERMAL WALL® RATING

EXCELLENT ACOUSTIC RATING

STRUCTURAL STRENGTH

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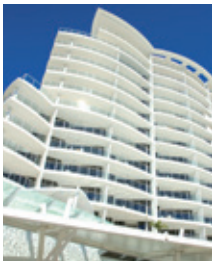

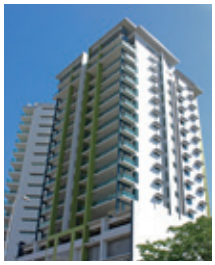

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Profit from our experience.

Design, Detailing & Installation Guide

Ritek® XL Wall® and XL Thermal Wall® Systems

Version 2015.01

A INTRODUCTION

Ritek® Benefit from our knowledge. Profit from our experience.

Ritek® Wall Systems - Introduction

Introduction

James Hardie Systems (Ritek®) is a leader in designing, manufacturing and supplying today's construction industry with cost effective, efficient and sustainable construction solutions.

Scope

This guide has been prepared to assist in the detailing of the Ritek® XL Wall® and XL Thermal Wall® Systems. It provides a basis from which to work, but does not replace the services of professional consultants on specific projects.

Product Description

Overview

Ritek® Wall Systems are pre-fabricated permanent formwork systems for concrete walls used for all types of external and internal walls. They consist of lightweight panels created by bonding high quality, hard-wearing and durable fibre cement sheets to a patented composite stud assembly. Ritek® Wall Systems are quickly and simply installed on site and then core-filled with reinforced structural concrete to achieve loadbearing walls that are fire and sound rated. The fibre cement sheeting remains in place as sacrificial formwork, and provides an excellent substrate for applied finishes such as acrylic render, cladding, tiling and painting.

The Ritek® XL Wall® System panels consist of 6mm fibre-cement, recessed-edge facing sheets, bonded to vertical studs. The studs are made up from aluminium sections connected together with plastic spacer pieces. All aluminium components are protected with a chromate coating. The panels are stood in place, both vertical and horizontal reinforcement is placed as required and the wall completed by filling the panels with structural concrete. Once complete, the walls act as reinforced concrete and the actual design, detailing and construction of the walls must comply with AS 3600 Concrete Structures.

Panel Dimensions

Ritek® XL Wall® System is manufactured with standard overall wall thicknesses of 115, 135, 150, 165, 200 and 265mm, preferred heights up to 5.0m, and a standard panel width of 1.2m. Panel heights and widths can vary to suit the architectural and engineering design requirements.

The number in the Ritek® XL Wall® type code refers to the overall thickness of the wall, including the 6mm fibre-cement facing sheets, i.e. a 135XL Ritek® XL Wall® is 135mm thick overall. The corresponding concrete thickness would be 135mm less 12mm, i.e. 123mm thick. Minimum panel width is 100mm and maximum panel height is 5.0m.

Product Features & Benefits

The advantages of using Ritek® Wall Systems include reduced materials handling and cranage; to faster build times and savings. With additional internal thermal mass and sustainability benefits.

High Quality, Durable & Low Maintenance

- High quality, resilient fibre cement faced wall panels.
- Fast erection speed – reduced need for cranes.
- Minimal waste, recyclable materials.
- BCA compliant – rated for structural fire, acoustic & thermal properties.

Superior Stud & Track System

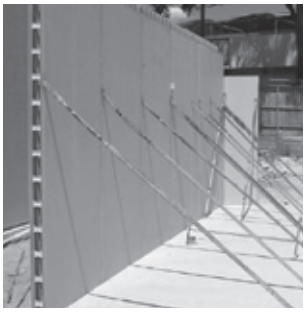
- Fully captured & aligned panels, top, bottom & corners, strong aluminium to aluminium connections.
- Straight wall faces, corners & edges.
- Reduced finishing trade requirements.

Engineering & Structural Capacity

- Walls can be designed as deep beams to span between columns, eliminating transfer beams.
- Structural elements can be easily reduced or increased to suit the building design.
- High load capacity allows wall thickness to be reduced to save on costs.

Ritek® Wall Systems - Introduction






Easy To Install

- Pre-fabricated panel packs are delivered to site to suit your construction program.
- No unnecessary materials on-site when not required.
- Pre-fabricated panels designed to suit the building.
- Panels create straight & true walls for easy installation.
- Increased build efficiencies as less weather reliant.

Range Of Accessories Available

- Standard express joint detail for external slab wall junctions.
- Built-in thermal insulation.
- Suite of architecturally modern compatible window & door frames.

A Rust Free Wall Solution

- All aluminium components and accessories used are protected with a coating system to give superior protection.
- Corrosion resistance, stability, durability and longevity are just some of the key advantages that aluminium has over other metals that are used in construction.

Typical Ritek® XL Wall® System Applications

- Internal, external, party & boundary walls
- Columns, stairwells, lift shafts & retaining walls
- Sheer walls, blade walls & core walls
- Partition passage, intertenancy

Concrete

Ritek® Wall Systems are suitable for a range of concrete strengths from 20 MPa to 50 MPa. Higher strength concretes can be used but special care needs to be taken and it is generally preferable to increase the wall thickness rather than concrete strength.

Reinforcement

For crack control and shear resistance, AS3600 requires a nominal minimum amount of reinforcement and maximum spacing. Please consult with your design engineer for your project specific reinforcing requirements. Where higher racking resistance is required the quantity or size of reinforcement can be increased. Where connection to floors is required, starter rods of the same size and spacing as the vertical reinforcement are used.

Ritek® Wall Systems - Features Overview

Ritek® - an alternative, innovative & cost effective building method

Pre-fabricated wall panel systems to suit your building requirements. The high quality innovative Ritek® Wall Systems provide speed of construction, structural, fire and acoustic properties, as well as safe building practices.

ACCURATE IN HOUSE DRAFTING SERVICE to ensure your walls are accurate and delivered ready to install.

FAST TRACK YOUR CONSTRUCTION PROJECT by reducing the floor cycle times.

ENVIRONMENTAL BENEFIT from reduced waste and water use on building sites compared to traditional methods.

EXCELLENT ACOUSTIC RATING meets and exceeds the BCA requirements of inter-tenancy sound transfer.

25 YEAR WARRANTY* for peace of mind, including coastal areas.

STRUCTURAL STRENGTH of reinforced concrete offers the ultimate outcome with minimal maintenance.

HIGH RITEK XL THERMAL WALL® RATING meets the requirements (section J) of BCA with built-in insulation.

BCA COMPLIANT FIRE RATED wall system for up to 4 hours. Ritek XL Thermal Wall® systems.

Ritek® Wall Systems - Features Overview

Benefit from our knowledge.
Profit from our experience.

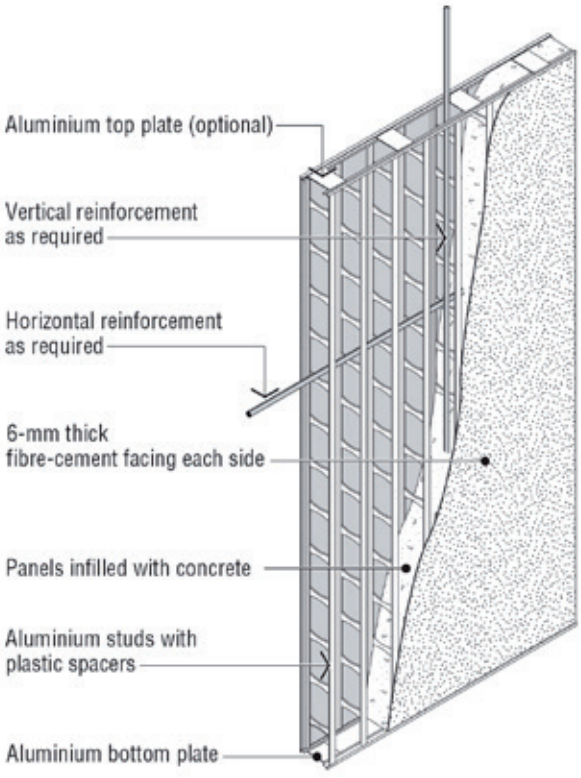
James Hardie Systems is the manufacturer of the innovative Ritek® XL Wall® and Ritek XL Thermal Wall® systems. These insitu systems consist of pre-fabricated panels using a composite stud assembly, providing a permanent formwork for reinforced concrete walls.

- A cost effective building method that achieves the benefits of fire rated, steel-reinforced concrete walls.
- Reduce material and handling costs.
- Provide a safer, cleaner workplace.
- Reduce site waste.

Wide range of wall thicknesses:

115mm, 135mm, 150mm, 165mm, 200mm & 265mm

- Wall can be tailored to building design requirements.
- 200mm + 265mm thick panels available with double layer reinforcement capability.



Internal walls –
free of restrictive system components

- Allows free flow of concrete within wall and uniform concrete structure.
- Wall can be designed in accordance with 'Concrete Structures AS3600' and BCA.
- Easy access, placement and inspection of reinforcement steel.
- Services (power etc.) can be installed through walls easily, prior to concrete pour.

Easy to install

- Pre-fabricated panel packs are delivered to site to suit your construction program.
- No unnecessary materials on-site when not required.
- Pre-fabricated panels designed to suit the building.
- Panels create straight & true walls for easy installation.
- Increased construction efficiencies as less weather reliant.

Range of accessories available

- Standard express joint detail for external slab wall junctions.
- Built-in thermal insulation.
- Suite of architecturally modern compatible window & door frames.

Dedicated Ritek service team

- Committed technical services team.
- On-site project co-ordination assistance.
- Dependable customer service & sales support team.
- In-house drafting services.

Ritek® Wall Systems - Environmental & Green Star Benefits

The Ritek® XL Wall® and XL Thermal Wall® Systems are suitable for single and multi-storey structures which are reinforced and concrete filled on site.

Structural walls, lift shafts, party walls, partition, passage, external, intertenancy and stairwells can all be constructed using the all-inclusive Ritek® Wall Systems. These systems can be used for all wall applications internally and externally. The response from the building industry regarding the Ritek® Wall Systems has been excellent, as it has proven to be a viable, price competitive alternative to traditional concrete and masonry based methods such as precast, block and brick veneer, column and infill.

The XL Thermal Wall with its high performance thermal insulation provides an innovative and cost effective solution for Building Designers to meet or exceed the requirements for thermal building insulation and energy efficiency.

Minimize the contribution and levels of VOCs and Formaldehyde in the building:
The Ritek® Wall Systems use adhesives with no solvent or VOC content and no Formaldehyde content. There are no PVC plastics used in the panel finish or onsite wall construction.

The environmental benefits of the Ritek® Wall Systems include the areas of waste, water conservation and preservation of natural resources:
The Ritek® Wall Systems are manufactured to order and generate less wastage on the construction site than conventional methods.

The product is water wise as minimal water is required during installation. Conventional block methods utilize a large amount of water on site to flush out contaminants. By eliminating this requirement, the Ritek® Wall Systems preserve a scarce resource and also eliminates the mess and safety issues related to this practice.

Reduction in Building Embodied Energy:
Prefabricated, made to order panels ensure quick and easy installation, with minimal on site wastage and project costs are achieved by; reducing the construction time, crane costs, scaffold costs and site utilities.
The Ritek® XL Wall® and XL Thermal Wall® Systems are pre finished with a durable high quality finish and do not require traditional battens and plasterboard linings.

James Hardie Systems' manufacturing facility uses minimal power (energy) and water resources during the manufacture of the Ritek® XL Wall® and XL Thermal Wall®, therefore adding minimal embodied energy to its products.

Ritek's products listed and assessed by Ecospecifier:
The Ritek® Wall Systems have been fully assessed and are listed on ecospecifier.org: a knowledge base of over 3500 eco-products, eco-materials, technologies and resources, the leading global source of sustainable development and life-cycle assessed green product information.

Ritek® Wall Systems - XL Wall Specification Sheet

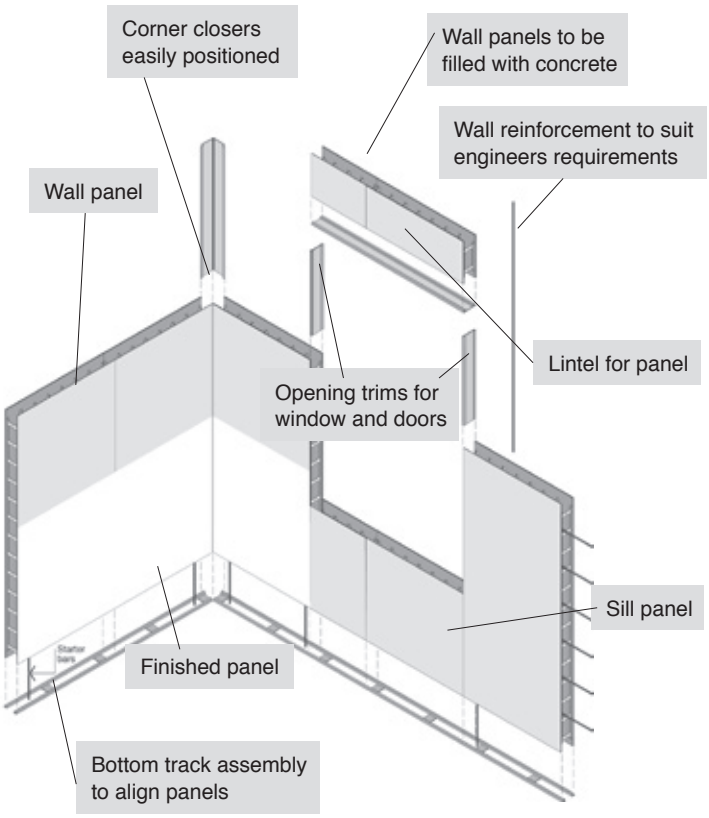
Product Description

The Ritek® XL Wall® System, a pre-fabricated permanent formwork system is a versatile structural walling system, which has been successfully used in an extensive range of building projects nationally and internationally.

The system is used for all internal and external walls and selectively for such areas as lift shafts, stairwell and party walls. The key benefits of the Ritek® XL Wall® System are its structural integrity, speed of installation, reduced on site waste, fire and acoustic ratings.

The Ritek® XL Wall® System is made up of prefabricated panels used to provide permanent formwork for in situ reinforced concrete walls. Ritek wall panels consists of 6mm fibre cement, recessed edge facing sheets, bonded to patented vertical composite studs.

All aluminium components and accessories used are protected by a chromate coating. Panels are stood in place, both vertical and horizontal reinforcement is placed as required and the wall completed by core filling the panels with structural concrete.



RITEK® XL WALL® SYSTEM SPECIFICATION			TABLE 1.1			
XL Wall Panel Thickness	Concrete Core	Surface Density	Panel Components	Internal Finish	External Finish	Typical Panel Weight
115mm	103mm	>220 kg/m^2	6mm Fibre-cement sheeting bonded to a Patented Composite Stud (Aluminium & ABS)	Set joints and apply a standard paint finish	Set joints and apply a standard texture coating system finish	20 kg/m^2
135mm	123mm	>220 kg/m^2				21 kg/m^2
150mm	138mm	>220 kg/m^2				23 kg/m^2
165mm	153mm	>220 kg/m^2				24 kg/m^2
200mm	188mm	>220 kg/m^2				26 kg/m^2
265mm	253mm	>220 kg/m^2				28 kg/m^2

Note: For all fire, thermal and acoustic ratings - please refer to Section C - Design

Suitable for use in single residential, multi-storey residential and commercial buildings as load bearing/structural walls up to 25 storeys or higher in non-load-bearing capacities. Panels can be configured to include additional materials to increase thermal and acoustic properties. Refer to the Ritek Wall System Design and Detailing Guide - Section C for further information.

Referenced Australian Standards:
AS3600:2009 - Concrete structures
AS3610:1995 - Formwork for structures
AS 1530.4:2005 - Fire tests on building materials
NCC/BCA 2015:Vol1 & Vol2 - Building Code of Australia

Ritek® Wall Systems - XL Thermal Wall Specification Sheet

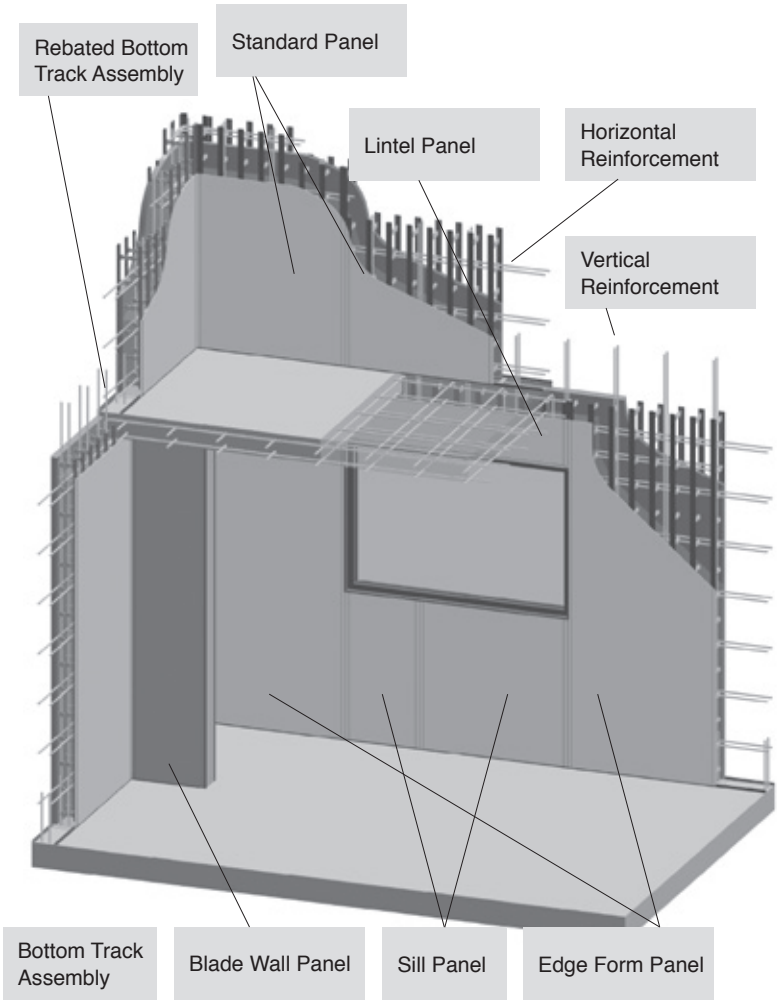
Product Description

The Ritek XL Thermal Wall® System is a pre-fabricated wall panel system that is manufactured specifically to the architect's drawings and is delivered complete with a high performance thermal insulation layer bonded to the inside of the panel. This ensures that what is delivered to site is exactly what is required for the job and not more or less.

The Ritek XL Thermal Wall System is used for all external (building envelope) walls where thermal insulation, energy efficiency is required. The key benefits of the Ritek XL Thermal Wall System are built in thermal insulation providing a high level of energy efficiency and thermal comfort, high structural integrity, rapid speed of installation, reduced on site waste, fire and acoustic ratings.

The Ritek XL Thermal Wall System is made up of pre-fabricated panels used to provide permanent formwork for in situ reinforced concrete walls. Ritek wall panels consists of 6mm fibre cement, recessed edge facing sheets, bonded to patented vertical composite studs plus an integrated thermal insulation layer.

All aluminium parts and accessories that are used are protected by chromate plating for full protection. Panels are stood in place, both vertical and horizontal reinforcement is placed as required and the wall completed by core filling the panels with structural concrete. Horizontal steel reinforcing bars can be placed at spacings in accordance with AS 3600-2009.



RITEK XL THERMAL WALL SYSTEM - PROPERTIES			TABLE 1.2			
XL Wall Panel Thickness	Concrete Core	Surface Density	Panel Components	Internal Finish	External Finish	Typical Panel Weight
135mm to 265mm	95mm to 225mm	>220 kg/m^2	6mm Fibre-cement sheeting bonded to a Patented Composite Stud (Aluminium & ABS) with High Density Thermal Insulation	Set joints and apply a standard paint finish	Set joints and apply a standard texture coating system finish	22 kg/m^2 to 28 kg/m^2

Note: For all fire, thermal and acoustic ratings - please refer to Section C - Design

Suitable for use in single residential, multi-storey residential and commercial buildings as load bearing/structural walls up to 25 storeys or higher in non-load-bearing capacities. Panels can be configured to include additional materials to increase thermal and acoustic properties. Refer to the Ritek Wall System Design and Detailing Guide - Section C for further information.

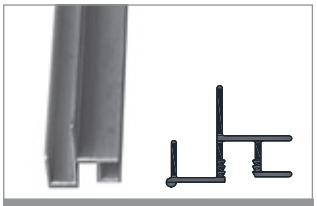
Referenced Australian Standards:
AS3600:2009 - Concrete structures
AS3610:1995 - Formwork for structures
AS 1530.4:2005 - Fire tests on building materials
NCC/BCA 2015:Vol1 & Vol2 - Building Code of Australia

Ritek® Wall Systems - Components Overview

Standard Track
Aluminium extrusions used in conjunction with Track Joiner to make a Standard Bottom Track Assembly. Also used as part of the assembly for Nib End Closers.

Track Joiner
Aluminium extrusion combined with two lengths of Standard Track to make a Standard Bottom Track Assembly.

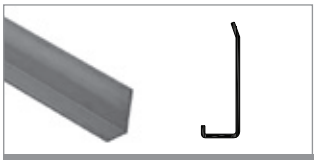
Standard Bottom Track Assembly
Secures Wall Panels, Tees and End Closers to floor slabs and footings.


Standard Track


Track Joiner / Assembly

Panel Joiner
Aluminium Extrusion to secure Wall Panels to adjacent Wall Panels, Tees and Corners in the same plane.

XL-T Joiner Insert
Foam insulation insert used at joins between XL-T Wall Panels.


Panel Joiner

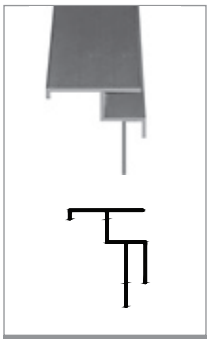

XL-T Joiner Insert

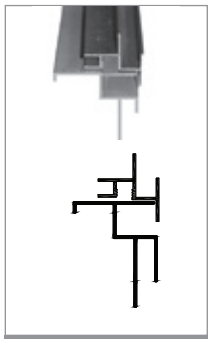
Rebated Top Track
Aluminium extrusion used in conjunction with Rebated Bottom Track to form an articulated horizontal joint and weather seal.

Rebated Bottom Track
Aluminium extrusion used in conjunction with Track Joiner and Rebated Top Track to make a Rebated Track Assembly. May also used as an optional edge on a finished slab to perimeter walls when no step down in the slab is provided.

Rebated Track Assembly
Used to create a shadow joint at Panel to slab and footing connections.


Rebated Bottom Track


Rebated Top Track

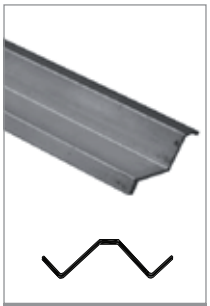

Rebated Track Assembly

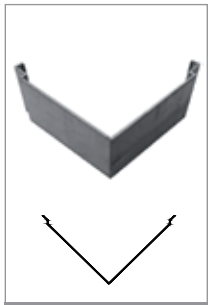
Two Part FC External Corner
Prefabricated FC and aluminium assembly installed at 90° external corners. Foam Insulation included in assembly for XL-T.

Internal Corner Closer
Prefabricated aluminium extrusion folded to suit required internal corner angle.

Aluminium Squint Closer
Prefabricated aluminium extrusion folded to suit required external corner angle other than 90°. Foam Insulation supplied separately for XL-T.

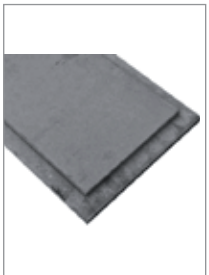

XL and XL-T External Corners

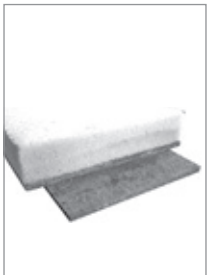

Internal Corner Closer

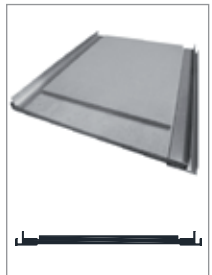

Aluminium Squint Closer

Tee Closer
Custom sized FC sheet assembly installed at Wall Panel Tee Junctions. Foam Insulation supplied for XL-T.

Nib End Closer
FC and Standard Track assembly to close off wall ends, window and door openings without aluminium window adaptors or folded metal door frames. Nib End Closers for 265 Wall Panels use a different track.


XL Tee Closer


XL-T Tee Closer


265 Nib End Closer

Ritek® Wall Systems - Legal Information

Legal Statements

All reasonable efforts have been made to ensure the accuracy of this publication; however, any information and data contained herein is subject to change without notice. To ensure the information you are using is correct, Ritek® recommends you review the latest technical information available on the Ritek® website www.jhsritek.com.au, or alternatively call 1300 929 782 to speak to a Technical Representative.

"Ritek® Wall Systems" refers to panels used as permanent formwork prior to being installed and core filled with concrete.

Disclaimer

i. This technical publication named Design, Detailing & Installation Guide together with the design tables and associated information related to Ritek® Wall Systems has been prepared to assist design professionals using Ritek® Wall Systems including without limitation, developers, builders, engineers, architects or quantity surveyors with the design of structural walls.

ii. It is the responsibility of the user to ensure that the use of this publication is appropriate and to exercise their own judgment when using this guide.

iii. James Hardie Systems accept no responsibility (whether for negligence or otherwise) for any consequence arising from the use or application of this publication.

iv. The design and engineering of the structure of any building using Ritek® Wall Systems should only be undertaken by suitability qualified and experienced design professionals, engineers or consultants.

v. The full responsibility for the design, engineering and structural design, and certification of compliance with all relevant Australian Standards, NCC/BCA and any other statutory requirements at Local, State and Federal levels rests with the design professional, project engineer or project consultants including but not limited to the design engineer, acoustic consultant, energy efficiency consultant, fire engineer and any of their officers, employees, delegates, partners, agents and service providers of any nature.

vi. James Hardie Systems reserve the right to change the specifications of this publication without notice.

vii. Please check with James Hardie Systems that you have the latest version as this publication may be updated from time to time and certain details may change. This disclaimer applies to the extent permitted by law.

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Version 2015.01

Design, Detailing & Installation Guide

Ritek® XL Wall® and XL Thermal Wall® Systems

Version 2015.01

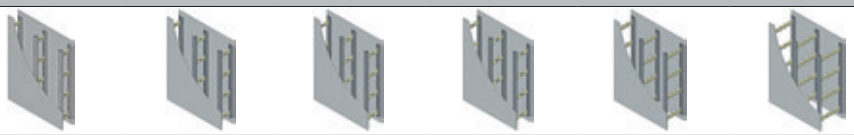
B PANEL SELECTION

Ritek® Benefit from our knowledge. Profit from our experience.

Ritek® Wall Systems - Preliminary Wall Selection Guides

Table 2.1 and Table 2.2 gives guidance as to the wall type most likely to be required for various building applications based on the main fire resistance requirements. Note that there may be some specific situations where additional fire resistance requirements are required, therefore it is recommended to refer to the current BCA for details. In certain locations, to satisfy thermal or acoustic requirements the walls may need to be built up with additional material, refer to thermal and acoustic properties in this guide.

PRELIMINARY WALL SELECTION GUIDE - RITEK® XL WALL® SYSTEMS (XL) **TABLE 2.1**



Wall Type	115XL	135XL	150XL	165XL	200XL	265XL
Wall Thickness (mm)	115	135	150	165	200	265
Concrete Core Thickness (mm)	103	123	138	153	188	253
Reinforcement Layers	Single	Single	Single	Single	Double	Double
Typical Application (BCA Class 2 - 9) (Refer To BCA FRL Requirements)	Non fire rated walls, Ballustrades	External & Internal walls; Load bearing walls	External & Internal walls; Load bearing walls; Party walls; Stair & lift shafts	External & Internal walls; Load bearing walls; Party walls; Blade walls; Stair & Lift shafts	Heavily loaded walls; Deep beams; Shear walls; Blade walls; Stair & Lift shafts	Heavily loaded walls; Deep beams; Shear walls; Columns; Stair & Lift shafts
Fire Resistance CSIRO Test (FRL)	-	-	240/240/240 #1	240/240/240 #1	240/240/240 #1	240/240/240 #1
Fire Resistance Level (AS3600 - 2009) - Fire One Side (FRL) - Fire Two Sides (FRL)	 -/-/- -/-/-	 90/90/90 60/-/-	 90/90/90 60/-/-	 120/120/120 90/-/-	 180/180/180 120/-/-	 240/240/240 240/-/-
Acoustic Rating - Weighted Sound Reduction (RW) - Bca Field Verification (Dnt, w +Ctr)	 47 -	 51 -	 53 45 - 47	 54 46 - 48	 56 46 - 50	 59 50 - 54
Surface Density (kg/m2)	247	295	331	367	451	607
Axial Design Capacity 2.7M Wall - 32MPa; e=0.05; k=0.75 - (kN/m) - 40MPa; e=0.05; k=0.75 - (kN/m)	 748 936	 1025 1281	 1221 1526	 1410 1762	 1835 2293	 2590 3238

PRELIMINARY WALL SELECTION GUIDE - RITEK XL THERMAL WALL® SYSTEMS (XL-T)

	BCA FRL	AS3600 - 2009 Fire Resistance Period (FRL)				
Fire Rating	60 / 60 / 60*	30 / 30 / 30	60 / 60 / 60	90 / 90 / 90	120 / 120 / 120	180 / 180 / 180
Minimum Concrete Core (mm)	90	100	110	120	150	180
Surface Density (kg/m2)	216	240	264	288	360	432
Acoustic Rating - Weighted Sound Reduction (RW) - BCA Field Verification (Dnt, w +Ctr)	 46 -	 47 -	 47 -	 51 -	 54 46 - 48	 56 46 - 50
Typical Application (BCA class 1 - 10) (Refer to BCA FRL requirements)	External walls; Load bearing walls	External walls; Load bearing walls	External walls; Load bearing walls	External walls; Load bearing walls	External walls; Load bearing walls	External walls; Load bearing walls

R Value	Insulation	Wall Panel Selection					
1.5	28	135XLT - R1.5	150XLT - R1.5	150XLT - R1.5	165XLT - R1.5	200XLT - R1.5	265XLT - R1.5
2.0	38	150XLT - R2.0	150XLT - R2.0	165XLT - R2.0	200XLT - R2.0	265XLT - R2.0	265XLT - R2.0
2.5	50	165XLT - R2.5	200XLT - R2.5	200XLT - R2.5	200XLT - R2.5	265XLT - R2.5	265XLT - R2.5
2.8	56	165XLT - R2.8	200XLT - R2.8	200XLT - R2.8	200XLT - R2.8	265XLT - R2.8	265XLT - R2.8
3.2	66	200XLT - R3.2	200XLT - R2.8	200XLT - R3.2	200XLT - R3.2	265XLT - R3.2	265XLT - R3.2
4.1	86	200XLT - R4.1	200XLT - R4.1	265XLT - R4.1	265XLT - R4.1	265XLT - R4.1	n/a
4.8 ++	100	265XLT - R4.8	265XLT - R4.8	265XLT - R4.8	265XLT - R4.8	265XLT - R4.8	n/a
6.2 ++	132	265XLT - R6.2	265XLT - R6.2	265XLT - R6.2	265XLT - R6.2	n/a	n/a
6.6 ++	142	265XLT - R6.6	265XLT - R6.6	265XLT - R6.6	n/a	n/a	n/a
7.5 ++	162	265XLT - R7.5	n/a	n/a	n/a	n/a	n/a

Notes

* BCA 2015 Deemed to Satisfy Provisions Volume 2

Wall R Value shown is the overall Total R (heat flow out), Insulation Thermal Conductivity K = 0.022 (R Values measured at 23 deg C)

Actual panel concrete core thickness can be calculated by noting the panel size then subtract the insulation thickness and fibre cement sheet thickness e.g. 200XLT-R3.2 = 200 - 66 - 12 = 122mm concrete core

++ Special Order - Consult with Ritek before specifying/ordering.

#1 FRL determined by CSIRO fire test, walls up to 3m high up to 266 kN/m loading

Ritek® Wall Systems - Wall Applications

The applications presented in the tables below are based on common applications for multi-residential building.

RITEK® XL WALL® PANEL SELECTION (XL) **TABLE 2.2**

Wall Type	115XL	135XL	150XL	165XL	200XL	265XL
Wall Thickness (mm)	115	135	150	165	200	265
Concrete Core Thickness (mm)	103	123	138	153	188	253
Reinforcement Layers	Single	Single	Single	Single	Double	Double

APPLICATION - BASEMENT & RETAINING WALLS (XL)

BCA Performance Requirements		Ritek XL Wall Panel Performance					
Requirement:	Value	115XL	135XL	150XL	165XL	200XL	265XL
Fire Resistance (FRL - AS3600) (minimum concrete core)	See BCA	N/A	90/90/90	90/90/90	120/120/120	180/180/180	240/240/240
Acoustic Rating							
- Sound Reduction (Rw)	N/A	47	51	53	54	56	59
- Field Verification (Dnt,w +Ctr)	N/A	-	-	45 - 47	46 - 48	46 - 50	50 - 54
Thermal Rating (R Value)	N/A	0.28	0.29	0.30	0.31	0.34	0.39

APPLICATION - LIFT SHAFT & STAIR WELLS (XL)

BCA Performance Requirements		Ritek® XL Wall® Panel Performance					
Requirement:	Value	115XL	135XL	150XL	165XL	200XL	265XL
Fire Rating							
- Fire Resistance (FRL) AS3600	90/90/90 to 240/120/120	-	90/90/90	90/90/90	120/120/120	180/180/180	240/240/240
- Fire Resistance (FRL) CSIRO Test		-	-	240/240/240#1	240/240/240#1	240/240/240#1	240/240/240#1
Acoustic Rating							
- Sound Reduction (Rw)	Rw 50#2	47	51	53	54	56	59
- Field Verification (Dnt,w +Ctr)	Dnt,w 45#2	-	45-46	45 - 47	46 - 48	46 - 50	50 - 54
Thermal Rating (R Value)	N/A	0.28	0.29	0.30	0.31	0.34	0.39

APPLICATION - SERVICE SHAFTS (XL)

BCA Performance Requirements		Ritek® XL Wall® Panel Performance					
Requirement:	Value	115XL	135XL	150XL	165XL	200XL	265XL
Fire Resistance (FRL) AS3600 (minimum concrete core)	90/90/90 to 240/120/120	-	90/90/90	90/90/90 240/240/240#1	120/120/120 240/240/240#1	180/180/180 240/240/240#1	240/240/240
Acoustic Rating							
- Sound Reduction (Rw +Ctr)	Rw +Ctr 40	42	46	48	49	51	54
- Field Verification (Dnt,w +Ctr)	N/A	-	45-46	45 - 47	46 - 48	46 - 50	50 - 54
Thermal Rating (R Value)	N/A	0.28	0.29	0.30	0.31	0.34	0.39

#1 FRL determined by CSIRO fire test, walls up to 3m high up to 266 kN/m loading

#2 + Impact insulation required if lift shaft is adjacent to a living or bedroom.

Ritek® Wall Systems - Wall Applications

RITEK® XL WALL® PANEL SELECTION (XL) **TABLE 2.2**

Wall Type	115XL	135XL	150XL	165XL	200XL	265XL
Wall Thickness (mm)	115	135	150	165	200	265
Concrete Core Thickness (mm)	103	123	138	153	188	253
Reinforcement Layers	Single	Single	Single	Single	Double	Double

APPLICATION - BLADE COLUMNS (XL)

BCA Performance Requirements		Ritek® XL Wall® Panel Performance					
Performance Requirement:	Value	115XL	135XL	150XL	165XL	200XL	265XL
Fire Resistance (FRL - AS3600) (minimum concrete core)	90/90/90 to 240/120/120	-	60/ - / -	60/ - / -	90/ - / -	120/ - / -	240/ - / -
Acoustic Rating							
- Sound Reduction (Rw)	N/A	47	51	53	54	56	59
- Field Verification (Dnt,w +Ctr)	N/A	-	45-46	45 - 47	46 - 48	46 - 50	50 - 54
Thermal Rating (R Value)	N/A	0.28	0.29	0.30	0.31	0.34	0.39

APPLICATION - EXTERNAL FAÇADE WALLS (XL)

BCA Performance Requirements		Ritek® XL Wall® Panel Performance (Inc. 28mm furring channel on beta fix bracket, 15mm foil board and 10mm plaster board)					
Performance Requirement:	Value	115XL	135XL	150XL	165XL	200XL	265XL
Fire Resistance (FRL - AS3600) (minimum concrete core)	90/90/90 to 240/120/120	-	90/90/90	90/90/90 240/240/240[#1]	120/120/120 240/240/240[#1]	180/180/180 240/240/240[#1]	240/240/240
Acoustic Rating							
- Sound Reduction (Rw)	N/A	47	51	53	54	56	59
- Field Verification (Dnt,w +Ctr)	N/A	-	45-46	45 - 47	46 - 48	46 - 50	50 - 54
Thermal Rating (R Value)	N/A						
- Climate Zone 1,2,3,4,5,6,7 (R Value)	1.4[#2]	-	1.45	1.46	1.48	1.50	1.55
- Climate Zone 8 (R Value)	3.8	-	-	-	-	-	-

BCA Performance Requirements		Ritek XL Thermal Wall® Panel Performance (Inc. built in factory installed thermal insulation lining)					
Performance Requirement:	Value	115XL	135XLT-R[#3]	150XLT -R[#3]	165XLT-R[#3]	200XLT -R[#3]	265XLT-R[#3]
Fire Resistance (FRL - AS3600) (minimum concrete core)	90/90/90 to 240/120/120	-	-	-	90/90/90	90/90/90 to 120/120/120	90/90/90 to 180/180/180
Acoustic Rating							
- Sound Reduction (Rw)	N/A	-	-	-	51	51 - 54	51 - 56
Thermal Rating (R Value)	N/A						
- Climate Zone 1,2,3,4,5,6,7 (R Value)	1.4[#2]	-	-	-	1.5	1.5 to 3.2	1.5 to 6.2
- Climate Zone 8 (R Value)	3.8	-	-	-	-	-	3.8 to 6.2

[#1] FRL determined by CSIRO fire test, walls up to 3m high up to 266 kN/m loading

[#2] BCA Deemed-to-Satify Provisions J1.5a (b) where the space for insulation is provided by a furring channel, top hat section, batten or the like
i) achieve a minimum Total R Value or 1.4; and
ii) satisfy glazing energy index Option B Table J2.4a

[#3] Refer to Ritek XL Thermal Wall (XLT) Panel selection guide for range of R Values available

Ritek® Wall Systems - Wall Applications

RITEK® XL WALL® PANEL SELECTION (XL) — TABLE 2.2

Wall Type	115XL	135XL	150XL	165XL	200XL	265XL
Wall Thickness (mm)	115	135	150	165	200	265
Concrete Core Thickness (mm)	103	123	138	153	188	253
Reinforcement Layers	Single	Single	Single	Single	Double	Double

APPLICATION - INTERNAL CORRIDOR WALLS (XL)

BCA Performance Requirements		Ritek® XL Wall® Panel Performance					
Requirement:	Value	115XL	135XL	150XL	165XL	200XL	265XL
Fire Resistance (FRL) (minimum concrete core)	90/90/90 to 240/120/120	-	90/90/90	90/90/90 240/240/240[#1]	120/120/120 240/240/240[#1]	180/180/180 240/240/240[#1]	240/240/240 240/240/240[#1]
Acoustic Rating							
- Sound Reduction (Rw)	Rw 50	-	51	53	54	56	59
- Field Verification (Dnt,w +Ctr)	Dnt,w 45	-	45 - 46	45 - 47	46 - 48	46 - 50	50 - 54
Thermal Rating (R Value)	N/A	0.28	0.29	0.30	0.31	0.34	0.39

APPLICATION - INTERNAL PARTY WALLS (XL)

BCA Performance Requirements		Ritek® XL Wall® Panel Performance					
Requirement:	Value	115XL	135XL	150XL	165XL	200XL	265XL
Fire Resistance (FRL) (minimum concrete core)	90/90/90 to 240 / - / -	-	90/90/90	90/90/90 240/240/240[#1]	120/120/120 240/240/240[#1]	180/180/180 240/240/240[#1]	240/240/240 240/240/240[#1]
Acoustic Rating							
- Sound Reduction (Rw +Ctr)	Rw +Ctr 50 [#2]	-	-	-	-	-	-
- Field Verification (Dnt,w +Ctr)	Dnt,w +Ctr 45 [#2]	-	45 - 46	45 - 47	46 - 48	46 - 50	50 - 54
Thermal Rating (R Value)	N/A	0.28	0.29	0.30	0.31	0.34	0.39

APPLICATION - OTHER INTERNAL WALLS (XL)

BCA Performance Requirements		Ritek XL Wall Panel Performance					
Requirement:	Value	115XL	135XL	150XL	165XL	200XL	265XL
Fire Resistance (FRL) AS3600 (minimum concrete core)	90/ - / - to 240/ - / -	-	60/ - / -	60/ - / -	90/ - / -	120/ - / -	240/ - / -
Acoustic Rating							
- Sound Reduction (Rw)	N/A	47	51	53	54	56	59
- Field Verification (Dnt,w)	N/A	-	45 - 46	45 - 47	46 - 48	46 - 50	50 - 54
Thermal Rating (R Value)	N/A	0.28	0.29	0.30	0.31	0.34	0.39

[#1] FRL determined by CSIRO fire test, walls up to 3m high up to 266 kN/m loading

[#2] + Impact Insulation required if party wall is separating a kitchen or bathroom from a living or bedroom

Ritek® Wall Systems - Typical Wall Applications

Ritek® Wall Systems are pre-fabricated permanent formwork for reinforced concrete walls and can be used for all applications for reinforced concrete walls from 103mm up to 253mm concrete core thickness.

External

Stairwells

Lift Shafts / Internal Walls

Party Walls

Balustrades

High Traffic Areas

Ritek® Wall Systems - Typical Wall Applications

Ritek XL and XL Thermal wall systems are suitable for use in single residential, multi-storey residential and commercial buildings as load bearing/structural, fire and acoustic rated walls up to 25 storeys or higher in non load-bearing capacities. Panels can be configured to include additional materials to increase thermal and acoustic properties as specified by the building designer.

Retaining Walls

Blade Walls

Planter Boxes

Basements

Remote Housing

Footings & Boundaries

PANEL SELECTION B

James Hardie Systems
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1300 929 782

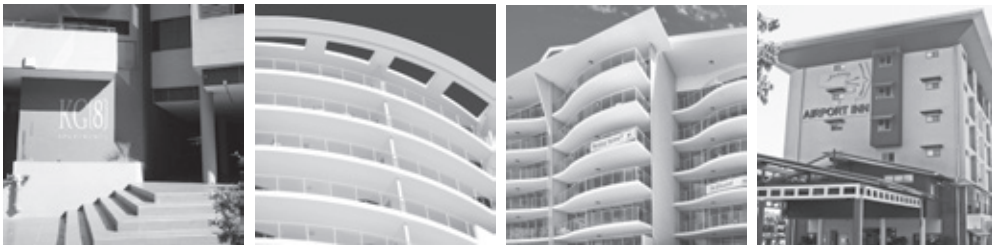
Version 2015.01

Design, Detailing & Installation Guide

Ritek® XL Wall® and XL Thermal Wall® Systems

Version 2015.01

C DESIGN



Ritek® Benefit from our knowledge. Profit from our experience.

Ritek® Wall Systems - **Vertical Load Capacity**

The vertical load design capacity (ϕN_u) for the various wall thicknesses, wall heights and support conditions are shown in the Design Axial Load Capacity Charts.

The design capacities have been calculated in accordance with AS 3600 Clause 11.5 SIMPLIFIED DESIGN METHOD FOR WALLS SUBJECT TO VERTICAL COMPRESSION FORCES, as follows:

Design axial compressive strength = $\varphi\phi N_u$ (kN/m)
where:

φ ϕ = 0.6

N_u = the ultimate strength (kN/m)
= $(t_w - 1.2e - 2e_a)0.6\, f'_c\, 10^3$

t_w = Wall concrete thickness (m)
= overall thickness – 0.012

e = the eccentricity of the load (m)
= 0 for continuous floor slab
(adopt 0.05 tw as minimum)
= 0.166 t_w for discontinuous floor slab

e_a = additional eccentricity (m)
= $H^2_{we}/(2500\, t_w)$

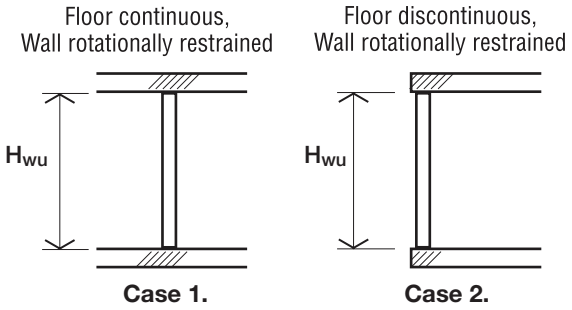
H_{we} = the effective height of wall (m)
= 0.75 H_{wu} where wall restrained against rotation top and bottom by floors
= 1.0 H_{wu} where wall not rotationally restrained top and bottom

$\frac{H_{we}}{t_w}$ = 30 max. when $N^* > 0.03\, f'_c\, A_g$
= 50 max. when $N^* \leq 0.03\, f'_c\, A_g$

H_{wu} = Unsupported height of wall (m)

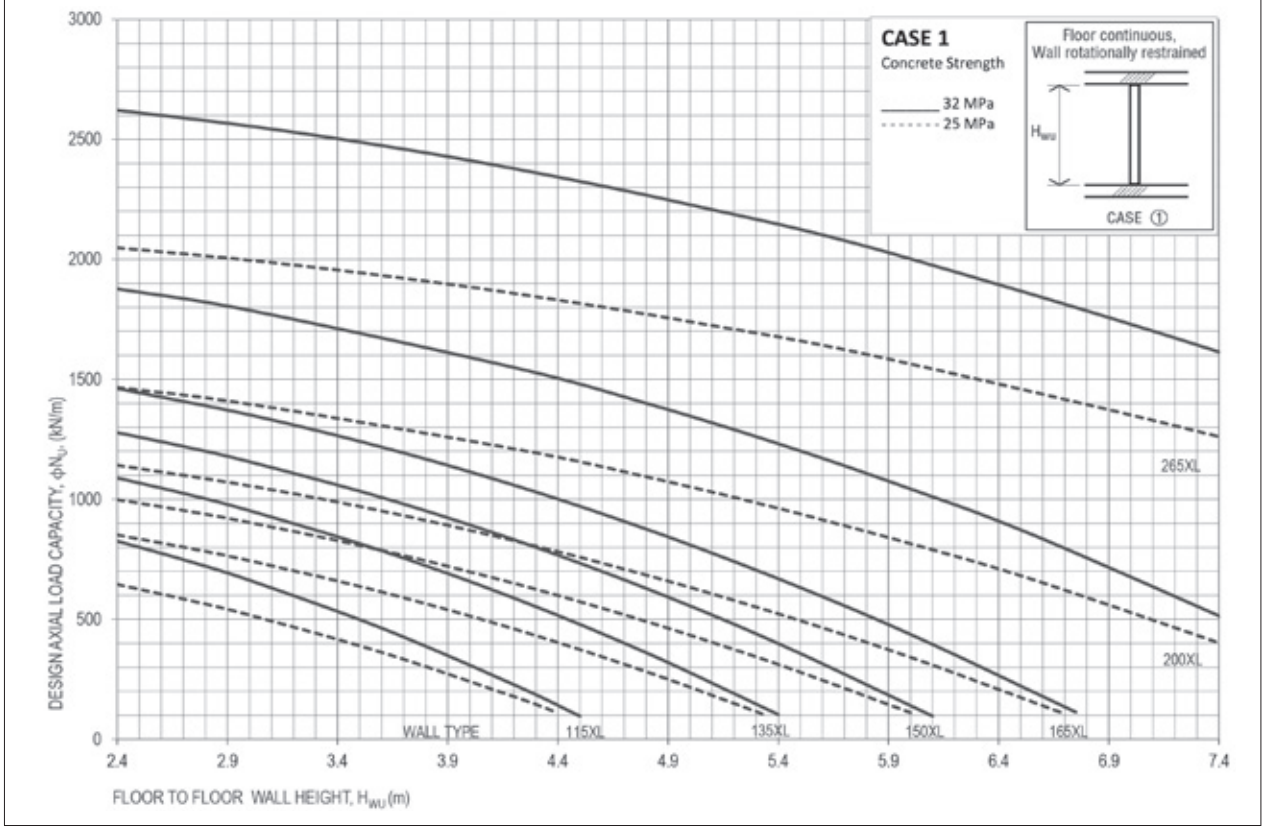
f'_c = Concrete compressive strength (MPa)

CONTINUITY & RESTRAINT CONDITIONS **FIGURE 3.1**

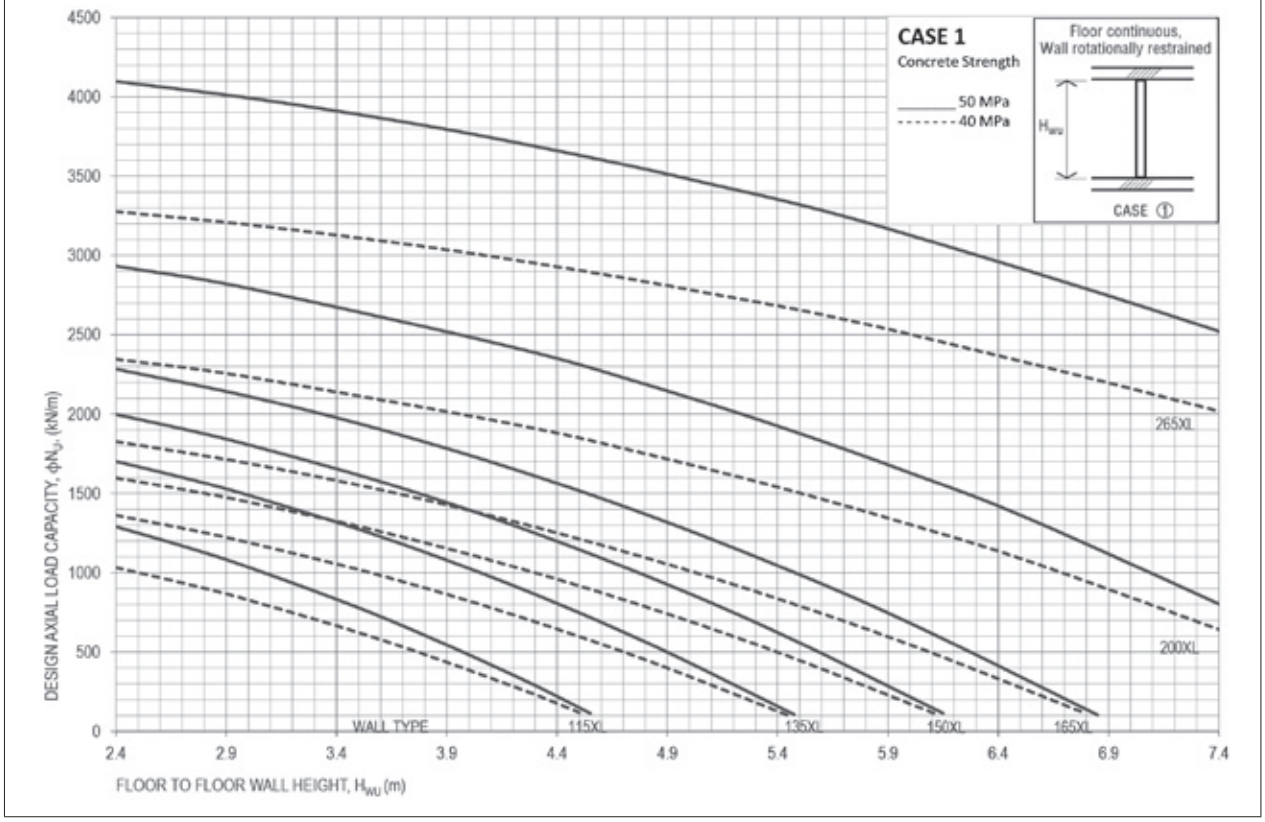


Ritek® Wall Systems - **Vertical Load Capacity**

VERTICAL LOAD CAPACITY **CHART 3.1**

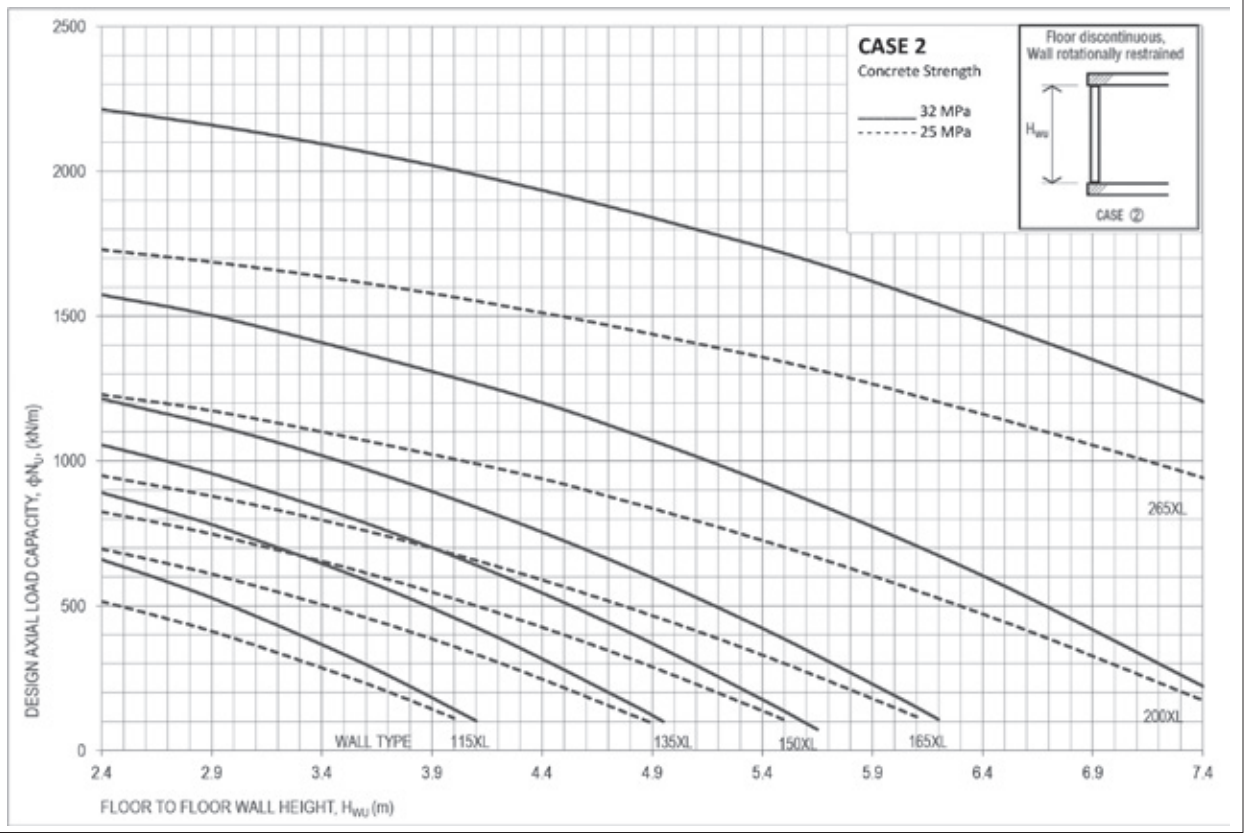


VERTICAL LOAD CAPACITY **CHART 3.2**

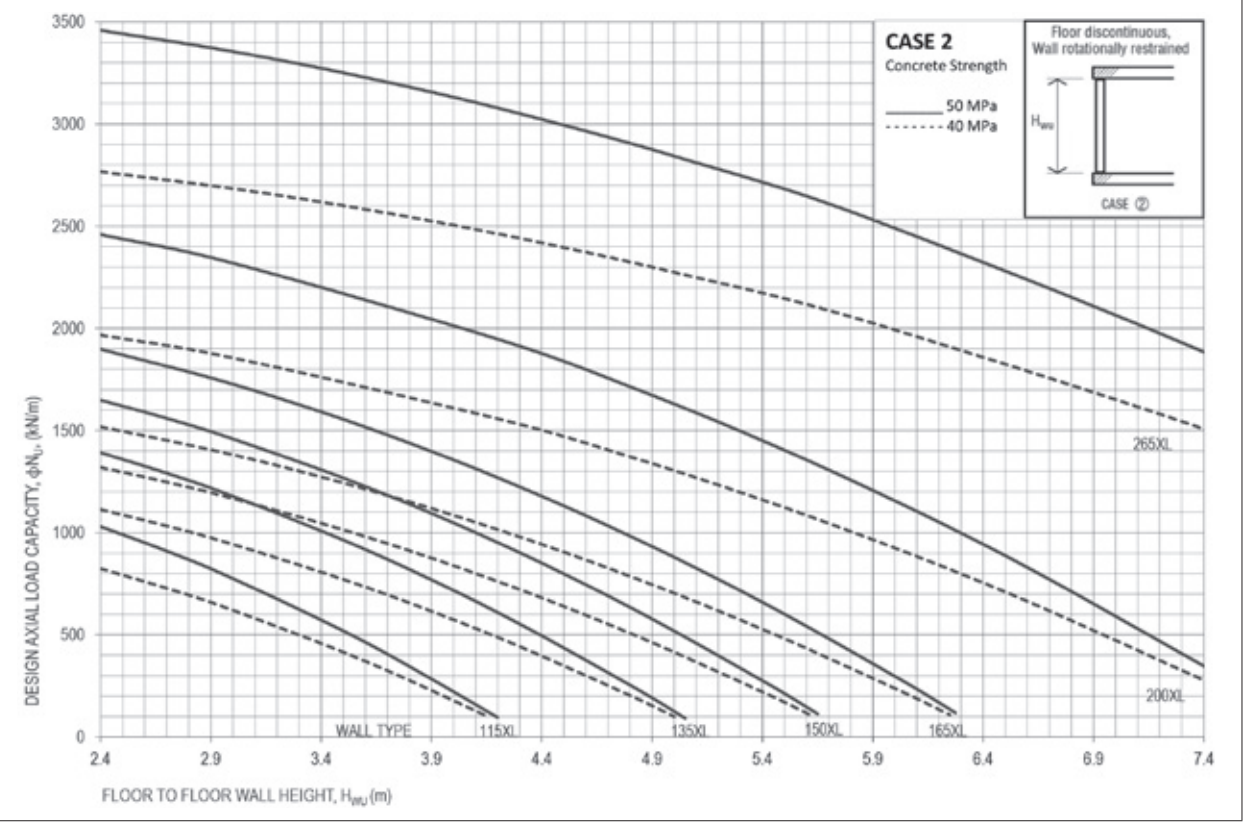


Ritek® Wall Systems - **Vertical Load Capacity**

VERTICAL LOAD CAPACITY **CHART 3.3**



VERTICAL LOAD CAPACITY **CHART 3.4**



Ritek® Wall Systems - **Lateral Load Capacity**

The capacity of a wall subjected to a lateral load (wind or earthquake) is given in Chart 3.5.

It has been calculated on the basis of a simply-supported beam spanning vertically between floor supports, with central reinforcement @ 400 mm centres and concrete strength 25 MPa, refer Figure 3.2.

Capacities are given for N12 and N16 vertical reinforcement. Higher capacities can be achieved by increasing the size of the vertical reinforcement.

The capacity is given by the formula:

Design Capacity, $w = 8 \phi M_u / L^2$ (kPa)

where:

$$M_u = f_{sy}\, d\, A_{st} \left[1 - \frac{0.6\, A_{st}\, f_{sy}\, 10^{-6}}{f'_c\, b\, d\, 10^{-3}} \right] \quad \text{(kN.m/m)}$$

ϕ = 0.8

L = Design span for bending (m)
= Height between centre of floor slabs

b = Design width (m)
= 1.0

d = Depth to tensile reinforcement (m)
= $t_w/2$

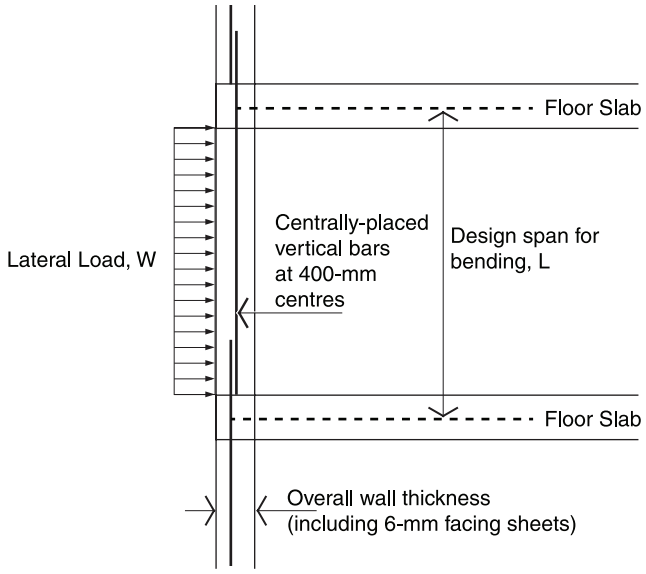
t_w = Wall concrete thickness (m)
= Overall wall thickness - 0.012

A_{st} = Area of vertical reinforcement (mm^2/m)

f'_c = Concrete compressive strength (MPa)

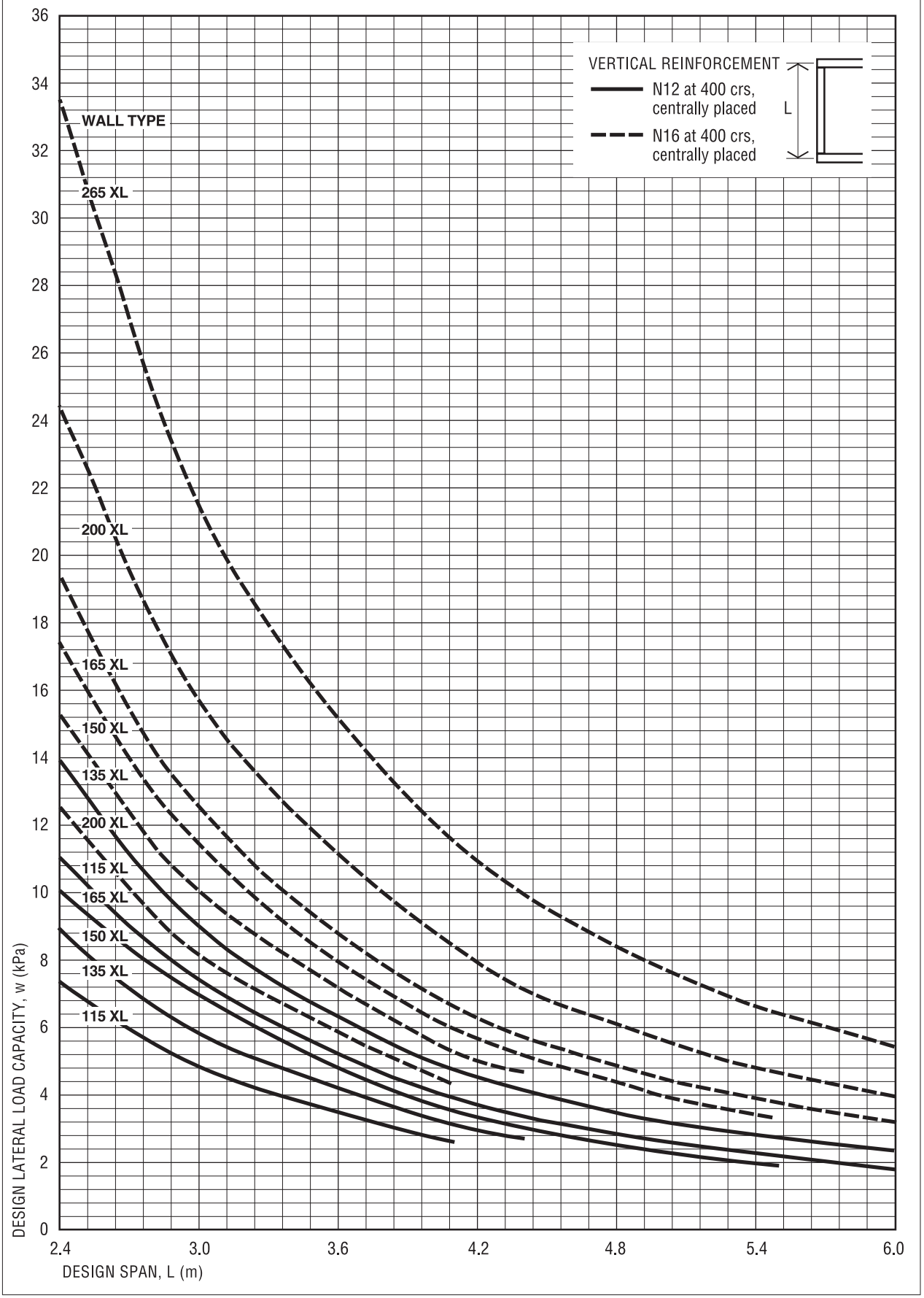
f_{sy} = Yield strength of reinforcement (MPa)

ASSUMPTIONS FOR LATERAL LOAD CAPACITY **FIGURE 3.2**



Ritek® Wall Systems - **Lateral Load Capacity**

DESIGN LATERAL LOAD CAPACITY **CHART 3.5**



Ritek® Wall Systems - **Racking Resistance**

Racking Resistance

When a wall is subjected to racking forces, it can fail by either overturning of the wall or shear through the length of the wall. The wall capacity is therefore limited by the lesser value of overturning or shear.

Wall Overturning

The resistance to overturning of the wall is controlled by wall thickness and length, concrete strength and the amount and strength of tiedown reinforcement. In addition, weight of the wall as well as any other applied loads will help to resist overturning. The overturning is calculated in accordance with the assumptions contained in AS 3600 Clause 8.1.2.1 Combined bending and axial force. The following formula has been used:

$$V = \varphi\phi \frac{\left[(f_{sy} A_{st} 10^{-3} + w L_w) d \left(1 - \frac{0.6(f_{sy} A_{st} 10^{-3} + w L_w)}{t_w d f'_c 10^3} \right) - w L_w \left(d - \frac{L_w}{2} \right) \right]}{H_w}$$

where:

	V	=	Design overturning resistance	(kN)
φ	ϕ	=	Strength reduction factor for shear	
		=	0.7 (adopt shear value)	
	f_{sy}	=	Yield strength of reinforcement	(MPa)
	f'_c	=	Concrete compressive strength	(MPa)
	A_{st}	=	Area of tiedown reinf. in tension	(mm^2)
		=	Reinf. area over half wall length	
	w	=	Total Vertical load on wall	(kN/m)
		=	$w_s + w_{sw}$	
	w_s	=	Superimposed permanent load (PL)	(kN/m)
	w_{sw}	=	Self-weight of wall (SW)	(kN/m)
	d	=	Distance from the compression face (end of wall) to the centroid of tensile reinforcement	(m)
	H_w	=	Wall height	(m)
	L_w	=	Wall length	(m)
	t_w	=	Concrete thickness	(m)
		=	Overall wall thickness – 0.012	

The overturning capacities shown in Chart 3.6 have been calculated for the 115XL walls with concrete strength 25 MPa and tiedown rods N12@ 400 mm centres. Two sets of design curves are given covering two load cases. One set of curves is for a UPL of 0 kN/m and the second set is for a UPL of 100 kN/m. Where a UPL is between these values, the overturning capacity can be obtained by interpolation. Increases in wall size or concrete strength will only give marginally higher strength.

Ritek® Wall Systems - **Racking Resistance**

Wall Shear

The shear strength through the wall is controlled by wall thickness and length, concrete strength and amount and strength of reinforcement. The shear capacity is calculated in accordance with AS 3600 Clause 11.6.3 **Strength in shear**, as follows:

$V_u = \varphi\phi\,(V_{uc} + V_{us})$

When $H_w/L_w < 1.3$

$$V_{uc} = \left[0.66\sqrt{f'_c} - 0.21\,\frac{H_w}{L_w}\sqrt{f'_c}\,0.8\right] L_w\, t_w\, 10^3$$

When $1.3 \le H_w/L_w < 1.83$

$$V_{uc} = \left[0.05\sqrt{f'_c} + \frac{0.1\,f'_c}{\left[\frac{H_w}{L_w} - 1\right]}\,0.8\right] L_w\, t_w\, 10^3$$

When $H_w/L_w \ge 1.83$

$$V_{uc} = [0.17\sqrt{f'_c}]\,0.8\, L_w\, t_w\, 10^3$$

$$V_{us} = \frac{A_s}{s} f_{sy}\, 0.8\, L_w\, 10^3$$

where:

V_u	=	Design strength in shear	(kN)
V_{uc}	=	Shear strength without reinf.	(kN)
V_{us}	=	Contribution to shear strength by reinforcement	(kN)
ϕ	=	Strength reduction factor for shear	
	=	0.7	
f'_c	=	Concrete compressive strength	(MPa)
f_{sy}	=	Yield strength of reinforcement	(MPa)
A_s	=	Area of vertical and horizontal reinforcing bars	(mm^2)
s	=	Spacing of vertical and horizontal reinforcing bars	(mm)
H_w	=	Wall height	(m)
L_w	=	Wall length	(m)
t_w	=	Wall concrete thickness	(m)
	=	Overall thickness – 0.012	

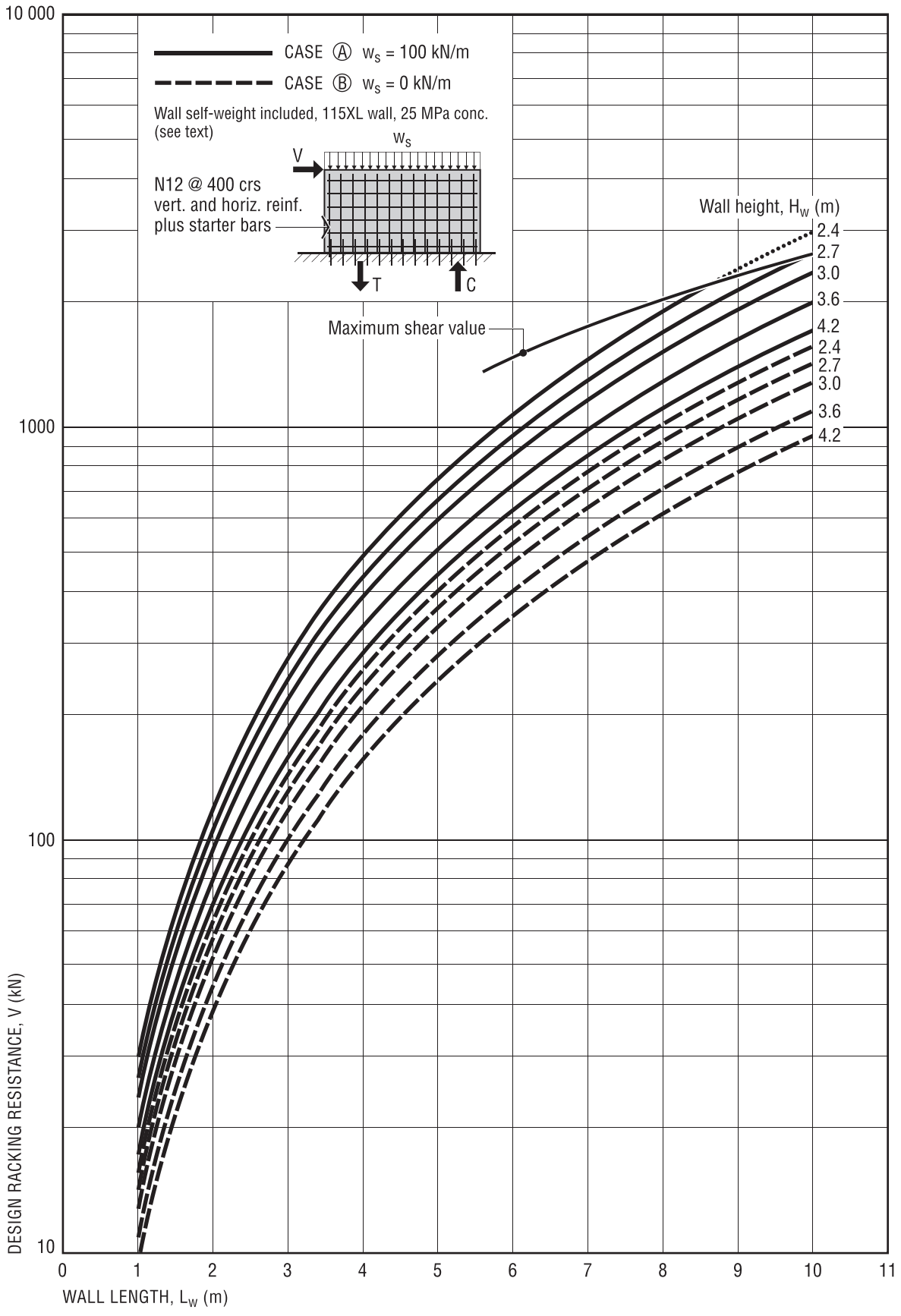
The shear capacity given in Chart 3.6 have been calculated for the 115XL wall with concrete strength 25 MPa and N12 bars@ 400 mm centres. Increases in wall size, concrete strength or reinforcement will give proportionally higher shear strength.

Racking Resistance

The racking resistance given in Chart 3.6 is the lesser of the shear and overturning values. Except for long and heavily loaded walls, the value of racking resistance is limited by overturning.

Ritek® Wall Systems - **Racking Resistance**

RACKING RESISTANCE - VERTICAL BARS, N12 AT 400 CRS **CHART 3.6**



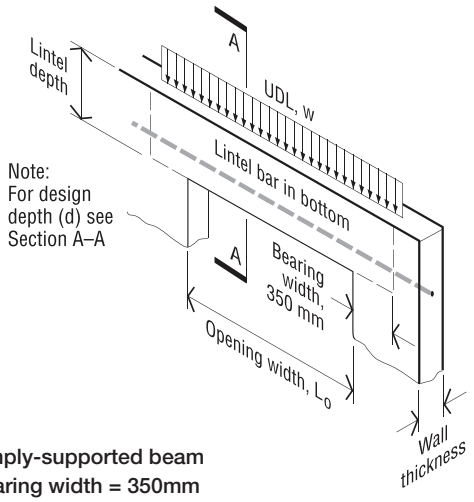
Ritek® Wall Systems - **Lintel Capacity**

Lintel Capacity

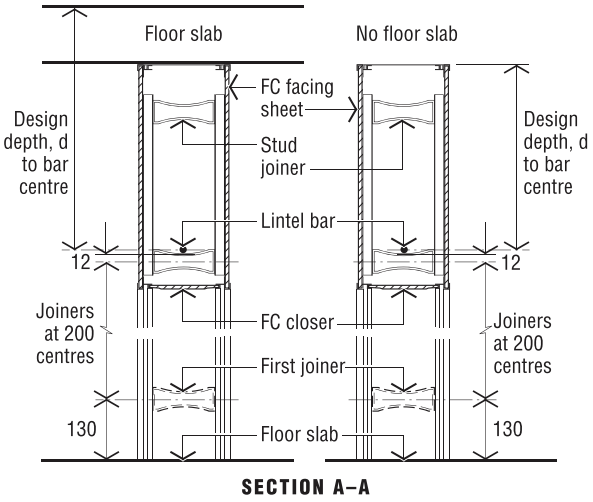
The design lintel capacity is the lesser of the strength in flexure or in shear. Deflection must also be checked to ensure that serviceability limits are not exceeded.

The design capacities given in Charts 3.7 to 3.12 have been calculated on the basis of simply supported beams using concrete strength of 25 MPa and the details shown in Figure 3.3

ASSUMED DETAILS FOR LINTEL CAPACITIES **FIGURE 3.3**



- Simply-supported beam
- Bearing width = 350mm
- Design span for flexure, L = Opening width +0.35 (m)
- Design span for deflection, L = Opening width (m)
- Design span for shear, L = Opening width - 2d (m)
- No vertical shear reinforcement



SECTION A–A

Flexural Capacity

The capacity in flexure is calculated for a simply-supported beam using the following formula:

Design Capacity, $w = 8 \phi M_u / L^2$ (kN/m)

where:

$$M_u = f_{sy}\, d\, A_{st} \left[1 - \frac{0.6\, A_{st}\, f_{sy}\, 10^{-6}}{f'_c\, b\, d}\right] 10^{-3} \quad \text{(kN.m)}$$

ϕ = 0.8

L = Design span for flexure (m)
= L_o + 0.35

L_o = Opening width (m)

b = Thickness (m)
= Overall wall thickness – 0.012

d = Depth to tensile reinforcement (m)

A_{st} = Area of tensile reinforcement (mm^2)

NOTE: AS3600 requires the minimum area of tensile reinforcement to be such that:

$A_{st} \geq [\varphi_b (D/d)^2 f'_{ct.f}/f_{sy}] b_w d$

The cases where the reinforcement does not reach this minimum have not been included in the charts.

f'_c = Concrete compressive strength (MPa)

f'_{ct} = Concrete flexural tensile strength
= $0.6\sqrt{f'_c}$ (MPa)

f_{sy} = Yield strength of reinforcement (MPa)

Ritek® Wall Systems - **Lintel Capacity**

Shear Capacity

The shear capacity shown in Charts 3.7 to 3.12 has been calculated on the basis of simply supported beams without vertical shear reinforcement, using the following formula. For lintels with depths greater than 750 mm, shear reinforcement must be used. Where capacity, greater than shown in Charts 3.7 to 3.12 is needed, it may be increased by using either shear reinforcement or higher strength concrete.

Design capacity, $w = 2V^*/L$ (kN/m)

where:

V^* = $\phi (V_{uc} + V_{us})$ (kN)
when $A_{sv} \geq 0.35\ b_v\ s/f_{sy.f}$

V^* = $0.5\ \phi\ V_{uc}$ (kN)
when A_{sv} = none

φ ϕ = 0.7

V_{uc} = $\beta_1\ \beta_2\ \beta_3\ b_v\ d_o\ (A_{st}\ f'_c/b_v\ d_o)^{1/3} 10^{-3}$ (kN)

V_{us} = $(A_{sv}\ f_{sv.f}\ d_o/s)\ \cot\theta_v\ 10^{-3}$ (kN)

L = Design span for shear
= $L_o - 2\ d$ (m)

L_o = Opening width (m)

d = Depth to tensile reinforcement (m)

β_1 = $1.1(1.6 - d) \geq 1.1$

β_2 = 1.0

β_3 = 1.0

A_{st} = Area of tensile reinforcement (mm^2)

A_{sv} = Area of shear reinforcement (mm^2)

s = Spacing of shear reinforcement (m)

$\cot\theta_v$ = 0.707 for vertical shear reinforcement

f'_c = Concrete compressive strength (MPa)

$f_{sy.f}$ = Yield strength of shear reinforcement (MPa)

b_v = Web thickness (m)
= Overall wall thickness - 0.012

Deflection

The amount of deflection has been calculated on the basis of simply-supported beams. The maximum deflection was checked not to exceed span over deflection ratio of 500 for a serviceability load of 70% of ultimate strength design load. The following formula has been used.

Deflection, $\Delta = \frac{5}{384} \times \frac{w_d L^4}{E_{cj}\ I_{ef}}$ (m)
$\leq L/500$

where:

w_d = Design load for deflection (kN/m)
= $0.7\ w\ (1.0 + k_{cs})$

w = Ultimate strength design capacity

k_{cs} = Long-term factor
= 0.8

L = Design span for deflection (m)
= L_o

L_o = Opening width (m)

Υ = Concrete density (kN/m^3)
= 25

f_{cm} = Mean concrete compressive strength (MPa)

E_{cj} = Concrete modulus of elasticity (MPa)
= $\Upsilon^{1.5}(0.043\sqrt{f_{cm}})$
= 30,400

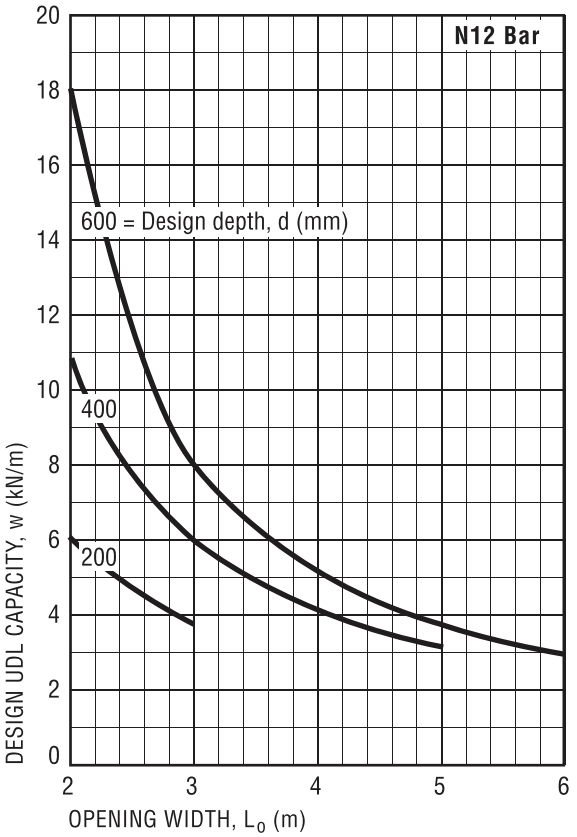
I_{ef} = Effective second moment of inertia (m^4)
= $0.045\ b\ d^3$

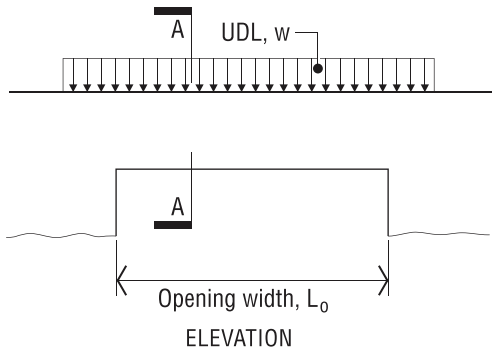
b = Thickness (m)
= Overall wall thickness - 0.012

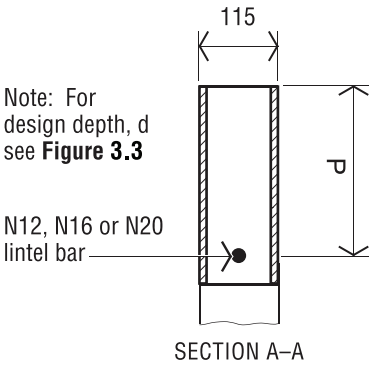
d = Depth to tensile reinforcement (m)

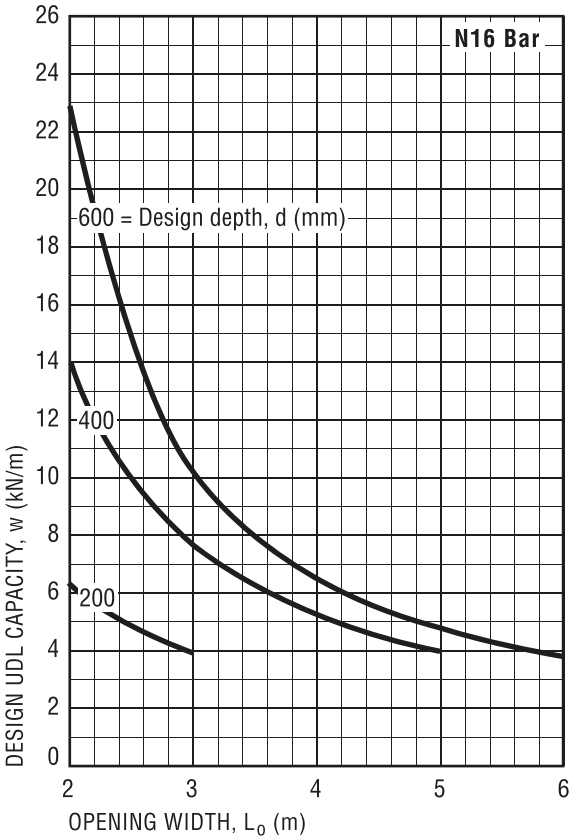
Ritek® Wall Systems - **Lintel Capacity**

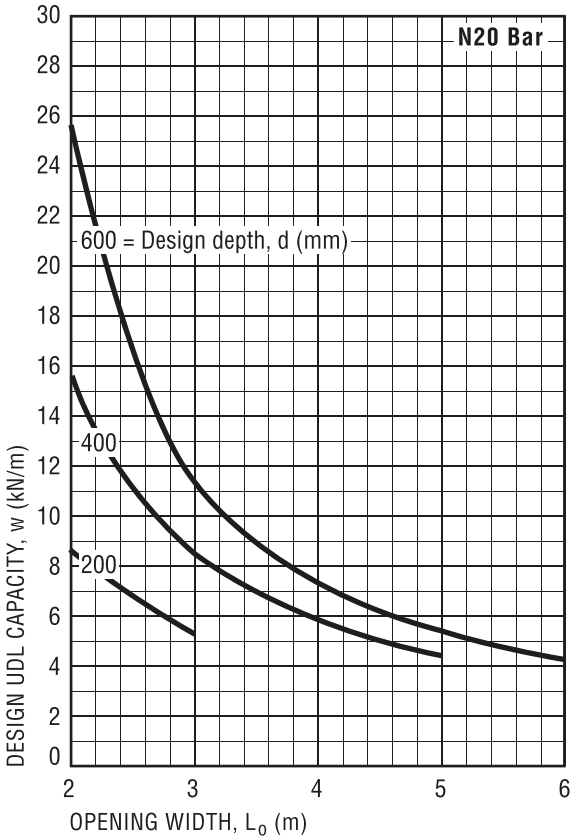
115XL WALL LINTEL DESIGN LOAD CAPACITY **CHART 3.7**





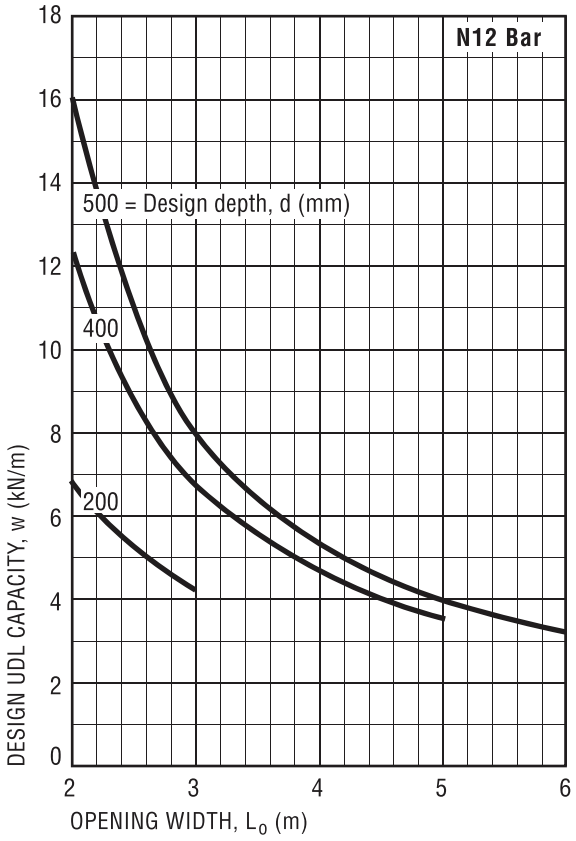


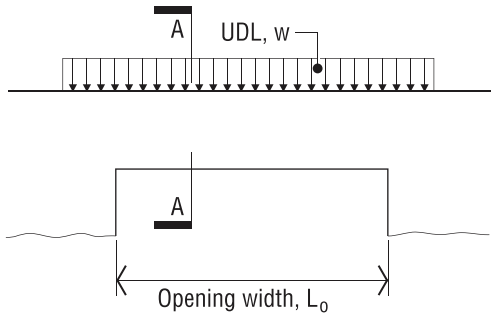


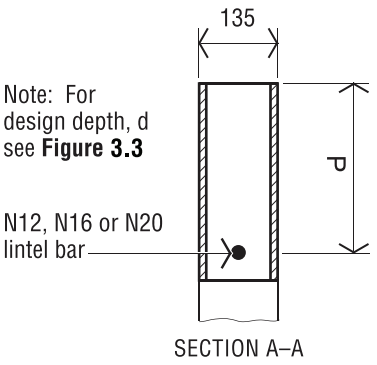


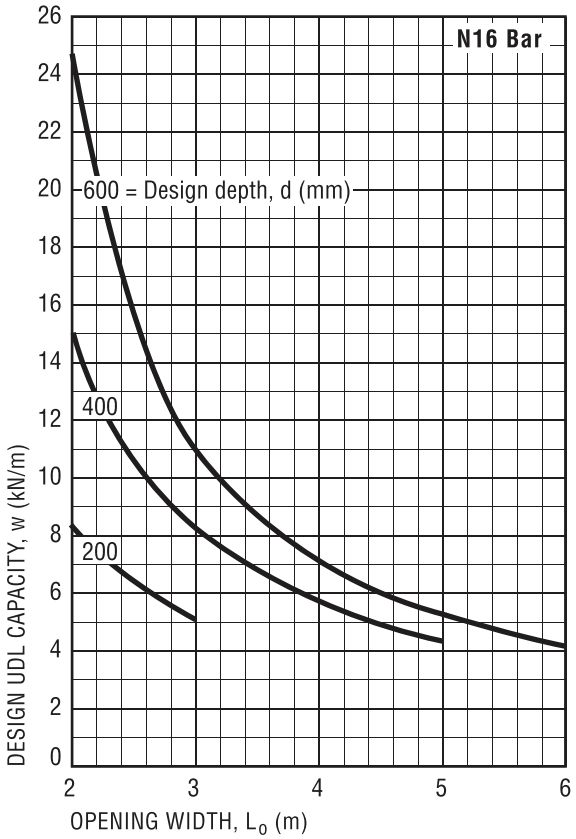
Ritek® Wall Systems - **Lintel Capacity**

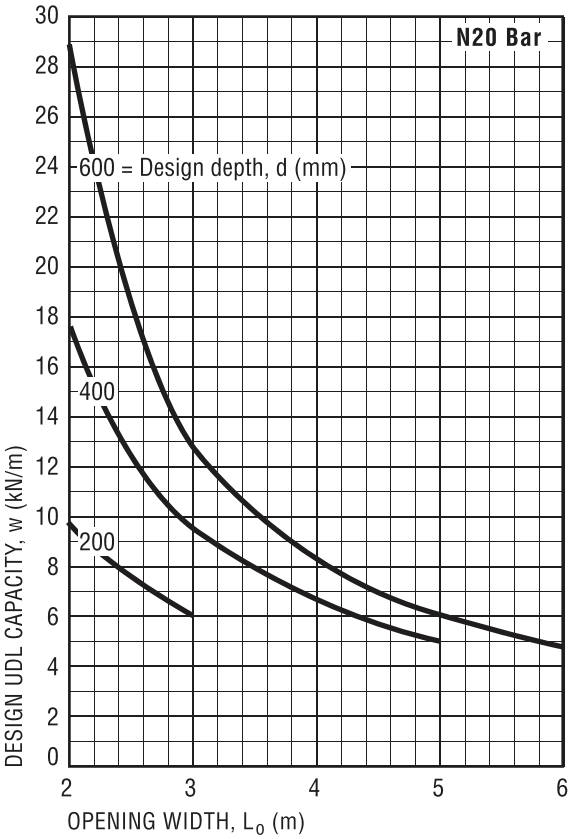
135XL WALL LINTEL DESIGN LOAD CAPACITY **CHART 3.8**





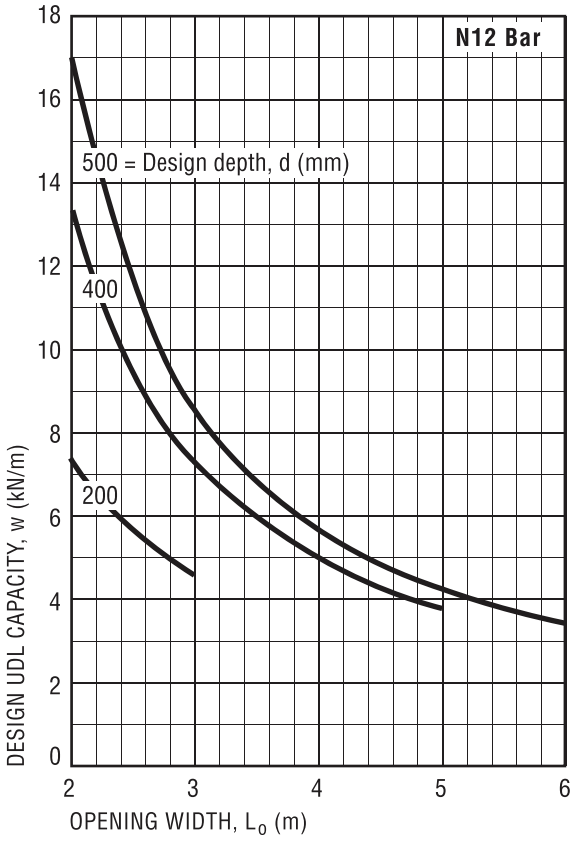


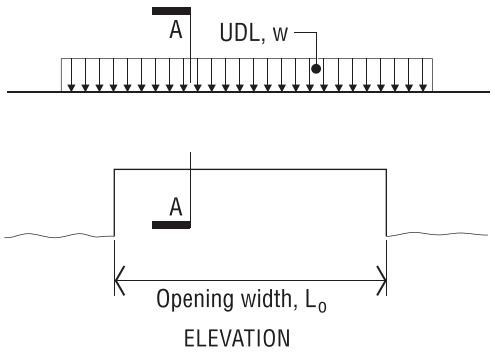


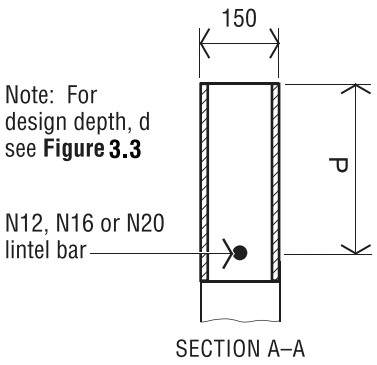


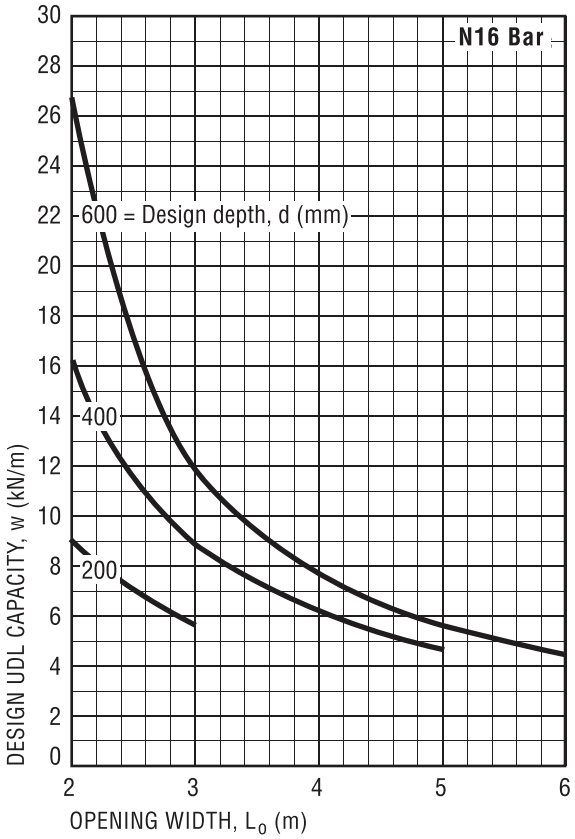
Ritek® Wall Systems - **Lintel Capacity**

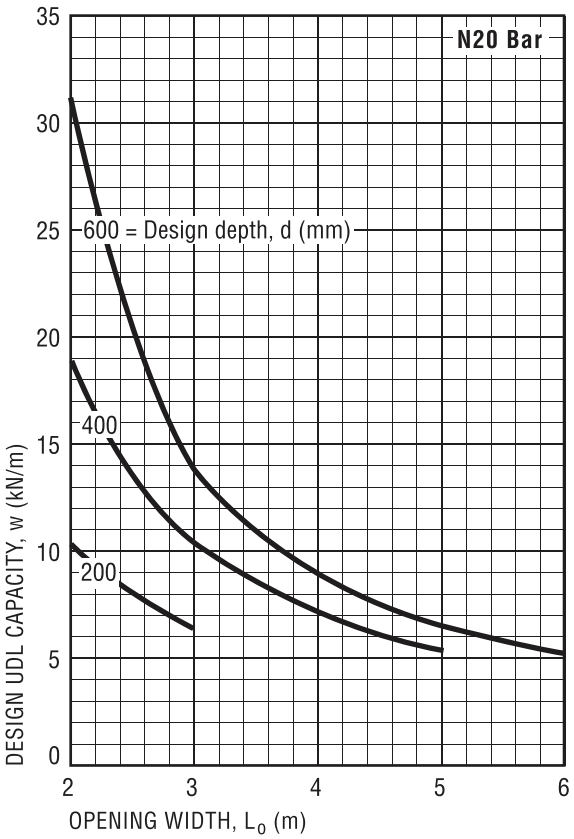
150XL WALL LINTEL DESIGN LOAD CAPACITY **CHART 3.9**





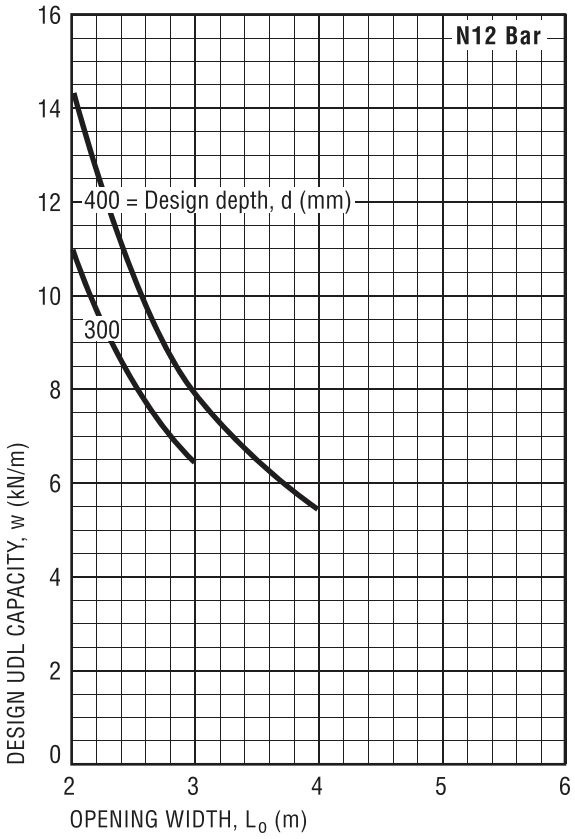


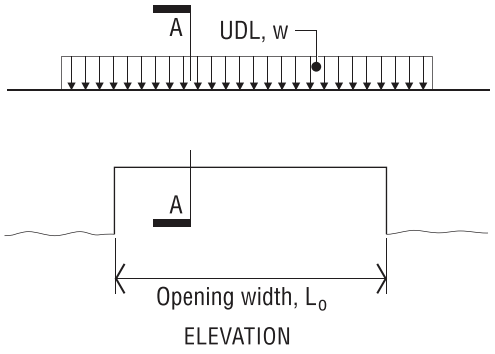


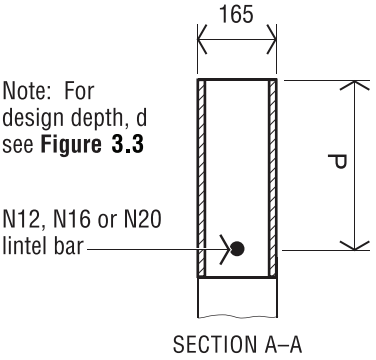


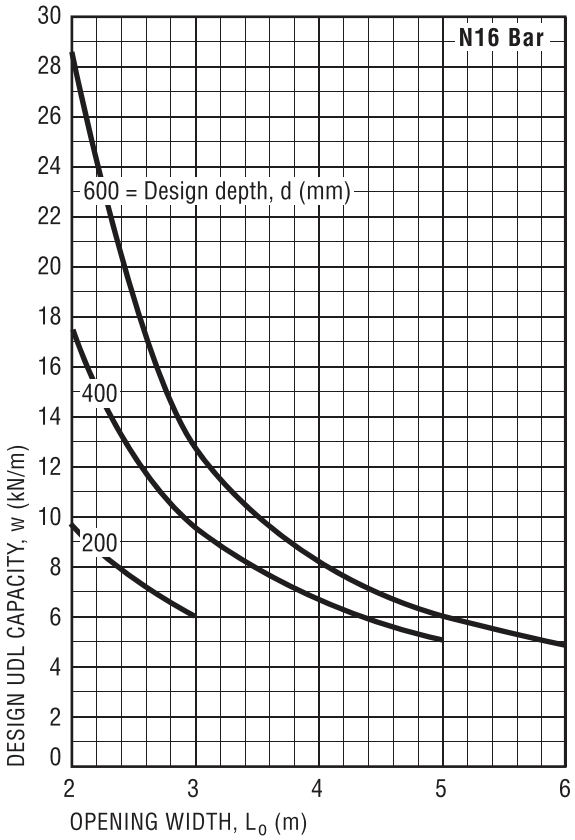
Ritek® Wall Systems - **Lintel Capacity**

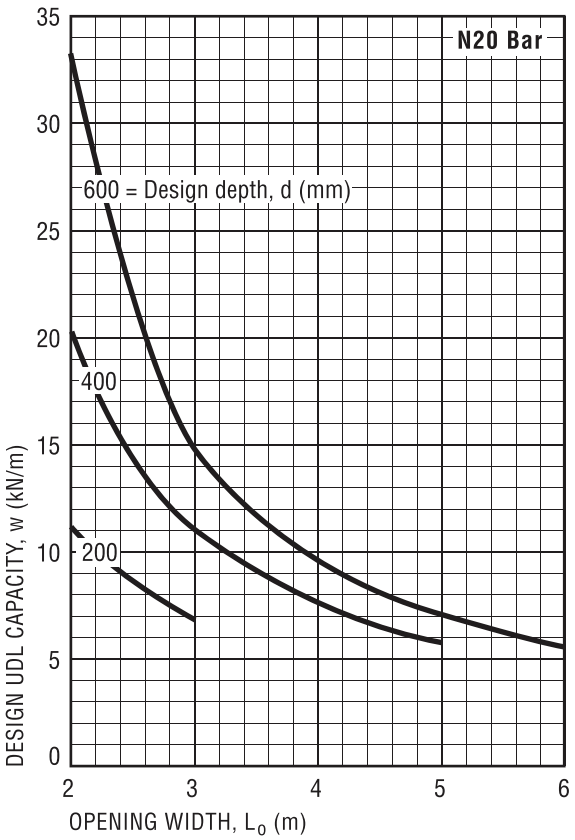
165XL WALL LINTEL DESIGN LOAD CAPACITY **CHART 3.10**





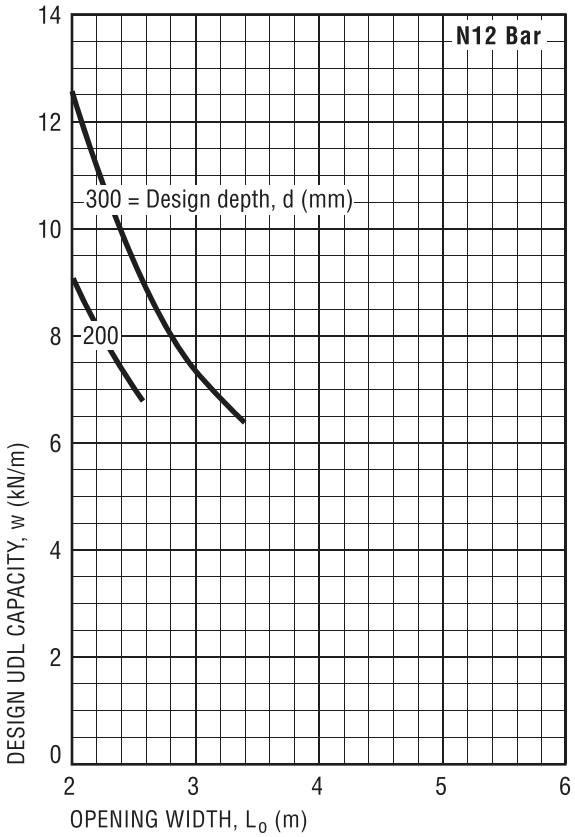


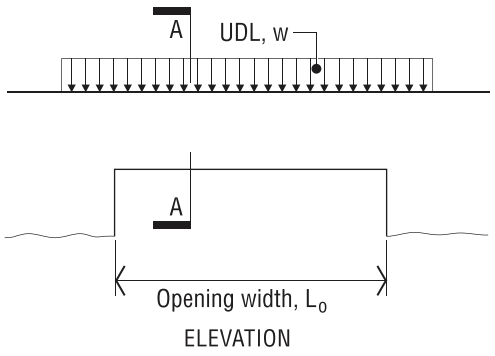


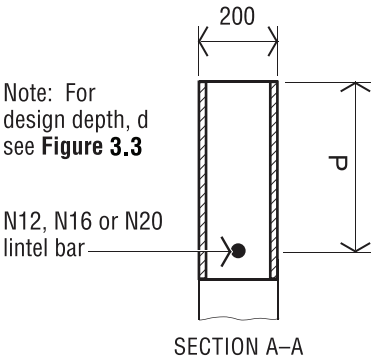


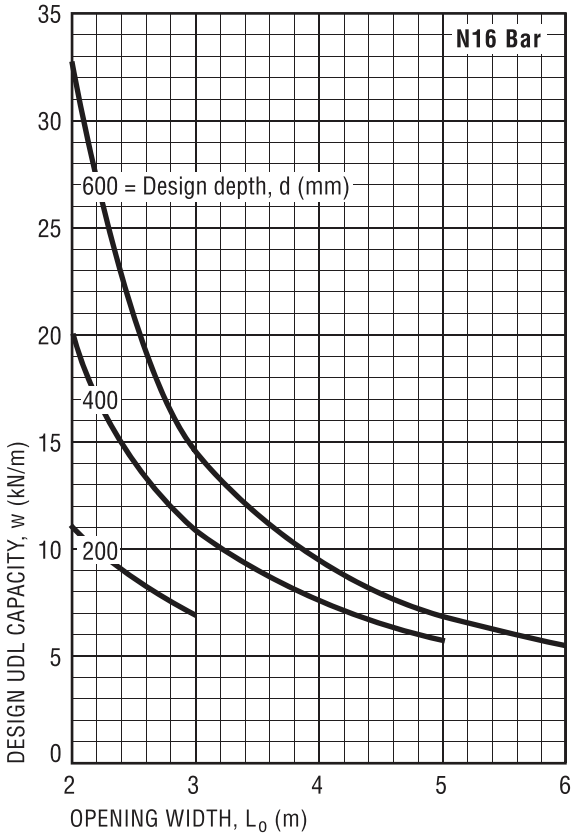
Ritek® Wall Systems - **Lintel Capacity**

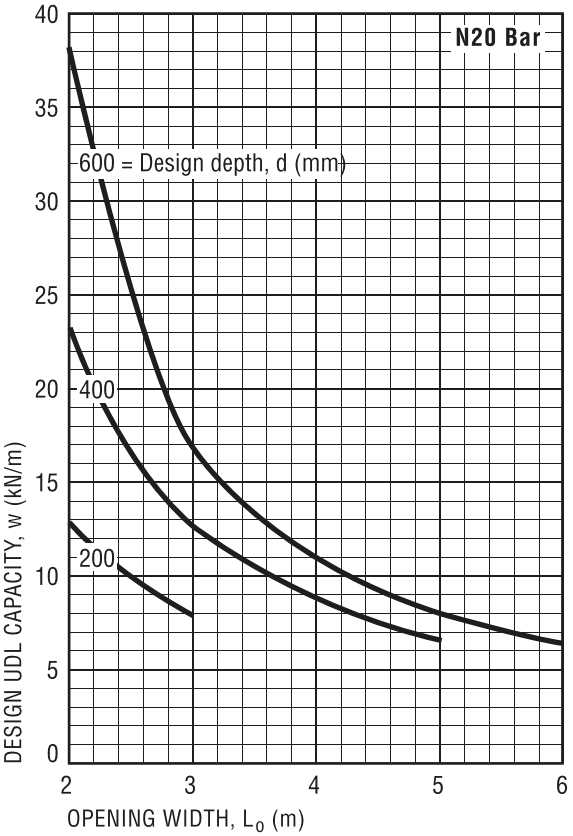
200XL WALL LINTEL DESIGN LOAD CAPACITY **CHART 3.11**





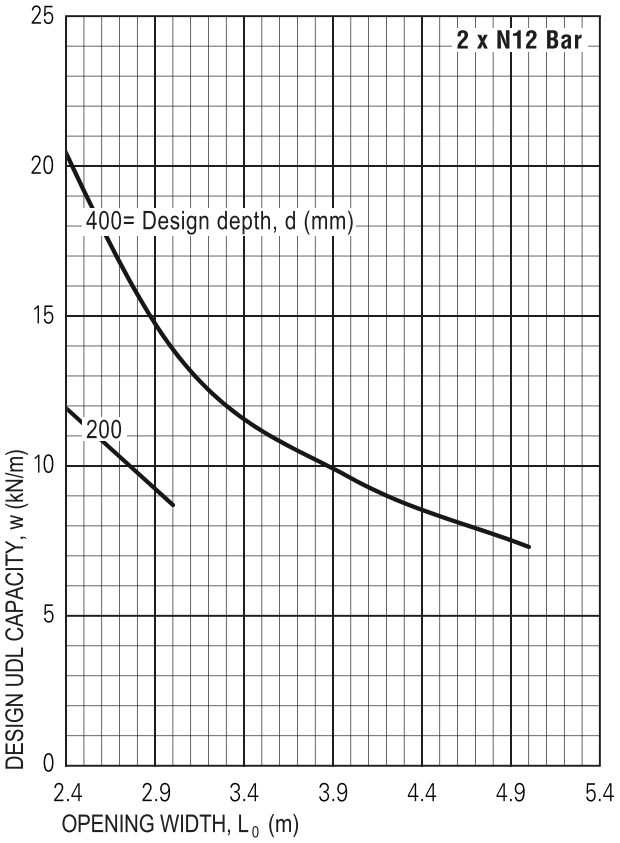


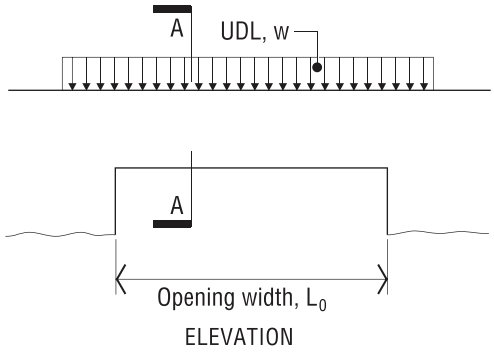


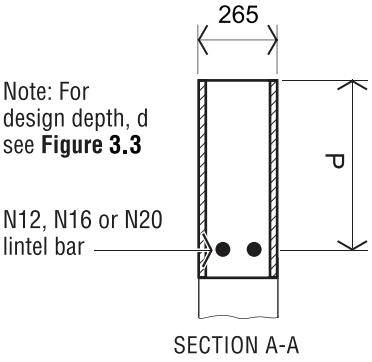


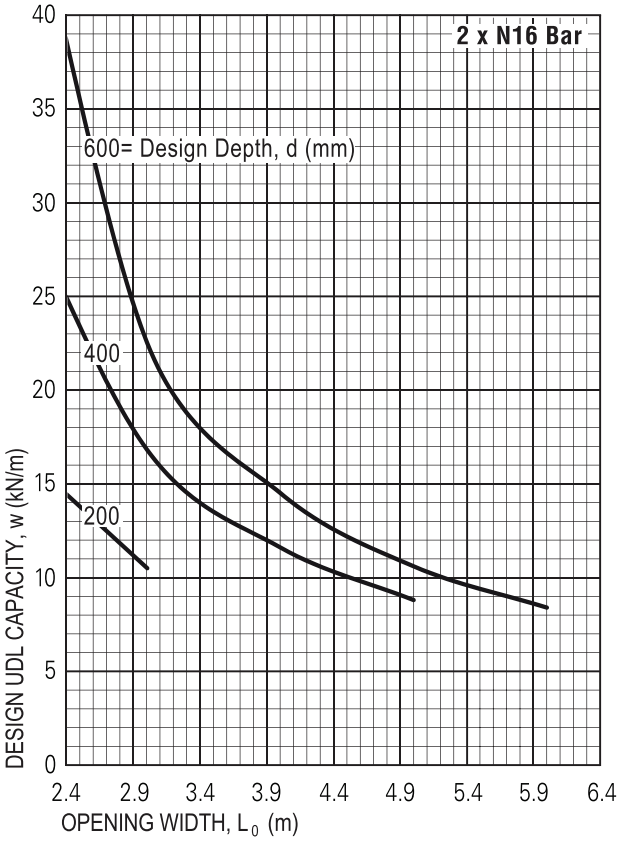
Ritek® Wall Systems - **Lintel Capacity**

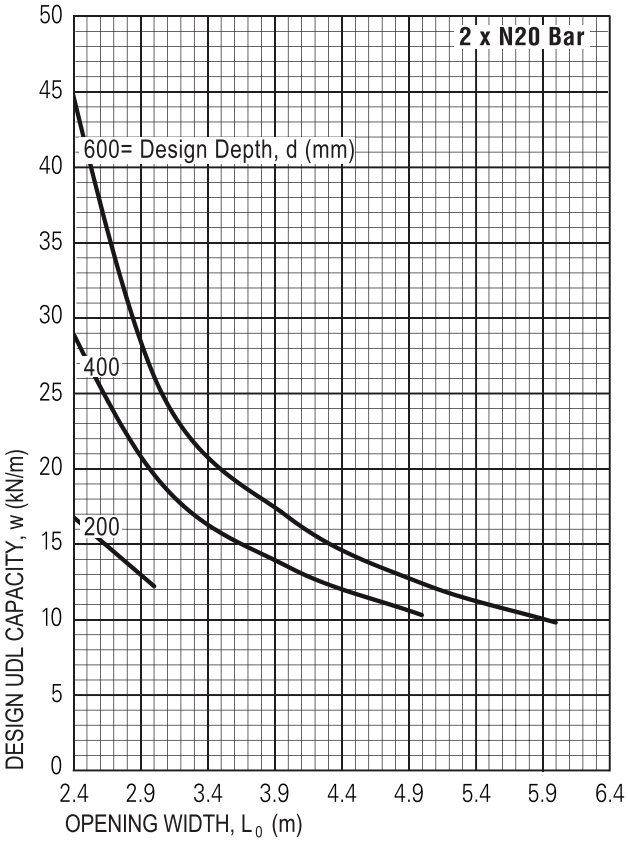
265XL WALL LINTEL DESIGN LOAD CAPACITY **CHART 3.12**











Ritek® Wall Systems - **Fire Design**

Requirements

The requirements for fire resistance are contained within the BCA. These requirements are summarized in Table 3.1, however designers should refer to the BCA for specific details or variations. Note: The BCA does not specify which walls are to be designed for fire on both sides. When designing in accordance with AS3600 it is reasonable to assume that only “other loadbearing walls” should be designed for fire on both sides as all “bounding walls” have a fire separating function.

For compliance, the wall must be designed to achieve each of three actions i.e. Structural Adequacy, Integrity and Insulation.

GROUP 1 - CLASS 1 BUILDING	**TABLE 3.1**
CLASS 1 - Single dwelling (house) or group with common wall (town houses)	
External wall less than 900mm from boundary	60/60/60
Separating wall between class 1 buildings	60/60/60

GROUP 2 - CLASS 2, 3 OR 4 PART BUILDINGS				
CLASS 2 - Building with separate dwellings (units) CLASS 3 - Residential building for unrelated people (boarding house/motel) CLASS 4 - A dwelling in a building that is Class 5, 6, 7, 8 or 9 if it is the only dwelling in the building.				
	NUMBER OF STORIES	1	2	3 or more
	TYPE OF CONSTRUCTION	C	B	A
External walls with a distance from fire source feature of:	Less than 1.5m	90/90/90	90/90/90	90/90/90
	1.5m to less than 3m	-/-/-	90/60/30	90/60/60
	3m or more	-/-/-	90/30/30	90/60/30
Internal Walls	Common and fire walls	90/90/90	90/90/90	90/90/90
	Fire - resisting lift shaft		90/90/90	90/90/90
	Fire - resisting stair shaft	60/60/60	90/90/90	90/90/90
	Bounding public corridors and similar	60/60/60	60/60/60	90/90/90
	Bounding or between sole-occupancy	60/60/60	60/60/60	90/90/90
	Bounding shafts			90/90/90
	Other loadbearing internal walls		60/-/-	90/-/-

GROUP 3 - CLASS 5, 7A OR 9 BUILDINGS				
CLASS 5 - Office building CLASS 7a - Carpark CLASS 9 - Public Building				
	NUMBER OF STORIES class 5 or 7a buildings	1 or 2	3	4 or more
	NUMBER OF STORIES class 9 buildings	1	2	3 or more
	TYPE OF CONSTRUCTION	C	B	A
External walls with a distance from fire source feature of:	Less than 1.5m	90/90/90	120/120/120	120/120/120
	1.5m to less than 3m	60/60/60	120/90/60	120/90/90
	3m or more	-/-/-	120/30/30	120/60/30
Internal Walls	Common and fire walls	90/90/90	120/120/120	120/120/120
	Fire - resisting lift shaft		120/120/120	120/120/120
	Fire - resisting stair shaft	60/60/60	120/120/120	120/120/120
	Bounding public corridors and similar	-/-/-	120/-/-	120/-/-
	Bounding or between sole-occupancy	-/-/-	120/-/-	120/-/-
	Bounding shafts			120/90/90
	Other loadbearing internal walls		120/-/-	120/-/-

Ritek® Wall Systems - **Fire Design**

Summary of Fire Resistance Level requirements for loadbearing walls

GROUP 4 - CLASS 6 BUILDINGS				
CLASS 6 - Shop or restaurant				
	NUMBER OF STORIES	1 or 2	3	4 or more
	TYPE OF CONSTRUCTION	C	B	A
External walls with a distance from fire source feature of:	Less than 1.5m	90/90/90	180/180/180	180/180/180
	1.5m to less than 3m	60/60/60	180/120/90	180/180/120
	3m or more	-/-/-	180/90/60	180/120/90
Internal Walls	Common and fire walls	90/90/90	180/180/180	180/180/180
	Fire - resisting lift shaft		180/120/120	180/120/120
	Fire - resisting stair shaft	60/60/60	180/120/120	180/120/120
	Bounding public corridors and similar	-/-/-	180/-/-	180/-/-
	Bounding or between sole-occupancy	-/-/-	180/-/-	180/-/-
	Bounding shafts			180/120/120
	Other loadbearing internal walls		180/-/-	180/-/-

GROUP 5 - CLASS 7B OR 8 BUILDINGS				
CLASS 7b - Wholesale warehouse CLASS 8 - Factory building				
	NUMBER OF STORIES	1 or 2	3	4 or more
	TYPE OF CONSTRUCTION	C	B	A
External walls with a distance from fire source feature of:	Less than 1.5m	90/90/90	240/240/240	240/240/240
	1.5m to less than 3m	60/60/60	240/180/120	240/240/180
	3m or more	-/-/-	240/90/60	240/180/90
Internal Walls	Common and fire walls	90/90/90	240/240/240	240/240/240
	Fire - resisting lift shaft		240/120/120	240/120/120
	Fire - resisting stair shaft	60/60/60	240/120/120	240/120/120
	Bounding public corridors and similar	-/-/-	240/-/-	240/-/-
	Bounding or between sole-occupancy	-/-/-	240/-/-	240/-/-
	Bounding shafts			240/120/120
	Other loadbearing internal walls		240/-/-	240/-/-

In addition to the FRL's, the BCA has a special requirement for electrical switches in specification C3.15 Clause 6: -

If an electrical switch, outlet, socket or the like is accommodated in an opening or recess in a wall, floor or ceiling -
(a) the opening or recess must not -
(i) be located opposite any point within 300mm horizontally or 600mm vertically of any opening or recess on the opposite side of the wall; or
(ii) extend beyond half the thickness of the wall; and
(b) the gap between the service and the wall, floor or ceiling must be fire-stopped in accordance with clause 7.

Ritek® Wall Systems - **Fire Design**

Compliance

A concrete wall meets the RFL requirements of the BCA if;

(A) A prototype has been submitted to the Standard Fire Test; or
(B) It is designed to achieve the FRL in accordance with AS3600

Prototype Test

A Ritek® 150XL wall was submitted to the Standard Fire Test and achieved a FRL of 240/240/240 at a height of 3.0m.

Design in Accordance with AS3600

AS3600 gives two alternative methods to establish the FRL for a concrete member;

(A) Determine from the tabulated data and figures given
(B) Predict by methods of calculation. Clause 5.3.1 of AS3600 nominates Eurocode 2, Part 1.2 as providing a method of calculation to predict the FRL's

FRL from Tabular Values

Clause 5.7.1 of AS3600 gives minimum wall thickness required to achieve the fire-resistance levels for insulation and integrity. Table 3.2 shows the AS3600 tabular values as well as the Ritek® wall type needed to achieve those thicknesses. **NOTE;** for loadbearing walls the minimum thickness required in the tabular value for structural adequacy is always greater than that required for insulation and integrity.

AS3600 - MINIMUM THICKNESSES FOR INSULATION AND INTEGRITY		TABLE 3.2
Fire-resistance period for insulation and integrity (minutes)	**Minimum wall thickness (mm)**	**Minimum Ritek® wall type**
60	80	115XL - 265XL
90	100	115XL - 265XL
120	120	135XL - 265XL
180	150	165XL - 265XL
240	175	200XL - 265XL

Clause 5.7.2 of AS3600 gives tabular values of minimum cover to reinforcement and the minimum wall thickness required to achieve the fire-resistance levels for structural adequacy, with an upper limit on the fire design load (expressed as a ratio to the structural load capacity). Table 3.3 shows the AS3600 tabular values, as well as the Ritek® wall type needed to achieve those values.

Clause 5.7.3 of AS3600 limits the maximum wall heights for walls requiring a FRL by limiting the ratio of the effective height to thickness not exceeding 40. However this is overridden by the requirement that this ratio not exceed 30 when the wall is designed as load bearing.

AS3600 - MINIMUM DIMENSIONS FOR STRUCTURAL ADEQUACY						TABLE 3.3
$\frac{\text{Design Load for Fire, } N_f^*}{\text{Design Axial Load Capacity, } \theta N_u} \leq 0.35$						
	Wall Exposed on One Side			Wall Exposed on Two Sides		
Fire Resistance Period for Structural Adequacy (minutes)	Minimum Thickness (mm)	Minimal Axial Distance * (mm)	Ritek® Wall Type	Minimum Thickness (mm)	Mimimum Axial Distance* (mm)	Ritek® Wall Type
60	110	10	135XL - 265XL	120	10	135XL - 265XL
90	120	20	135XL - 265XL	140	20	165XL - 265XL
120	150	25	165XL - 265XL	160	25	200XL - 265XL
180	180	40	200XL - 265XL	200	45	265XL
240	230	55	265XL	250	55	265XL

* Distance from surface of concrete to center of reinforcement

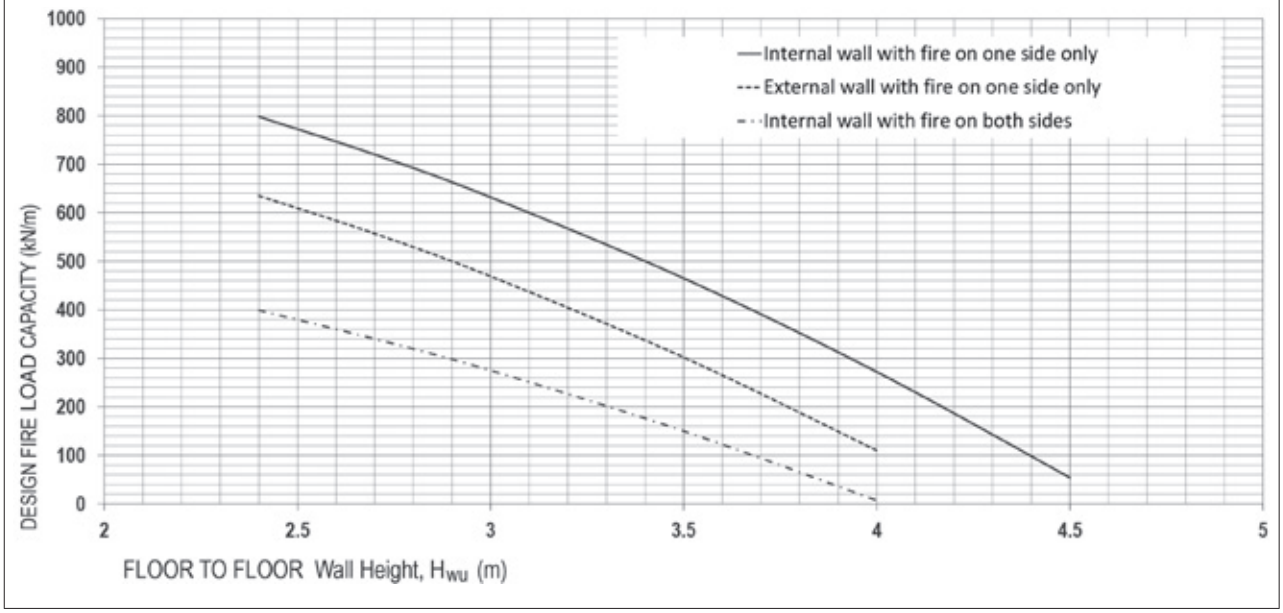
FRP by Method of Calculation

The FRP for integrity and insulation in Eurocode 2 - Part 1-2 are the same as tabulated in Table 3.2.

For FRL for structural Adequacy, Eurocode 2 - Part 1-2 provides two simplified methods of calculation, the one is the *"500°C isotherm method"* (outlined in Clause B.1) and the other is the *"Zone method"* (outlined in Clause B.2). Although more laborious, the Zone method provides a more accurate method and for this reason has been chosen to calculate the FRP's for Ritek® walls. Essentially this method involves reducing the section thickness by the amount of concrete that would be damaged by the fire (using graphs provided in the code) and then calculating the capacity of the reduced section taking into account the compressive strength reduction due to heating (again using graphs provided in the code). From this the Load Capacity for a particular FRL can be calculated, dependant on wall thickness, wall height, restraint conditions and concrete strength. The minimum wall thickness is limited only by the load capacity.

Typical load capacities, obtained by calculation using this method, are shown in Charts 3.13 for the case of 150XL walls that require 90 minutes Fire Resistance. Charts for other walls and fire levels are available on request from James Hardie Systems.

TYPICAL LOAD CAPACITIES BY CALCULATION METHOD - 32 MPa
RITEK® 150XL - FRL 90 MINUTES FIRE RESISTANCE **CHART 3.13**



Ritek® Wall Systems - **Fire Design**

Recesses & Chases

The inclusion of recesses and chases in a wall for services can affect the walls ability to satisfy the required performance. However depending on their size and position in the wall, the effect of recesses and chases may not be significant and can be ignored. AS 3600 set out the conditions upon which the effect of recesses and chases are to be ignored. The following are the conditions from AS 3600: -

RECESSES & CHASES CONDITIONS (*EXTRACT FROM AS 3600*)

5.7.4.1 RECESSES FOR SERVICES IN WALLS

The effect of recesses for services, on the fire-resistance periods for structural adequacy, integrity and insulation of a wall, shall be ignored if the thickness of wall remaining under the bottom of the recess is not less than half the wall thickness and the total recessed area, within any 5 m^2 of wall face, is not more than 10 000 mm^2 on one or both faces of the wall. If the above limits are exceeded, the wall thickness (*t*) used to determine fire-resistance periods shall be taken as the overall thickness less the depth of the deepest recess.

CHASES

General

In concrete members subject to fire, chases shall be kept to a minimum. The effect of chases on the fire-resistance periods of walls shall be taken into account in accordance with the provisions of Clauses 5.7.4.2 and 5.7.4.3. The effects of chases in other members shall be taken into account using rational methods of analysis.

5.7.4.2 Effect of chases on structural adequacy of walls

The effect of chases, on the fire-resistance period for structural adequacy of walls, shall be taken into account as follows:

(a) For walls spanning one way, where —

(i) the chase direction is parallel to the span direction — ignored;

(ii) the chase direction is perpendicular to the span direction and of length not greater than four times the wall thickness
or 0.4 times the overall length of the wall, whichever is greater — ignored; or

(iii) the chase is perpendicular to the span direction and of length greater than four times the wall thickness or 0.4 times the overall length of the wall—accounted for by using a slenderness ratio for the wall based on the reduced wall thickness.

(b) For walls spanning two ways (panel action), where —

(i) there is either a vertical chase with a length not greater than half the wall height *(H)*, or a horizontal chase with a length not greater than half the wall length *(L)*— ignored;

(ii) the length of a vertical chase is greater than half the wall height *(H)*, or the length of a horizontal chase is greater than half the wall length *(L)*—accounted for by using a slenderness ratio for the wall based on the reduced wall thickness,
or the chase may be regarded as an unsupported edge and the panel designed as two sub-panels.

5.7.4.3 Effect of chases on integrity and insulation of walls

The effect of chases, on the fire-resistance periods for integrity and insulation of walls, shall be taken into account as follows:

(a) Where —

(i) the depth of the chase is not greater than 30mm;

(ii) the cross-sectional area of the chase, on a plane perpendicular to the plane of the wall face and at right angles to the centre-line of the chase, is not greater than 1000mm^2; and

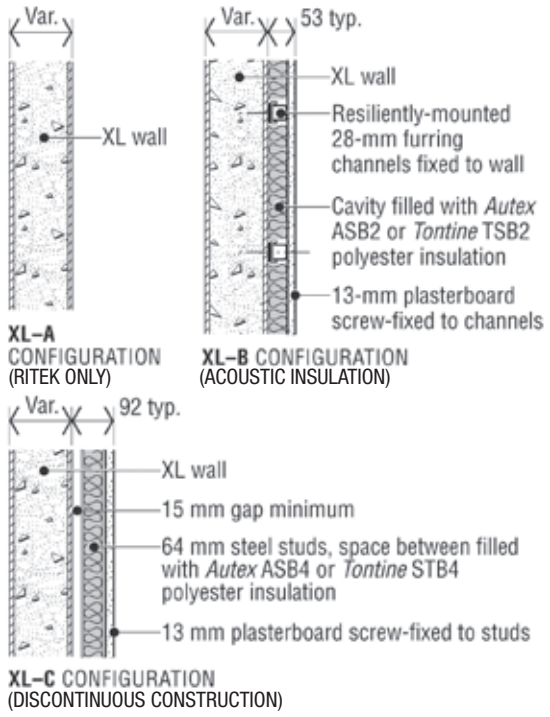
(iii) the total face area of chases within any 5m^2 of wall face is not greater than 100,000mm^2 on one or both wall faces,
the effect shall be ignored.

Ritek® Wall Systems - **Acoustic Performance**

XL Wall System Using Insulation Cladding

Ritek® Wall Systems use three configurations to satisfy BCA acoustic requirements, Figure 3.4. The acoustic performance of these wall configurations is given in Table 3.4. The compliance of these wall configurations to satisfy the requirements for Class 2 and 3 buildings is given in Table 3.5.

RITEK® WALL CONFIGURATIONS FIGURE 3.4



ACOUSTIC PERFORMANCE OF RITEK® WALL CONFIGURATIONS[1] TABLE 3.4

Ritek® XL Wall® System configuration	Value of R_w		Value of $D_{nt,w} + C_{tr}$
115XL-A	47	NT	-
135XL-A	51	NT	-
150XL-A	53	NT	45 - 47
165XL-A	54	NT	46 - 48
200XL-A	56	NT	46 - 50
265XL-A	59	NT	50 - 54
115XL-B	56	NT	45 - 47
135XL-B	58	NT	46 - 48
150XL-B	59	NT	47 - 49
165XL-B	60	NT	47 - 50
200XL-B	62	NT	48 - 52
265XL-B	70	NT	56 - 60
115XL-C	60	NT	46 - 50
135XL-C	62	NT	48 - 52
150XL-C	64	NT	50 - 54
165XL-C	64	NT	50 - 54
200XL-C	66	NT	50 - 55
265XL-C	75	NT	63 - 67

[1] PKA Acoustic Consulting Assessment Number PKA-A038
Whilst the laboratory measurements may be of the order predicted above, normal heavy apartment construction will rarely exceed Rw60

The BCA requires particular walls in various Classes of building to have a minimum acoustic insulation to avoid the airborn transmission of sound through walls. This is expressed either as a minimum R_w value or $R_w + C_{tr}$ value. The BCA also allows insitu verification using a $D_{nt,w}$ value or $D_{nt,w} + C_{tr}$ value. In addition, certain walls are required to have an impact sound isolation rating. Figure 3.5 summarises these requirements for Class 2 and 3 buildings, refer BCA for details.

Acoustic Requirements

There are two methods to comply with the NCC/BCA deemed to satisfy for acoustic performance:

Laboratory testing $R_w + C_{tr}$ and field verification $D_{nt,w} + C_{tr}$ When the Ritek® system was developed, the laboratory test option was not possible, therefore Ritek invested in the field verification method.

Laboratory tested terms:
R_w = Weighted sound reduction index
C_{tr} = Spectrum adaptation term

Field verification terms:
$D_{nt,w}$ = Weighted standardised level difference
C_{tr} = Spectrum adaptation term

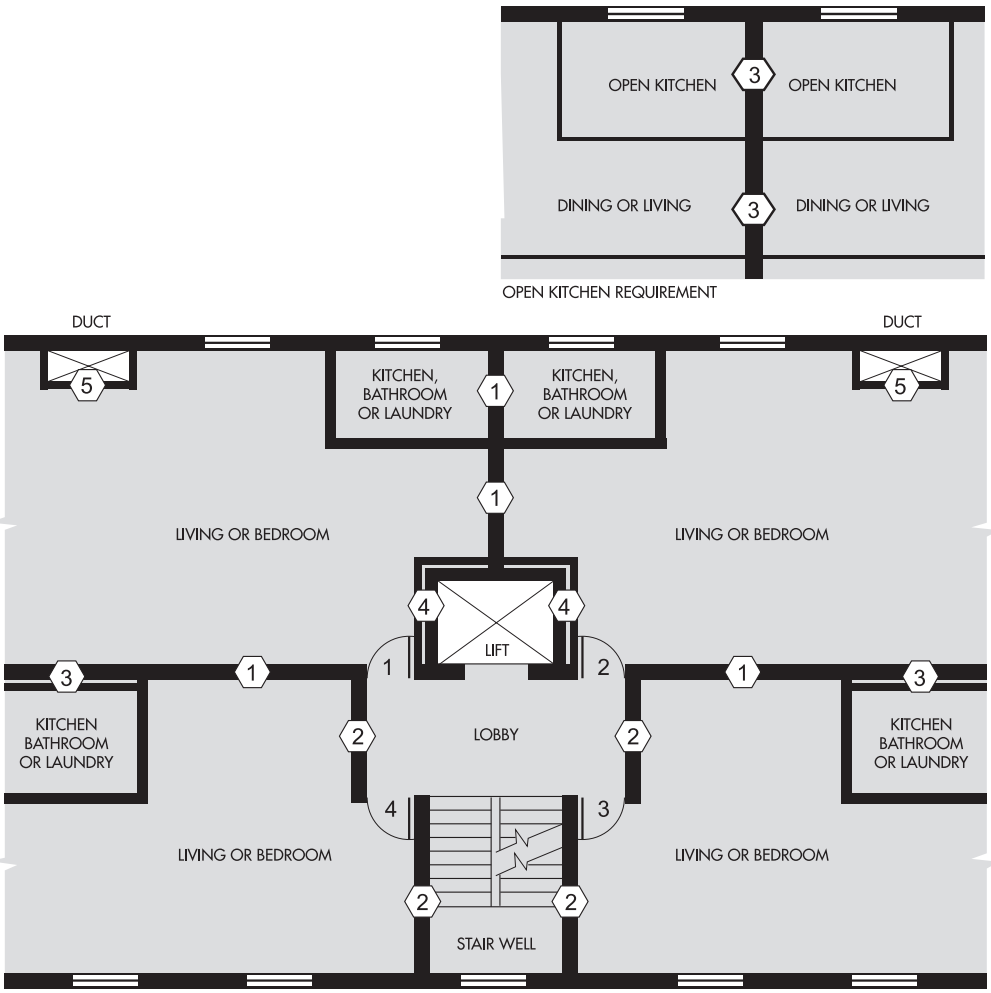
Ritek can refer to the laboratory ratings for the weighted sound reduction R_w ratings, but only use the field verification ratings when the spectrum adaptation value is required ($D_{nt,w} + C_{tr}$). So when the specified rating is $R_w + C_{tr}$ we need to refer to $D_{nt,w} + C_{tr}$

To complicate matters a little further, field verification ratings ($D_{nt,w}$) are shown as lower figures, typically less 5, therefore $D_{nt,w} + C_{tr}$ 45 is the same as $R_w + C_{tr}$ 50. Note that this does not mean the wall performance is less.

As most acoustic performance values are being specified as the laboratory test values (e.g. $R_w + C_{tr}$ 50) we need to always compare this to the field verification ratings (Ritek certified ratings) to meet the deemed to satisfy requirements of the BCA.

Ritek® Wall Systems - **Acoustic Performance**

ACOUSTIC PERFORMANCE **FIGURE 3.5**



TYPICAL COMPLIANCE OF RITEK® WALL CONFIGURATIONS FOR CLASS 2 AND 3 BUILDINGS **TABLE 3.5**

Compliance with BCA - 2016 for walls shown in Figure 3.5

	Wall 1		Wall 2		Wall 3		Wall 4		Wall 5	
Ritek® XL Wall® con-	**NT**	**Other States**	**NT**	**Other States**	**NT**	**Other States**	**NT**	**Other States**	**NT**	**Other States**
115XL-A	✓	-	✓	-	-	-	-	-	✓	✓
135XL-A	✓	-	✓	✓	-	-	-	-	✓	✓
150XL-A	✓	✓	✓	✓	-	-	-	-	✓	✓
165XL-A	✓	✓	✓	✓	-	-	-	-	✓	✓
200XL-A	✓	✓	✓	✓	-	-	-	-	✓	✓
265XL-A	✓	✓	✓	✓	-	-	-	-	✓	✓
115XL-B	✓	✓	✓	✓	✓	-	✓	-	✓	✓
135XL-B	✓	✓	✓	✓	✓	-	✓	-	✓	✓
150XL-B	✓	✓	✓	✓	✓	-	✓	-	✓	✓
165XL-B	✓	✓	✓	✓	✓	-	✓	-	✓	✓
200XL-B	✓	✓	✓	✓	✓	-	✓	-	✓	✓
265XL-B	✓	✓	✓	✓	✓	-	✓	-	✓	✓
115XL-C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
135XL-C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
150XL-C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
165XL-C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
200XL-C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
265XL-C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

φ ✓ = Complies

Always refer to local state building regulations and current safety requirements. Please Note: Diagrams not to scale. Version 2015.01

Ritek® Wall Systems - **Thermal Performance**

There are two insulation options for the Ritek® Wall System:
Insulation can be applied post erection to XL Wall Panels, or insulation can be integrated into XL Thermal Wall Panels during manufacture.

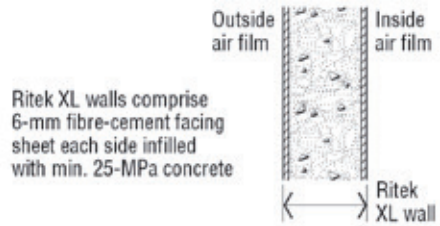
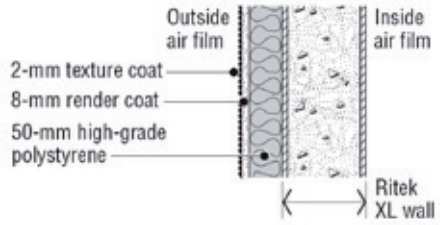
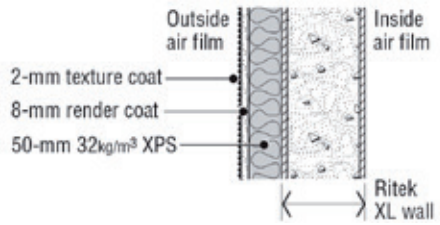
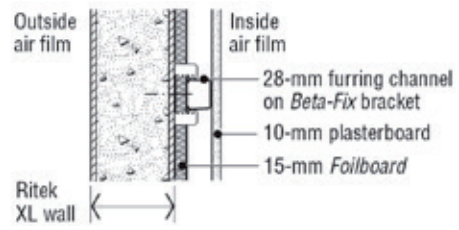
XL Wall System Using Insulation Cladding

The thermal performance of a building envelope depends on interrelation of the thermal mass and insulation values of its components relative to the influence of local climate.

The BCA sets out regulations for energy efficient designs. One approach of the BCA is to nominate a total R-value for individual building elements (walls, roof, etc) based on a range of climatic characteristics. The total R-value of composite construction is the sum of the R-values of the individual components, including the air space and associated surface resistance. Some states have adopted alternative measures.

Ritek® XL Wall® System can be combined with a variety of insulation materials to produce a large range of R-values to satisfy energy-efficiency requirements. See Table 3.6 for thermal performance of some typical Ritek® XL Wall® System configurations using insulation cladding. It should be noted that having the thermal mass on the inside of the insulation (ie, the Ritek® XL Wall® on the inside rather than the outside) produces better thermal efficiency, even with the same R-value.

THERMAL PERFORMANCE OF RITEK® XL WALL® SYSTEM USING INSULATION CLADDING (XL) TABLE 3.6

Ritek® XL Wall® configuration	Ritek® XL Wall® type	Total wall thickness (mm)	Total R-value[1]	
			Winter	Summer
1 	115XL	115	0.28	0.28
	135XL	135	0.29	0.29
	150XL	150	0.30	0.30
	165XL	165	0.31	0.31
	200XL	200	0.34	0.34
	265XL	265	0.38	0.38
2 	115XL	175	1.70	1.62
	135XL	195	1.71	1.63
	150XL	210	1.72	1.64
	165XL	225	1.73	1.65
	200XL	260	1.76	1.67
	265XL	320	1.80	1.71
3 	115XL	175	2.16	2.05
	135XL	195	2.18	2.07
	150XL	210	2.19	2.08
	165XL	225	2.20	2.09
	200XL	260	2.22	2.11
	265XL	320	2.27	2.16
4 	115XL	168	1.60	1.44
	135XL	188	1.62	1.45
	150XL	203	1.63	1.46
	165XL	218	1.64	1.48
	200XL	253	1.66	1.50
	265XL	318	1.71	1.54

[1] Source: Configurations 1 to 3 - James M Fricker Pty Ltd, Report 128E Configuration 4 - Solartex Insulation Systems

Ritek® Wall Systems - **Thermal Performance**

XL Thermal Wall System (Integrated Insulation)

The Ritek XL Thermal Wall® System is a pre-fabricated wall panel system that is manufactured specifically to the architect's drawings and is delivered complete with a high performance thermal insulation layer bonded to the inside of the panel. This ensures that what is delivered to site is exactly what is required for the job and not more or less.

The Ritek XL Thermal Wall® System technology creatively reduces construction costs when compared to conventional building methods. The wall system offers superior finish, high strength and durability and is low in maintenance.

The built in thermal insulation layer provides a cost effective solution to meet the energy efficiency requirements of today's sustainable and eco-friendly building requirements.

RITEK XL THERMAL WALL® SYSTEM – PROPERTIES (XL-T) **TABLE 3.7**

XL Thermal Wall Panel Thickness	Concrete Core	Surface Density (Core Filled)	Panel Components	Internal Finish	External Finish	Typical Panel Weight
135mm to 265mm	95mm to 225mm	> 220 kg/m^2	6mm Fibre Cement bonded to a Composite Stud with High Density	Set joints and apply a standard paint finish to (Level 4)	Set joints and apply a standard texture coating system finish	22 kg/m^2 to 28 kg/m^2

Note: For all fire, thermal and acoustic ratings – please refer to Ritek® XL Wall® System Design, Detailing & Installation Guide

RITEK XL THERMAL WALL® SYSTEM – PANEL SELECTION (XL-T) **TABLE 3.8**

	HOUSES	AS 3600 FIRE RESISTANCE PERIOD (FRP)				
FIRE RATING	60/60/60	30	60	90	120	180
Minimum Concrete Core(mm)	(90)	(100)	(110)	(120)	(150)	(180)

R VALUE	Insulation Thickness		WALL PANEL SELECTION (XL-T)				
1.5	28	135XLT-R1.5	150XLT-R1.5	150XLT-R1.5	165XLT-R1.5	200XLT-R1.5	265XLT-R1.5
2	38	150XLT-R2.0	150XLT-R2.0	165XLT-R2.0	200XLT-R2.0	200XLT-R2.0	265XLT-R2.0
2.5	50	165XLT-R2.5	200XLT-R2.5	200XLT-R2.5	200XLT-R2.5	265XLT-R2.5	265XLT-R2.5
2.8	56	165XLT-R2.8	200XLT-R2.8	200XLT-R2.8	200XLT-R2.8	265XLT-R2.8	265XLT-R2.8
3.2	66	200XLT-R3.2	200XLT-R3.2	200XLT-R3.2	200XLT-R3.2	265XLT-R3.2	265XLT-R3.2
4.1	86	200XLT-R4.1	200XLT-R4.1	200XLT-R4.1	200XLT-R4.1	265XLT-R4.1	n/a
4.8	100	265XLT-R4.8	265XLT-R4.8	265XLT-R4.8	200XLT-R4.8	265XLT-R4.8	n/a
6.2**	132	265XLT-R6.2	265XLT-R6.2	265XLT-R6.2	200XLT-R6.2	n/a	n/a
6.6**	142	265XLT-R6.6	265XLT-R6.6	265XLT-R6.6	n/a	n/a	n/a
7.5**	162	265XLT-R7.5	n/a	n/a	n/a	n/a	n/a

** Special order - consult with Ritek before specifying/ordering.

Suitable for use in single residential, multi-storey residential and commercial buildings as load bearing/ structural walls up to 25 storeys or higher in non-load bearing applications. Panels can be configured to include additional materials to increase thermal and acoustic properties.

Refer to the Ritek® XL Wall® System Design, Detailing & Installation Guide for further information. R-Values shown indicate heat flow out in accordance with AS/NZS 4859.1.

Ritek® Wall Systems - **Reinforcement Detailing**

Panel Reinforcement

For walls not subject to racking (shear) forces, N12 starter bars should be provided at the ends of walls, the side of openings and at not more than 2.0 m spacing along the wall.

For walls subject to racking (shear) forces, starter bars of the same size and spacing as the vertical reinforcement should be provided.

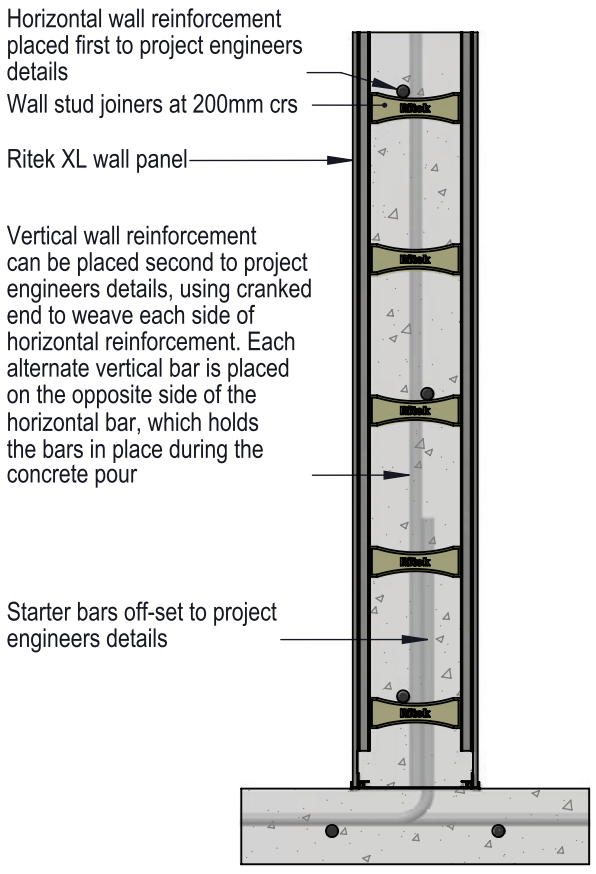
Starter bars may be either cast in the slab or added later by drilling the slab and chem-setting the starter bars in place. The starter bars should be off-set to avoid interferring with the placing of the main wall reinforcement.

All walls are to have a single layer of reinforcement, however if required, the 200XL & 265XL wall may have two layers of reinforcement.

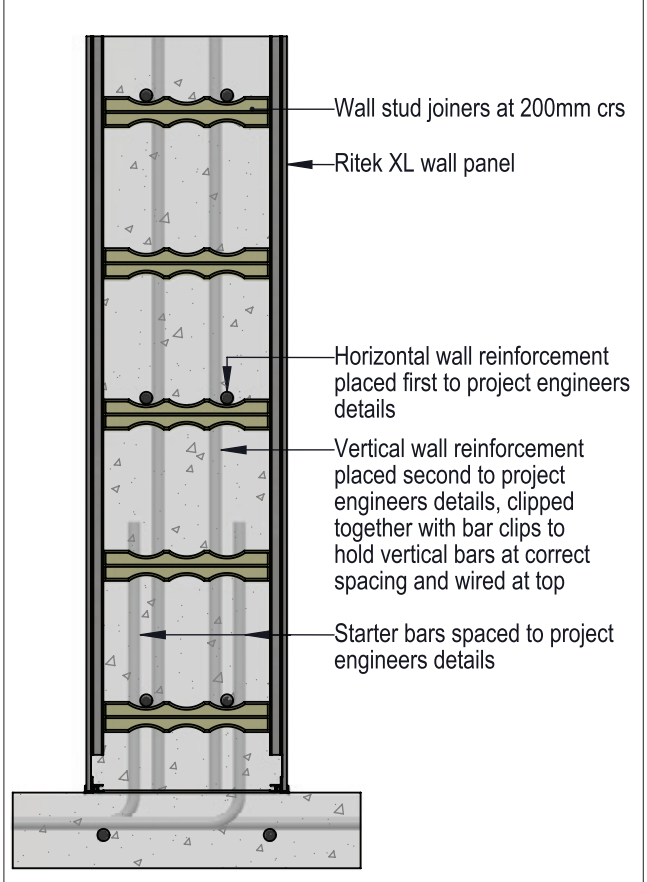
For single-layer reinforcement, the horizontal bars are placed first by sliding from an end or corner on the plastic stud joiners (which are at 200 mm centres).The vertical bars, assisted by a slight crank on the end, are threaded from the top such that they weave in and out of the horizontal reinforcement, as shown in Figure 3.6. Each alternate vertical bar is placed on the opposite side of the horizontal bar to form a 'basket-weave' when possible, which holds the bars in place during concreting.

In the case of two-layer reinforcement, the horizontal bars are again placed first, sitting on the outer indents of the stud joiner, Figure 3.7.

SINGLE LAYER REINFORCEMENT FIGURE 3.6



DOUBLE LAYER REINFORCEMENT FIGURE 3.7

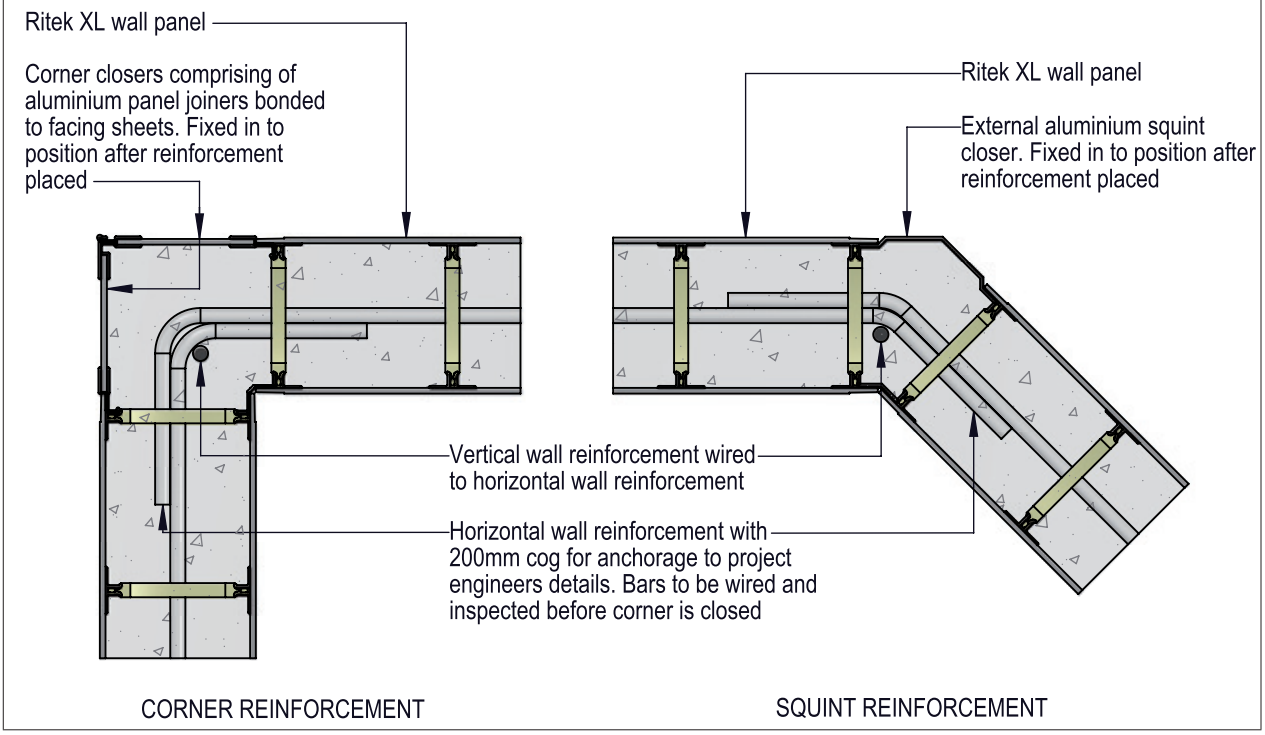


Ritek® Wall Systems - **Reinforcement Detailing**

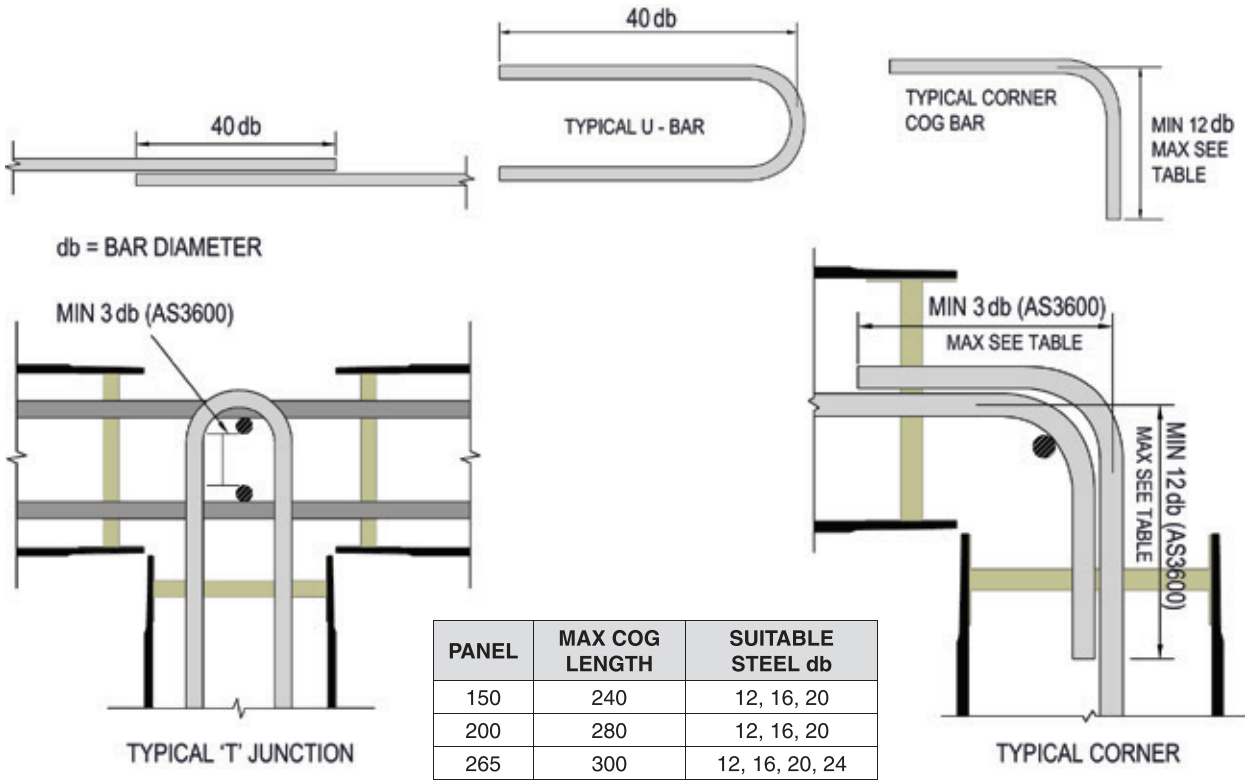
Corners & Squints

Comers are left open until the horizontal reinforcement is placed. This also allows the bars to be wired and inspected. Both bars are usually anchored with 200mm cogs to achieve the required anchorage lengths, as shown in Figure 3.8. Squints are treated the same as corners.

CORNERS & SQUINT REINFORCEMENT SECTIONAL PLAN **FIGURE 3.8**



TYPICAL 'T' JUNCTION & TYPICAL CORNER **FIGURE 3.9A**



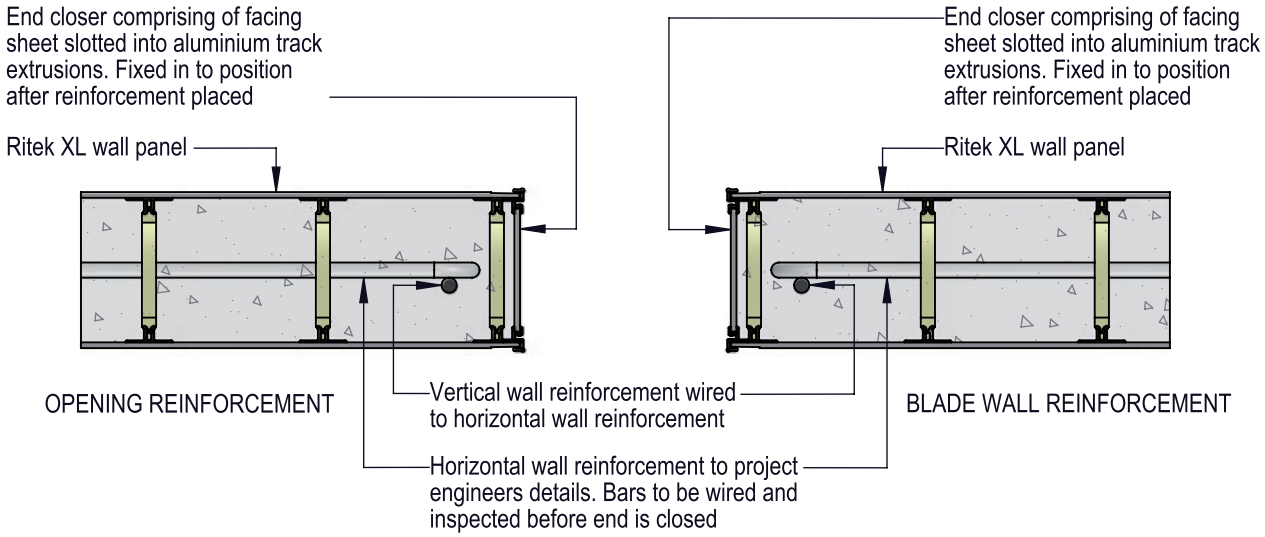
PANEL	MAX COG LENGTH	SUITABLE STEEL db
150	240	12, 16, 20
200	280	12, 16, 20
265	300	12, 16, 20, 24

Ritek® Wall Systems - **Reinforcement Detailing**

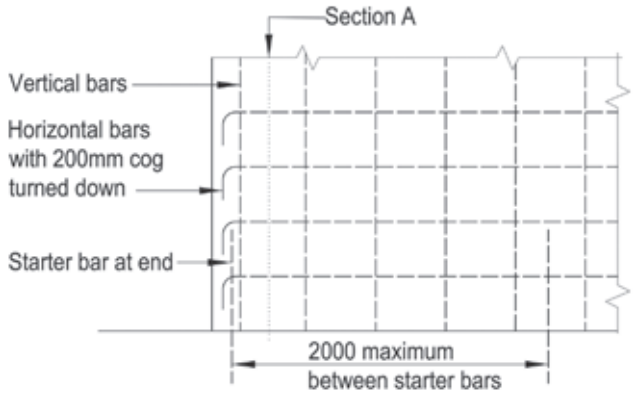
Blade Wall Ends & Wall Openings

Ends of blade walls usually require the horizontal bars to be turned down with a cog. If the wall is not a shear wall, a starter bar should be provided at the end and at not more than 2.0 m centres along the wall, as shown in Figure 3.10. For walls that are not shear walls, a starter bar should be located each side of the opening.

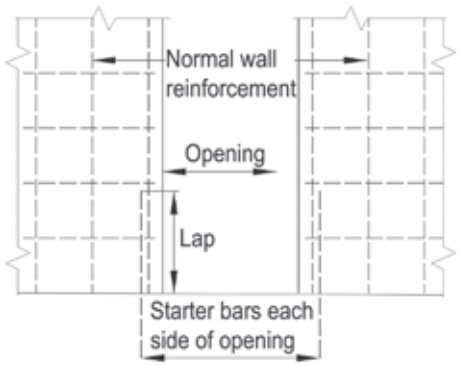
BLADE WALL ENDS & WALL OPENING REINFORCEMENT SECTIONAL PLAN **FIGURE 3.10**



BLADE WALL ELEVATION **FIGURE 3.11A**



WALL OPENING ELEVATION **FIGURE 3.11B**

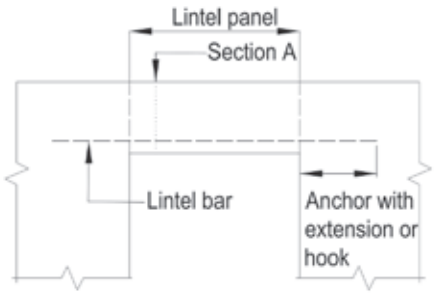


Lintels

Lintels are usually designed requiring only a single bottom bar. If the lintels are required to be designed as continuous, they will then require a top bar and stirrups.

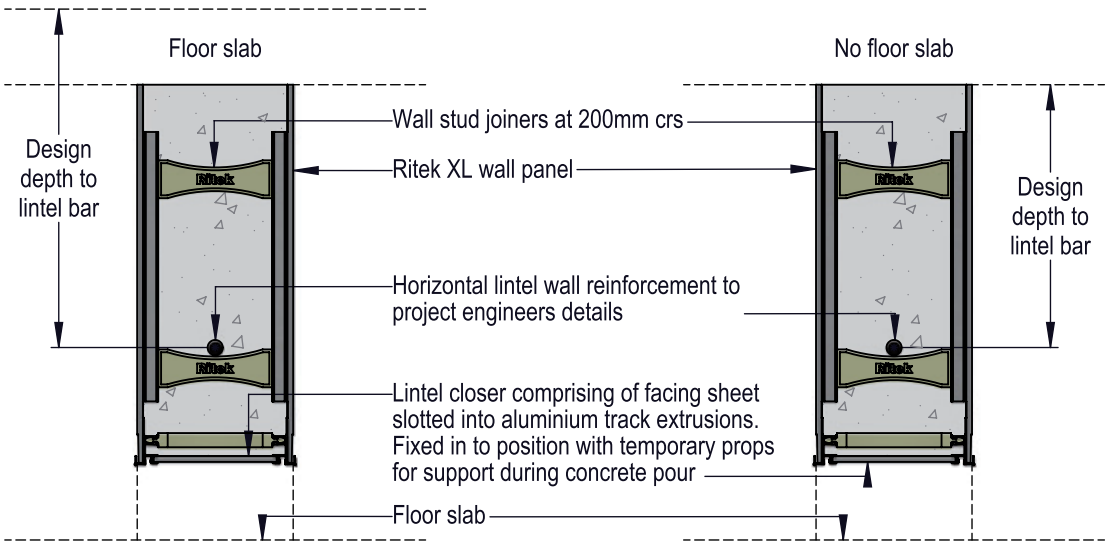
The relative wall to opening height will determine the position of the stud joiner, in turn the position of the lintel bar and consequently the design depth of the lintel. If the bar does not continue as horizontal reinforcement in the wall then it will need to be anchored.

LINTEL PANEL ELEVATION **FIGURE 3.12**



Ritek® Wall Systems - **Reinforcement Detailing**

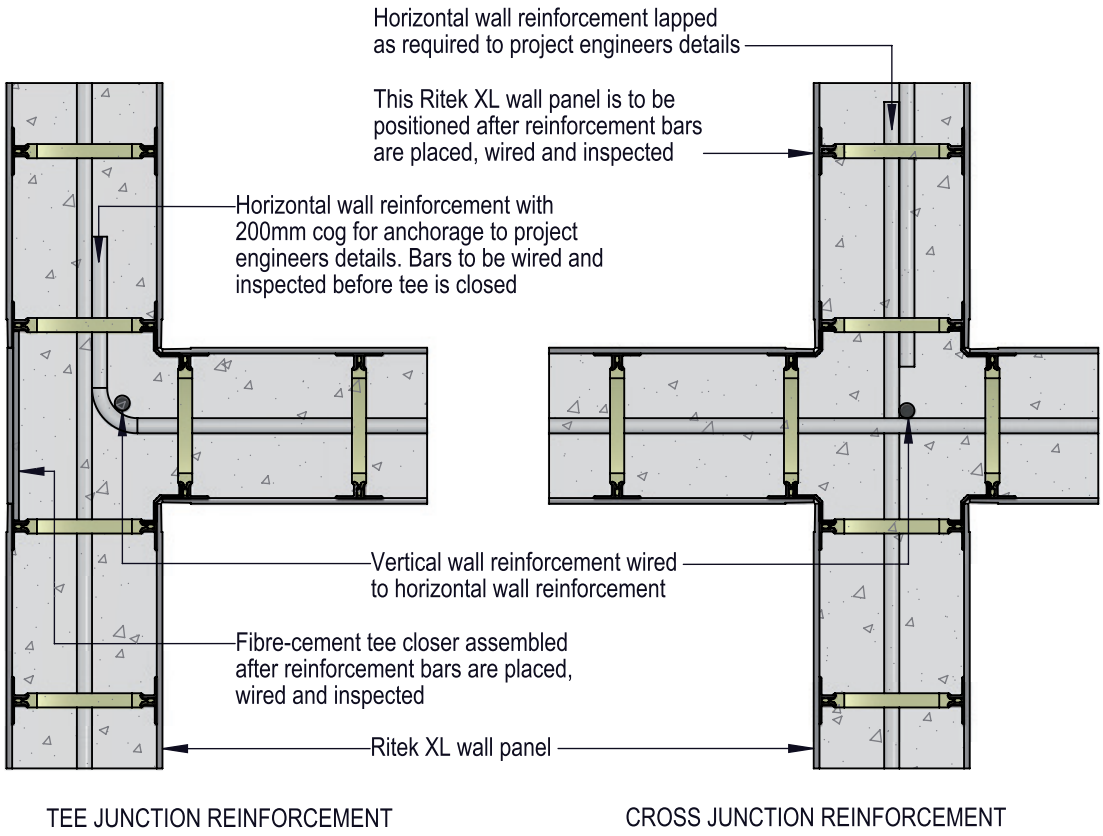
LINTEL REINFORCEMENT SECTIONAL ELEVATION **FIGURE 3.13**



Tee Junctions & Cross Junctions

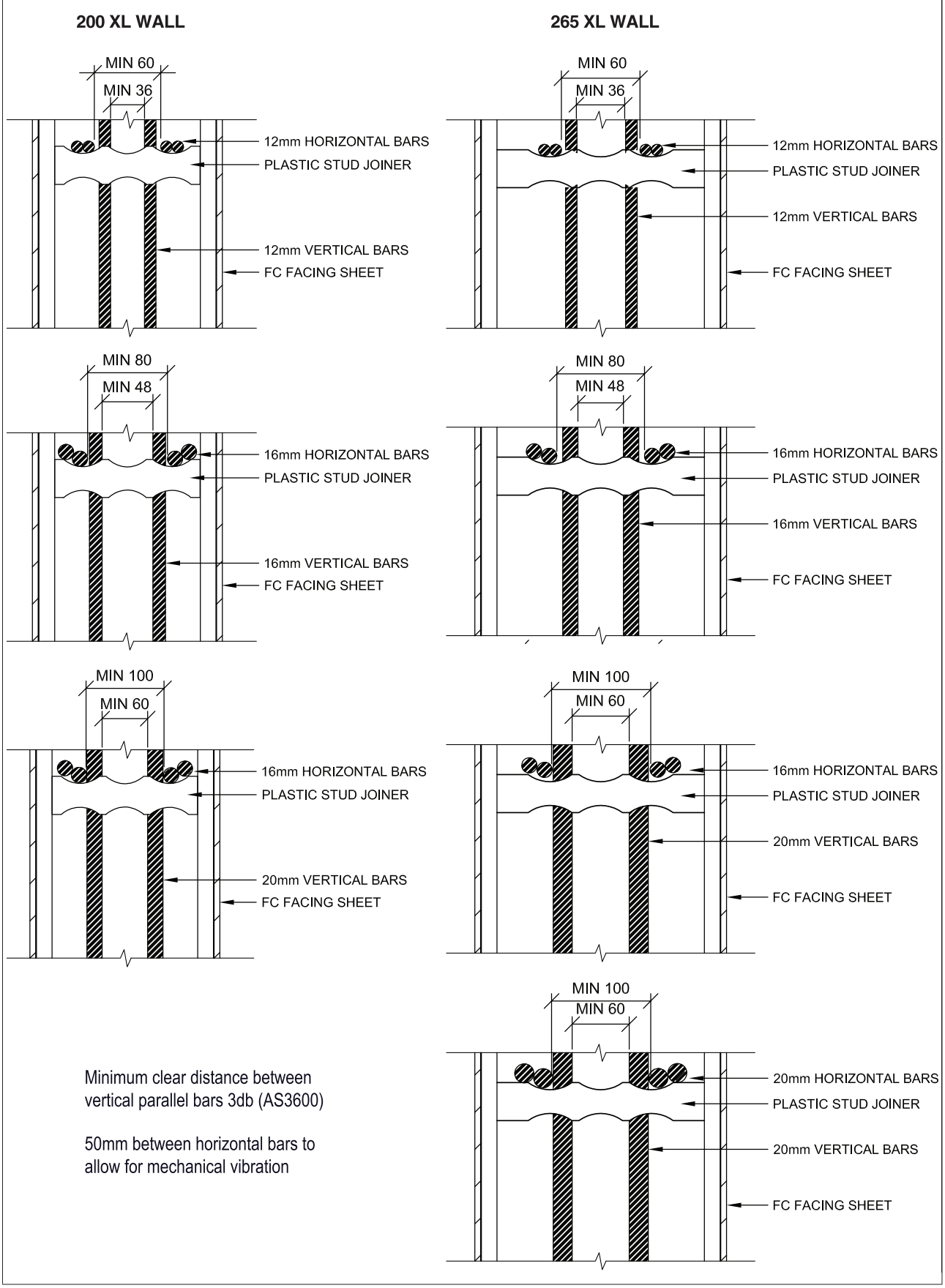
Tee junctions are usually designed with a 200mm cogged end in the horizontal bars within the leg of the tee. An extra vertical bar should be wired to the horizontal bars before the fibre-cement tee closer is put in place. Cross junctions should have an extra vertical bar wired to the horizontal bars before the junction is completed. If necessary, the horizontal bars can be lap-joined at this point, as shown in Figure 3.14.

TEE JUNCTIONS & CROSS JUNCTIONS REINFORCEMENT SECTIONAL PLAN **FIGURE 3.14**



Ritek® Wall Systems - **Reinforcement Detailing**

TYPICAL DOUBLE LAYER REINFORCEMENT DETAILS FOR 200 XL AND 265XL **FIGURE 3.9B**



Ritek® Wall Systems - **Services in Walls**

Plumbing

It is recommended that, where possible, plumbing be installed on the outside of the Ritek panel. The wall is then finished with standard battens and plasterboard, unless there are acoustic requirements, in which case it is finished with an attached insulated plasterboard lining or a discontinuous insulated wall, as appropriate. Refer to Figure 3.15.

If plumbing is to be installed within the Ritek panel then a number of options are available:

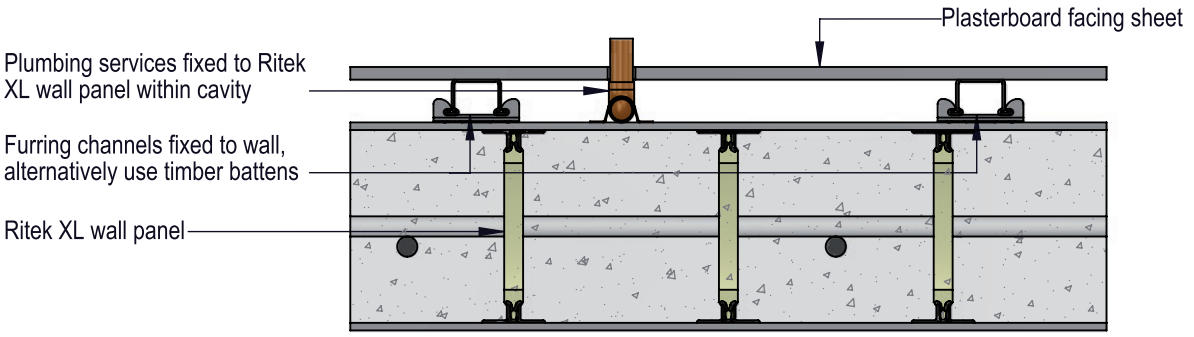
- Plumbing dropped into position from the top of the wall (preferred method);
- Plumbing placed in slab below the wall, or;
- Wall chased after concrete core filling.

Where plumbing is dropped into position from the top of the wall, cut out the panel face (ie sheeting) prior to core-filling, install the unit, then box-up in preparation for concrete core filling. It is recommended that pipework be tested prior to core-filling.

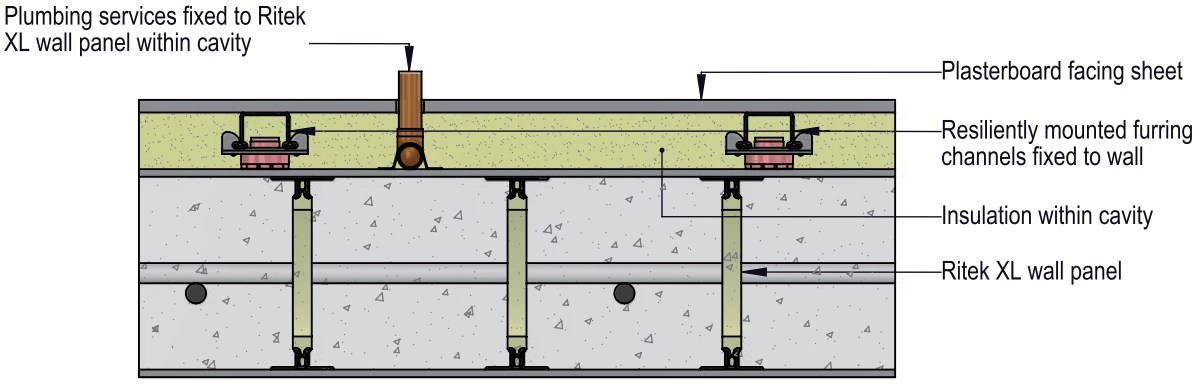
Where plumbing supply lines are under the slab, pipework can be run below the centre of the Ritek bottom plate assembly to the required location, with vertical pipes rising to the required height. The Ritek panel is then lifted over and the vertical pipe positioned within the appropriate void. Finally, cut out the panel face, install the unit, then box-up in preparation for concrete core filling. It is recommended that pipework be tested prior to core-filling.

The chased option should be carried out just after concrete core filling is finished, while the concrete is still green. Chase the wall, install the unit, then patch the wall as in a blockwork application.

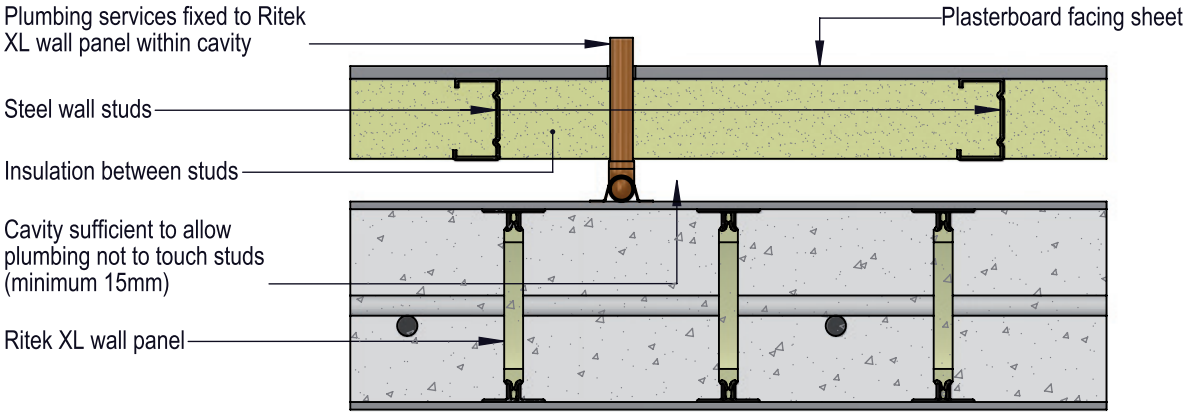
PLUMBING SERVICES SECTIONAL PLAN **FIGURE 3.15**



ATTACHED PLASTERBOARD LINING



ATTACHED INSULATED PLASTERBOARD LINING



Ritek® Wall Systems - **Services in Walls**

Electrical

Generally, two systems may be used; 1. Surface-mounting kits 2. Conventional electrical box in wall.

System 1

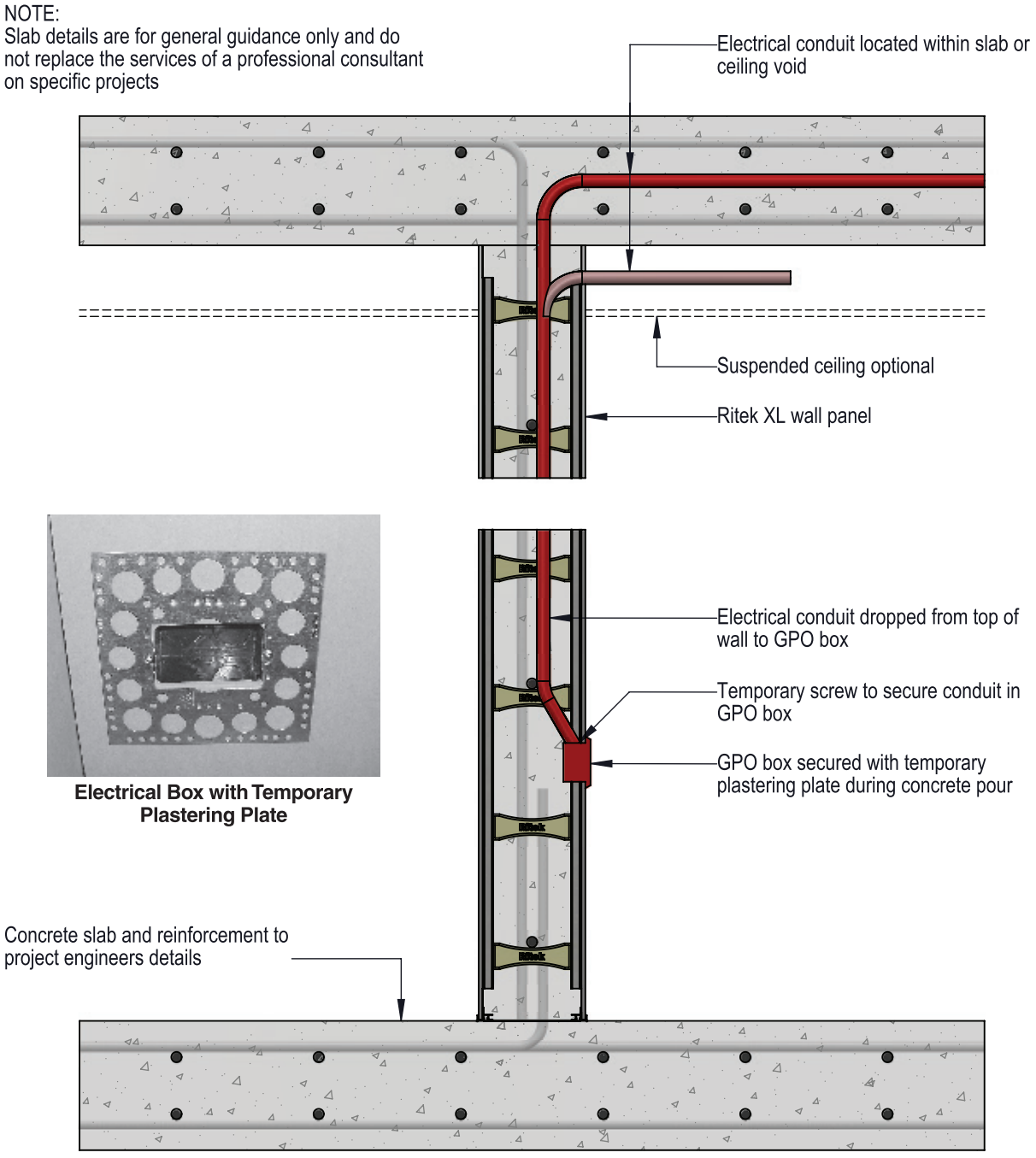
Mark locations and required heights of services on the Ritek panels and make a hole in panel ready to receive the conduit. Place a 90° bend in the conduit then drop down within the wall from above and secure with a screw ready for concrete core-filling.

System 2

Mark locations and required heights of services on the Ritek panels. Trace around the box and cut the panel using a diamond blade. Attach temporary plastering plate to the box, push the box into the cut hole and screw plaster plate to fibre-cement sheet. Feed conduit from the top of the Ritek panel into box and secure box using the nailing plate as in timber framing. See Figure 3.16 below.

If a Ritek® Wall System is used to satisfy acoustic requirements, GPO boxes on opposite sides of the wall must be off-set so there is 200 mm of concrete between them and they must each have separate conduits.

ELECTRICAL SERVICES SECTIONAL ELEVATION **FIGURE 3.16**



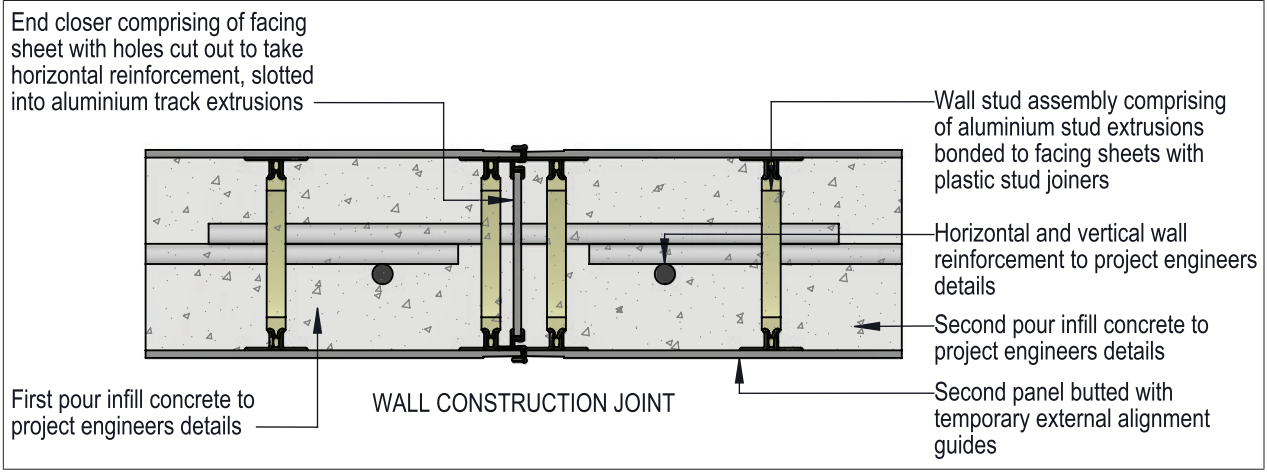
Electrical Box with Temporary Plastering Plate

Ritek® Wall Systems - **XL Wall Movement Joints**

Wall Construction Joints

These may be planned or unplanned but should follow the typical details shown in Figure 3.18

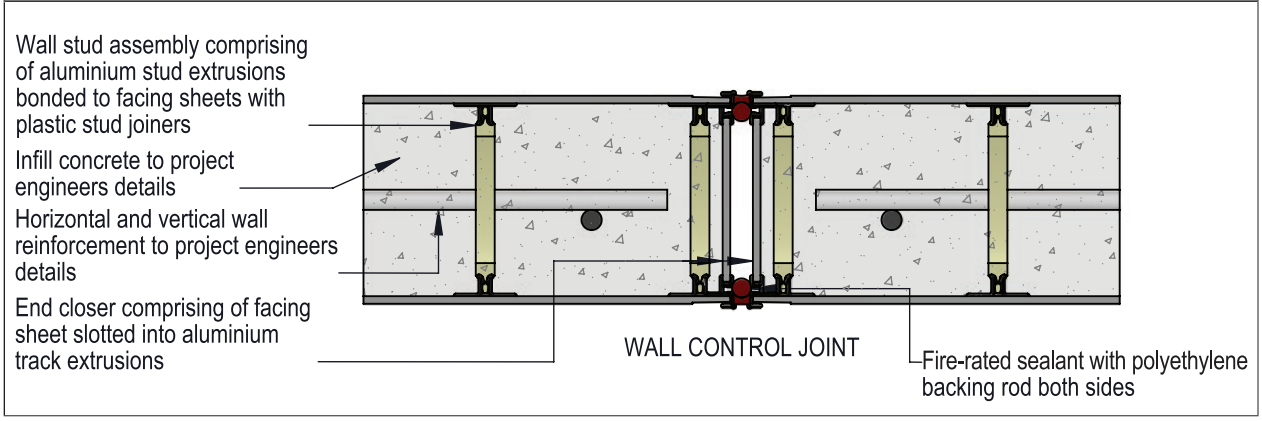
WALL CONSTRUCTION JOINTS (XL) SECTIONAL PLAN **FIGURE 3.18**



Wall Control Joints

The engineer will nominate locations for control joints. A control joint consists of two end-sections of wall panel butted together with a 12mm gap. The gap should be detailed with a proprietary fire-resistant material. Refer to engineers details for any additional requirements. See Figure 3.19 for typical details.

WALL CONTROL JOINTS (XL) SECTIONAL PLAN **FIGURE 3.19**

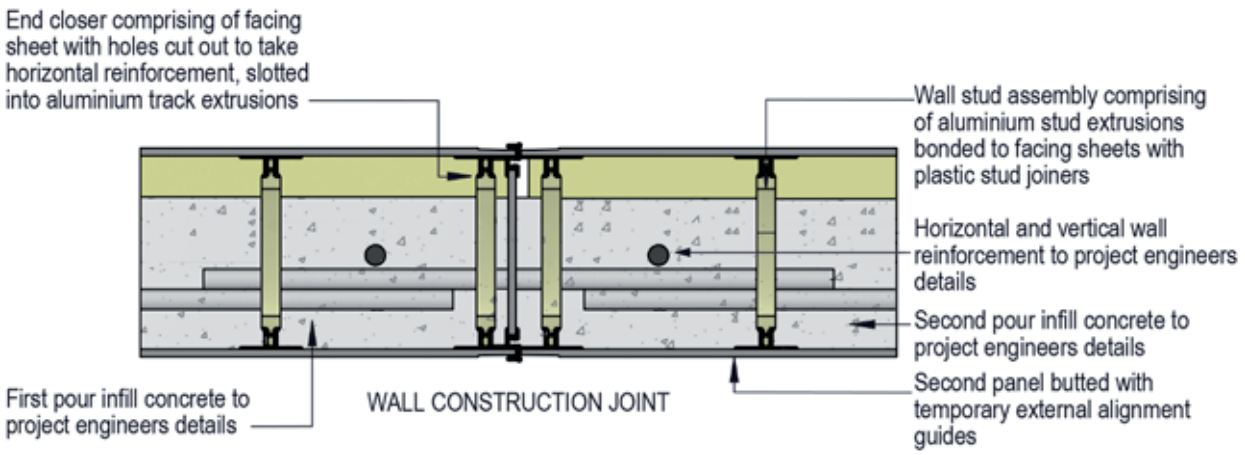


Ritek® Wall Systems - **XL Thermal Wall Movement Joints**

Wall Construction Joints

These may be planned or unplanned but should follow the typical details shown in Figure 3.21.

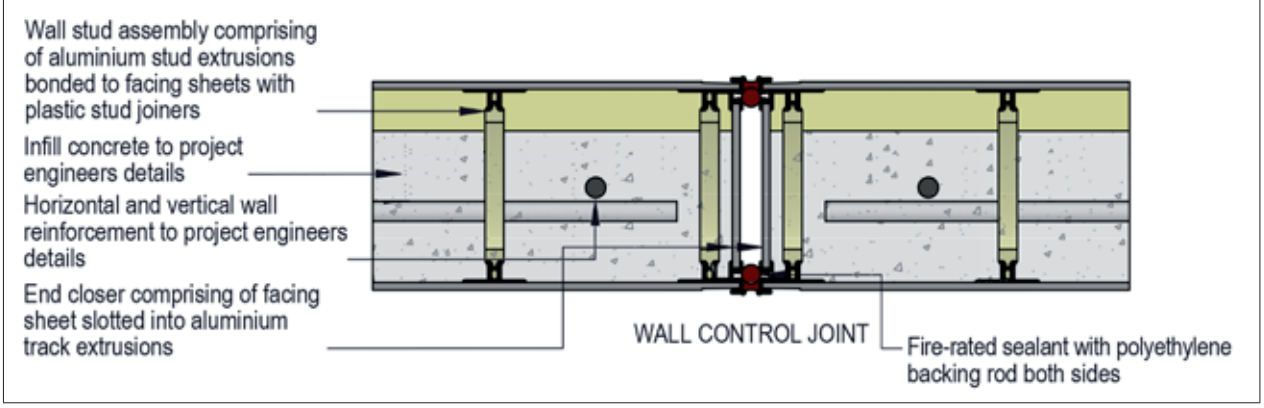
WALL CONSTRUCTION JOINTS (XL-T) SECTIONAL PLAN **FIGURE 3.21**



Wall Control Joints

The engineer will nominate locations for control joints. A control joint consists of two end-sections of wall panel butted together with a 12mm gap. The gap should be detailed with a proprietary fire-resistant material. Refer to engineers details for any additional requirements. See Figure 3.22 for typical details.

WALL CONTROL JOINTS (XL-T) SECTIONAL PLAN **FIGURE 3.22**



Ritek® Wall Systems - **Concrete Mix Specification**

Recommended guidelines for concrete mix and slump specification for the Ritek® XL Wall® and Ritek® XL Thermal Wall® Systems.

Typical Concrete Mix Specification (25 MPa to 60 MPa) Concrete shall be supplied in accordance with AS 1379:2007- Specification and Supply of Concrete.

The concrete supplier is responsible to provide a mix design in accordance with the Ritek® requirements for high flow characteristics, minimum water content, and a target slump at the pump as specified in the table below and aggregate size of 7mm to 10mm (max), using retarders and plasticisers to achieve the desired slump.

RITEK® CONCRETE MIX SPECIFICATION (DENSITY > 2200 KG / M³)					
Mix Description Ritek®	Ritek® 25/7/180	Ritek® 32/7/180	Ritek® 40/7/180	Ritek® 50/7/180	Ritek® 60/7/180
Strength f 'c (MPa)	25	32	40	50	60
Cement Type (AS 3972)	SL				
Course Aggregate Size (mm)	7 - 10				
Max. Water/Cementitious Ratio	0.50				
Slump ± 20 (mm)	180				
Concrete Admixtures	Yes				
Max. Supplementary Cement Content	20%				

Concrete Compressive Strength (f 'c)

The concrete compressive strength is specified by the design engineer. Common specified strengths for walls are shown.

Cement Type

Shrinkage Limited cement (SL) complying with AS 3972 should be used in the concrete mix to limit drying shrinkage.

Concrete Aggregate

The specified mix design includes coarse aggregate size of 7mm to 10mm (max) to ensure the correct concrete flow in the Ritek® panels is achieved.

Water to Cementitious Material Ratio (w/cm)

The specified mix designs maximum water-to-cementitious-materials ratio of 0.50 is intended to limit the amount of excess free water in the concrete mix which is known to increase concrete shrinkage during the curing process. The cementitious materials includes cement and supplementary cement content (fly ash) in the ratio limit calculation. No additional water is to be added to the supplied mix at the point of discharge.

Concrete Slump

Slump specification is to ensure the concrete mix completely fills the formwork up to the intended level during placement while it expels entrapped air and closely surrounds all fixings, reinforcement, tendons, ducts, anchorages and embedments.

Concrete Admixtures

The concrete supplier is responsible for the use of water-reducers, superplasticisers and slump keeper admixtures in the mix design to achieve the targeted slump value without the need for additional water on-site.

Supplementary Cement

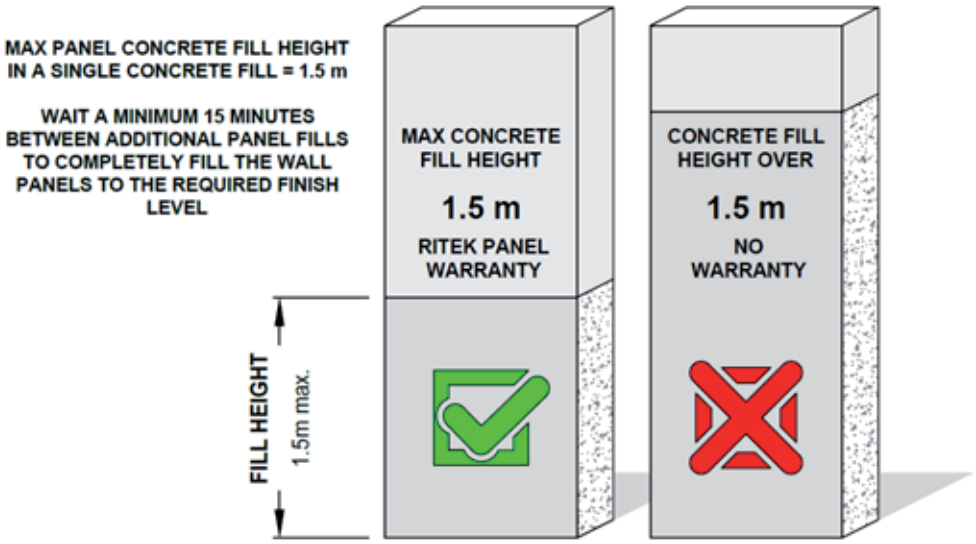
Fly ash may be used as a cement substitution up to a maximum limit of 20% in the concrete mix design. The use of slag cement and other pozzolans should be avoided as some have been shown to have adverse effects on early concrete strength gains and potential long term drying shrinkage.

Block Mix

A standard "Block-Mix" should not be used for core-filling of the Ritek® panels as the ratio of coarse aggregate to fines is typically low, and is not as capable in limiting crack development within the concrete structure.

Ritek® Wall Systems - **Concrete Mix Specification**

PANEL CONCRETE FILL HEIGHT SPECIFICATION



IF THE RITEK PANELS ARE SATURATED WET DUE TO HEAVY RAIN, PANEL FILL HEIGHT IS TO BE REDUCED TO 0.6M

Concrete Placement

Clause 17.1.3 of the Australian Standard AS 3600 Concrete Structures requires that "Concrete shall be handled, placed and compacted so as to completely fill the formwork to the intended level, expel entrapped air, and closely surround all reinforcement, tendons, ducts, anchorages, embedments and fixings.

Panels are to be filled progressively in layers up to 1500 mm high. Scaffold or formwork decks are required to place the concrete. When using higher strength concretes (40 MPa - 60 MPa), light wetting of the steel and inside face of the Ritek® panel may assist concrete flow between concrete pours during hot and dry site conditions.

Concrete Pump Equipment

Concrete is to be placed using a concrete boom pump or line pump. The boom pump or line pump delivers the concrete in a continuous stream. For maximum efficiency when pouring, schedule the concrete trucks approximately 30 minutes apart to provide continuous supply of concrete to the pump with minimal idle times. Ensure a 50 mm (2") or 75 mm (3") reducer is used and a flexible hose at the end.

Concrete Vibration

The design of the Ritek® XL and XL Thermal Wall® Systems and the flow characteristics of the Ritek® concrete mix specification allows the concrete to flow efficiently within the Ritek® panels and completely fill them without trapping pockets of air, and will closely surround all reinforcement, tendons, ducts, anchorages, embedments and fixings. Mechanical vibration, although not usually required, is permitted on Ritek® panels; however excessive use of vibration is likely to result in more damage to the panels than the benefits of increased compaction.

Use a 25 mm vibrating shaft (pencil vibrator). When mechanical vibration is required, the most effective method is by vibrating the concrete from the bottom to the top of the concrete as the panels are being filled. Vibrating the steel reinforcement bars positioned inside the Ritek® Panels can also be effective. Choose the appropriate method to best suit the actual site condition/panel configuration.

Concrete Fill Height

Ritek® XL Wall® panels have a maximum concrete fill height of 1.5 m (in a single fill) and are core filled in stages with a 15 minute rest time before the next fill. The Ritek® concrete mix specification allows the concrete within the panel to be easily levelled off to accommodate being filled in stages. Ensure rest time does not allow the concrete to set over upper reinforcement steel.

Ritek® Wall Systems - **Design Examples**

It is proposed to use a Ritek 150XL wall for the internal bearing walls in a multi-story Class 2 building. The wall is 3.1 m high, 4.0m long carrying a permanent load (PL) of 150 kN/m, an imposed Load (IL) of 100 kN/m and a racking force (assumed to be at top of wall) of 300 kN. The wall is to be filled with 32 MPa concrete and N12 @ 400 crs starter bars are to be used to match the vertical reinforcement in the wall.

Check the wall for vertical strength, racking strength and fire resistance. Load Factors (LF) are in accordance with AS1170.

Wall self-weight, SW= ÞHt
= 25 x 3.1 x 0.138
= 11 kN/m

Vertical Strength

Design load (at mid-height) = LF.PL + LF.SW + LF.IL
= 1.2 x 150 + 1.2 x 11/2 + 1.5 x 100
= 343 kN/m

Effective wall height- $H_{we} = 0.75H_{wu}$
= 0.75 x 3.1
= 2.325 m

Load eccentricity, Case (1) $e = 0.05\ t_w$
= 0.05 x 0.138
= 0.0069 m

Additional eccentricity- $e_a = \frac{H_{we}^2}{2500t_w}$
$= 2.325^2/(2500 \times 0.138)$
= 0.01567m

Design Capacity- $øN_u = ø(t_w - 1.2e - 2\ e_a)\ 0.6F'_c10^3$

$= 0.6\ (0.138 - 1.2 \times 0.0069 - 2 \times 0.0157)\ 0.6 \times 32 \times 10^3$
= 1133 kN/m

>Vertical Load of 343 kN/m Vertical strength OK

Alternatively, check capacity using load chart Case (1)

From chart $øN_u$ = 1130 kN/m OK

Racking Strength

Design racking force = 300 kN

Check Shear Capacity

H_w/L_w = 3.1/4.0 = 0.8 < 1.3

$$V_{uc} = \left[0.66\sqrt{f'_c} - 0.21\frac{H_w}{L_w}\sqrt{f'_c}\right] 0.8\, L_w t_w 10^3$$
$$= \left[0.66\sqrt{32} - 0.21 \times 0.78\sqrt{32}\right] 0.8 \times 4.0 \times 0.138 \times 10^3$$
$$= 1280 \text{ kN}$$

$$V_{us} = \frac{A_s}{s} f_{sy}(0.8L_w)10^{-3}$$
$$= 113/400 \times 500(0.8 \times 4.0)10^{-3}$$
$$= 452 \text{ kN}$$

Vu = ø(Vuc + Vus)
= 0.7(1280 + 452)
= 1210 kN

Check Overturning Resistance

Restoring Load- RL = LF.PL + LF.SW + LF.IL
= 0.9 x 150 + 0.9 x 11 + 0 x 100
= 145 kN/m

Anchored Reinforcement- $A_{st} = \frac{A_s}{s} \times \frac{L_w}{2} \times 10^{-3}$
= 113/400 x 4.0/2 x 10^{-3}
= 565 mm^2

Overturning Resistance-

$$\frac{ø\left[\left(f_{sy}A_{st}10^{-3} + RL.L_w\right)d\left(1 - \frac{0.6\left(f_{sy}A_{st}10^{-3} + RL.L_w\right)}{t_w d f'_c 10^3}\right) - RL.L_w\left(d - \frac{L_w}{2}\right)\right]}{H_w}$$

$$\frac{0.7\left[\left(500x565x10^{-3} + 145x4.0\right)3.0\left(1 - \frac{0.6\left(500x565x10^{-3} + 145\,x4.0\right)}{0.138x3.0x32x10^3}\right) - 145x4.0\left(3.0 - \frac{4.0}{2}\right)\right]}{3.1}$$

= 449 kN

Racking Resistance = the lesser of shear strength and overturning resistance
≤ 1210 and 449
= 449 kN
> 300 Design Load Racking OK

Check using CHART 4.1- Applied load = LF.PL = 0.9 x 150 = 135
Interpolating for a wall height of 3.1 m and applied load 135 kN,
Racking resistance = 440 kN > 300 OK

Ritek® Wall Systems - **Design Examples**

Fire Design

Design by calculation in accordance with Eurocode 2, Part 1-2: General rules – Structural fire design, ANNEX B.2 Zone method.

Wall being an internal loadbearing wall, it is required to have a FRL of 90/-/- (fire on both faces).

Insulation and integrity – no requirements for minimum thickness.

Structural Adequacy – check that the fire load capacity exceeds fire design load

Design load for fire = LF*PL + LP*SW + LF*IL
= 1.0*150 + 1.0*11/2 +0.4*100
= 196 kN/m

For fire on both sides; W = half wall thickness
= 138/2
= 69 mm

Find reduced concrete strength, using Figure B.5 (a);
For 90 minutes and W = 69 $k_c = 0.65$
Reduced concrete strength; $f'_{cf} = k_c f'_c$
= 0..65*32
= 20.8 MPa

Find reduced wall thickness, using Figure B.5 (c);
Damaged zone (90 minute fire); $a_z = 25$ mm (on both faces)
Reduced Design Thickness $t_{wf} = t_w - 2*a_z$
= 138 – 2* 25
= 88 mm

Load eccentricity (continuous floor slab); $e = 0.05\ T_{wf}$
= 0.05*88
= 4.4 mm

Additional eccentricity; $e_a = H^2_{ws} / (2500\ T_{wf})$
= (3100*0.75)^2/(2500*88)
= 24.6 mm

Fire Load Capacity; $\Phi N_{uf} = \Phi(t_{wf} - 1.2e\text{-}2e_a)0.6f'_{cf}10^3$
= 0.6(0.088 – 1.2*0.0044 – 2*0.0246)0.6*20.8*10^3
= 251 kN/m
> 196 Wall has satisfactory Structural Adequacy for FRL 90/-/-

Alternatively, check using CHART 6.1
From chart, Load Capacity = 250 kN/m OK

Ritek® Wall Systems - **Design Examples**

Aluminium Components

The Australian Standard AS3600 Concrete Structures requires that “Metals such as aluminium shall not be embedded in structural concrete unless effectively coated, covered, or treated to prevent chemical action between the metal and the concrete and electronic action between the metal and steel.”

All aluminium extrusions as part of Ritek® Wall Systems are adequately coated with chromate plating and sufficient to satisfy the requirements of the Standard.

Generally, for electrolytic action to take place the concrete needs to be continuously wet with aluminium in contact with the reinforcement. Electrolytic action is unlikely to occur as once the concrete has cured and the finished panels will remain dry. There is no contact between the extrusions and the reinforcement due to the design of the wall systems.

The Ritek® Wall Systems aluminium extrusions serve no purpose once the concrete is in place, even if the extrusions were to corrode completely away, this would have no detrimental effect on the structure.

The chromate plated aluminium extrusions that form part of the Ritek® Wall Systems can safely be used and embedded in concrete.

Ritek® Wall Systems - **Notes**

Ritek® Wall Systems - **Notes**

James Hardie Systems
www.jhsritek.com.au
1300 929 782

Design, Detailing & Installation Guide

Ritek® XL Wall® and XL Thermal Wall® Systems

Version 2015.01

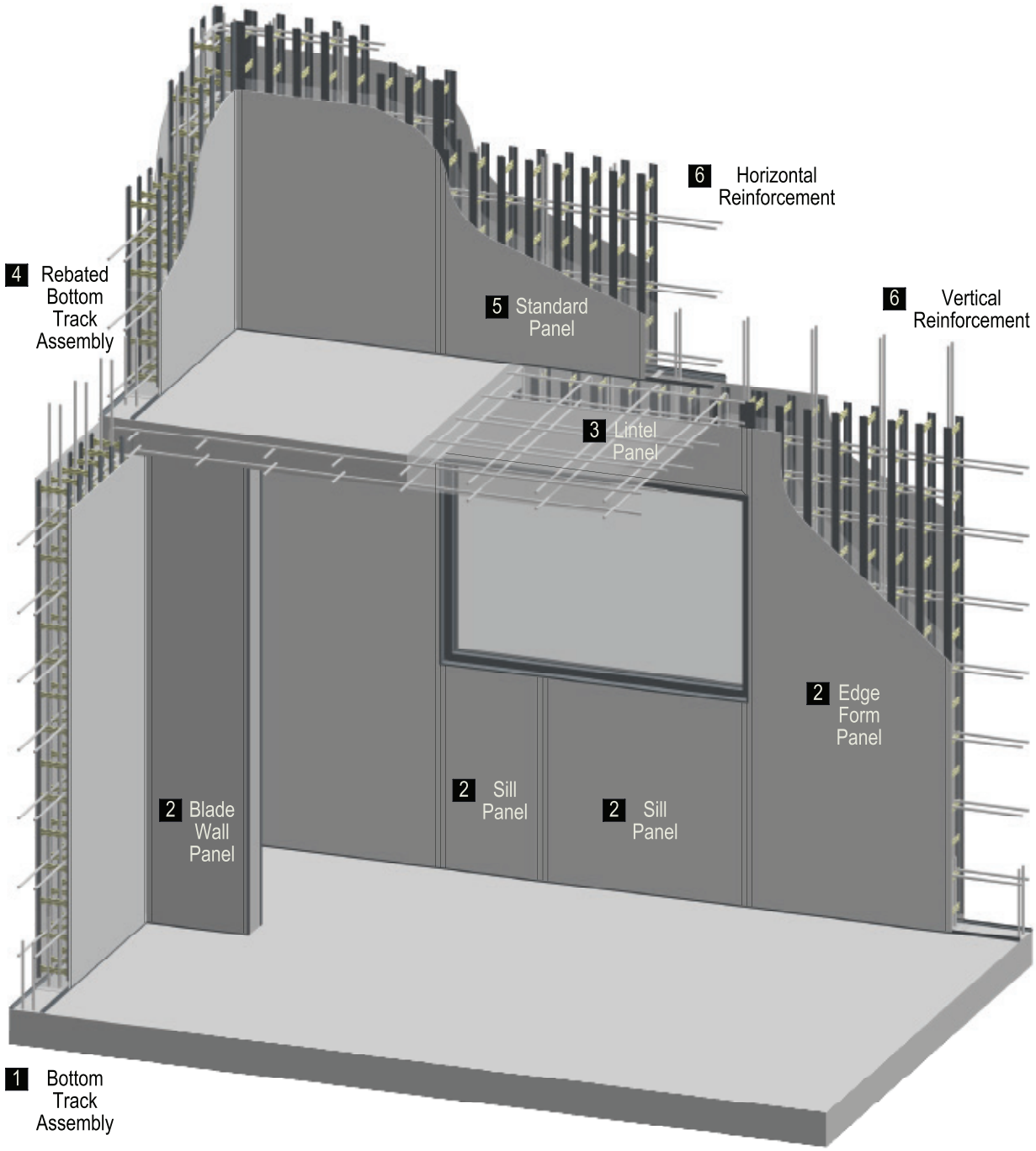
D ARCHITECTURAL DETAILING



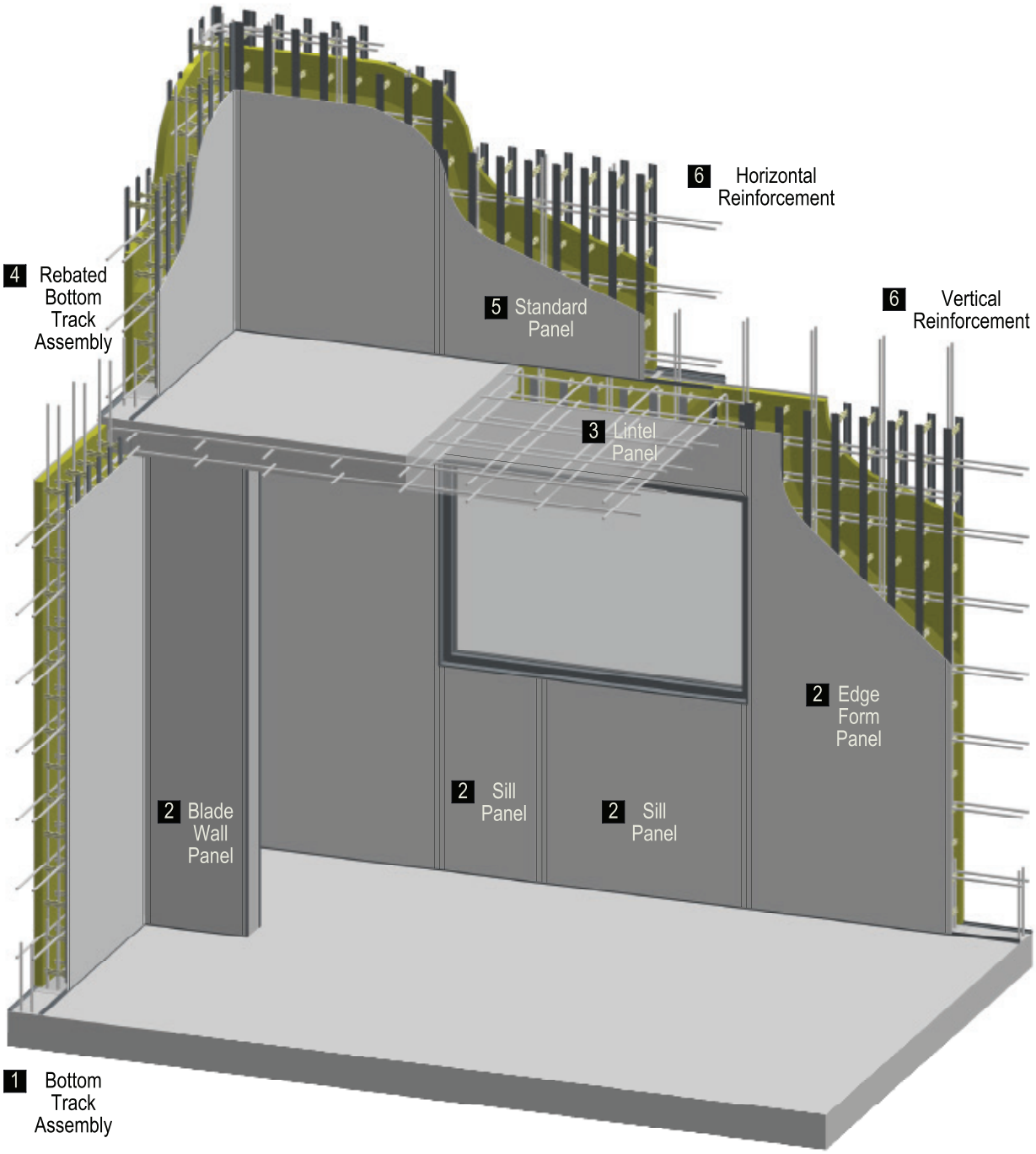

Ritek® Benefit from our knowledge. Profit from our experience.

Ritek® Wall Systems - Architectural Details

XL WALL SYSTEM COMPONENT OVERVIEW (XL) **FIGURE 4.1**

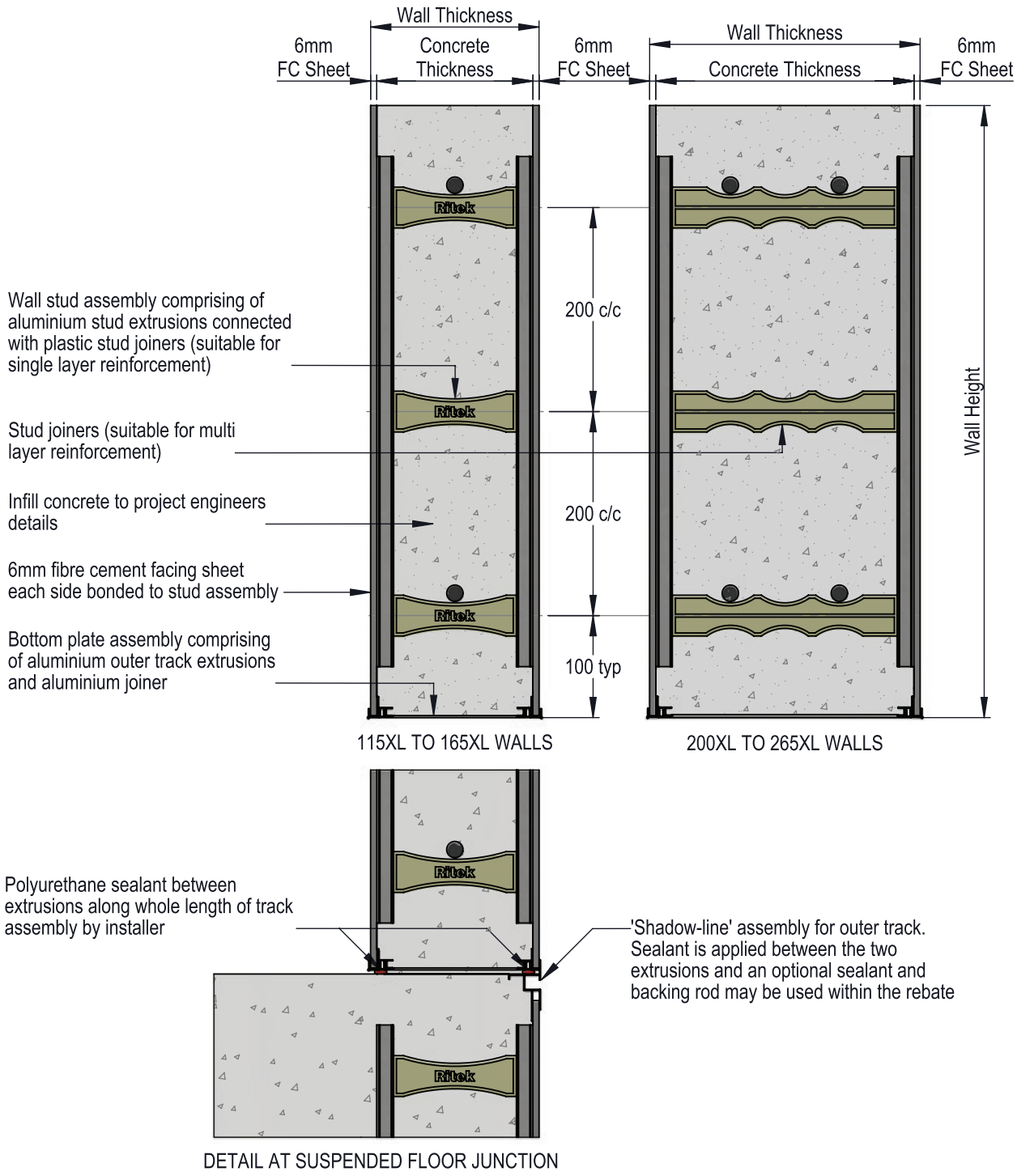


XL THERMAL WALL SYSTEM COMPONENT OVERVIEW (XL-T) **FIGURE 4.2**

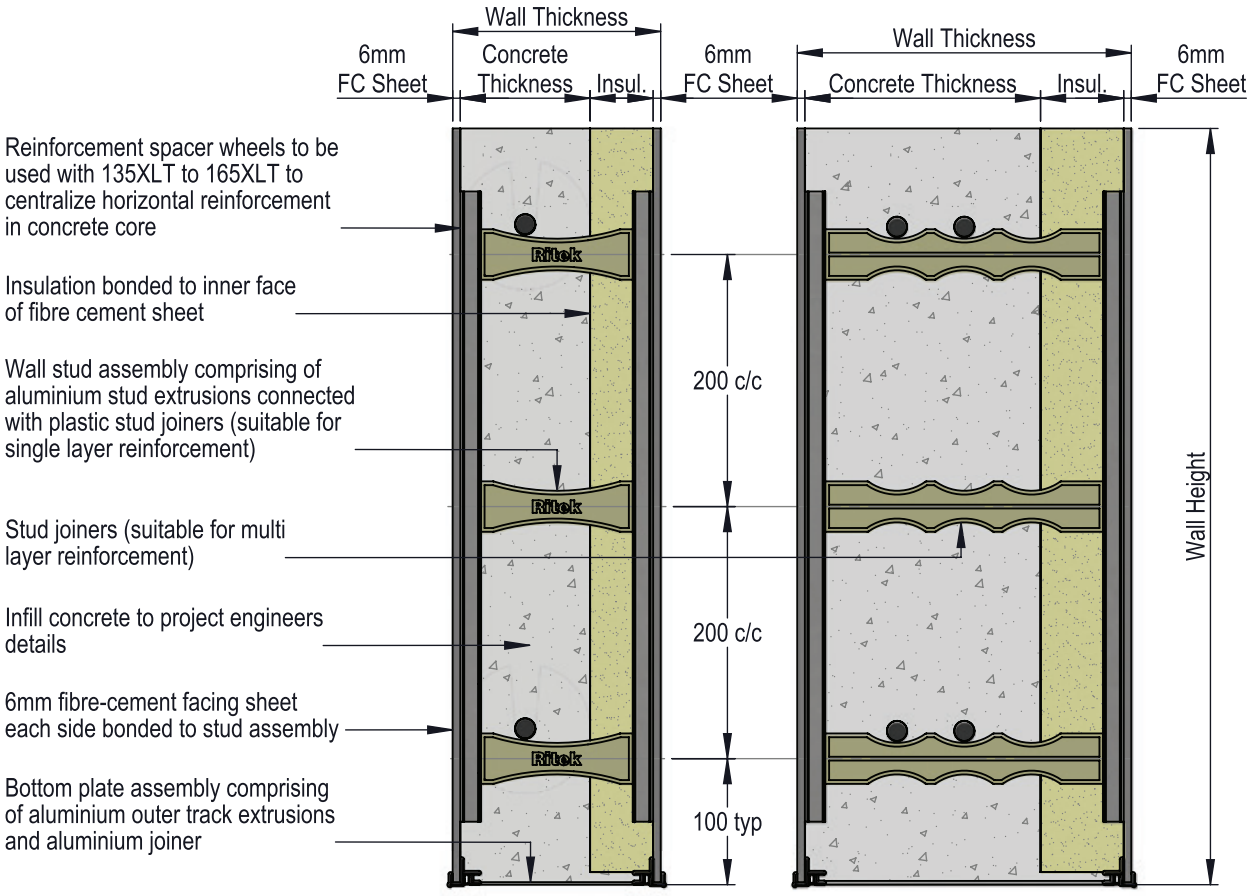


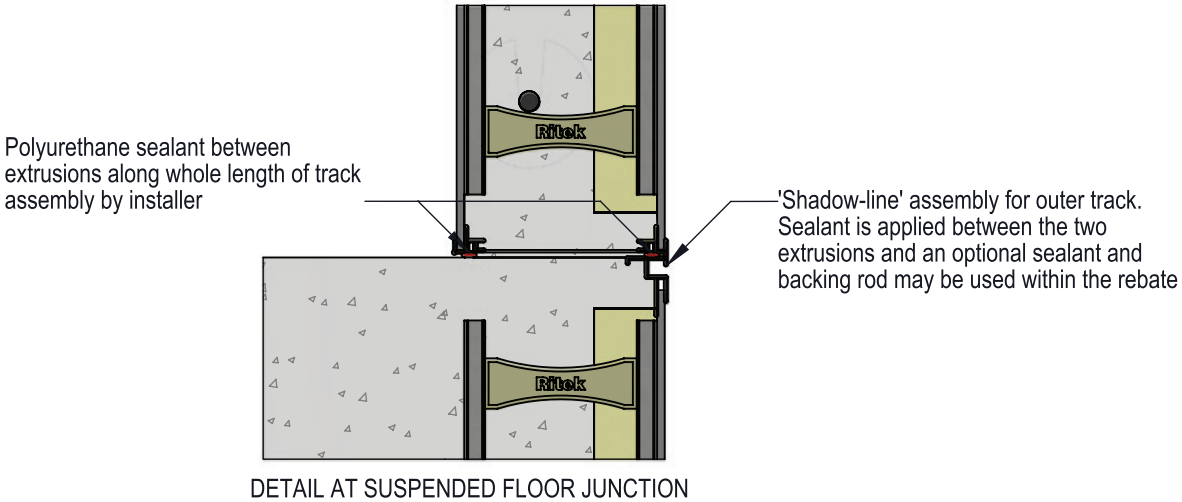
Ritek® Wall Systems - Architectural Details

XL WALL SYSTEM SECTIONAL ELEVATIONS (XL) **FIGURE 4.3**



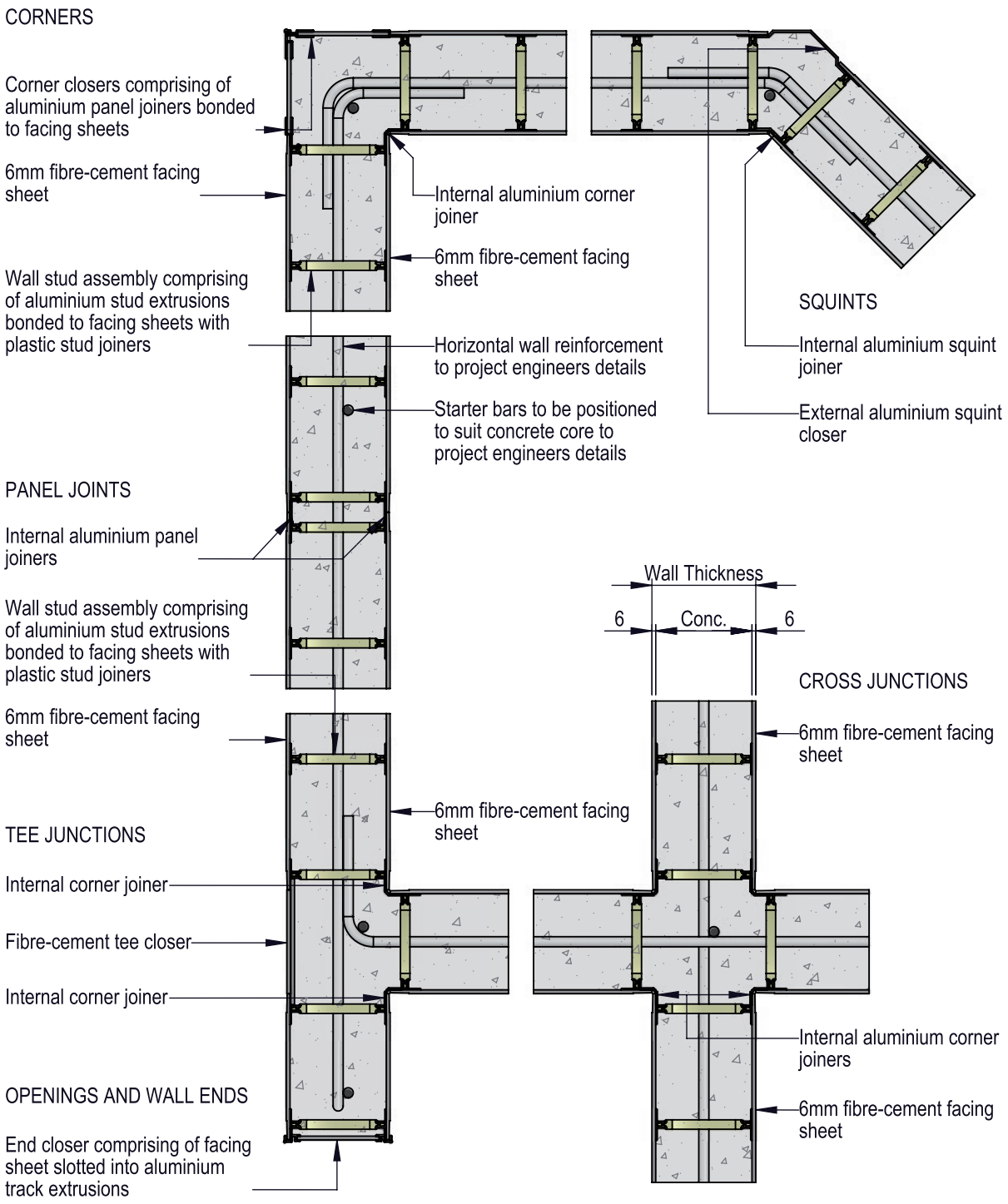
XL THERMAL WALL SYSTEM SECTIONAL ELEVATIONS (XL-T) FIGURE 4.4



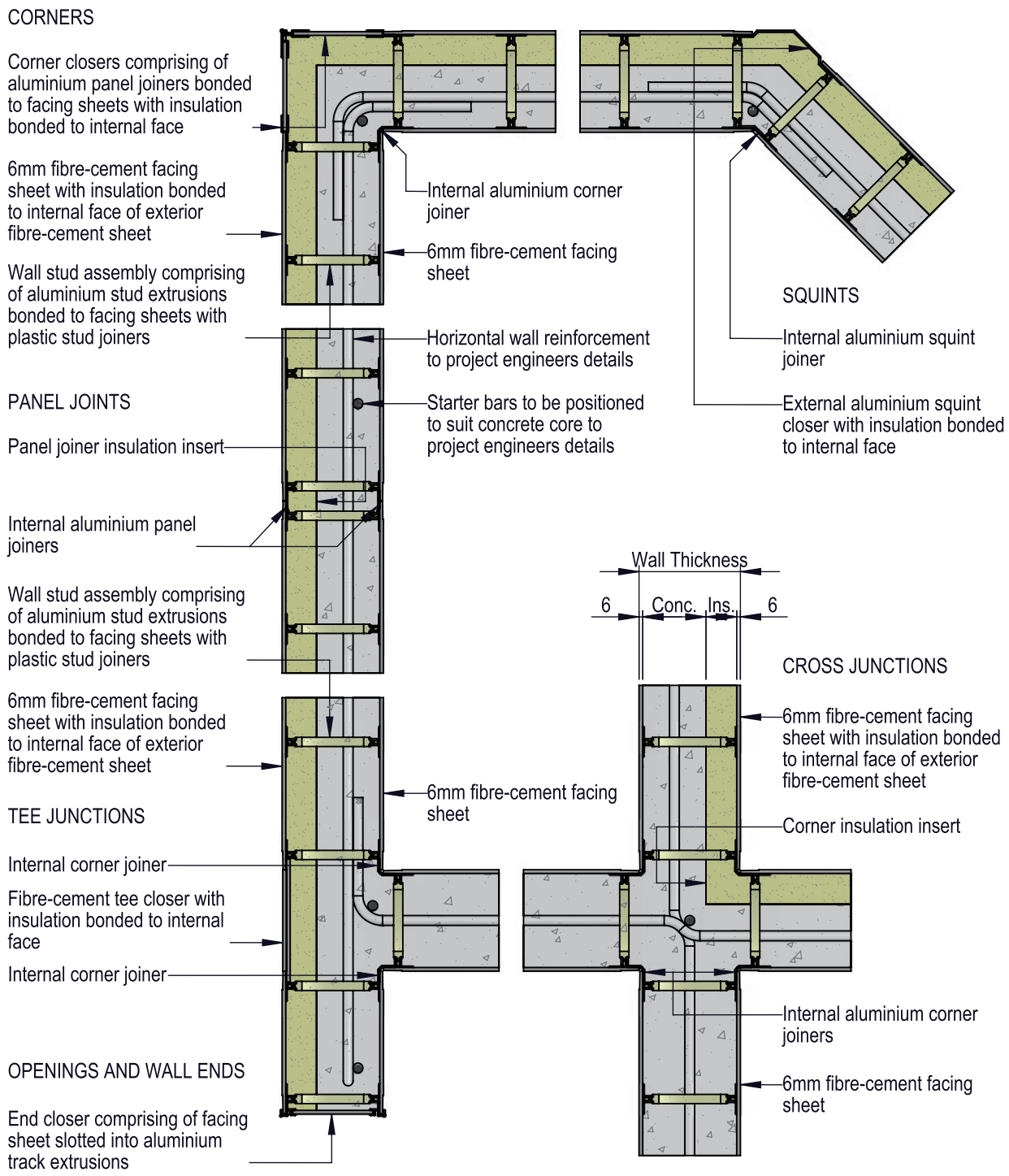


Ritek® Wall Systems - Architectural Details

XL WALL SYSTEM SECTIONAL PLANS (XL) **FIGURE 4.5**

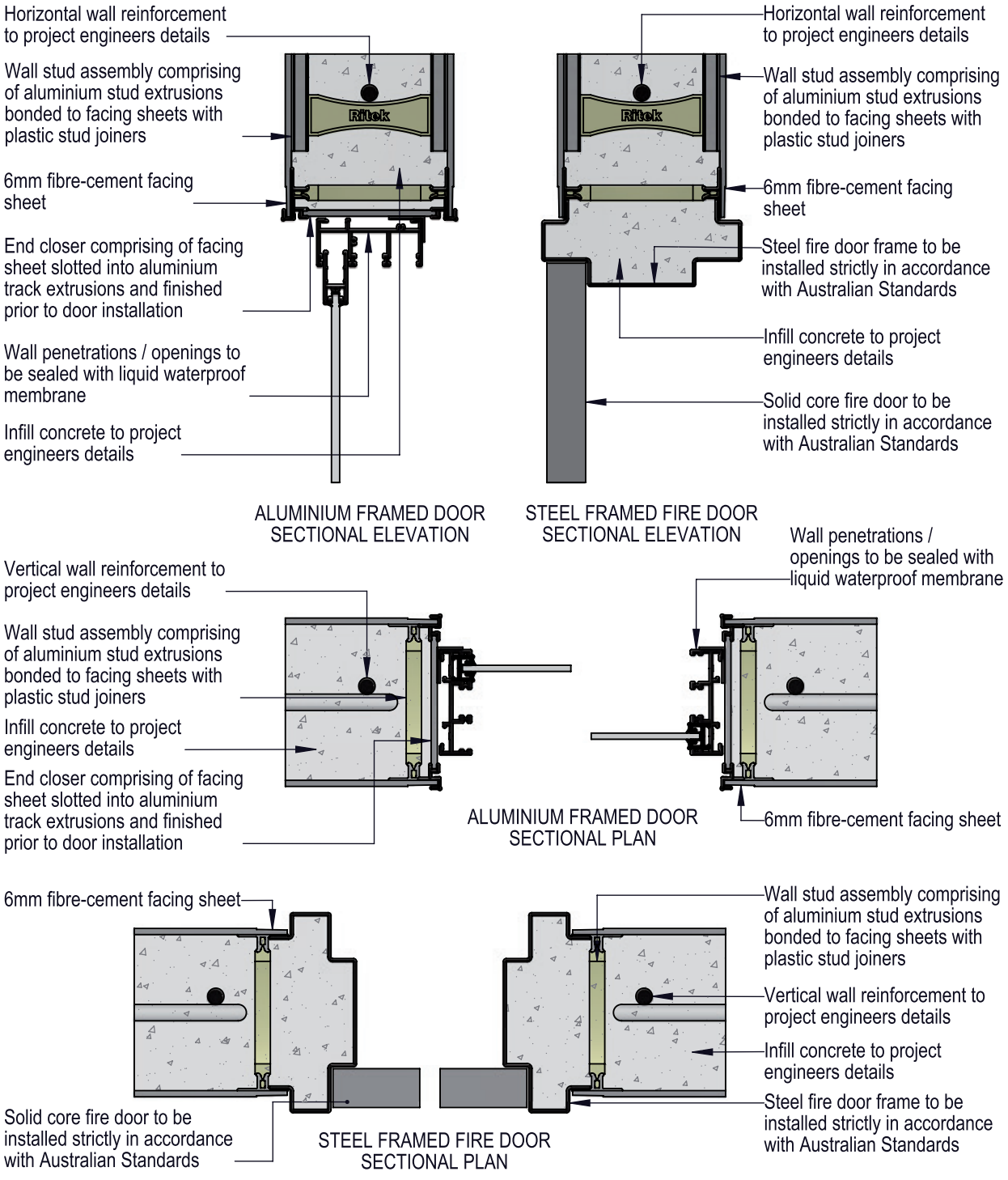


XL THERMAL WALL SYSTEM SECTIONAL PLANS (XL-T) FIGURE 4.6



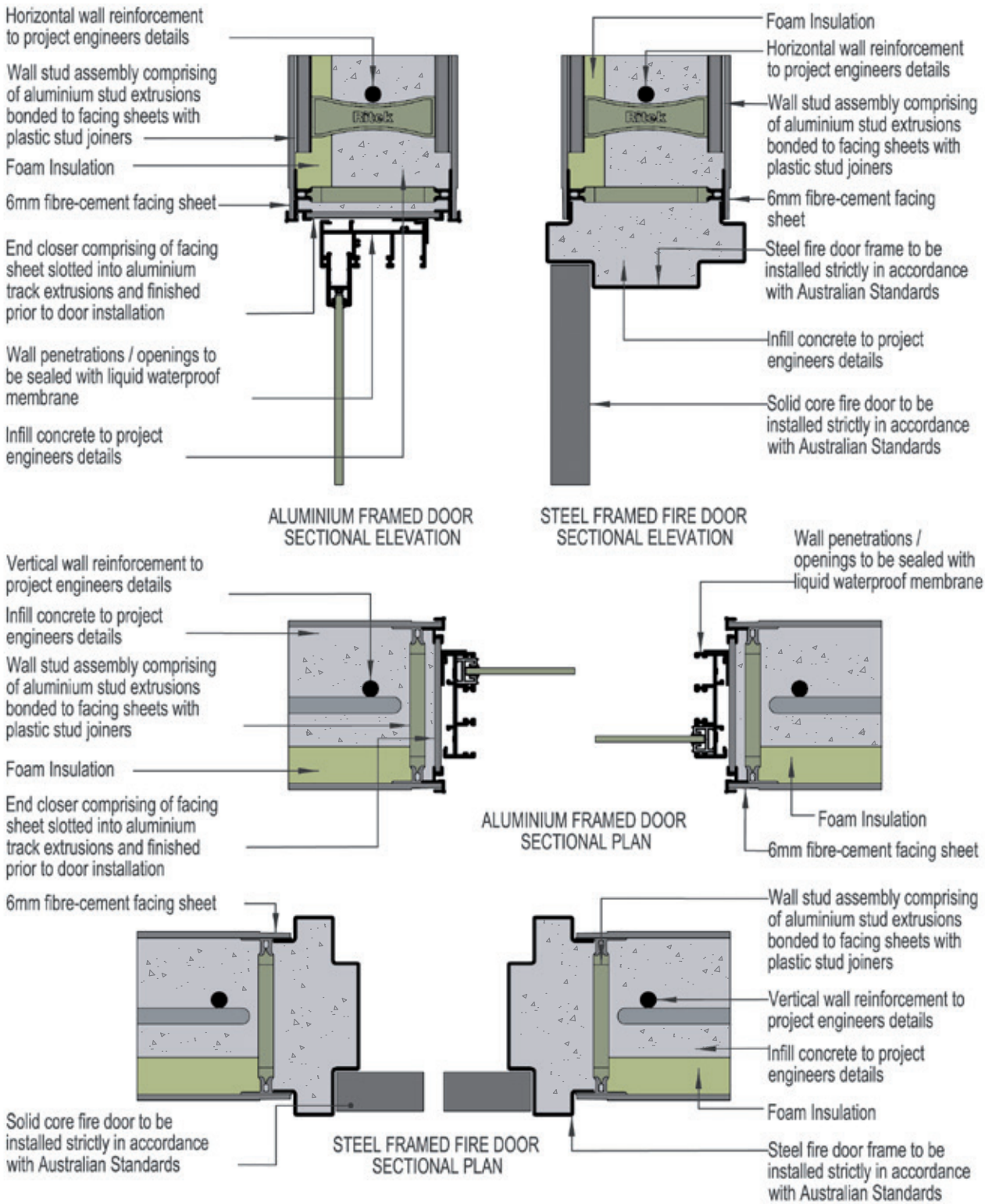
Ritek® Wall Systems - Architectural Details

DOOR SECTIONAL DETAILS (XL) **FIGURE 4.7**



Note: Wall penetrations/openings to be sealed with liquid waterproof membrane.

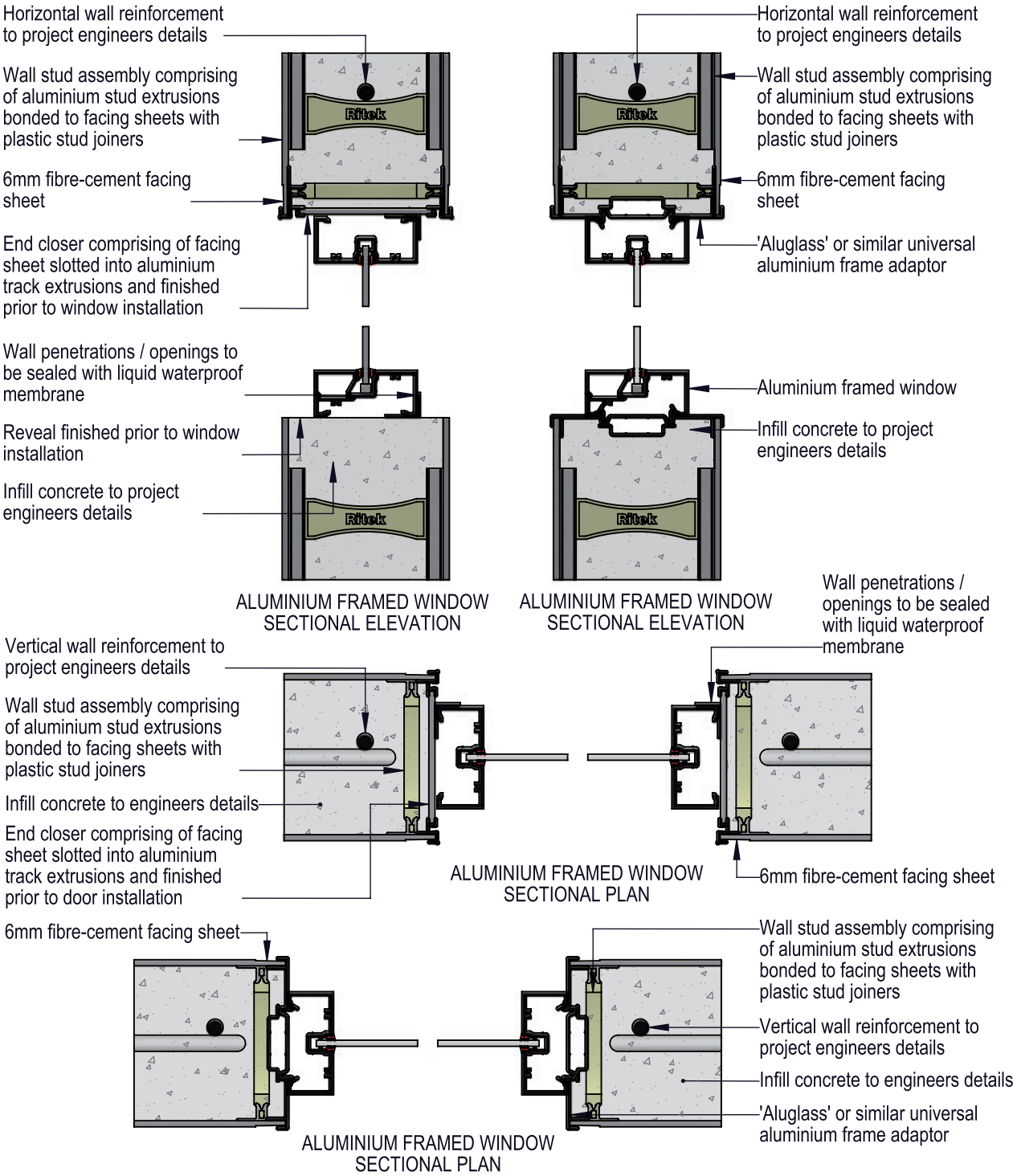
DOOR SECTIONAL DETAILS (XL-T) **FIGURE 4.8**



Note: Wall penetrations/openings to be sealed with liquid waterproof membrane.

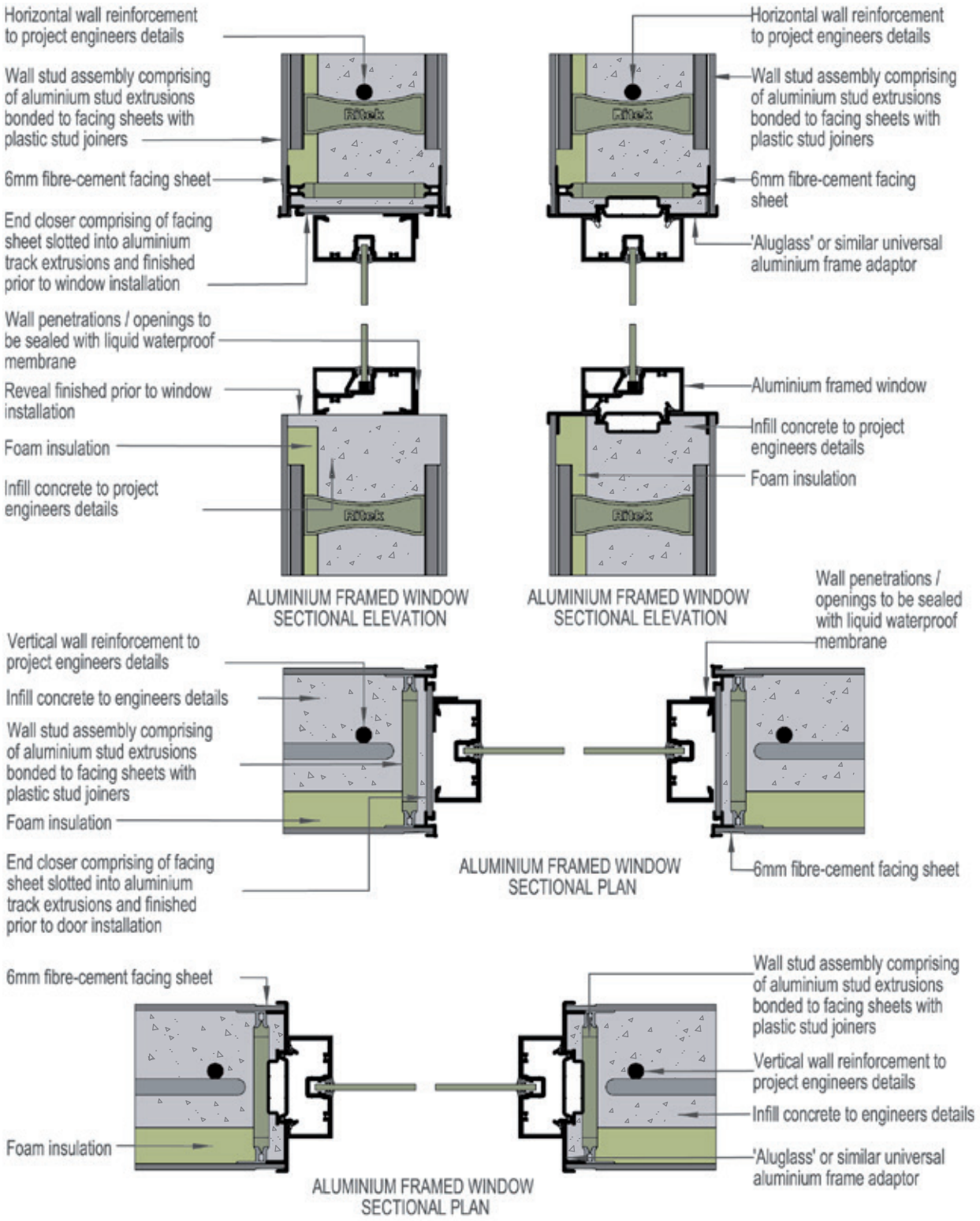
Ritek® Wall Systems - Architectural Details

WINDOW SECTIONAL DETAILS (XL) **FIGURE 4.9**



Note: Wall penetrations/openings to be sealed with liquid waterproof membrane.

WINDOW SECTIONAL DETAILS (XL-T) **FIGURE 4.10**



Note: Wall penetrations/openings to be sealed with liquid waterproof membrane.

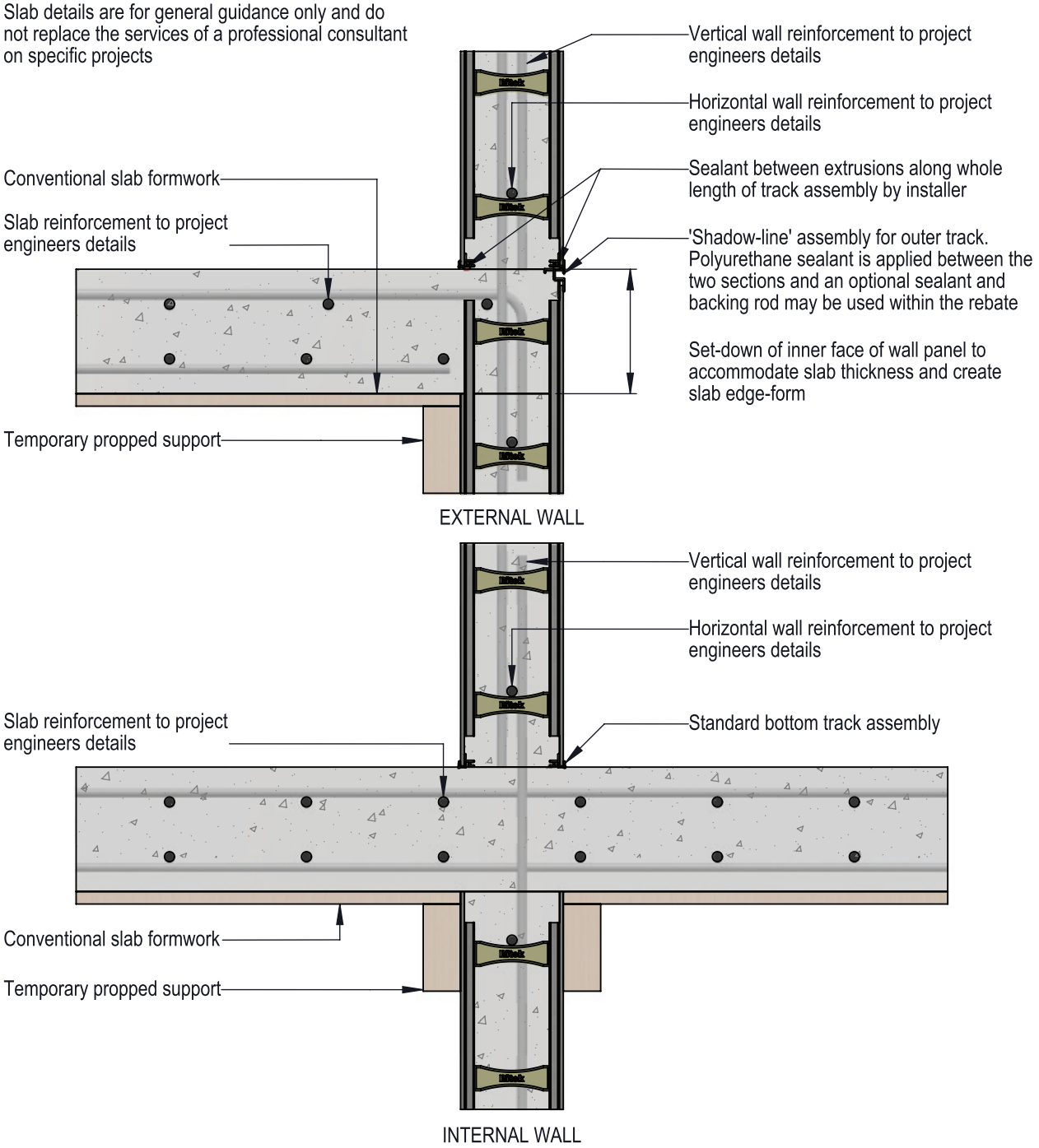
Ritek® Wall Systems - Architectural Details

Conventional Slab Junction

Typical details are shown in Figure 4.11 for both external and internal wall junctions.

CONVENTIONAL SLAB JUNCTION **FIGURE 4.11**

NOTE:
Slab details are for general guidance only and do not replace the services of a professional consultant on specific projects



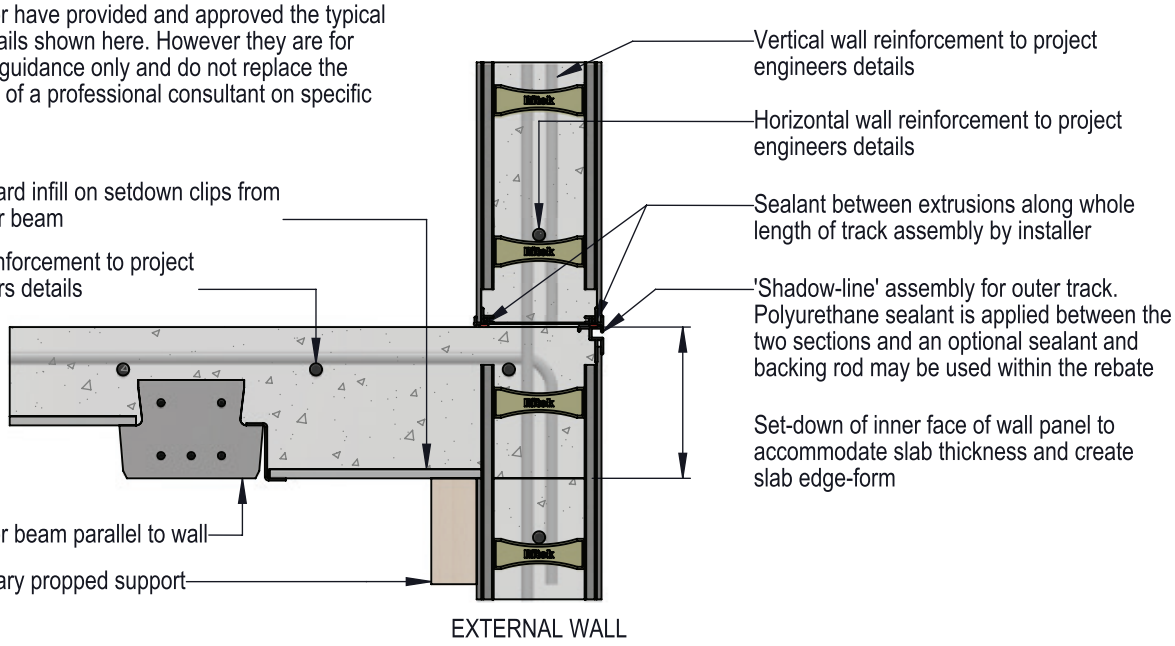
Ritek® Wall Systems - Architectural Details

Ultrafloor Slab Junction

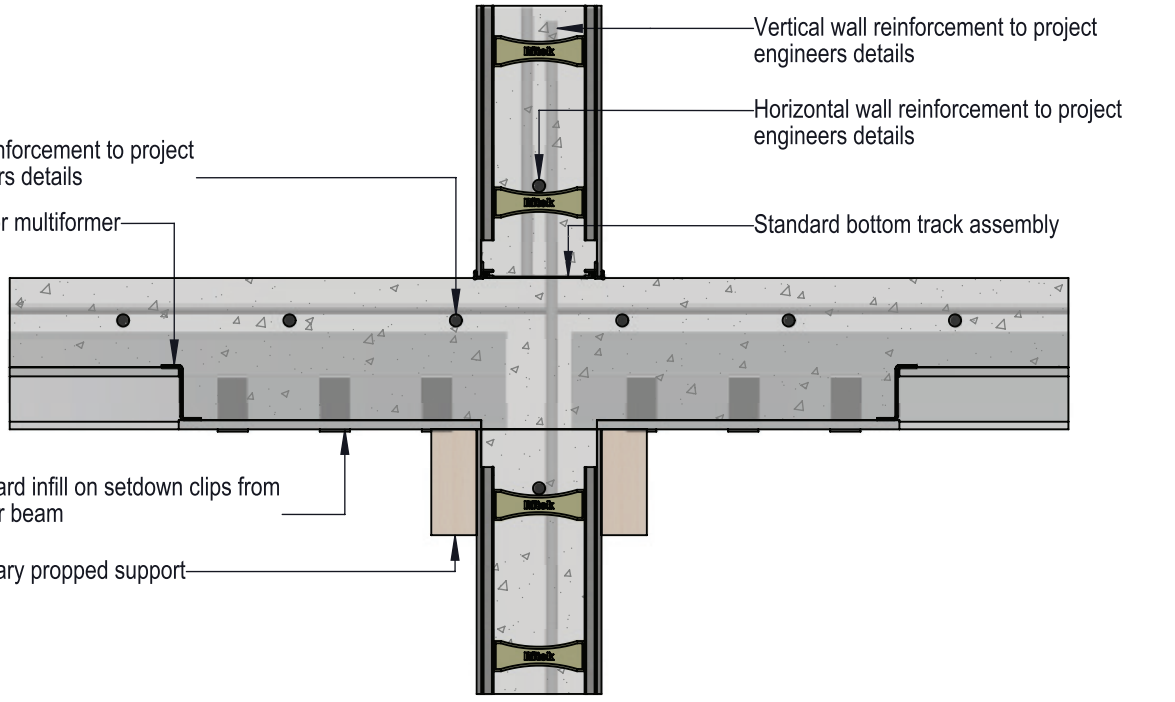
Typical details are shown in Figure 4.12 for both external and internal wall junctions assuming opposite orientations of the floor beams. Each detail can be adapted for the other orientation.

ULTRAFLOOR SLAB JUNCTION **FIGURE 4.12**

NOTE:
Ultrafloor have provided and approved the typical slab details shown here. However they are for general guidance only and do not replace the services of a professional consultant on specific projects



EXTERNAL WALL



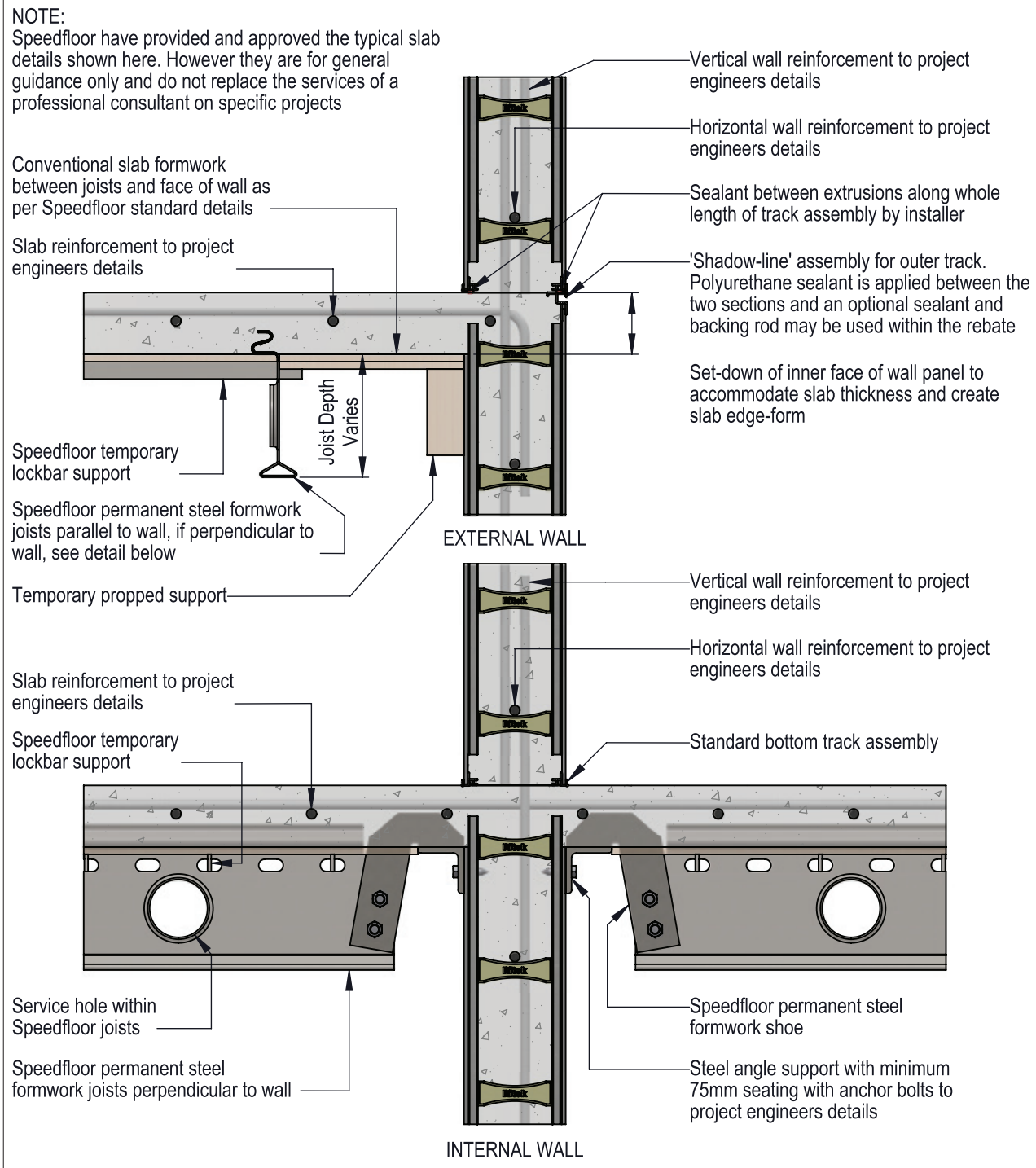
INTERNAL WALL

Ritek® Wall Systems - Architectural Details

Speedfloor Slab Junction

Typical details are shown in Figure 4.13 for both external and internal wall junctions.

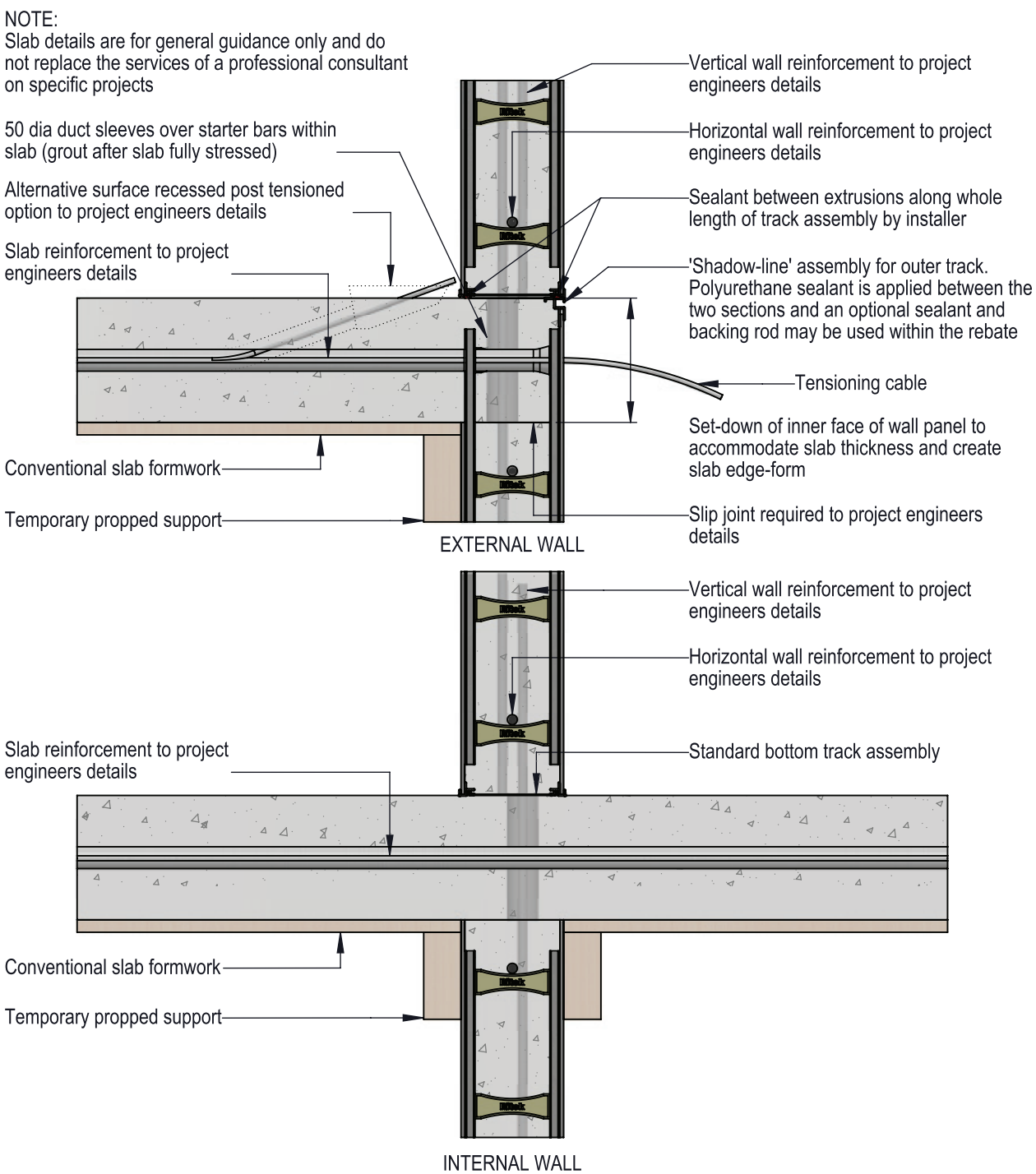
SPEED FLOOR SLAB JUNCTION **FIGURE 4.13**



Post Tensioned Slab Junction

Typical details are shown in Figure 4.14 for both external and internal wall junctions.

POST TENSIONED SLAB JUNCTION **FIGURE 4.14**

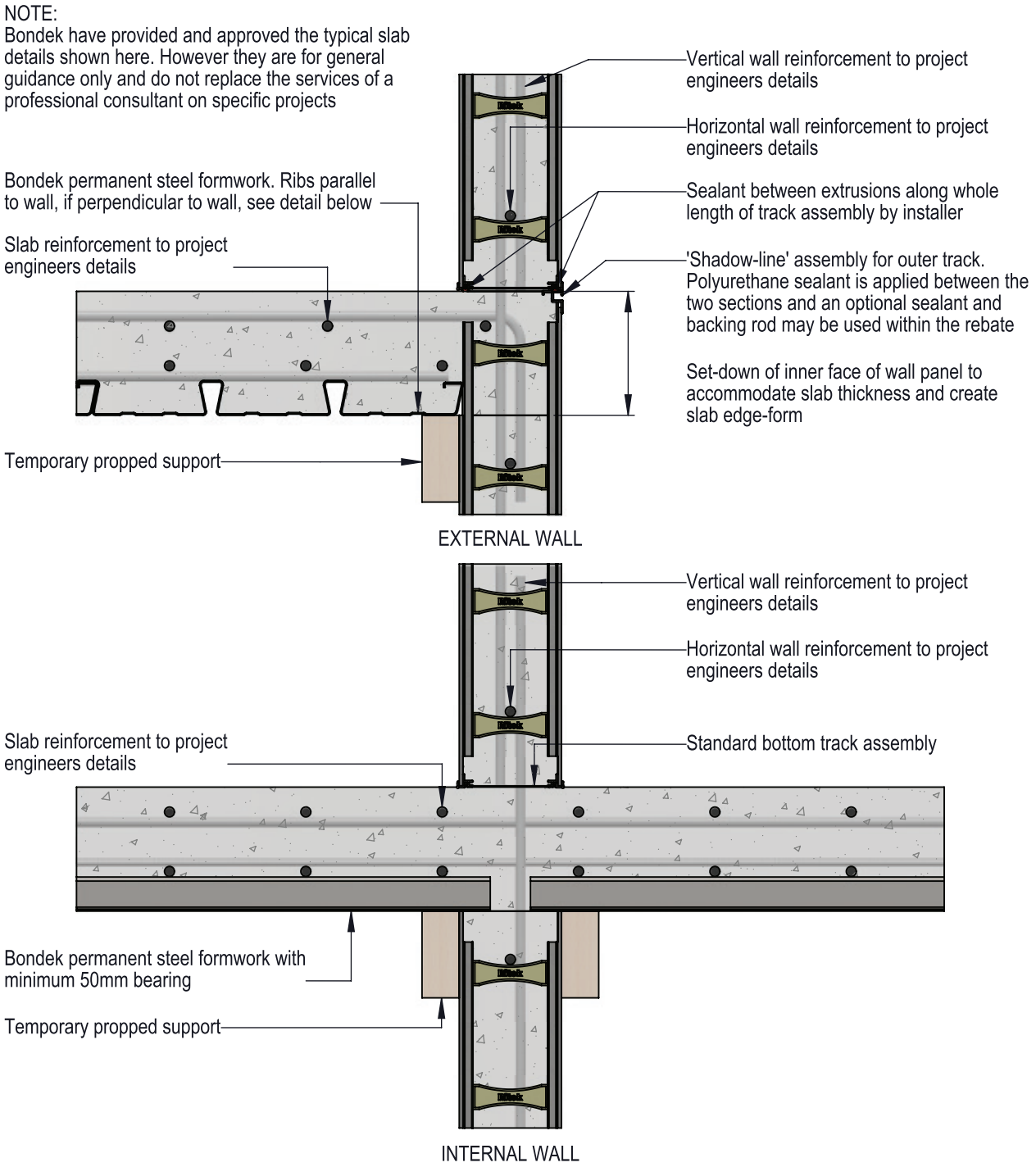


Ritek® Wall Systems - Architectural Details

Bondek Slab Junction

Typical details are shown in Figure 4.15 for both external and internal wall junctions.

BONDEK SLAB JUNCTION **FIGURE 4.15**

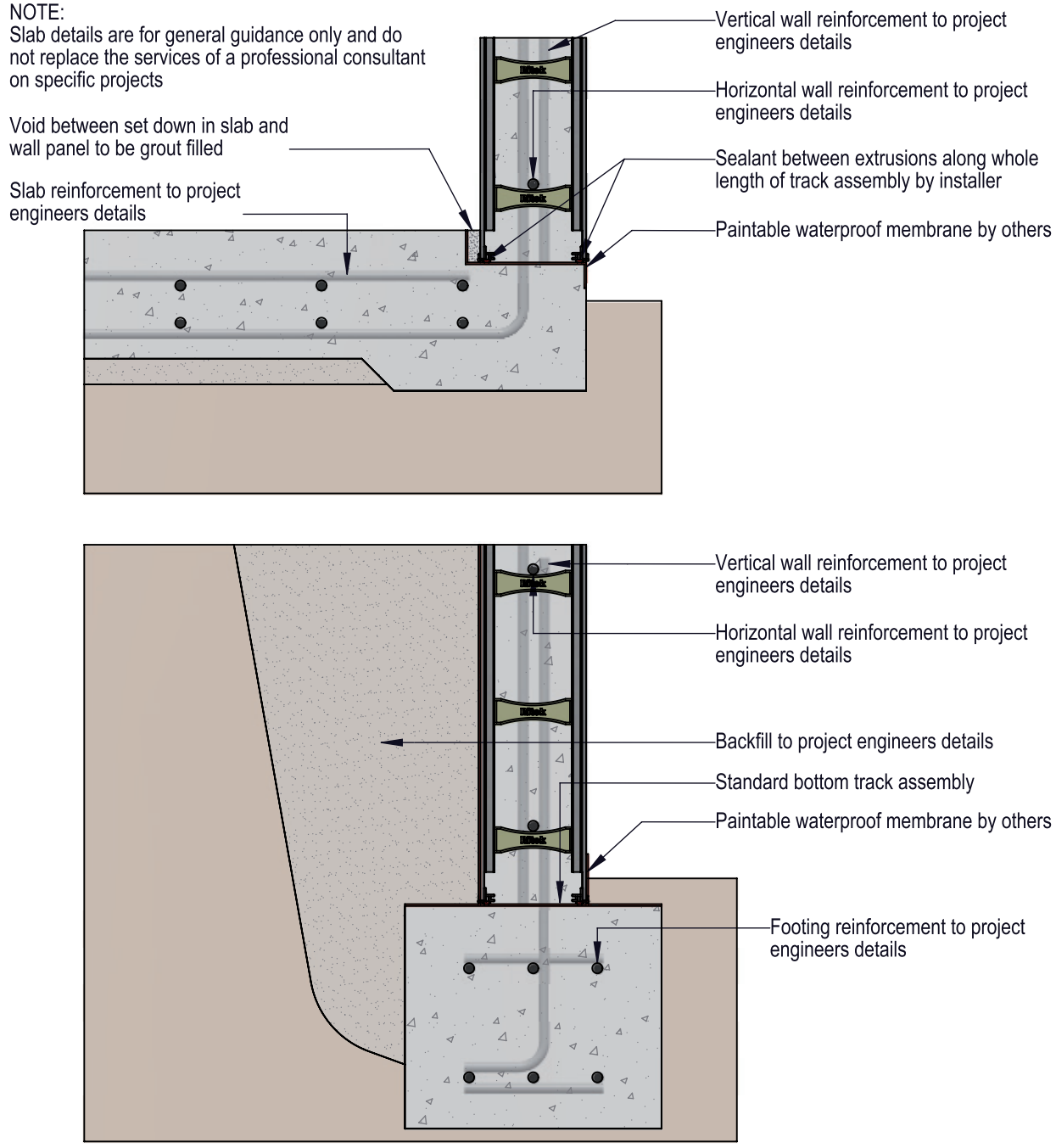


Ritek® Wall Systems - Architectural Details

Footing Connection

Typical details are shown in Figure 4.16 for footing connection.

FOOTING CONNECTION **FIGURE 4.16**



Ritek® Wall Systems - Waterproofing

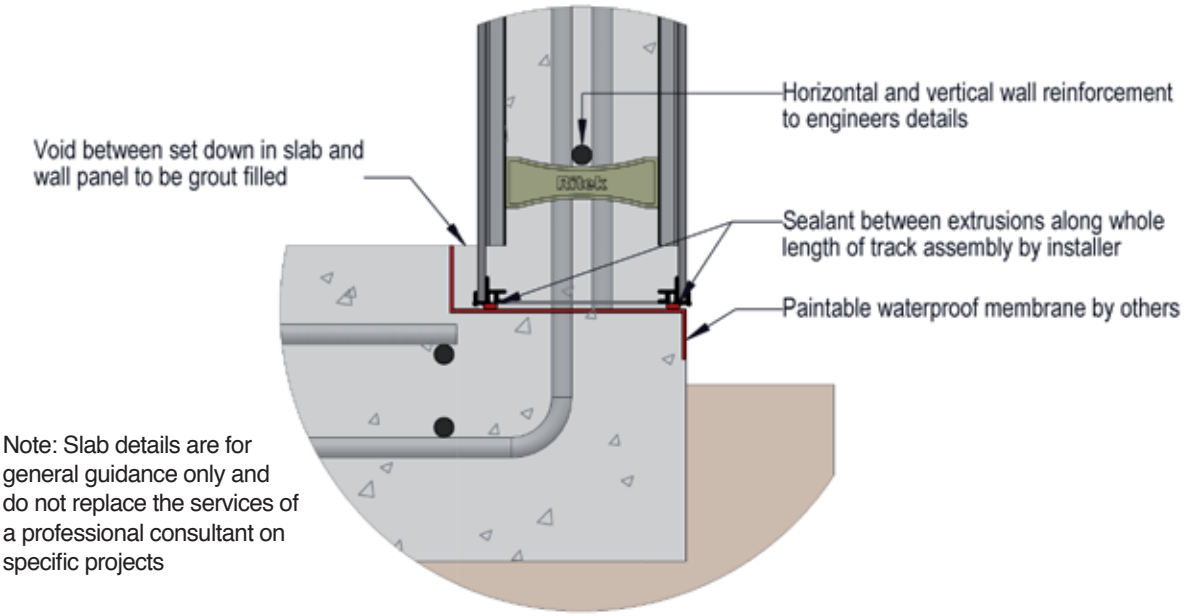
With any application using Ritek® Wall Panels, it is the Project Engineers responsibility to be mindful that the Ritek® panels and some accessories are manufactured using fibre cement sheeting. Ritek® panels and accessories require protection from moisture and exposure to weathering by applying a suitable protective waterproofing coating system to them, ensuring the prevention of any water ingress to a building through its facades.

In the case when using Ritek® Wall System as a retaining wall, where there is a high probability of hydrostatic pressure against the panel and in turn the wall, an applicable proprietary waterproofing system is required.

Refer to Figures 6.8 and 6.9 for typical footing to wall connection details. It is recommended that the Ritek® Wall Panels have a full waterproof membrane applied prior to installation and that a sealant is applied at panel to panel joints and all connections to accessories.

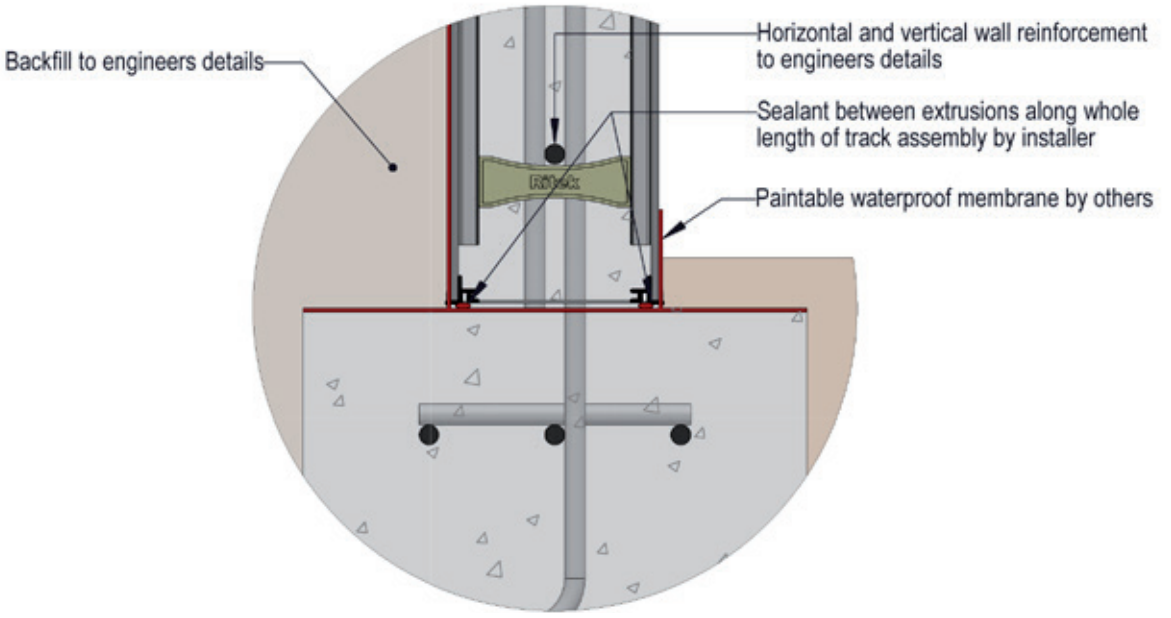
Waterproofed Ritek® Wall Panels have been shown to withstand intense weather events in a variety of environments, providing all standard requirements for structural adequacy and drainage are maintained. The proprietary waterproofing system must be applied in accordance with the proprietary waterproofing system manufacturer. Ritek® does not provide any guarantee on the watertightness of the panels.

SLAB EDGE DETAIL **FIGURE 6.8**



Note: Slab details are for general guidance only and do not replace the services of a professional consultant on specific projects

FOOTING DETAIL **FIGURE 6.9**



Ritek® Wall Systems - Notes

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E INTERNAL FINISHING

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Ritek® Wall Systems - **Internal Finishing**

Recommended guidelines for internal joint setting of Ritek®\ XL Wall® and XL Thermal Wall® Systems

Interior Joint Setting of Ritek® Wall Panels

Industry Standards
Refer to AS/NZS 2311:2009 Standard for guidance and recommended good practice for the preparation of specifications, the application and maintenance of decorative paint systems for use by the paint industry.

Preparation for Joint Setting / Flushing Compounds

Ritek® XL Wall® Panels can be covered in dust, mud and other contaminants following installation on project sites. The panels need to be cleaned of all contaminants to ensure of a quality finish being applied.

Required Procedure:

Ensure that the substrate surface condition meets the requirements of the jointing compounds and finishing systems being used at the time of application.

Ritek® Panel Rebate Detail

Ritek® XL Wall® Panels are supplied with a standard FC sheet rebate detail to allow for jointing compounds and joint reinforcing tapes to be used. A standard FC sheet rebate detail is typically 0.5mm deep tapering to 1.5mm deep at the edge of the panel and 30mm wide.

Required Procedure:

The rebate detail must be clean of any excess concrete, adhesive or any other contaminant.
Fixing screws used during the panel installation must be set below flush with the surface or removed.

External


Lift Shafts / Internal Walls


Stairwells


Party Walls

Ritek® Panel Moisture Content

Ritek® XL Wall® Panels following core-fill, after heavy rain or during high humidity periods may result in a wet substrate surface. Due care is required to ensure the finishing systems are applied within the acceptable conditions of the system being applied. It is standard practice to ensure the substrate contains less than 20% Wood Moisture Equivalent (WME) before applying joint setting / patching materials and finishing system. Refer to the joint setting compound manufacturer's specification sheets.

Aluminium Accessories

The Ritek® XL Wall® System uses aluminium accessories for corners and nib end closers. All aluminium accessories are supplied etched with a chromate finish as a protective coating to prevent corrosion and a barrier to the concrete. During panel assembly, aluminium accessories can be cut to length, scratched, holes created for screw fixing etc. and can have dust, mud and other contaminants on them. It is important to ensure that the substrate surface condition meets the requirements of the jointing compounds and finishing systems being used at the time of application. Refer to the joint setting compound manufacturer's specification sheets.

Internal Joint Setting

For setting to internal joints please refer to section I1 of this manual.

Ritek® Wall Systems - **Internal Finishing**

Wall System Finishes

The aesthetic appeal of the walls depends on:

- Correct installation of the panels;
- Straightness / flatness of walls;
- Choice of finishes for internal or external walls;
- The amount of glancing light projected on the wall surface; and
- The quality of the applied paint or texture system.

Lighting

Lighting design is very much a matter of cause and effect. The Australian Standard AS2589 details five levels of finish. It is recommended designers give consideration to the level of finish required and eliminate potential problems due to critical lighting.

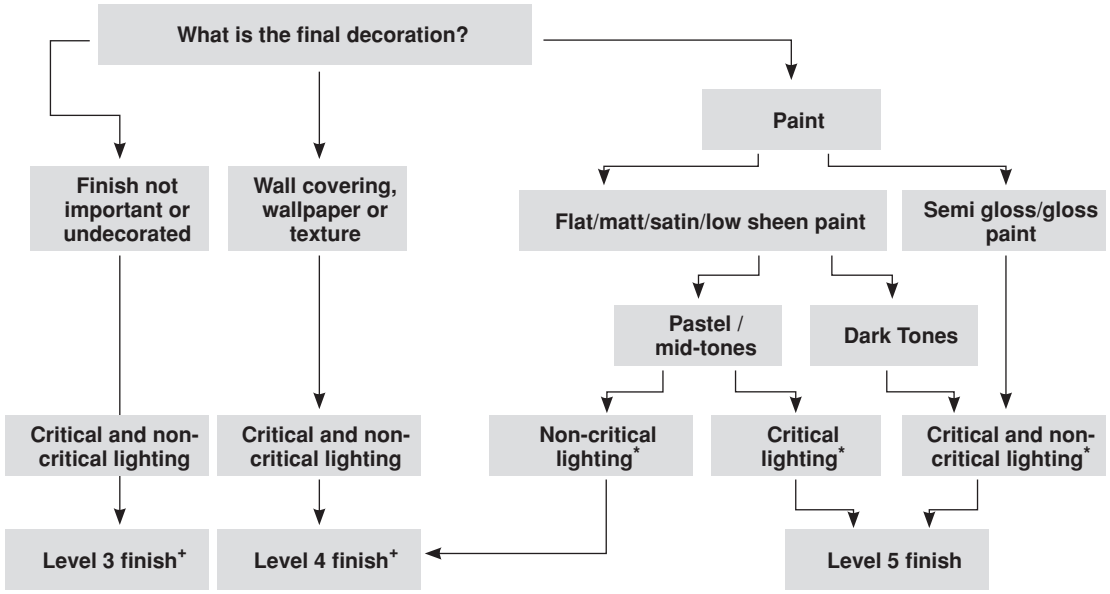
Interior Joint Setting and General Setting

Procedures for flush jointing the Ritek® wall system panels are similar to jointing of any fibre cement sheeting lining. Ritek® guidance is to use products which are designed and recommended for flush joint setting of fibre cement lining/ sheeting.

Internal Joint Setting

For setting to internal joints please refer to section I1 of this manual.

LEVELS OF FINISH AVAILABLE **CHART 5.1**



* Critical lighting: natural or artificial light projected across a surface at a low incidence angle. Non-critical lighting: when the light striking the surface is diffuse or at right angles, or both.
+ May not be suitable for subsequent decoration to high levels of quality in the future. See Level 4 or Level 5 for upgrading requirements.

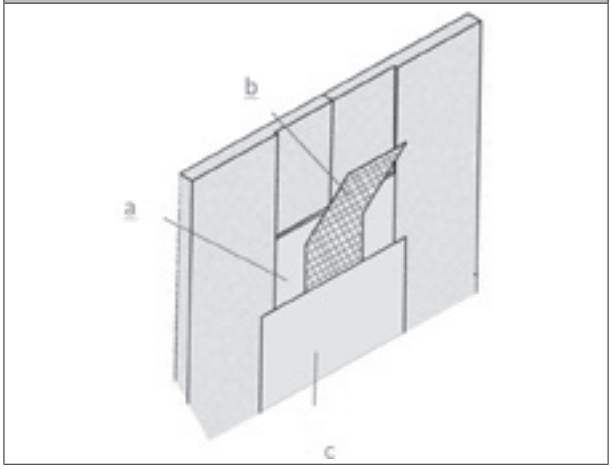
Ritek® Wall Systems - **Interior Joint Setting**

Typical Joint Setting Application

First Coat

a. Apply Base Coat to fill the rebate using a 150mm broadknife.
b. Embed the fibre mesh centrally over the joint using a 150mm broadknife ensuring there are no voids under the tape and remove excess compound.
c. Immediately cover tape with thin layer of Base Coat applied using a 150mm broadknife.

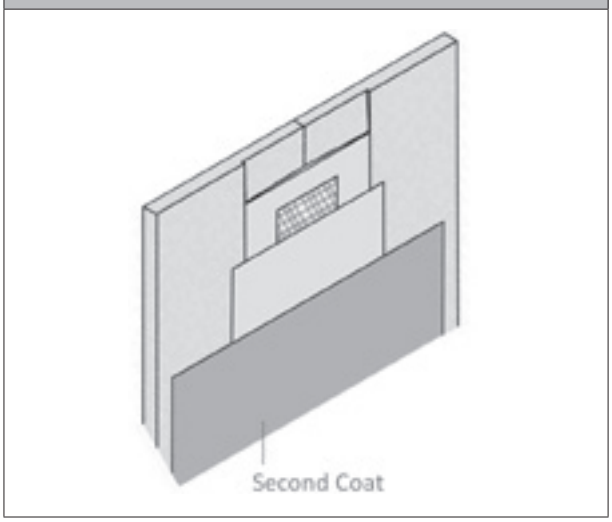
FIRST COAT FINISHING **FIGURE 5.1**



Second Coat

When the base coat is fully dry, use a 150mm wide second coat trowel to apply the Base Coat. Apply this coat approximately 180mm wide, laid down over the rebate and feather the edges.

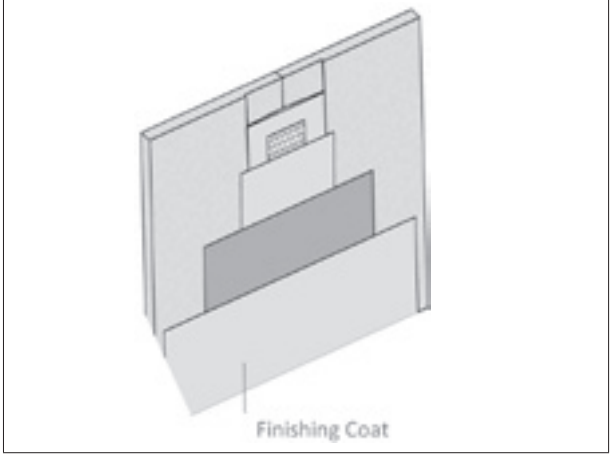
SECOND COAT **FIGURE 5.2**



Finishing Coat

Ensure the second coat is fully dry. Using a finishing trowel, apply a coat of Top Coat 200mm wide centrally over the joint and feather out the edges. Allow to dry fully before sanding.

FINISHING COAT **FIGURE 5.3**



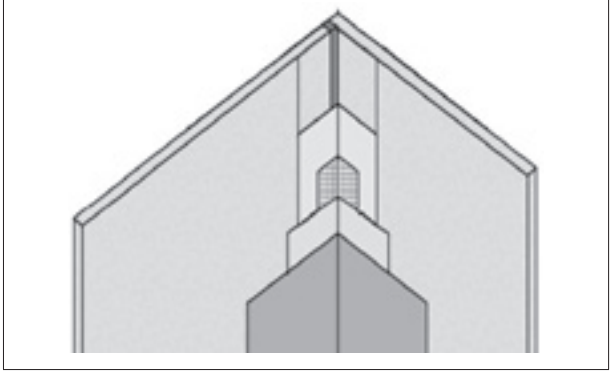
Sanding and Finishing

a. Allow the finish coat to dry at least 24 hours.
b. Lightly Sand smooth with 150 grit paper or with 220 sanding mesh.
c. Wipe off excess dust with a slightly damp cloth prior to painting.

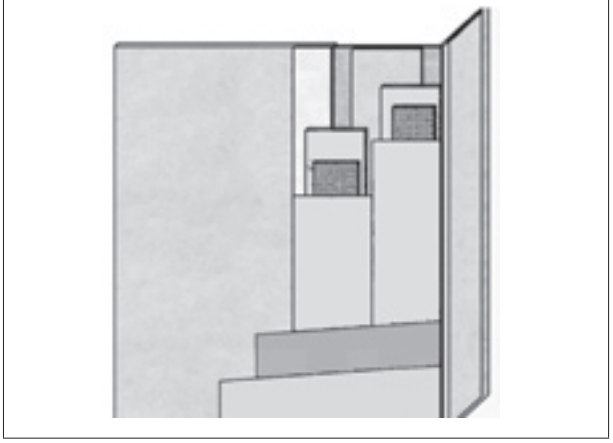
Corner Closer Setting

All Ritek® wall systems aluminium accessories are specially treated to ensure correct adhesion of industry standard finishing compounds and finishes.

INTERNAL CORNER DETAIL **FIGURE 5.4**



EXTERNAL CORNER DETAIL **FIGURE 5.5**



Ritek® Wall Systems - **Interior Joint Setting**

BASE COAT APPLIED **FIGURE 5.6**

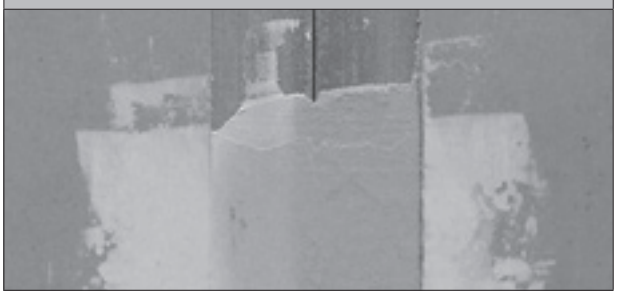


Figure 5.7 shows base coat application to a corner closer. A second coat is applied with the final sanded finish shown in Figure 5.8.

BASE COAT APPLIED TO CORNER CLOSER **FIGURE 5.7**

Note: Aluminium corner shown

SANDED FINISH TO CORNER CLOSER **FIGURE 5.8**

Setting of Nib Ends, Square-set Doors and Window Openings

Nib ends, square-set door and window openings are set to the standard aluminium track extrusion. Figure 5.9 shows base coat for window/door opening and the sanded finish.

BASE COAT WINDOW / DOOR OPENING **FIGURE 5.9**

Setting of Tee-Junction Closers

Tee junction closers are set back approximately 1 mm from the line of the wall face to allow for a flush joint. The setting process is the same as for standard panel joints, Figure 5.10.

SETTING OF T-JUNCTION CLOSERS **FIGURE 5.10**

Interior Panel Decoration

To achieve a satisfactory standard of finish it is recommended that a prime coat and two finish coats of "brand name" acrylic paints be applied in accordance with the paint manufacturer's recommendations. Correct setting and surface preparation is critical to ensuring an appropriate finish is achieved.

Note: *Paints, when subjected to critical light, may require a higher level of finish (Level 5) and hence cost implications.*

Steps in Floor Levels

Where panels are joined horizontally at midfloor, due to a different floor slab height in the adjoining room, the horizontal join may move due to differential movement in the structure. Provision should be made to express the joint or the wall should be sheeted over with plaster board or similar.

Cracking and Peaking of Internal Joints

Fibre cement sheet constructions are prone to stress cracking if the correct design, installation and finish systems are not applied. Stress cracking is caused by a number of factors including structural movement, thermal expansion and contraction, improper construction, lack of adequately formed control and movement joints, improper fixing and a variety of other factors which are all beyond the control of Ritek®.

Internal Joint Setting to Non Ritek® Panels

For joints between Ritek® XL Wall® Panels and non Ritek® panels such as dry walls and stud partition walls, it is recommended to install an expansion joint or express the joint using a paintable flexible sealant. Walls having a different thermal mass are likely to expand and contract at different rates therefore flush jointing is not recommended.

Ritek® Wall Systems - **Over Sheeting of the Ritek® Wall Systems**

Over sheeting of the Ritek® XL Wall® Systems can be achieved by using the following methods:

- Batten and sheeting (recommended method)
- Direct stick plasterboard (optional method)

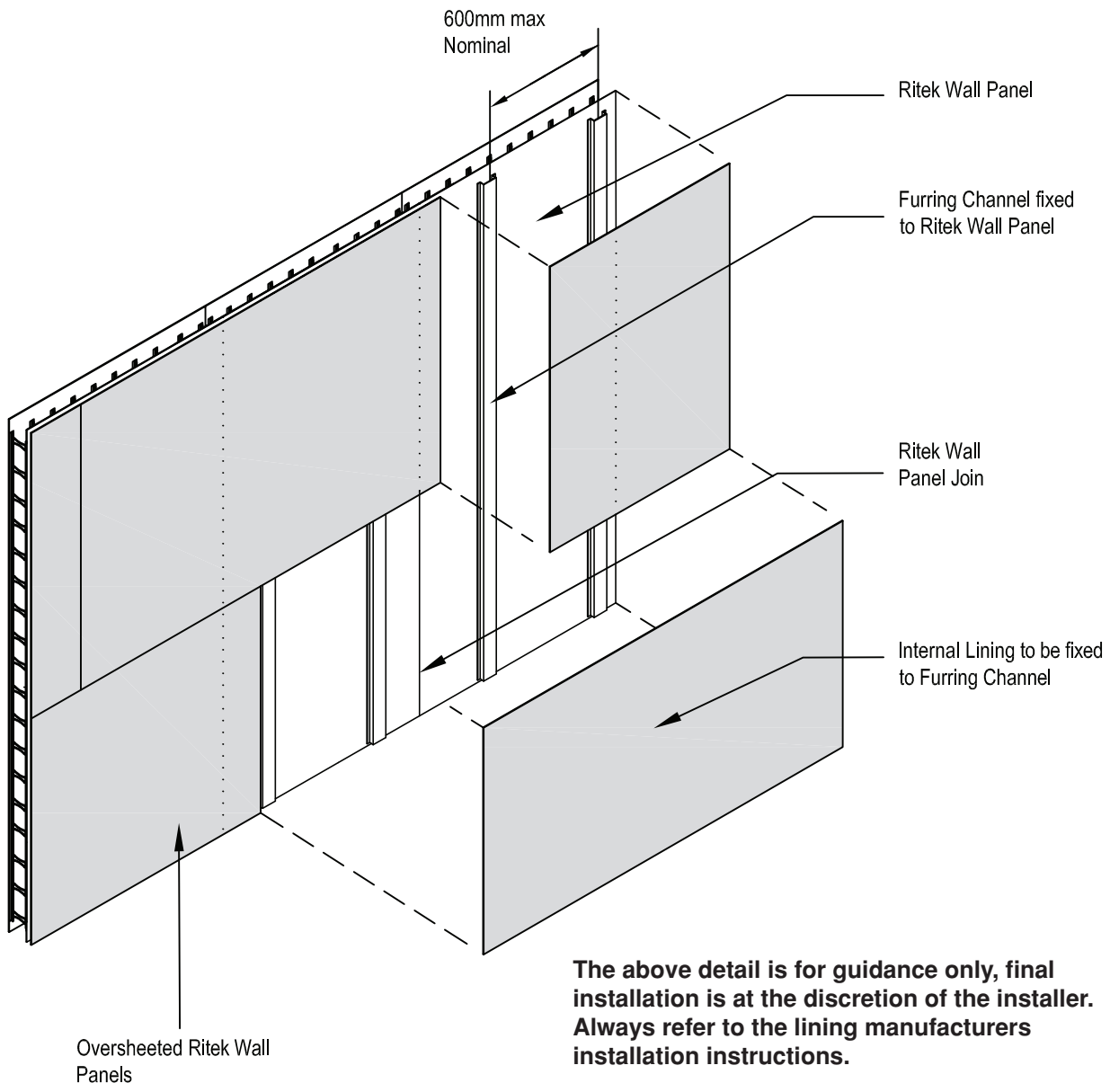
Batten and Sheeting of Plasterboard to Ritek® XL Wall® Panels

Ritek® recommends the batten and sheeting method using a furring channel/batten mechanically fixed to the Ritek® XL Wall® Panel then sheeted with plasterboard.

The surface of the Ritek® XL Wall® System must be flat, clean and dry prior to the installation of the battens and plasterboard sheeting.

The installation of the furring channel/battens, plasterboard and requirements for setting of the plasterboard joints is to be carried out in accordance with the installation and joint setting methods provided by the appropriate plasterboard supplier's installation and finishing guidelines.

OVERSHEETING WALL PANELS BATTEN & SHEETING METHOD **FIGURE 5.11**



The above detail is for guidance only, final installation is at the discretion of the installer. Always refer to the lining manufacturers installation instructions.

Ritek® Wall Systems - **Over Sheeting of the Ritek® Wall System**

Direct Sticking of Plasterboard to Ritek® XL Wall® Panels

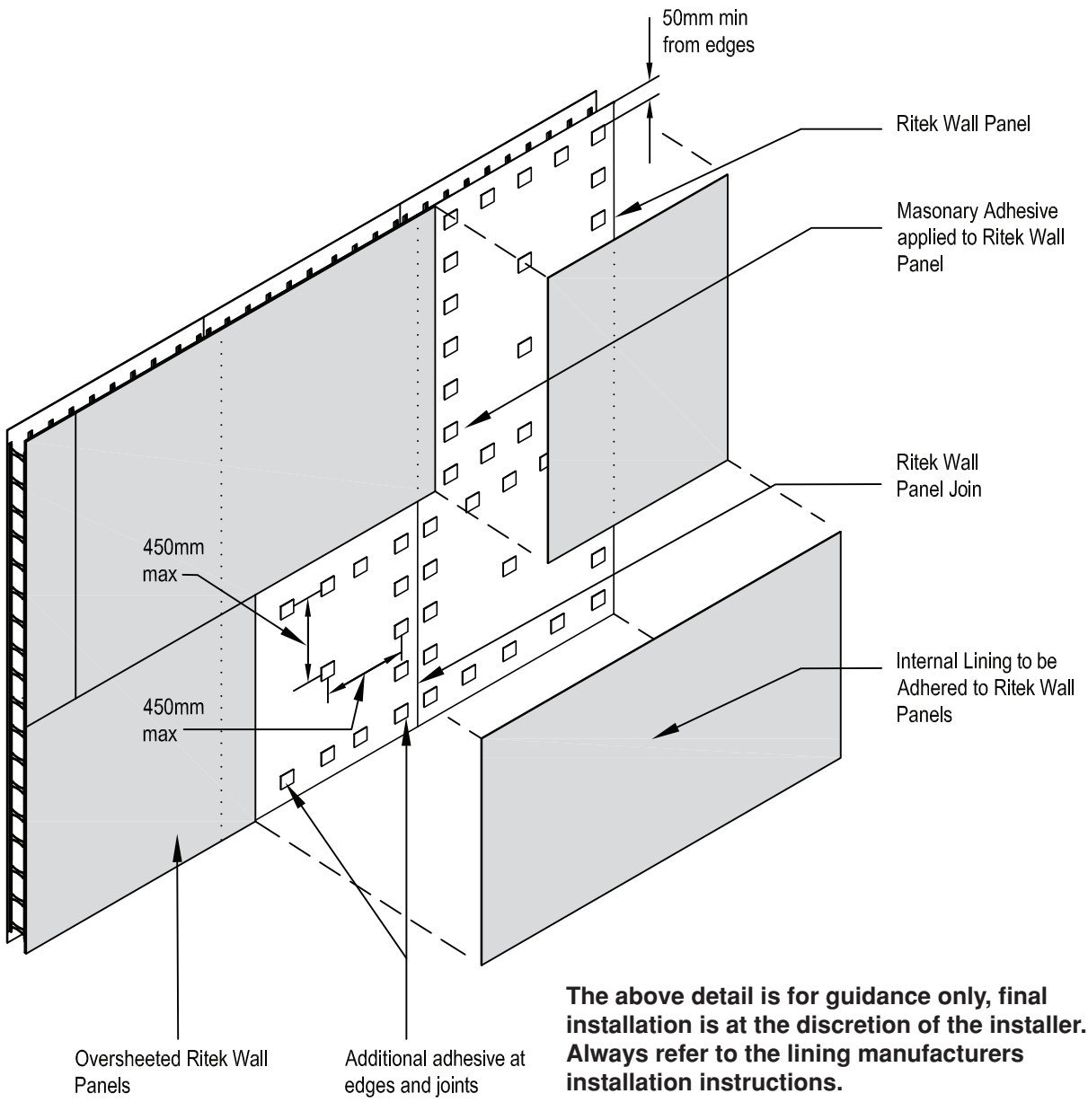
'Direct stick plasterboard' is a term used for directly adhering plasterboard lining to the Ritek® XL Wall® System. The surface of the Ritek® XL Wall® System must be flat, clean, dry and free of dust, oil and other elements that may reduce the plasterboard adhesive performance.

Daubs of plasterboard adhesive are applied to the Ritek® XL Wall® System surface or to the back of the plasterboard sheets at 450mm centres maximum vertically and horizontally. Additional daubs of plasterboard adhesive can be used at butt joints of the plasterboard for additional adhesive strength. Plasterboard sheets must be held in position until adhesive sets by using temporary masonry nails as required.

The installation of the plasterboard and requirements for setting of the plasterboard joints is to be carried out in accordance with the installation and setting methods provided by the respective plasterboard supplier / manufacturer's installation and finishing guidelines.

When direct sticking plasterboard to walls requiring an acoustic rating, plasterboard adhesive may need to be trowelled on to prevent a drummy effect when wall is impacted. Please discuss with your acoustic consultant prior to installation.

OVERSHEETING WALL PANELS MASONARY ADHESIVE METHOD **FIGURE 5.12**



The above detail is for guidance only, final installation is at the discretion of the installer. Always refer to the lining manufacturers installation instructions.

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F EXTERNAL FINISHING

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Ritek® Wall Systems - **External Finishing**

Recommended guidelines for external joint setting and finishing systems for the Ritek® XL Wall® and XL Thermal Wall® Systems

External Joint Setting of Ritek® Wall Panels

Industry Standards
Refer to AS/NZS 2311:2009 Standard for guidance and recommended good practice for the preparation of specifications, the application and maintenance of paint systems for use by the paint industry.

Preparation for Joint setting / Flushing Compounds

Ritek® XL Wall® Panels can be covered in dust, mud and other contaminants following installation on project sites. The panels need to be cleaned of all contaminants to ensure a quality finish.

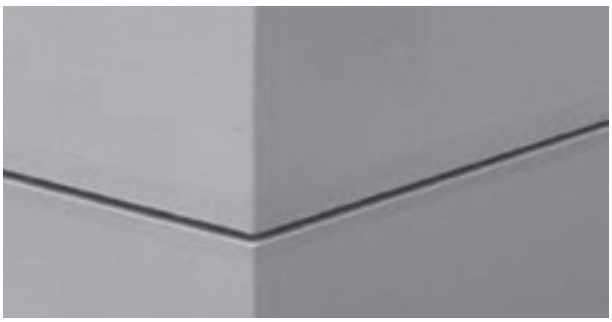
Required Procedure:
Ensure that the substrate surface condition meets the requirements of the jointing compounds and finishing systems being used at the time of application.

Ritek® Panel Rebate Detail

Ritek® XL Wall® Panels are supplied with a standard FC sheet rebate detail to allow for jointing compounds and joint reinforcing tapes to be used. A standard FC sheet rebate detail is typically 0.5mm deep tapering to 1.5mm deep at the edge of the panel and 30mm wide.

Required Procedure:
The rebate detail must be clean of any excess concrete, adhesive or any other contaminant.
Fixing screws used during the panel installation must be set below flush with the surface or removed.

Note: It is recommended for external walls that an industry-standard, external texture coat system be applied. It should, as a minimum, entail a 2–3 mm trowel-on system and be designed to perform as a membrane.



Rebate Finish

Ritek® Panel Moisture Content

Ritek® XL Wall® Panels following core-fill, after heavy rain or during high humidity periods may result in a wet substrate surface. Due care is required to ensure the finishing systems are applied within the acceptable conditions of the system being applied. It is standard practice to ensure the substrate contains less than 20% Wood Moisture Equivalent (WME) before applying joint setting / patching materials and finishing system. Refer to the joint setting compound manufacturer's specification sheets.

Aluminium Accessories

The Ritek® XL Wall® System uses aluminium accessories for corners and nib end closers. All aluminium accessories are supplied etched with chromate finish as a protective coating to prevent corrosion and a barrier to the concrete. During panel assembly, aluminium accessories can be cut to length, scratched, holes created for screw fixing etc. and can have dust, mud and other contaminants on them. It is important to ensure that the substrate surface condition meets the requirements of the jointing compounds and finishing systems being used at the time of application. Refer to the joint setting compound manufacturer's specification sheets.

External Jointing Tape

The use of jointing tape must be used for fibre cement sheeting flush jointing. 160GSM fibre mesh, non-adhesive alkaline resistant mesh tape is required to reinforce the Ritek® XL Wall® panel to panel and panel to accessory joint. Tape dimensions to be appropriate to that which the joint application requires.

Required Procedure:
Mesh jointing tape is to be used for joint setting:

- 160GSM Fibre Mesh Tape – without self-adhesive backing - alkaline resistant
- Tape width at panel to panel joint = 50mm
- Tape width at FC/alum corners = 2 x 75mm
- Tape width at full aluminium corners & squint corners = 150mm (min 50mm on the fibre cement sheeting)
- Tape width at FC/alum nib ends (only required on longer side of aluminium extrusion) = 50mm

Facing Sheet Movement Joints
It is essential that a movement joint be placed in the facing sheets a distance of no mote than 5400mm centres.
On western walls or walls exposed to significant heat, movement joints should be located at 4800mm centres maximum. This is completed by saw-cutting the fibre cement facing, both internally and externally, after the concrete pour, at the desired locations.

Ritek® Wall Systems - **External Finishing**

External Joint Setting Compounds

In order to achieve a quality result a high level of skill and experience is required on behalf of the contractor responsible for the application.

There are a number of different types of compounds including setting type, drying type or acrylic drying type. All compounds can be applied by hand or with mechanical jointing tools. Acrylic drying type compounds produce very strong and durable joints. These joints are resistant to some movement without displaying cracking.

Ritek® recommend low-shrink jointing compounds which provide a high performance, semi - flexible filling compound for joints in fibre cement, Blue Board, weatherboard sheeting etc.
It is important that a system is used from one reputable and long standing manufacturer and not made up from a range of different component materials as they would not have been tested for adhesion or cohesion etc.

Refer to the specific product specification from the Ritek® recommended finishing system provider as included within this technical bulletin.

Note: Gypsum/plasterboard jointing compounds are not approved as they are known to cause joint cracking and joint peaking under certain environmental / weathering conditions.

Recommended and Approved Suppliers:
Astec: Exterior render System
Dulux : Acra-Tex render system
Euromix: Exterior render System
Rockcote : Rockcote render system
RSA : Acrylic render system
STO: Exterior render System
Wattyl : Granosite render system

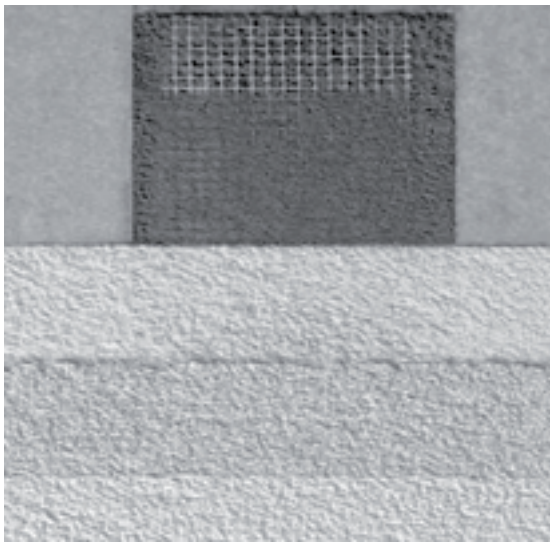
Cracking and Peaking of External Joints

Fibre cement sheet constructions are prone to stress cracking if the correct design, installation and finish systems are not applied. Stress cracking is caused by a number of factors including structural movement, thermal expansion and contraction, improper construction, lack of adequately formed control and movement joints, improper fixing and a variety of other factors which are all beyond the control of Ritek®.

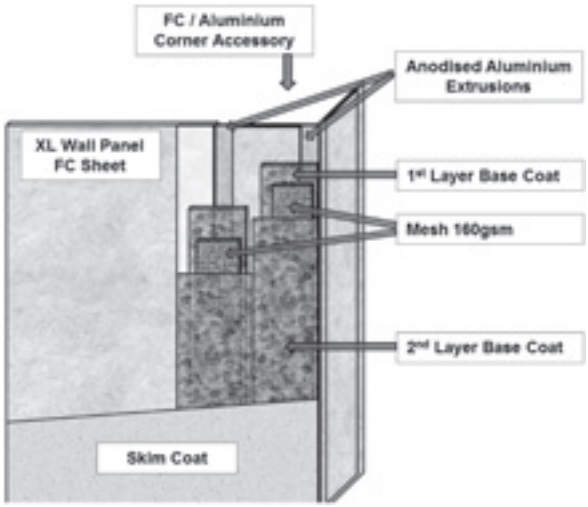
External Joint Setting to Non Ritek® Panels

For joints between Ritek® XL Wall® Panels and non Ritek® panels such as dry walls and stud partition walls, it is recommended to install an expansion joint or express the joint using a paintable flexible sealant. Walls having a different thermal mass are likely to expand and contract at different rates therefore flush jointing is not recommended.

EXTERNAL JOINT SETTING **FIGURE 6.1**



EXTERNAL JOINT SETTING **FIGURE 6.2**



Ritek® Wall Systems - **External Finishing**

Wall Finishes

The aesthetic appeal of the walls depends on:

- Correct installation of the panels;
- Straightness / flatness of walls;
- Choice of finishes for internal;
- The amount of glancing light projected on the wall surface; and
- The quality of the applied joint setting, paint or texture system.

Lighting

Lighting design is very much subject to the building application. The Australian Standard AS2589-1997 details six levels of finish. It is recommended designers give consideration to the level of finish required and eliminate potential problems due to critical lighting.

Typical Joint Setting Application

First Coat

a. Apply Base Coat to fill the rebate using a 150mm broadknife.
b. Embed the fibre mesh centrally over the joint using a 150mm broadknife ensuring there are no voids under the tape and remove excess compound.
c. Immediately cover tape with thin layer of Base Coat applied using a 150mm broadknife.

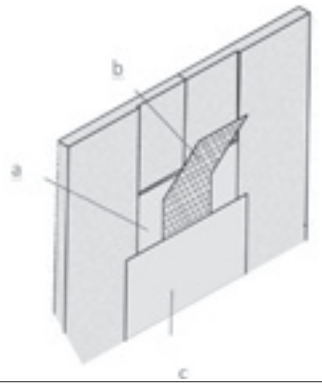
Second Coat

When the base coat is fully dry, use a 150mm wide second coat trowel to apply the second coat. Apply this coat approximately 180mm wide, laid down over the rebate and feather the edges.

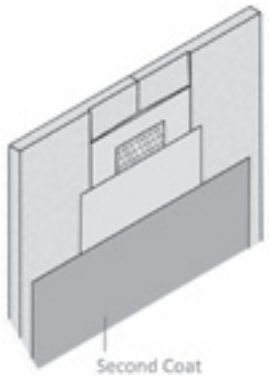
Sanding and Finishing

a. Allow the finish coat to dry at least 24 hours.
b. Lightly Sand smooth with 150 grit paper or with 220 sanding mesh.
c. Wipe off excess dust with a slightly damp cloth prior to render application.

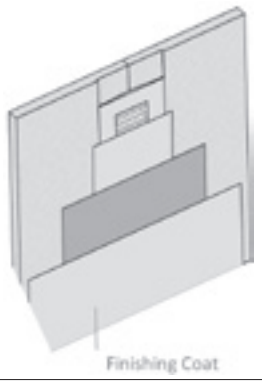
FIRST COAT FINISHING **FIGURE 6.3**



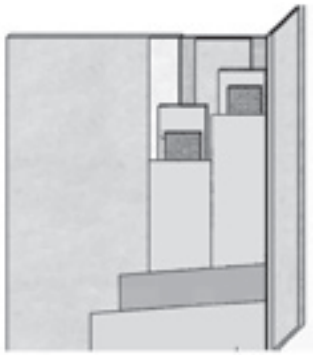
SECOND COAT **FIGURE 6.4**



FINISHING COAT **FIGURE 6.5**



CORNER DETAIL **FIGURE 6.6**



Ritek® Wall Systems - **Texture Coating**

External Panel Texture Coating

General
All external walls need to have joints set with a flexible reinforced acrylic compound and then finished with a trowel-on render.

Texture coatings are available from several manufacturers who offer advice on the use of their systems.

System components must be from the one chosen manufacturer to obtain that manufacturer's system warranty.

External Panel Jointing
The procedure from the chosen manufacturer shall be followed. Generally this will include:

- priming the sheet;
- applying jointing compound

External Panel Texture Coating
The procedure from the chosen manufacturer shall be followed. The complete surface, joints and panels are primed. Rough texture is trowelled to a minimum thickness of 3 mm to successfully cover the panel joints. Where a fine texture is required, the complete surface is rendered (or skim coated) with one or more coats to a thickness of 1.5–10 mm to provide a flat surface for the fine texture.

After the texture application, the texture is sealed and coloured by the application of the "impact" coat.

The purpose of trowel-on finishes is to cover the set joints and to take out lips or variations to the surface of the sheet.

The quality of the preparation of the wall surface by the applicator, prior to application of the final coats is of paramount importance if a quality finish is to be achieved.

Note: *If external horizontal and vertical joints are set and not trowel-finished as above, the set joints will most likely be visible. If the walls are simply painted or finished with a roll-on texture coat, the joints will remain visible.*

The fibre cement sheeting used by Ritek® has been formulated and prepared to meet the requirements for use in wet areas and is primed during the sheet manufacturing process to give basic protection. Providing that an industry-standard texture coating system is applied and maintained, the sheeting will be fully protected against all weathering.

Texture Coatings Manufacturers
Texture coatings are available from a range of manufacturers who can offer advice on the use of their systems:

Astec: Exterior render System
Dulux : Acra-Tex render system
Euromix: Exterior render System
Rockcote : Rockcote render system
RSA : Acrylic render system
STO: Exterior render System
Wattyl : Granosite render system

TYPICAL TEXTURE COATING FINISH **FIGURE 6.7**

Ritek® Wall Systems - **Notes**

Ritek® Wall Systems - **Notes**

James Hardie Systems
www.jhsritek.com.au
1300 929 782

Version 2015.01

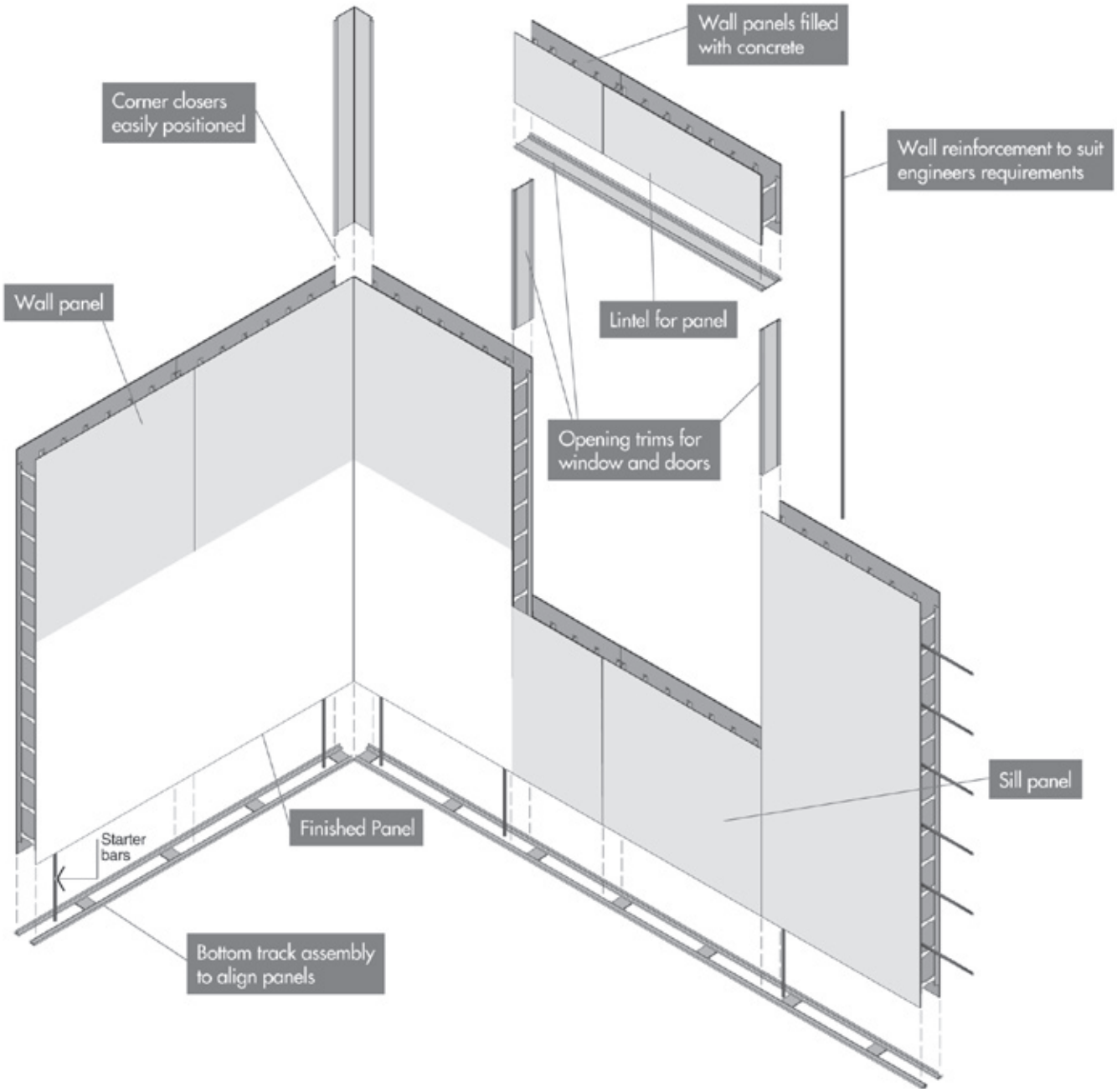
Design, Detailing & Installation Guide

Ritek® XL Wall® and XL Thermal Wall® Systems

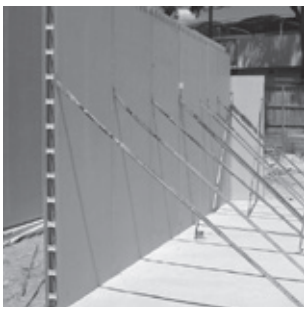
Version 2015.01

Ritek® - the alternative, innovative & cost effective building method.

Ritek® Wall Systems - **Introduction**








Ritek® Wall Systems - Introduction

Introduction

James Hardie Systems Pty Ltd (Ritek®) is an Australian owned, innovative wall and roof systems manufacturer combining over 30 years of expertise and solid business values. Ritek® is a leader in designing, manufacturing and supplying today's construction industry with cost effective, energy efficient and sustainable construction solutions to provide its customers with outstanding benefits.

Ritek® wall systems are pre-fabricated permanent formwork systems for concrete walls used for all types of external and internal walls. They consist of lightweight panels created by bonding quality hard-wearing and durable fibre cement sheets to a patented composite stud assembly. Ritek® wall systems are quickly and simply installed on site and then core-filled with structural concrete to achieve loadbearing walls that are fire and sound rated. The fibre

Disclaimer

It is at the discretion of the contractor or installer involved with the installation to use the information provided in this Installation Guide and other information as may be published by Ritek® or an alternate methodology for the purposes of installing the Ritek® XL Wall® & XL Thermal Wall® Systems.

The contractor or installer must meet or exceed the minimum requirements for plumb, straightness, finish and detailing as presented in this Installation Guide and as per other information as may be published by Ritek®, Australian Standards or the Project Engineer.

Installer Responsibilities

The contractor or installer involved with the installation of the Ritek® XL Wall® & XL Thermal Wall® System is responsible for:

- Proper installation of the System
- Supply of tools and equipment to complete the installation
- Supply of consumables to complete the installation
- Cutting of rakes to panels
- Cutting and forming of panels for apertures or the like less than 0.5m²
- Meeting or exceeding tolerances as documented in this Installation Guide for wall plumb and straightness
- Placement of the reinforcement steel in accordance with the Project Engineer's requirements
- Placement and compaction of the (concrete mix) core fill in accordance with information as documented in this guide, to suit the requirements of the Project Engineer
- Trowel to finish off window sills and top of walls
- Stripping of any forms and reduction of any proud concrete post concrete core fill
- Removal of props post concrete core fill
- Removal of any concrete spill from the wall surfaces and other building elements post concrete core fill
- Sealant under tracks

Ritek® is a manufacturer and supplier of the XL Wall® System & XL Thermal Wall® system only and is not responsible for the installation, installation workmanship and finishing of XL Wall® System & XL-Thermal Wall® Systems.

This Installation Guide is subject to regular updates, the latest version can be obtained by contacting James Hardie Systems Pty Ltd. on 07 5472 2500 or at www.jhsritek.com.au

The design of the wall system for a building or application requires the services of professional consultants. This information has been prepared as a source of information to provide general guidance to professional consultants and no way replaces the services of professional consultants. No liability can therefore by accepted by James Hardie Systems Pty Ltd for its use.

Ritek® Wall Systems - **Considerations Prior to Installation**

Installer Licences

Installers need to be licenced as required by the appropriate authority in each State relevant to the works they are undertaking. (e.g. QBCC in Queensland)

Installer Insurances

Installers should carry Contractors All Risk, Public Liability Insurance and WorkCover as a minimum.

Contracts / Legal

Installers should be prudent when entering into contracts with the Project Builder / Principal Contractor. It is recommended for Installers to avail themselves with all the relevant information to the Project e.g.

- Contract Terms and Conditions, Scope of Works
- Architectural drawings, structural drawings
- Window / Reveal / Opening schedules
- Project construction program & sequence
- Cranage requirements and availability
- Required resources, EBA's
- Reinforcement requirements and scheduling
- Concrete supplier, MPa, Concrete placement
- SWMS (JSA)

Installers will require a SWMS (JSA) for lodgement with the Builder/Principal Contractor prior to starting works.

Site Inductions

Installers will be required to attend a Site Induction as determined by the Project Builder/Principal Contractor prior to starting works. Presentation by the Installer of a General Induction Card (White Card or as recognised) is required at this time.

Tool Box Meetings

Installers will be required to hold a Tool Box or Pre-Start Meeting prior to works each day or as determined by the Project Builder/Principal Contractor.

Safe Work Method Statement

A work method statement should be completed by the panel installation contractor and signed off prior to onsite work commencing.

Equipment Safety Tags

Ensure that all tools are tagged and tested.

Accurate Layout Grid and Set Out

An accurate Layout grid must be provided by the builder before wall bottom plate assembly is positioned. It is suggested that a surveyor mark out the slab to the architectural plans with surveying pins. It is imperative that there are pins at the wall corners, start of wall, the end of wall, and at every directional change (no offset).

Set out the slab using a chalk line and workshop drawings supplied. Check set out with a string line to ensure the marked chalk line is correct. In this process it is also recommended that the distance between pins be measured and those measurements be checked with the workshop drawings.

For increase of speed of installation - with the use of Ritek® workshop drawings - mark out the slab with a marking crayon placing wall numbers and panel numbers with their coinciding walls.

Slab Level Tolerances

It is required as a minimum, that slab levels meet the following tolerances:
Generally, the floor slab tolerance is to be:

- Within + / – 10mm of level over the entire room
- Within + / – 5mm of level over any 3m length

Starter Bar Positions

Check location of cast-in starter bars or marked position of starter bars are in accordance with the Project Engineers specification.

Note: For XL Thermal Wall® – Starter bars to be positioned to suit the concrete core ensuring that sufficient concrete cover is achieved (bars may need to be offset from the insulation).

Ritek® Pre Installation Checklist

Refer to Ritek® Pre-works Checklist at the back of this Installation Guide.

TYPICAL RITEK® PANEL INSTALLATION TOLERANCES (UNLESS STATED OTHERWISE): **TABLE 7.1**

Description	Tolerance	
Concrete blow holes / voids	None	
Flatness	Over 1.25m Grid	Within 5mm
	At 5m over 10m	Within 7mm
Out of plumb	< 3m	Within 5mm
	> 3m	Within 8mm
Straightness	Wall Length / 1000mm	Within 3mm
Corner Details	Stated Angle	+ / - 2deg

Ritek® Wall Systems - **Safe Working Practices**

General Responsibility

All installers have a general responsibility, under Government Legislation, for the health, safety and welfare of themselves and their fellow workers. You should also become familiar with and comply with Federal and State Legislation specific to the building industry. Each building site may have its own specific rules for contractors and these must also be complied with.

As a guide only, these are some areas that require attention to health & safety when installing the Ritek® Wall Systems:

- Ultraviolet radiation
- Manual handling (lifting of panels)
- Scaffolding
- Working at height
- Exposed reinforcing steel
- Personal protective equipment
- Housekeeping
- Electrical safety
- Cranes and slings
- Power tools

PPE – Personal Protective Equipment kit should include:

- High visible vest/shirt
- Safety glasses
- Gloves
- Glove guard
- Ear plugs
- Dusk mask
- Steel cap boots
- Hard hat
- Long trousers
- Long sleeve shirt

Note: For XL Thermal Wall® – PUR or PIR insulation is used therefore eye protection and dust masks PPE must be worn.

Recommended Safe Working Practices

Breathing in fine silica dust liberated when working with products such as fibre-cement, clay and concrete is hazardous. Over time, usually a number of years, this may result in bronchitis, silicosis or lung cancer.

Work safely with fibre-cement sheets by following the precautions described below.

Minimise dust when cutting sheets, by using either Score and Snap knife, Kwikrip™ hand guillotine, Toolex Fibre Shears or Makita Wet Saw (Models 4101R and 4107R).

When using other power tools or abrasive hand tools on sheets, wear approved personal protective equipment, ie P1 or P2 dust mask and safety goggles.

Ensure containment of dust during clean-up and disposal.

These precautions are not necessary when stacking, unloading or handling fibre-cement products.

Ritek® Wall Systems - **Tools & Accessories**

To efficiently install the Ritek® wall systems it is essential to have the necessary tools and equipment available.

Note: Power tools require tagging as per site requirements.

Ritek® Pre Installation Checklist

Typical range of tools and equipment required by a 6-person installation crew:

- Tool box (x1) designed, manufactured and certified for lifting. Large enough to hold all tools and consumables, wired and tagged for battery charging, lockable
- Mitre saw with aluminium blade – power tool (x1)
- Gas-actuated fastening / nail tool (x1)
- 125mm angle grinder – power tool (x1)
- 225mm angle grinder – power tool (x1)
- 185mm circular saw with timber blade – power tool (x1)
- Fibre cement shears – power tool (x1)
- 150mm diamond grinder – power tool (x1)
- Wet and dry vacuum cleaner – power tool (x1)
- Extension power leads (x4)
- Cordless rotary hammer drill (x1)
- Cordless impact wrench (x1)
- Cordless impact screwdriver with charger and 2 batteries each (x5)
- Tool belt (x5)
  - Claw hammer, 8m measuring tape, Chisel, All-purpose tin snips, Steel fixing nips, Stanley knife, Marking crayon, Builders pencil, Set square,
- 30m measuring tape (x1)
- String lines 100m (x3)
- Chalk line (x1)
- Spirit level 600mm (x1)
- Spirit level 1200mm (x1)
- Spirit level 2000mm (x2)
- Roofing square (x1)
- Floor scraper (x2)
- Finishing trowel (x2)
- Platform step ladders (x2)
- Junction box with earth leakage safety switch.
- Saw horses or a bench (x2)
- Certified Panel braces (x400 minimum)
- Sponge and bucket for wiping down after pour
- 15 L metal bucket (x4)
- Concrete pencil vibrator 6m x 25mm shaft (x1)
- 30m hose (x2)

Access scaffold, ladders, steps & platforms:

All scaffold, safe access provisions are the responsibility of the builder and installers and are governed by the site conditions. It is essential that safe work practices and safe work methods are complied with.

Installers would typically provide ladders, steps and platforms for personal access to the top of the panels for the fixing of braces.

TYPICAL RANGE OF INSTALLER POWER TOOLS	
GX 120 gas system with 40 nail magazine	
	Used for fastening bottom track assembly to slab with masonry pins.
Makita 24v Cordless Rotary hammer drill	
	Used to prepare holes ready for a 10mm x 60mm Concrete Screw Bolt
SIW 144-A cordless impact wrench	
	Used to secure the certified brace with an 10mm x 60mm Concrete Screw Bolt to the finished slab
SID 144-A cordless impact screwdriver	
	Used to fix the 7g/8g x 25 CSK Ribbed Head Winged Tip Tek Point Self Tapping Screws and 6.5mm x 40 mm Tek screws
DG 150 diamond grinder	
	Used to grind out any imperfections after the installation is completed
VCD 50 dry vacuum cleaner	
	Unit is connected to the DG 150 Diamond Grinder to extract the dust whilst grinding
225mm Angle Grinder	
	Used for cutting or grinding where needed. A diamond cutting blade is used for fibre cement and aluminium
125mm Angle Grinder	
	Used for trimming and cutting panels if needed
185mm Circular Saw	
	Circular saw is used to cut form ply if needed
Compound Saw	
	Used for cutting the aluminium section (mitre and 90º)

Ritek® Wall Systems - **Tools & Accessories**

To efficiently install the Ritek® wall systems it is essential to have the necessary tools and accessories required. Ritek® wall panels are fixed into place using the screw types and fixing centres as per the schedule table below.

It is important that the correct screw fixing type is used to ensure a secure and reliable connection and quality finish. Class 3 galvanised plated screws must be used. On some projects the builder may specify stainless steel fixings in external areas.

RITEK® XL WALL® / XL THERMAL WALL® – STANDARD FIXING SCHEDULE				
XL Wall® Fixing Location:	**Top & Bottom Fixing from Edge**	**Typical Fixing c/c**	**Maximum Fixing c/c**	**Fixing Type**
Panel To Panel Joiner	150	600	900	CSK Wing Tek Class 3 7-18 x 25 or 8-18 x 25 
Internal Corner Closer	100	450	900	
External Corner Closer	100	300	300	
Panel End Closer	100	300	300	
Bottom Track Joiner To Slab (2 x Nails Per Fixing)	N/A	600	600	Hilti X-GN 20 MX Nails - 20mm 

XL Wall® Panel Bracing:	**Required Fixings**	**Fixing Type**
Certified Brace to Panel	3 Per Brace	14-10 x 42 Hex Tek 
Certified Brace to Slab	1 Per Brace	10 x 60 Concrete Screw Bolt 
Refer to Ritek® XL Wall® certified brace detail for site specific panel bracing requirements		

Other consumables required for panel installation:

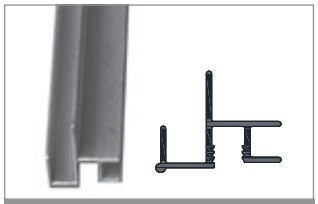
- Expandable foam filler
- Form ply sheets
- AV515 Polyurethane adhesive or equivalent
- Polyurethane sealant

Ritek® Wall Systems - **Components Overview**

Standard Track
Aluminium extrusions used in conjunction with Track Joiner to make a Standard Bottom Track Assembly. Also used as part of the assembly for Nib End Closers.

Track Joiner
Aluminium extrusion combined with two lengths of Standard Track to make a Standard Bottom Track Assembly.

Standard Bottom Track Assembly
Secures Wall Panels, Tees and End Closers to floor slabs and footings.



Standard Track

Track Joiner / Assembly

Panel Joiner
Aluminium Extrusion to secure Wall Panels to adjacent Wall Panels, Tees and Corners in the same plane.

XL-T Joiner Insert
Foam insulation insert used at joins between XL-T Wall Panels.

Panel Joiner

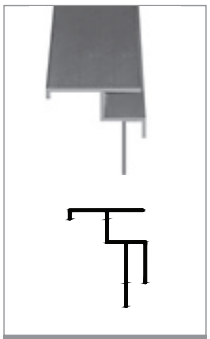
XL-T Joiner Insert

Rebated Top Track
Optional Accessory. Aluminium extrusion used when a clean upper edge is required on Edge Form Panels. Also used in conjunction with Rebated Bottom Track to form an articulated horizontal joint and weather seal.

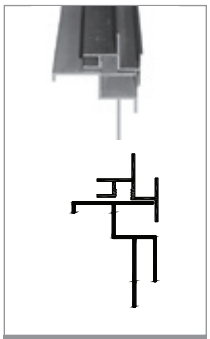
Rebated Bottom Track
Aluminium extrusion used in conjunction with Track Joiner and Rebated Top Track to make a Rebated Track Assembly. Also used as an optional edge on a finished slab to perimeter walls when no step down in the slab is provided.

Rebated Track Assembly
Used to create a shadow joint at Panel to slab and

Rebated Bottom Track



Rebated Top Track



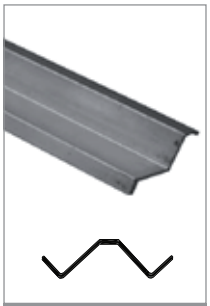
Rebated Track Assembly

Two Part FC External Corner
Prefabricated FC and aluminium assembly installed at 90° external corners. Foam Insulation included in assembly for XL-T.

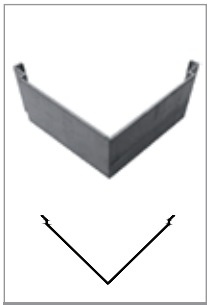
Internal Corner Closer
Prefabricated aluminium extrusion folded to suit required internal corner angle.

Aluminium Squint Closer
Prefabricated aluminium extrusion folded to suit required external corner angle other than 90°. Foam Insulation supplied separately for XL-T.

XL and XL-T External Corners



Internal Corner Closer

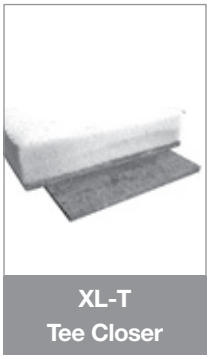


Aluminium Squint Closer

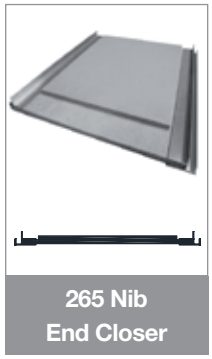
Tee Closer
Custom sized FC sheet assembly installed at Wall Panel Tee Junctions. Foam Insulation supplied for XL-T.

Nib End Closer
FC and Standard Track assembly to close off wall ends, window and door openings without aluminium window adaptors or folded metal door frames. Nib End Closers for 265 Wall Panels use a different track.

XL Tee Closer



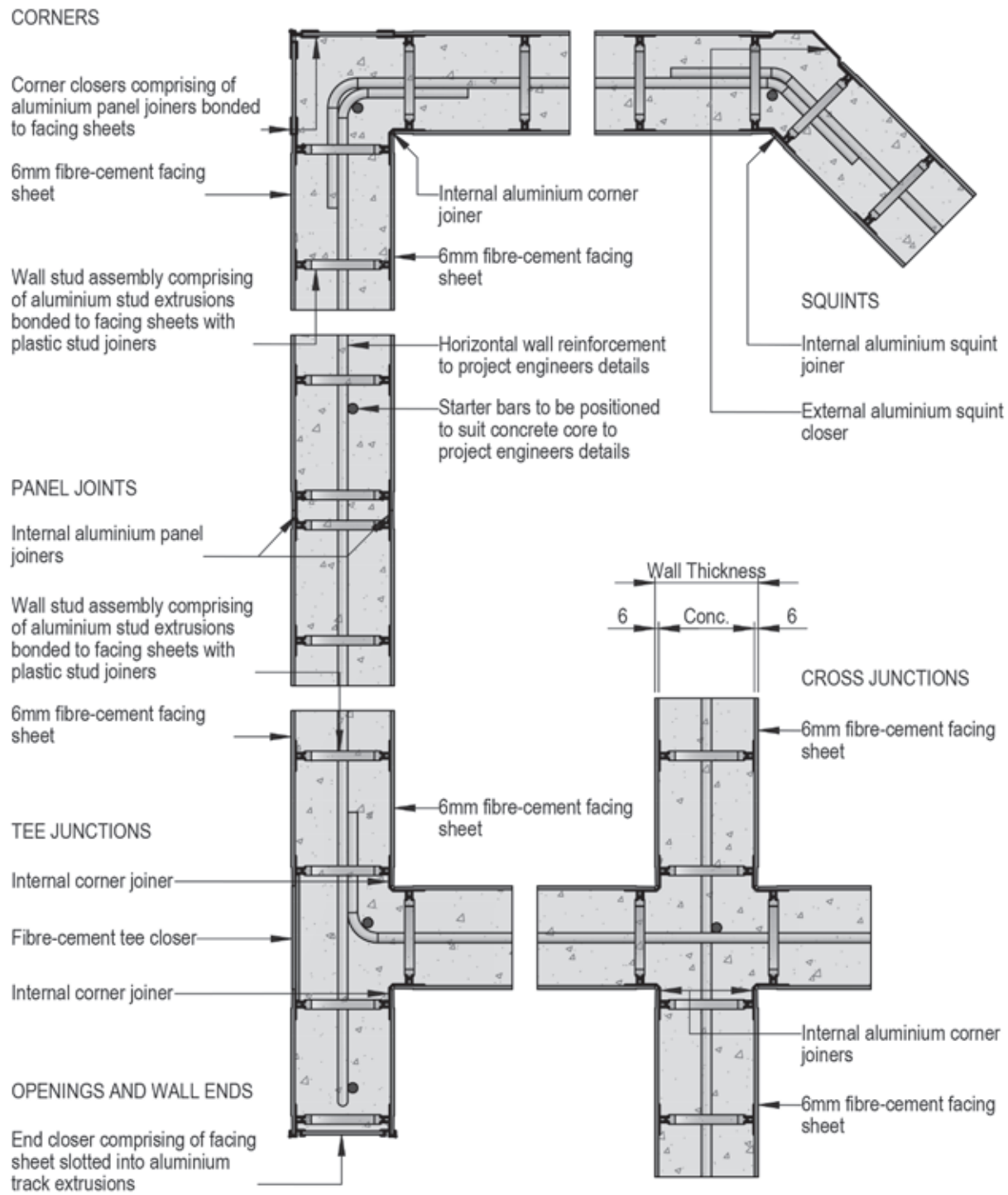
XL-T Tee Closer



265 Nib End Closer

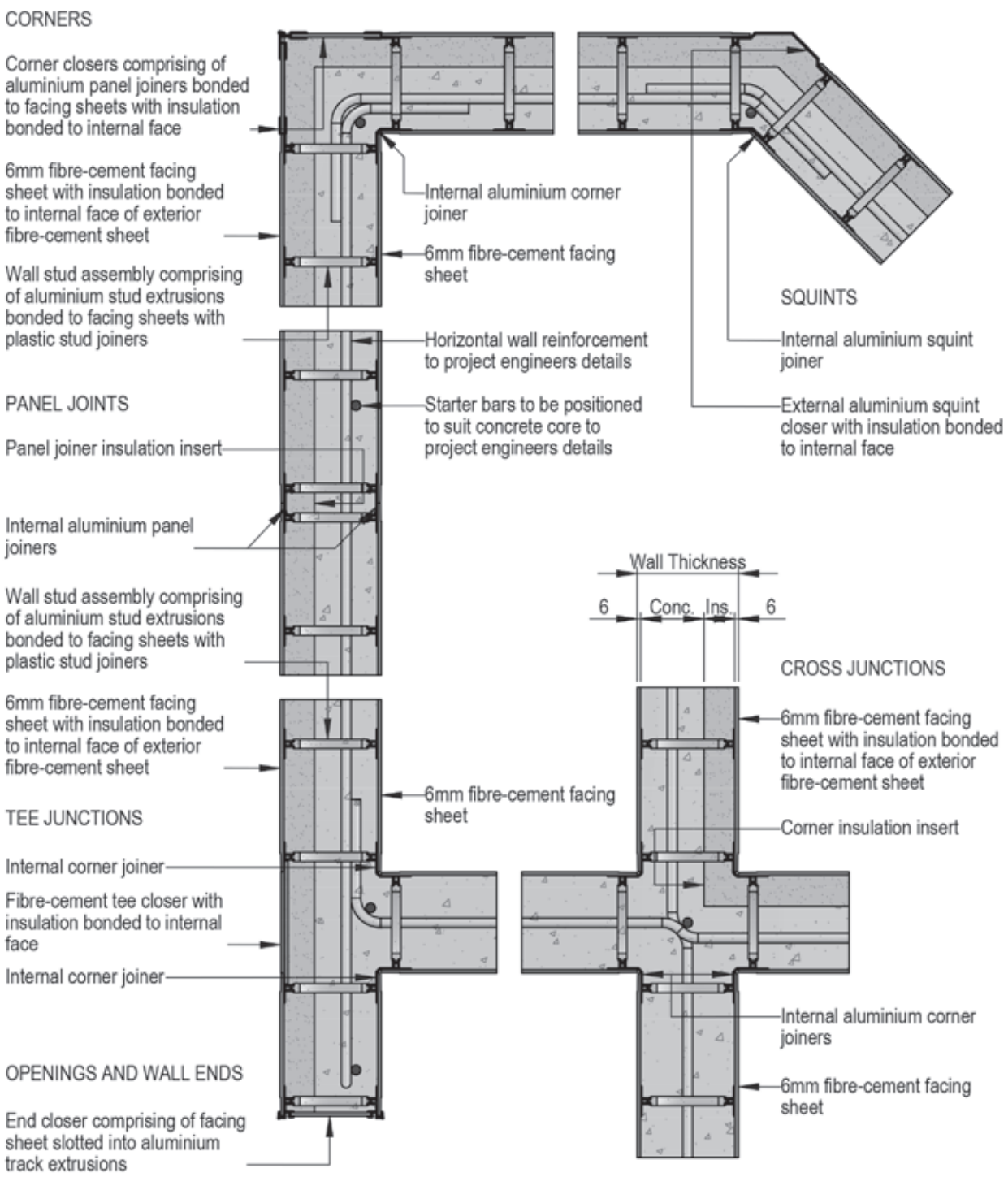
Ritek® Wall Systems - **XL Wall® System Sectional Plans**

XL WALL® SYSTEM SECTIONAL PLANS (XL) **FIGURE 7.1**



Ritek® Wall Systems - **XL Thermal Wall® System Sectional Plans**

XL THERMAL WALL® SYSTEM SECTIONAL PLANS (XL-T) **FIGURE 7.2**



Ritek® Wall Systems - **Handling of Panels**

General

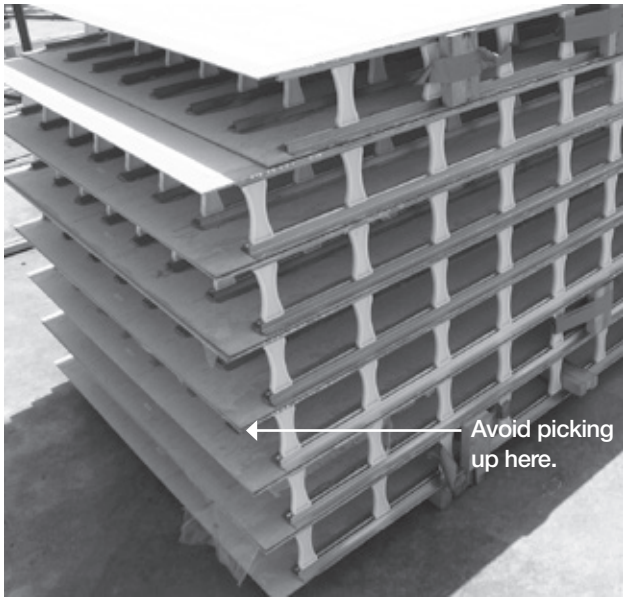
The panels will typically arrive on site on a flat bed semi-trailer.
The pallets will be labelled clearly for identification and to assist in the placement on slab.
A typical pallet of panels, say 2400 x 1200 x 1200 will weigh approximately 864 kg based on 25 kg/m^2.

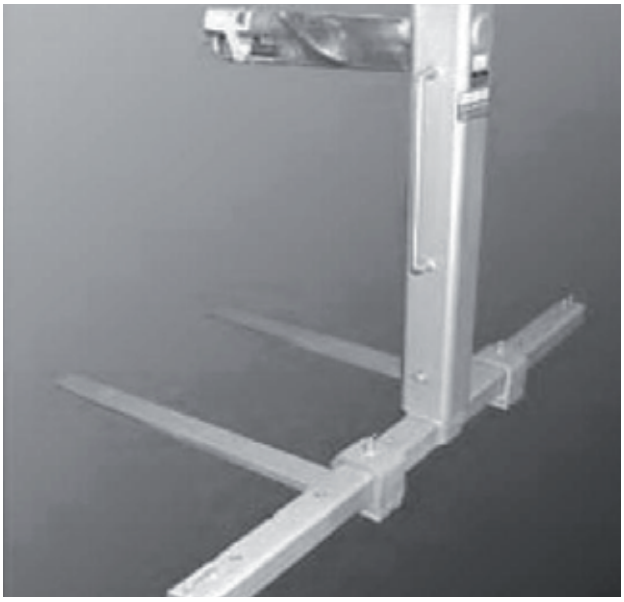
Handling Mechanically

Panels can be removed from the delivery vehicle by forklift or crane. If the crane is to be used it is at the crane drivers discretion which lifting method is acceptable.

Detailed are two recommended lifting methods that are used for unloading the Ritek® system.

In addition, approved and correctly-rated slings may be used to crane panels. Contact Ritek® for further information on the lifting tynes.





Typical sqm per semi load (200 - 300sqm)

Ritek® Wall Systems - **Overhead Crane Lifting using Soft Slings**

Ritek® wall panels should be stacked flat, off the ground on a level platform or on support members which extend the full width of the panels.

Packs of panels are to be craned onto the working deck as close as possible to the erection location.

Operational And Safety Procedures

A qualified person shall operate the crane and a qualified person (Dogger) shall attach the slings to the panels and crane, and direct the movement of panels handled by the crane.

A Dogger shall perform the following tasks:

- Check the loads to be moved, estimating size, shape, weight and centre of gravity, and ensure loads do not exceed lifting capacities of cranes or slings
- Ensure the sling is positioned correctly to the Ritek® panels centre of gravity
- Choose and use slings, covering sharp corners with padding to prevent damage to slings
- Guide the Ritek® panels into position as they are lowered
- Ensures the crane hook does not rest on top of the Ritek® panels.

Preliminary Safety Checks

A qualified person shall check that the crane hook and chains have been correctly fitted to the slings before hoisting.

All signage must be strictly adhered to and checked to ensure that the compliance plate is not damaged and is legible.

General Operating and Safety Procedures

Before the crane elevates any load, the dogger shall lift it to the required working height to confirm that all slings function correctly.

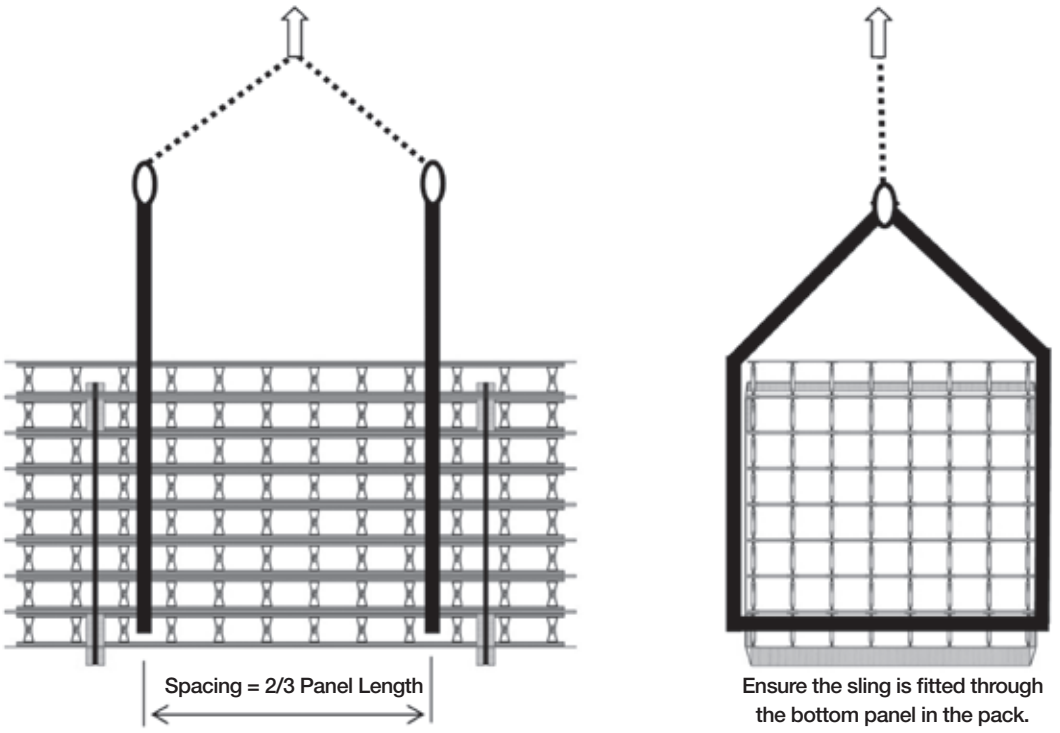
Ensure the crane hook does not rest on top of the Ritek® panels causing damage.

Lifting Procedures

Soft slings must be used to lift the Ritek® panel packs. Feed the soft sling through the bottom panel in the pack and place extra protection around the top of the packs, to prevent any damage to the load.

Ensure the original steel strapping is in place to prevent any potential movement of the panels during the lifting

SOFT SLING PLACEMENT **FIGURE 7.3**



NOTE
This information has been prepared as a source of information to provide general guidance to qualified / professional persons and no way replaces the services of qualified / professional persons responsible for site safety. No liability can therefore

Ritek® Wall Systems - **Overhead Crane Lifting using Pallet Hook**

Method Of Attachment To Crane

A qualified person shall operate the crane, and the pallet hook shall be hoisted in a safe manner. Engage the crane hook through the pallet hook lifting ring ensuring it is correctly fitted before hoisting.

When engaging or disengaging the crane hook, ensure that the hoist used to lift the pallet hook is not twisted or tangled. If a single fall rope is used to hoist the pallet hook, the hook may spin and create a dangerous situation. Do not allow the crane hook to rest on top of the pallet hook. Keep the pallet hook in an upright position at all times.

Operational And Safety Procedures

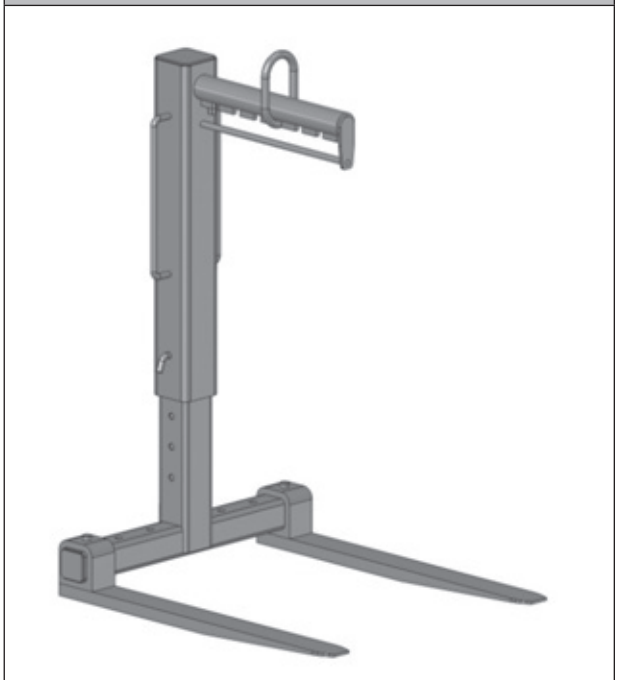
Preliminary Safety Checks

A qualified person shall check that the crane hook has been correctly fitted to the pallet hook lifting ring before hoisting.
All signage must be strictly adhered to and checked to ensure that the compliance plate is not damaged and is legible.
General Operating and Safety Procedures.

The use of the pallet hook shall be limited to those situations
for which it is specifically designed or in accordance with AS 2550.1.

Before and during hoisting of any load, the operator must account for the combined factors of pallet hook tilt, speed of travel, and the pendulum effect from the drop of the crane hook. A qualified person shall check the pallet hook load including the condition of the pallet supporting the load before hoisting. Before the pallet hook elevates any load, the operator shall lift it to the required working height to confirm that all systems function correctly. Do not exceed the recommended crane or attachment rating.

PALLET HOOK EXAMPLE **FIGURE 7.4**



Operating Procedures

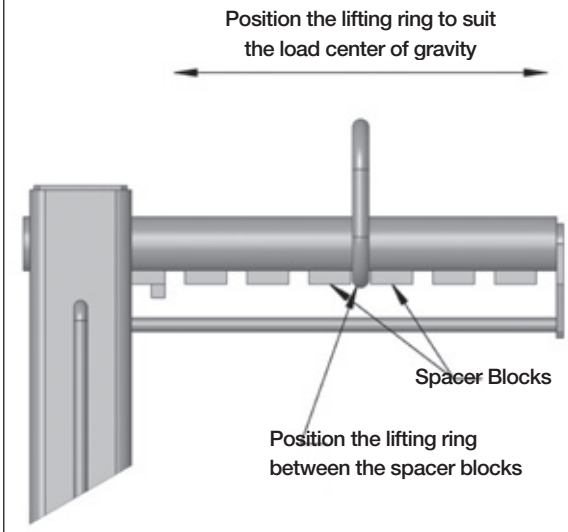
When lifting the pallet hook, ensure that the lifting ring is between the spacer blocks as shown in Figure 7.5. In this position, the lifting ring will not slide along the supporting bar creating a dangerous situation.

When lifting, place the load at the rear of the tines. Determine the centre of gravity of the load and position the lifting ring on the closest lifting position above this point as shown in Figure 7.6.

Because the pallet hook is free to swing on the lifting ring and crane hook, it is of the utmost importance and safety that the load and the lifting ring be positioned correctly. The further the loads vertical centre of gravity is away from the lifting ring, the further the pallet hook will tilt when hoisted.

To ensure safe lifting and transport of loads about the workplace, the pallet hook should be back tilted between 5°
and 10°.

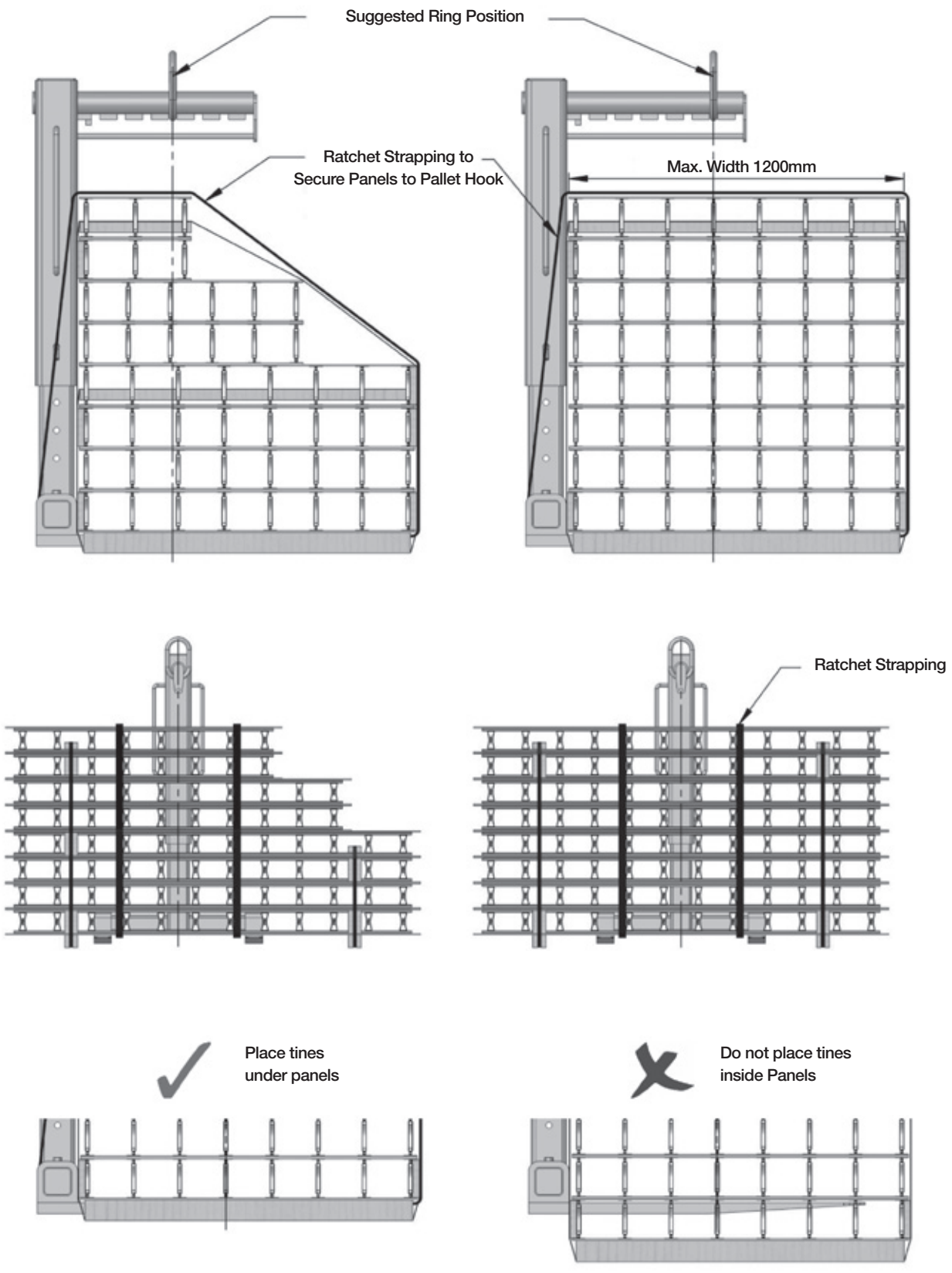
PALLET HOOK EXAMPLE **FIGURE 7.5**



Ritek® Wall Systems - **Overhead Crane Lifting using Pallet Hook**

Operational And Safety Procedures

PALLET HOOK PLACEMENT **FIGURE 7.6**



Ritek® Wall Systems - **Overhead Crane Lifting using Pallet Hook**

Risk Control Measures

When handling loads, the following risk control measures are to be observed by the crane operator and crane personnel to ensure all identified hazards relative to using this equipment are eliminated or controlled.

1. The crane operator's qualifications must conform to the requirements of the relevant regulatory authority. Where applicable, the crane operator shall hold a certificate of competency. To operate a particular crane, the operator must be authorized by a responsible representative of the crane used or hiring contractor. Training in the safe use of the attachment shall be undertaken before usage. The crane operator must not work with the crane unless they are physically and mentally capable. This is in accordance with AS 2550.1 clause 6.2.
2. Authorised personnel must perform the following pre-checks on the crane in accordance with the operating manual before the crane is placed into service. Typically, crane pre-checks as stated in AS 2550.1 appendix G covers the following;
    - Oil level, fuel levels and lubrication.
    - Condition of ropes, rope terminals, fittings and anchor points, rope drums and sheaves.
    - Condition and pressure of tyres where applicable.
    - Drain all water from air reservoirs.
    - Structural checks for loose, damaged or cracked components that may be indicated by rust marks, flaking or marked paint.
    - Check the security and application of counter weights.
    - Load movement system, where fitted is correctly set.
    - Indicator appropriate to the boom or fly-jib length is correctly fitted.
    - Cleanliness of cabin, is it free from grease, oil, rags, tools etc.
    - Pneumatic and hydraulic systems and their safety devices operate correctly.
    - Operation of the crane through all motions with particular attention to brakes.
    - Operation of all limit switches, cut-out and safety devices.
    - Communications equipment is working correctly and clearly loud enough to be heard.
    - All fire extinguishers are placed in the correct position, are suitable for the particular application and are in working order.
3. In conformance with AS 2550.1 clause 6.1, the operator shall review the logbook where applicable and be satisfied about the presence of unauthorized personnel on the crane, safe working condition of the crane and safe operation of each of the crane movements. Authorised personnel must carry out any adjustments or alteration needed for safe operation.
4. Any stabilizers shall be engaged prior to lifting.
5. Gain assurance from a responsible person that the load may be handled safely with a pallet hook and that person has provided all information necessary to ensure that risks are eliminated or controlled.
6. A competent person shall inspect the pallet supporting the load to ensure it is in good condition and safe to use with the pallet hook.
7. Do not exceed the rated working load of the crane.
8. Ensure the lifting ring is positioned at the closest lifting point to the centre of gravity of the load to prevent undue pallet hook tilt. To ensure safe lifting and transport of loads about the workplace, the pallet hook should be back tilted between 5° and 10°.
9. Ensure that all movements of the crane are carried out under power.
10. When engaging or disengaging the crane hook, ensure the hoist being used is not twisted or tangled.
11. Do not allow the crane hook to rest on top of the pallet hook.
12. The operator to be aware of the crane hook spinning when using a single fall rope as this may create a dangerous situation.
13. The operator shall check the pallet hook is securely attached – refer 'Method of Attachment to Crane'.

Ritek® Wall Systems - **Overhead Crane Lifting using Pallet Hook**

Risk Control Measures

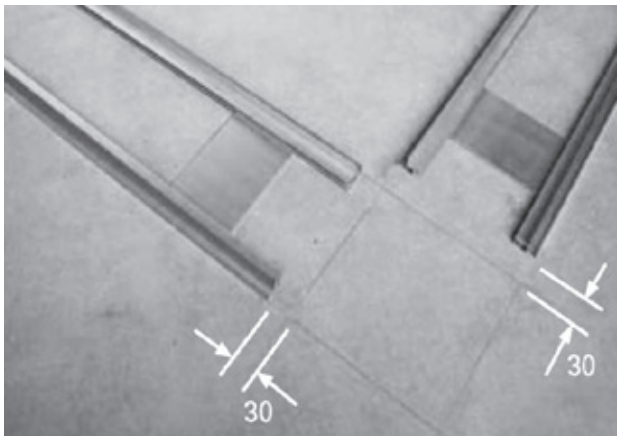
14. Do not move the crane / pallet hook unless the safety of persons in the vicinity of the crane is assured.
15. While lifting in an area subject to passing traffic, barriers or warning signs shall be used to prevent any interference.
16. The operator shall hoist the pallet hook vertically and in a smooth manner at slow speeds with minimum acceleration and deceleration.
17. Sudden stops, jerky or other movements that may cause the load to swing unduly must be avoided. Ensure minimum impact when crane engages 'end stops'.
18. Movement of crane hook / pallet hook when out of sight is only permissible when directed by an authorized person such as a dogman, crane chase, spotter or rigger.
19. The crane hook / pallet hook must be raised sufficiently to avoid collision during horizontal movement. Only when load is freely suspended is horizontal movement permissible.
20. The operator shall stay with the crane controls at all times.
21. No personnel shall ride on the pallet hook at any time.
22. When landing the pallet hook, avoid developing rope slack.
23. The operator shall keep clear of overhead obstructions and in particular maintain relevant clearance of electrical conductors.
24. Before any load is hoisted by the pallet hook, the operator shall lift the pallet hook unladen to the required working height to confirm that all systems are functioning correctly.
25. The operator must know the location of the main isolation switch and firefighting equipment.
26. Ensure there has been no unauthorized interference or alteration to the plant that may cause risk.
27. Ensure regular maintenance, testing and inspections are carried out and recorded in accordance with the relevant crane manuals and corrective action initiated where applicable. Particular attention must be paid to the fork arms, which should be thoroughly examined visually for cracks and defects.
28. Ensure the instructions of Ritek® James Hardie Systems are followed.
29. If any of the equipment becomes unsafe, stop all usage until the risk is eliminated or controlled.

Ritek® Wall Systems - **Panel Installation**

Set out wall positions from grid lines supplied by the head contractor. Mark locations of openings and individual panel positions ready for the bottom plate assembly.

Note: When positioning reinforcing starter bars for the XL Thermal Wall® panels, the starter bars are offset from the centre of the wall panel due to the thickness of the panel insulation.

At corner intersections, position bottom plates so both track sections stop 30 mm short of the corner.

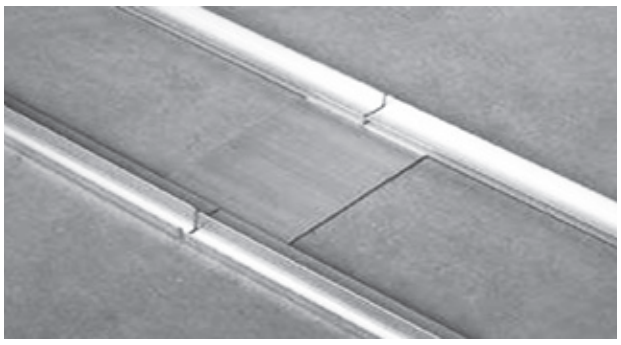


90º Corner Bottom Plate Set-out

T-Junction Bottom Plate Set-out

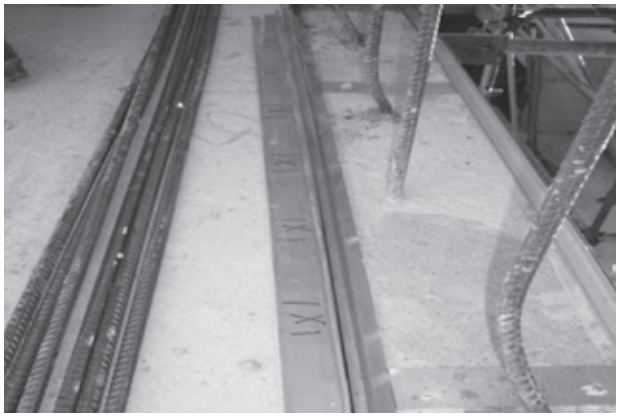
Fix Track Joiners down with masonry nails once the bottom plate is correctly positioned. Track joiners should be fixed at 600mm centres. Masonry nails should be positioned close to each track rail. Track joiners can be slid sideways before fixing to slab to avoid metal-to-metal contact with steel starter bars.

For long wall runs which require Track Joiners to be end-joined, locate a Track Joiner to bridge the joint between the extrusions.

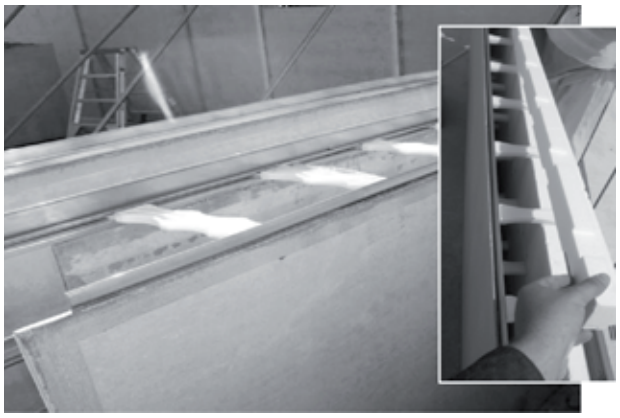


Ritek® Wall Systems - **Panel Installation**

The installation of the panels is undertaken in the following manner, care is to be taken when inserting the panels into the bottom track, and ensuring that the starter bars do not conflict with the studs, which can be done prior to installing the panel (ensure to keep starter bars at engineers specifications). Always be sure to start the installation process from a corner or end of wall



Create jig to ensure starter bars do not conflict with studs



For increased speed of panel installation fix the panel joiners to the panel before erecting.

Note: For XL Thermal Panel – fix the insulation infill and secure using the plastic/galvanised nails

Position first panel in line with surveyor's wall starting point.

Note: For XL Thermal Panel - ensure insulation is to

Secure brace foot plate to slab with Excalibur bolt and brace to panel with self-tapping screws into panel stud. Proceed to plumb panel in all directions utilising the brace's push pull mechanisms and a level.

Standard panel requires three people to be placed into position.

Panel is lifted over starter bars, slid over the Panel Joiners of the fixed panel and then lowered into position

Ritek® Wall Systems - **Panel Installation**

Guide each face of the panel into bottom track when

Panel is then checked for level and screwed off at 600mm centers into the rebate of the adjoining panel.

Note: Panels over 4.2m are to be craned into position. Please adhere to the Ritek®'s XL Wall® single panel lifting procedure and ensure that industry Workplace Health and Safety is followed.

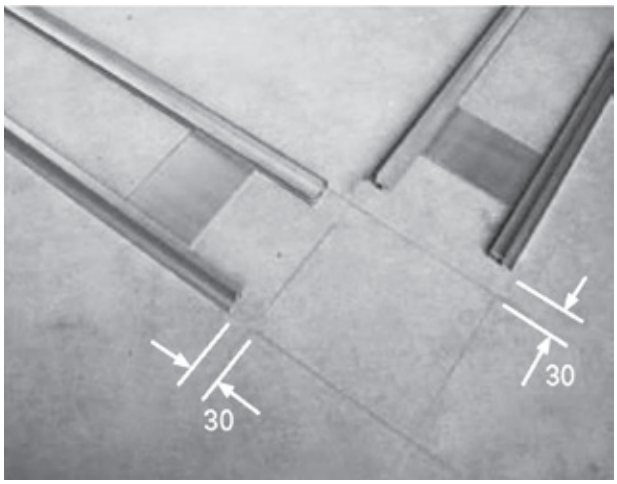
Wall Straightening

Secure Tek screws at either end of wall and fix a string line between the two. Cut three lengths of electrical conduit at the same diameter and length and place one at either end of the wall.

Ensure that both ends of the wall are plumb with a level, then move along to each panel join placing the conduit on the face of the panel beside the rebate. Adjust the brace until the string line touches the conduit to ensure a straight surface is achieved.

Note: Be sure to plumb and straighten every wall before any directional change occurs.

Ritek® Wall Systems - **Corner Installation**



Set bottom plate assembly 30mm back from internal corner to allow the corner extrusion to be flush with the slab.

Check corner panel positioning, ensuring that internal sheets are flush but allow 2mm in each direction for external corner to be fitted.

Install panels at corner ensuring they are levelled in both directions before fixing off internal corner.

Proceed to fix internal corner extrusion at 450mm centres to the stud as shown above. Ensure that all cogged bars are inserted and all horizontal steel is in place. At this stage the structural engineer is able to inspect the structural steel and sign off on it.

Note: For XL Thermal Wall® – Install internal corner insert and secure using the plastic/galvanised nails.

Reinforcing spacer wheels may be required to centralise the horizontal reinforcement.

Note: Allow corner extrusion to run 150mm past the Finished Floor Level (FFL) on all exterior walls that are consecutive. Use this same process on nib end closures and tee junctions that are on the exterior of the building.

Insert corner extrusion and fix off at 300mm centres ensuring the corner is plumb and square.

Ritek® Wall Systems - **T Junction Installation**

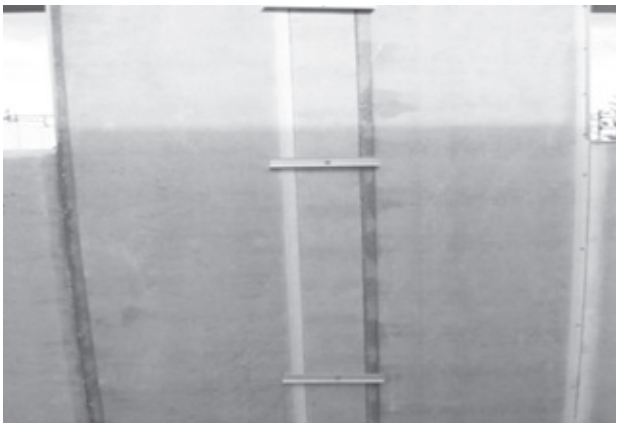
Set out the Tee Junction to surveyors pins

Fix bottom plate assembly to set out on slab with 20mm masonry pins.

Ensure panels are plumb in all directions and screw off internal corners. Ensure that all horizontal and vertical reinforcement has been fixed to engineers specifications.

Place Tee Closure into position ready for closing off

Fix a toggle (ply wood or aluminium angle) to the tee junction bringing it flush with adjacent panels.



Fix toggles vertically up the tee junction to keep it in position during the pour process

Ritek® Wall Systems - **Closing Wall Ends**

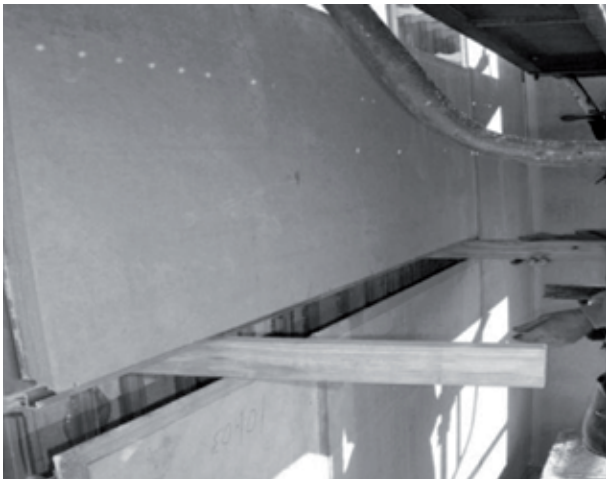
Wall and Blade Wall Ends

An End Closer section is placed over the end of the open wall and tapped into position. Screws are then fixed at 300mm centres through the sheeting and into stud extrusion. For 200XL, 265XL, 200XL-T and 265XL-T walls, it is recommended that hex-head screws are fixed through the aluminium end closer into the studs.

Once reinforcement has been inspected and signed off, the ends are closed.

Fixing Sill and Lintel Panels

Screw-fix panel joiners to either side of the lintel and the end closure to the underside.



Place sill panels into position checking for level in all directions. Screw in place the lintel section into the adjacent panel on some timber packers ready for positioning.

Install adjacent panel to window opening and fix the lintel into position utilising a Level for precision. Screw-fix the lintel at 300mm centres to the adjacent panels ensuring the bottom of lintel is level.

Prop Lintel sections with timbers and/or acrow-props prior to core-fill being placed to avoid any deviation.

Ritek® Wall Systems - **Fire Door Installation**

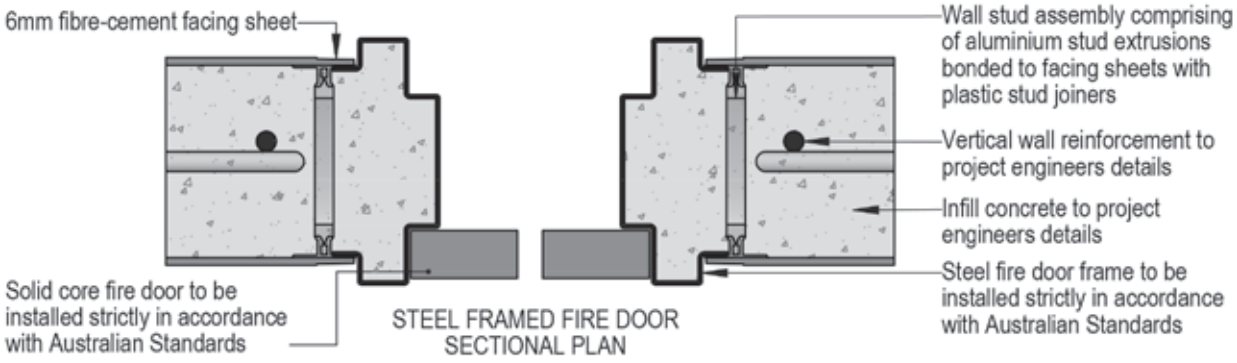
Install door frame, fixing it off at 300mm centres around the frame to the specification below.

Ensure the fire door frame is level in all directions then prop prior to pouring to avoid or stop any deviation occurring.

Fire Door Connection Detail

Fire Rated Frame is designed specifically for the XL Wall® and XL Thermal Wall® System. Recommended detail shown below. Manufacturing drawings for the subframe detail are available on request. Fire Certification is the responsibility of the fire door & frame manufacturer.

STEEL FRAMED FIRE DOOR SECTIONAL PLAN **FIGURE 7.7**



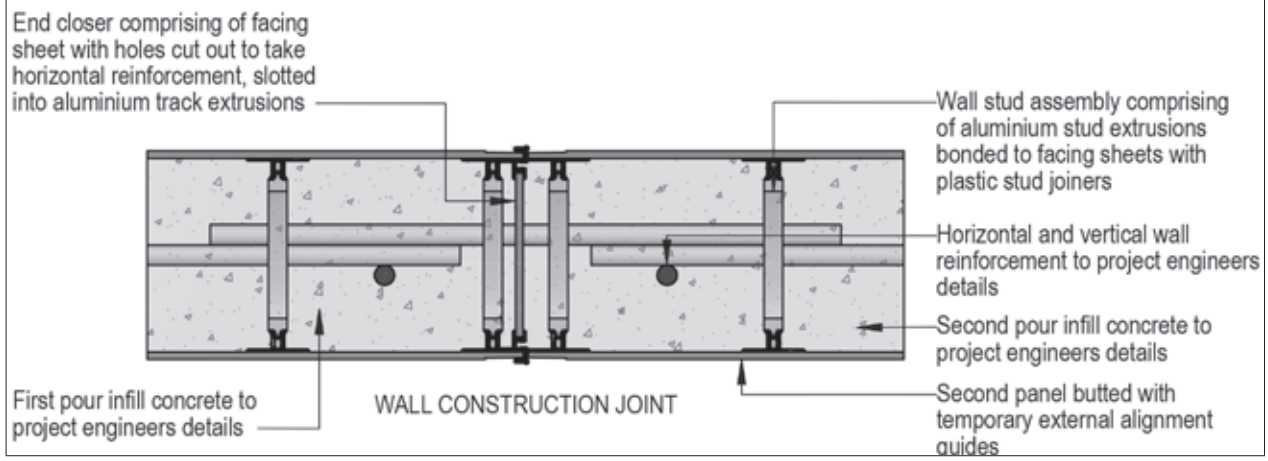
Ritek® recommend the use of internal fit door subframe systems

Ritek® Wall Systems - **Control & Construction Joint Installation**

Wall Construction Joints

These may be planned or unplanned but should follow the typical details shown in Figure 7.9.

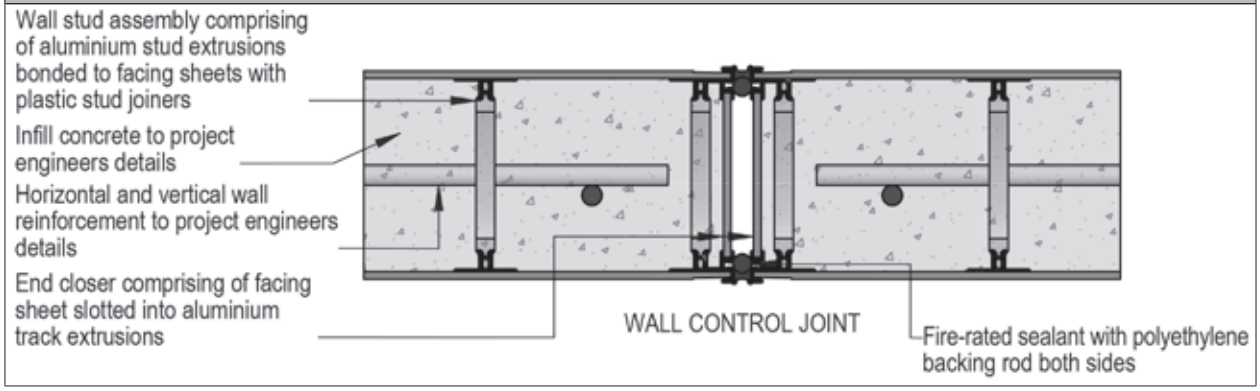
WALL CONSTRUCTION JOINTS (XL) **FIGURE 7.9**



Wall Control Joints

The engineer will nominate locations for control joints. A control joint consists of two end-sections of wall panel butted together with a 12mm gap. The gap should be detailed with a proprietary fire-resistant material. Refer to engineers details for any additional requirements. See Figure 7.10 for typical details.

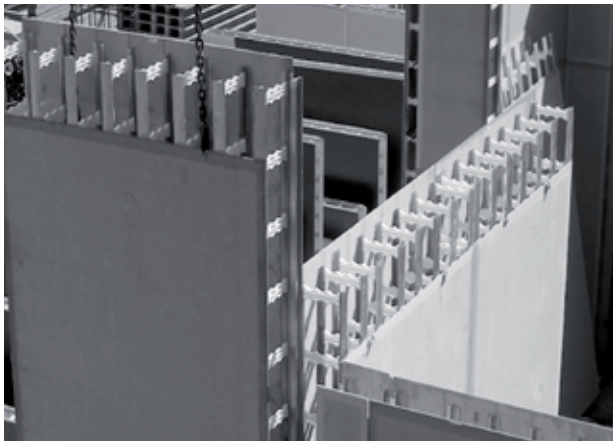
WALL CONTROL JOINTS (XL) **FIGURE 7.10**



Note: For XL Thermal Panel – facing sheet movement joints must be installed between insulated and non-insulated panels to accommodate thermal expansion/contraction of the fibre cement sheeting.

Ritek® Wall Systems - **External Wall & Slab Detail**

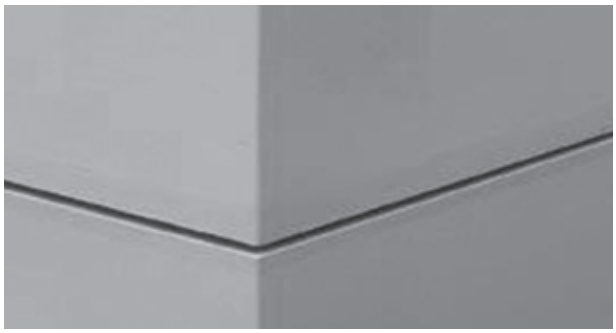
The External slab edge detail is completed with a drip groove former. This section replaces the standard bottom track on the external face of the wall sitting on the slab.



Install Rebated Top Track on top of the Edge Form utilising a string line or a Dumpy level, ensure that the rebated top track is fixed to the correct finished floor level. Heights can vary in the edge form fibre cement due to inconsistent slab levels; alteration may be required, utilising a chalk line and diamond cutting disc. For edge form above 300mm high additional site formwork is required. Edge form lintels with inside FC sheet height less than 800mm or any panels with edge form above 250mm high will require site formwork to support edge form as required.

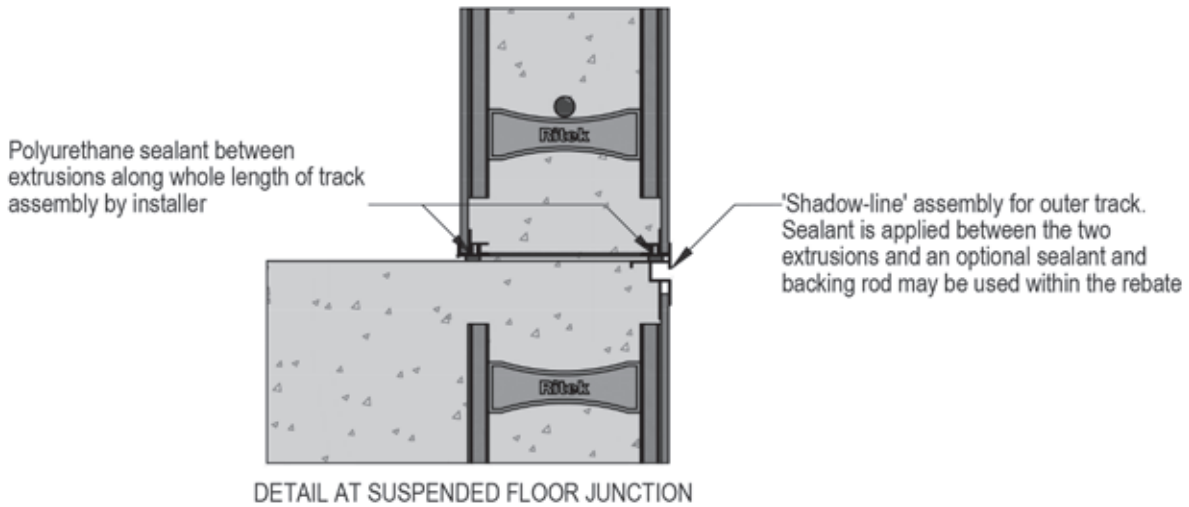
Polyurethane sealant is applied between the Rebated Top Track and the Rebated Bottom Track for water proofing. Refer to Design, Detailing & Installation Guide.

Finished external wall / slab Junction detail. Ensure to mitre the corners of the Rebated Top/Bottom extrusion if the expressed joint is required through to the corner. Ensure to use packers where required to provide an even expressed joint to finish to.



Silicon sealant can be applied to rebate at external wall finishing stage. Joint can be vee-joint detailed or set over as required by head contractor.

SUSPENDED FLOOR JUNCTION **FIGURE 7.11**



Note: If there is no express joint required through to corner, run corner extrusion 150mm past the R.L level of the finished slab and butt join the coinciding corner. Terminate the rebated top/bottom track inline with the edge of the corner.

Ritek® Wall Systems - **Concrete Mix Specification**

Recommended guidelines for concrete mix and slump specification for the Ritek® XL Wall® and Ritek® XL Thermal Wall® Systems.

Typical Concrete Mix Specification (25 MPa to 60 MPa) Concrete shall be supplied in accordance with AS 1379:2007- Specification and Supply of Concrete.

The concrete supplier is responsible to provide a mix design in accordance with the Ritek® requirements for high flow characteristics, minimum water content, and a target slump at the pump as specified in the table below and aggregate size of 7mm to 10mm (max), using retarders and plasticisers to achieve the desired slump.

RITEK® CONCRETE MIX SPECIFICATION (DENSITY > 2200 KG / M³)					
Mix Description Ritek®	Ritek® 25/7/180	Ritek® 32/7/180	Ritek® 40/7/180	Ritek® 50/7/180	Ritek® 60/7/180
Strength f 'c (MPa)	25	32	40	50	60
Cement Type (AS 3972)	SL				
Course Aggregate Size (mm)	7 - 10				
Max. Water/Cementitious Ratio	0.50				
Slump ± 20 (mm)	180				
Concrete Admixtures	Yes				
Max. Supplementary Cement Content	20%				

Concrete Compressive Strength (f 'c)

The concrete compressive strength is specified by the design engineer. Common specified strengths for walls are shown.

Cement Type

Shrinkage Limited cement (SL) complying with AS 3972 should be used in the concrete mix to limit drying shrinkage.

Concrete Aggregate

The specified mix design includes coarse aggregate size of 7mm to 10mm (max) to ensure the correct concrete flow in the Ritek® panels is achieved.

Water to Cementitious Material Ratio (w/cm)

The specified mix designs maximum water-to-cementitious-materials ratio of 0.50 is intended to limit the amount of excess free water in the concrete mix which is known to increase concrete shrinkage during the curing process. The cementitious materials includes cement and supplementary cement content (fly ash) in the ratio limit calculation. No additional water is to be added to the supplied mix at the point of discharge.

Concrete Slump

Slump specification is to ensure the concrete mix completely fills the formwork up to the intended level during placement while it expels entrapped air and closely surrounds all fixings, reinforcement, tendons, ducts, anchorages and embedments.

Concrete Admixtures

The concrete supplier is responsible for the use of water-reducers, superplasticisers and slump keeper admixtures in the mix design to achieve the targeted slump value without the need for additional water on-site.

Supplementary Cement

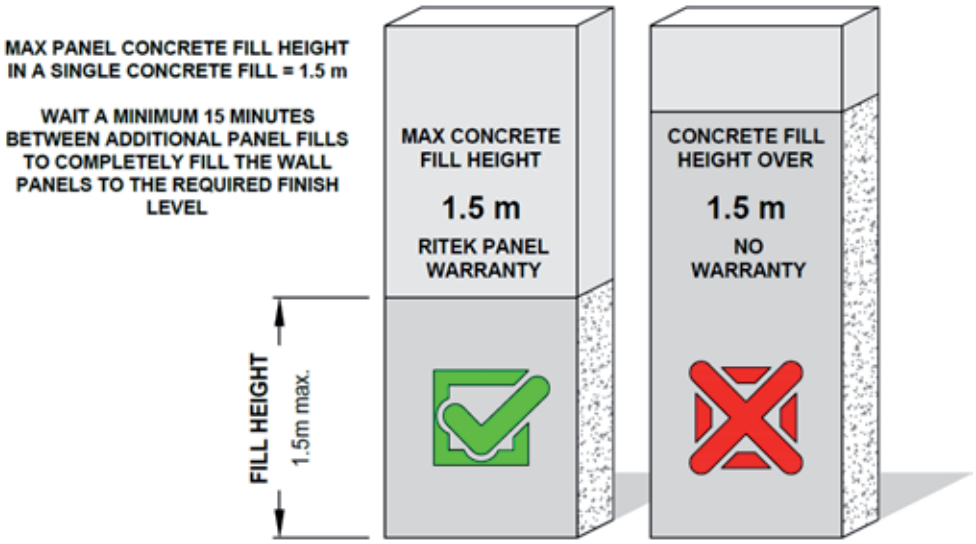
Fly ash may be used as a cement substitution up to a maximum limit of 20% in the concrete mix design. The use of slag cement and other pozzolans should be avoided as some have been shown to have adverse effects on early concrete strength gains and potential long term drying shrinkage.

Block Mix

A standard "Block-Mix" should not be used for core-filling of the Ritek® panels as the ratio of coarse aggregate to fines is typically low, and is not as capable in limiting crack development within the concrete structure.

Ritek® Wall Systems - **Concrete Mix Specification**

PANEL CONCRETE FILL HEIGHT SPECIFICATION



IF THE RITEK PANELS ARE SATURATED WET DUE TO HEAVY RAIN, PANEL FILL HEIGHT IS TO BE REDUCED TO 0.6M

Concrete Placement

Clause 17.1.3 of the Australian Standard AS 3600 Concrete Structures requires that "Concrete shall be handled, placed and compacted so as to completely fill the formwork to the intended level, expel entrapped air, and closely surround all reinforcement, tendons, ducts, anchorages, embedments and fixings.

Panels are to be filled progressively in layers up to 1500 mm high. Scaffold or formwork decks are required to place the concrete. When using higher strength concretes (40 MPa - 60 MPa), light wetting of the steel and inside face of the Ritek® panel may assist concrete flow between concrete pours during hot and dry site conditions.

Concrete Pump Equipment

Concrete is to be placed using a concrete boom pump or line pump. The boom pump or line pump delivers the concrete in a continuous stream. For maximum efficiency when pouring, schedule the concrete trucks approximately 30 minutes apart to provide continuous supply of concrete to the pump with minimal idle times. Ensure a 50 mm (2") or 75 mm (3") reducer is used and a flexible hose at the end.

Concrete Vibration

The design of the Ritek® XL and XL Thermal Wall® Systems and the flow characteristics of the Ritek® concrete mix specification allows the concrete to flow efficiently within the Ritek® panels and completely fill them without trapping pockets of air, and will closely surround all reinforcement, tendons, ducts, anchorages, embedments and fixings. Mechanical vibration, although not usually required, is permitted on Ritek® panels; however excessive use of vibration is likely to result in more damage to the panels than the benefits of increased compaction.

Use a 25 mm vibrating shaft (pencil vibrator). When mechanical vibration is required, the most effective method is by vibrating the concrete from the bottom to the top of the concrete as the panels are being filled. Vibrating the steel reinforcement bars positioned inside the Ritek® Panels can also be effective. Choose the appropriate method to best suit the actual site condition/panel configuration.

Concrete Fill Height

Ritek® XL Wall® panels have a maximum concrete fill height of 1.5 m (in a single fill) and are core filled in stages with a 15 minute rest time before the next fill. The Ritek® concrete mix specification allows the concrete within the panel to be easily levelled off to accommodate being filled in stages. Ensure rest time does not allow the concrete to set over upper reinforcement steel.

Ritek® Wall Systems - **Pre Pour Checklist**

Checking walls

- Make sure walls are straight, plumb, square and level – within specified standards
- Check corners are square and plumb

Checking Openings

- Check door frames are plumb and adequately propped
- Check window and door openings are located correctly and if openings are plumb and square

Checking Reinforcing Steel

- Check vertical and horizontal reinforcing steel comply with the engineers specifications
- Check reinforcing steel bars around window openings are installed
- Check reinforcing steel bars for lintels (window/ door headers) are installed and as per the engineers specifications

Checking Bracing & Alignment

- Check alignment and bracing is properly applied to keep panels plumb in the pouring process
- Check all Tee Junctions are braced adequately
- Check corners, joints, end closures are installed square and screwed off at correct screw centres
- Ensure that any variances in slab levels under standard bottom track are sealed
- Ensure any deviation at joints of panels are brought flush with cleat where necessary
- Ensure any broken edges are adequately patched and braced
- Ensure packers are placed between the Rebated Top Track and Rebated Bottom Track to provide an even expressed line of 5mm

Checking Wall Penetrations

- Check all penetrations (Electric, plumbing, mechanical.) have been accommodated and all form support has been installed

Checking Tool, Equipment and Materials

- Ensure you have steel trowels for finishing window sills.
- Ensure you have sponge and bucket for wiping any concrete spills on the wall panel.
- Ensure you have adequate materials to form up in the case of a blow-out or concrete spill.
- Ensure there are two shovels and a broom to clean up any concrete spill on formed deck.
- Ensure the specified Ritek® Concrete Mix Design is ordered and is acceptable for the method of placement and engineering requirements.
- A concrete slump test is recommended with the first concrete delivery to ensure the correct slump of 180 - 200mm is being applied
- Ensure that you have coordinated and confirmed the delivery times for both the boom pump and the concrete.
- Ensure there is enough man power to supervise the pour. Two men are required at the base, one either side of the wall and one man required to supervise the line hand and pump operator.

Checking Jobsite

- Check that the site is clean and there is enough room for trucks, workers etc
- Refer to the back of this Installation Guide for Ritek®

Ritek® Wall Systems - **Concrete Filling**

Initiate the Pouring process at the window openings by pouring the window sills first.

Finish off window sills with a steel trowel providing an even finished surface. When concrete starts to set it may slump a little, ensure to top up the sills and provide a steel trowel finish to the concrete surface in accordance with the AS3610 for proceeding contractors.

Important Note:
Ensure concrete fill heights are kept to 1.5m lifts during the pouring process. Fill height to be reduced if the base of panel is wet. Pour should be avoided if the panels or panel closures are heavily saturated. (e.g. after heavy downpour of rain)

Clean off any excess concrete with a wet rag before it sets and continue the pour around the rest of the building filling in 1.5m increments until the top of the panel is flush with the underside of the slab.

Ritek® Wall Systems - **Post Pour Checklist**

Checking walls

- Ensure walls are straight, plumb, square and level.
- Ensure all concrete leaks are cleaned off finished walls and door frames.

Checking Openings

- Check if door frames have remained plumb through the pour process.
- Check that window sills have been topped up and a steel trowel finish has been applied to concrete surface
- Ensure that window sill finish is plumb and straight in accordance with the AS3610.

Checking Reinforcing Steel

- Check if vertical reinforcing steel and cogged bars are inserted to engineers specifications

Strip Bracing and Patches

- Ensure props remain fixed until the concrete slab above is poured in-situ.
- Ensure any pre-pour patching is stripped and prepared for following trades

Preparation Work

- Ensure that all core filled walls are finished in accordance with AS3600/AS3610
- Ensure all patching is removed and areas are prepared for following trades.
- Ensure that any Tek screws protruding are removed before finishing trades begin.
- Ensure all screw heads are flush on recesses to allow following trades to apply finishes.
- Ensure any peaks on panel joins are ground out and are left in an acceptable standard for finishing trades to apply a coating of up to a 400mm trowel width.
- Ensure all walls are straight and plumb in accordance with AS3600/AS3610 and acceptable installation tolerances.
- Ensure all packers in between the Rebated Bottom Track and Rebated Top Track are removed

Ritek® Wall Systems - **Health & Safety**

All installers have a general responsibility, under Government Legislation, for the health, safety and welfare of themselves and their fellow workers. You should also become familiar with and comply with Federal and State Legislation specific to the building industry. Each building site may have its own specific rules for contractors and these must also be complied with.

As a guide only, these are some areas that need attention when installing the Ritek® Wall System:

- Ultraviolet radiation
- Manual handling (lifting of panels)
- Scaffolding
- Working at height
- Exposed reinforcing steel
- Personal protective equipment
- Housekeeping
- Electrical safety
- Cranes and slings
- Power tools

Note: For XL Thermal Wall® – PUR or PIR insulation is used therefore eye protection and dust masks must be worn.

For further information, contact Worksafe Australia or the safety authority in your State.

Minimise dust when cutting

Wear P1 or P2 dust mask + safety goggles

Recommended Safe Working Practices

Breathing in fine silica dust liberated when working with products such as fibre-cement, clay and concrete is hazardous. Over time, usually a number of years, this may result in bronchitis, silicosis or lung cancer.

Work safely with fibre-cement sheets by following the precautions described below.

- Minimise dust when cutting sheets, by using either Score and Snap knife, Kwikrip™ hand guillotine, Toolex Fibre Shears or Makita Wet Saw (Models 4101R and 4107R).

- When using other power tools or abrasive hand tools on sheets, wear approved personal protective equipment, ie P1 or P2 dust mask and safety goggles.

- Ensure containment of dust during clean-up and disposal.

These precautions are not necessary when stacking, unloading or handling fibre-cement products.

Ritek® Wall Systems - **Certified Panel Brace**

TODCONSULTING

TOD CONSULTING PTY LTD
CIVIL AND STRUCTURAL ENGINEERS
ABN 39 128 805 336

DIRECTORS
S Prystupa B.E., M.I.E.Aust. C.P.Eng. R.P.E.Q.
P McGrath B.Tech (Civil), M.I.E.Aust. R.P.E.Q.
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E enquiries@todconsulting.com
www.todconsulting.com

BG:AS 06665-27
17 November 2008

The Manager
Ritek Building Solutions
PO Box 730
COOROY QLD 4563

Dear Sir

RE: TEMPORARY WALL PROPS CERTIFICATION

This letter confirms that we have checked the "Heavy Duty" and "Standard Duty" prop details shown on the attached Ritek drawings RBS 1476-D & RBS 1477-D and XL Wall System Panel Bracing Table for structural adequacy and confirm they comply with all the relevant Australian Standards for the following conditions:--

- Design Wind speed for temporary short term condition Vu = 36 m/s
- Minimum fixing to panel 3 x 6.35mm shank Tek Screws
- Minimum fixing to concrete floor 1 x 10mm Excalibur Screw
- Props at 90 degrees to line of wall
- Props not designed to withstand impact from construction equipment
- Maximum Safe Working Load of Prop – 6 kN

Yours faithfully

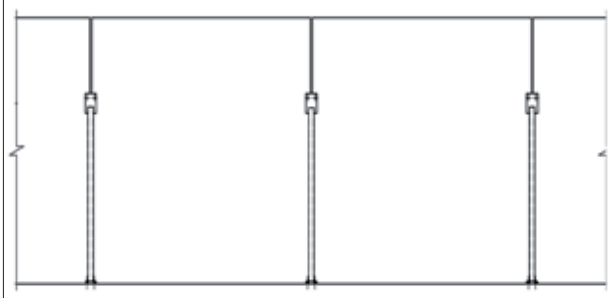
BARRY GEORGE RPEQ 1924
TOD CONSULTING

Ritek® Wall Systems - **Certified Panel Brace**

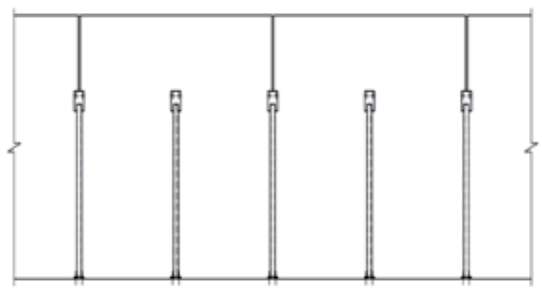
XL WALL® SYSTEM - PANEL BRACING								TABLE
PANEL DETAIL						BRACE DETAIL		
Number of Stories	Height Above Ground	Panel Width	Max Ultimate Wind Pressure	Limit State Line Load per Panel	Max Panel Height	Brace Design type	Number of Braces per Panel	Installed Brace Angle (a)
-	(m)	(m)	(kPa)	(kN/m)	(m)		-	(deg.)
2	6	1.2	0.80	0.96	3.0	STD	1	45/60
					3.5	STD	1	45/60
					4.5	HD	1	45/60
					5.0	HD	1	45/60
					5.5	HD	1	45/60
7	21	1.2	1.14	1.37	3.0	STD	1	45/60
					3.5	STD	1	45/60
					4.5	HD	1	45/60
					5.0	HD	2	45/60
					5.5	HD	2	45/60
10	30	1.2	1.21	1.45	3.0	STD	1	45/60
					3.5	STD	1	45/60
					4.5	HD	1	45/60
					5.0	HD	2	45/60
					5.5	HD	2	45/60
20	60	1.2	1.40	1.67	3.0	STD	1	45/60
					3.5	STD	1	45/60
					4.5	HD	2	45/60
					5.0	HD	2	45/60
					5.5	HD	2	45/60

* STD = Standard Brace HD = Heavy Duty Brace

1 BRACE PER PANEL **FIGURE 7.18**



2 BRACE PER PANEL **FIGURE 7.19**



Notes:

Brace Design:

Standard Brace (STD) height connection to panel = 2.0m, Effective brace length = 2.8m
Heavy Duty Brace (HD) height connection to panel = 3.5m, Effective brace length = 4.0m

Fixing Detail

Fixing to slab: Use 1 x 10mm x 60mm Excalibur Concrete Screw
Fixing to Panel: Use 3 x 6.35mm x 40mm Tex Screws
Max brace load = 9kN (limit state)
Vp = 30 m/s, Vu = 36m/s - for temporary short term installation
Certified Ritek® XL Wall® brace manufacturing drawings are available on request.

Ritek® Wall Systems - **Certified Panel Lifting**

TOD CONSULTING

TOD CONSULTING PTY LTD
CIVIL AND STRUCTURAL ENGINEERS
ABN 39 128 805 336

DIRECTORS
S Prystupa B.E., M.I.E.Aust. C.P.Eng. R.P.E.Q.
P McGrath B.Tech (Civil), M.I.E.Aust., R.P.E.Q.
C Dowding B.E., M.I.E.Aust., R.P.E.Q.

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E enquiries@todconsulting.com
www.todconsulting.com

BG:AS 06665-29
19 January 2009

The Manager
Ritek Building Solutions
PO Box 730
COOROY QLD 4563

Dear Sir

RE: TEMPORARY LIFTING POINTS CERTIFICATION

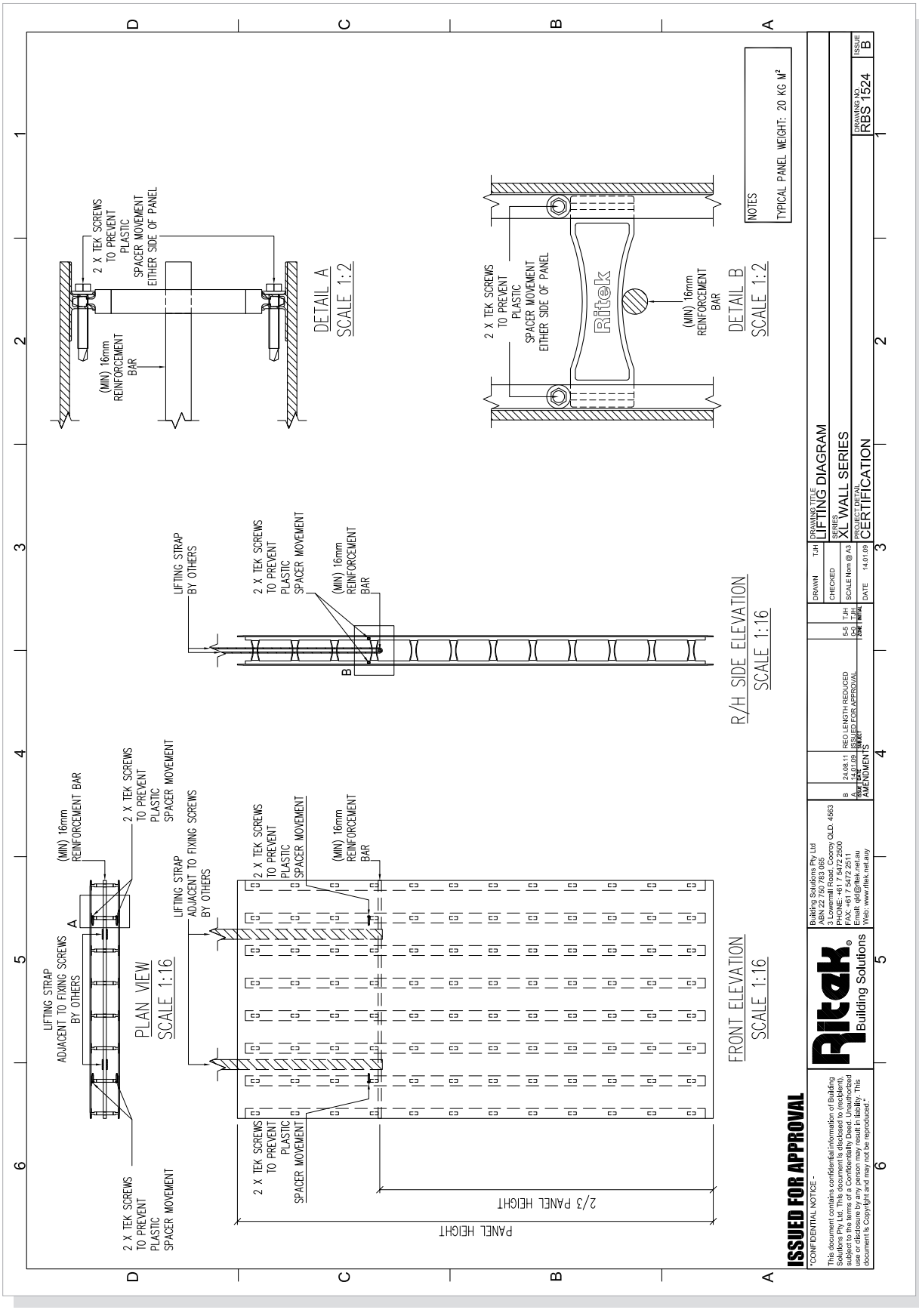
This letter confirms that we have checked the Lifting Point Location and details shown on the attached Ritek drawings RBS 1524 for the XL Wall System for structural adequacy and confirm they comply with all the relevant Australian Standards for the following conditions:--

- Impact (bounce) factor of 1.3
- No additional weight fixed or hung from panel
- No additional reinforcement placed within wall form, except the 1 x 16mm diameter lifting anchor bar

Yours faithfully

BARRY GEORGE
TOD CONSULTING

Ritek® Wall Systems - **Certified Panel Lifting**



Ritek® Wall Systems - **SITE COPY - Pre-works Checklist**

Check Footing/slab

- ☐ Make sure footing or slab RL's are correct
- ☐ Check concrete finish is suitable to receive Ritek® bottom track
- ☐ Check layout of reinforcement starter bars will not foul Ritek® panels

Check site conditions

- ☐ Check if panels can be or are loaded out to correct positions on slab
- ☐ Check site access is safe and to current legislation
- ☐ Check site for pump location and confirm with Site Manager
- ☐ Confirm delivery date with Site Manager of ……..

Checking Reinforcing Steel

- ☐ Check if Reinforcement is on site
- ☐ Check if reinforcement has been scheduled and not stock bar
- ☐ Confirm location of reinforcement is correct, i.e. nearest possible area to installation

Comments and general observations:

CONDITIONS OF USE: This document is to be used to check the installation techniques used for the installation of the Ritek® XL Wall® System in accordance with the Design, Detailing & Installation Guide and to assist the clients Quality Systems and form part of a recorded ITP. This checklist does not cover the quality of workmanship or defects which are caused by third parties and therefore deemed to be outside the control of James Hardie Systems Pty Ltd. No liability will be accepted by James Hardie Systems for the use or reliance of this checklist.

Ritek® Wall Systems - **SITE COPY - Pre-Pouring Checklist**

Checking walls

- ☐ Make sure walls are straight, plumb, square and level – within specified standards
- ☐ Check corners are square and plumb

Checking Openings

- ☐ Check door frames and window openings & lintels are plumb and adequately propped / supported
- ☐ Check window and door openings are located correctly and if openings are plumb and square

Checking Reinforcing Steel

- ☐ Check vertical and horizontal reinforcing steel comply with the engineers specifications
- ☐ Check reinforcing steel bars around window openings are installed
- ☐ Check reinforcing steel bars for lintels (window/door headers) are installed and as per the engineers specifications

Checking Bracing & Alignment

- ☐ Check alignment and bracing is properly applied to keep panels plumb in the pouring process
- ☐ Check all Tee Junctions are braced adequately
- ☐ Check corners, joints, end closures are installed square and screwed off at 300mm centres
- ☐ Ensure that any variances in slab levels under standard bottom track are sealed
- ☐ Ensure any deviation at joints of panels are brought flush with cleat where necessary
- ☐ Ensure any broken edges are adequately patched and braced
- ☐ Ensure the Rebated Top Track and Rebated Bottom Track are set correctly with uniform joint to provide an even expressed line of 5mm, track mitres and angles are to be cleanly cut
- ☐ Check polyurethane sealant is applied between bottom tracks (water proofing)

Checking Wall Penetrations

- ☐ Check all penetrations (Electric, plumbing, mechanical.) have been accommodated and all form support has been installed

Checking Tool, Equipment and Materials

- ☐ Make sure you have steel trowels for finishing window sills.
- ☐ Make sure you have sponge and bucket for wiping any concrete spills on the XL wall® panel
- ☐ Make sure you have adequate materials to form up in the case of a blow-out or concrete spill.
- ☐ Ensure there are two shovels and a broom to clean up any concrete spill on formed deck
- ☐ Make sure the specified Ritek® Concrete Mix Design is ordered and is acceptable for the method of placement and engineering requirements.
- ☐ A concrete slump test is recommended with the first concrete delivery to ensure the correct slump of 180mm is being applied
- ☐ Make sure that you have coordinated and confirmed the delivery times for both the boom pump and the concrete.
- ☐ Make sure there is enough man power to supervise the pour. 2 men required at the base, one either side of the wall and 1 man required to supervise the line hand and pump operator.

Checking Jobsite

- ☐ Check that the site is clean and there is enough room for trucks, workers etc

CONDITIONS OF USE: This document is to be used to check the installation techniques used for the installation of the Ritek XL Wall® System in accordance with the Design, Detailing & Installation Guide and to assist the clients Quality Systems and form part of a recorded ITP. This checklist does not cover the quality of workmanship or defects which are caused by third parties and therefore deemed to be outside the control of James Hardie Systems Pty Ltd. No liability will be accepted by James Hardie Systems for the use or reliance of this checklist.

Ritek® Wall Systems - **SITE COPY - Post-Pouring Checklist**

Checking walls

- ☐ Make sure walls are straight, plumb, square and level.
- ☐ Ensure all concrete leaks are cleaned off finished walls and door frames.

Checking Openings

- ☐ Check if door frames have remained plumb through the poor process.
- ☐ Check that window sills have been topped up and a steel trowel finish has been applied to concrete surface
- ☐ Ensure that window sill finish is plumb and straight in accordance with the AS3610 (Australian
- ☐ Standard; Formwork for Concrete).

Checking Reinforcing Steel

- ☐ Check if vertical reinforcing steel and cogged bars are inserted to engineers specifications

Strip Bracing and Patches

- ☐ Ensure props remain fixed until the concrete slab above is poured in-situ.
- ☐ Ensure any pre-pour patching is stripped and prepared for following trades

Preparation Work

- ☐ Ensure that all core filled walls are finished in accordance with the AS3610
- ☐ Ensure all patching is removed and areas are prepared for following trades.
- ☐ Ensure that any Tek screws protruding are removed before finishing trades begin.
- ☐ Ensure all screw heads are flush on recesses to allow following trades to apply finishes.
- ☐ Ensure any peaks on panel joins are ground out and are left in an acceptable standard for finishing trades to apply a coating of up to a 400mm trowel width.
- ☐ Ensure all walls are straight and plumb in accordance with the AS3610 and acceptable installation tolerances.
- ☐ Ensure all packers in between the Rebated Bottom Track and Rebated Top Track are removed.

CONDITIONS OF USE: This document is to be used to check the installation techniques used for the installation of the Ritek® XL Wall® System in accordance with the Design, Detailing & Installation Guide and to assist the clients Quality Systems and form part of a recorded ITP. This checklist does not cover the quality of workmanship or defects which are caused by third parties and therefore deemed to be outside the control of James Hardie Systems Pty Ltd. No liability will be accepted by James Hardie Systems for the use or reliance of this checklist.

Ritek® Wall Systems - **Notes**

James Hardie Systems
www.jhsritek.com.au
1300 929 782

Version 2015.01

Design, Detailing & Installation Guide

Ritek® XL Wall® and XL Thermal Wall® Systems

Version 2015.01




Ritek® - the alternative, innovative & cost effective building method.

Ritek® Wall Systems - Use of Aluminium Extrusions

CODEMARK™
CM40087 (REV3)

Choose products that meet Australia's highest level of BCA compliance.

CodeMark is a building product certification scheme which supports the use of new and innovative building products by providing a nationally and internationally accepted process for products to be assessed for compliance with the requirements of the building codes of Australia and New Zealand.

CodeMark strengthens the entire building supply chain and gives users confidence that their building products comply with the Building Code of Australia (or in New Zealand the New Zealand Building Code). CodeMark certificates are accredited from internationally recognised accreditation bodies, offering increased credibility and acceptance of a certificate holder's CodeMark certified products.

The scheme provides confidence and certainty to regulatory authorities and the market through the issue of a Certificate of Conformity.

How CodeMark Works: Third-party CodeMark certification bodies evaluate and certify products to ensure they meet the specified requirements of the National Construction Code (NCC) and Building Code of Australia (BCA).

Product Certification - The Australian Building Codes Board (ABCB) is committed to ensuring best practice in the building and construction industry. There are two product certification schemes to provide a nationally consistent quality of materials and products; the voluntary CodeMark building product certification scheme which the ABCB owns and jointly manages and the mandatory WaterMark plumbing and drainage product certification scheme which is managed and administered by the ABCB.

A register of CodeMark certified products is maintained by the ABCB and listed on this website. Relevant legislation requires building control authorities to accept CodeMark certified products.

Further information can be found at: http://www.abcb.gov.au/product-certification/codemark

Certificate of Conformity

Certificate number: CM40087 Rev3

THIS TO CERTIFY THAT

Ritek® XL Wall and XL Thermal Wall Systems

Certification Body:

CertMark International
ABN: 80 111 217 568
JAS-ANZ Accreditation
No. Z4450210AK
PO Box 7144, Sippy
Downs Qld 4556
+61 (07) 5445 2199
www.CertMark.org

Certificate Holder:

Ritek Building Solutions
ABN: 22 750 783 065
19 Lowermill Rd,
Cooroy Qld 4563
Ph: 1300 929 782
W: www.ritek.net.au

Type and/or use of product:

Pre-fabricated Permanent formwork system to enable the construction of external and internal concrete walls in residential and commercial buildings and structures.
Internal and external walls

- Party walls, internal walls, external walls
- Retaining walls
- Lift shafts and stairwells
- External insulated structural walls

Description of product:

Ritek® XL Walling System is manufactured with standard overall wall thicknesses of 115, 135, 150, 165, 200 and 265 mm, preferred heights of 2.7, 3.0, 3.6 and up to 5.0m, and a standard panel width of 1.2 m.
Other thicknesses and heights are supplied if necessary to suit specific project requirements.
The number in the Ritek® XL Wall Type Code is the overall thickness of the wall, including the 6-mm fibre-cement facing sheets, i.e. a 135XL Ritek® wall is 135 mm thick overall. The corresponding concrete thickness would be 135-mm less 12-mm, i.e. 123-mm thick. Minimal panel width is 50-mm and maximum panel height is 5.0m.

Trade name:

1	XL Wall System
2	XL Thermal Wall System

COMPLIES WITH THE FOLLOWING BCA PROVISIONS AND STATE OR TERRITORY VARIATION(S) **BCA 2016**

	Volume One		Volume Two	
Performance Requirement(s)	CP2 (a), (b)(ii), (ii), (iii), and (iv)	Spread of fire	Not applicable to this product	
	FP1.4	Weatherproofing		
Deemed-to-Satisfy Provision(s):	C1.1	Fire-resisting construction	3.3.2	Reinforced masonry
	F5.5	Sound insulation rating of walls	3.3.4	Weatherproofing of Masonry
	G5.2	Protection	3.7.1	Fire Separation
	J1.2	Thermal constructions	3.7.4	Bushfire areas
	J1.5	Walls	3.8.6	Sound insulation
			3.12.1.4	External walls
State or territory variation(s):	SA C1.1, NT F5.5, NSW G5.2, SA G5.2, SA, Tas G5.3 and 5.4		NSW 3.7.4 NT 3.8.6	
	NSW J(A)P1), In NT and QLD Section J is replaced by BCA 2009 Section			

SUBJECT TO THE FOLLOWING LIMITATIONS AND CONDITIONS AND THE PRODUCT TECHNICAL DATA IN APPENDIX A AND EVALUATION STATEMENTS IN APPENDIX B

Limitations and conditions:

- Refer to A.5 below

Building classification/s: 1 to 10
Class 1 to 10

Scope of certification: The CodeMark Scheme is a building product certification scheme. The rules of the Scheme are available at the ABCB website www.abcb.gov.au. This Certificate of Conformity is to confirm that the relevant requirements of the Building Code of Australia (BCA) as claimed against have been met. The responsibility for the product performance and its fitness for the intended use remain with the certificate holder. The certification is not transferrable to a manufacturer not listed on Appendix A of this certificate.

Disclaimer: The Scheme Owner, Scheme Administrator and Scheme Accreditation Body do not make any representations, warranties or guarantees, and accept no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any material contained within this certificate; and the Scheme Owner, Scheme Administrator and Scheme Accreditation Body disclaim to the extent permitted by law, all liability (including negligence) for claims of losses, expenses, damages and costs arising as a result of the use of the product(s) referred to in this certificate.

Ritek® Wall Systems - XL Wall® - AS1530.4 Test Certificate

Certificate of Test

No. 2087

This is to certify that the element of construction described below was tested by the CSIRO Division of Materials Science and Engineering in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2005 on behalf of:

Building Solutions Pty Ltd
19 Lowermill Road
COOROY QLD

A full description of the test specimen and the complete test results are detailed in the Division's sponsored investigation report numbered FSV 1324.

Product Name: Load-bearing permanent formwork, concrete core, XL 150 Wall System.

Description: The specimen comprised a reinforced concrete wall system 3000-mm high x 3000-mm wide x 150-mm thick made up of three pre-fabricated permanent formwork panels filled with concrete after assembly.
The pre-fabricated permanent formwork panels comprised two 6-mm thick fibre cement sheets bonded using industrial strength adhesive to plated aluminium extrusions separated with plastic joiners at nominally 200-mm centres, to form a stud assembly. The studs were equally spaced over the width of the panel at nominally 164-mm centres. The plastic joiners generate a large open aspect for provision of horizontal and vertical reinforcing bars, as shown in drawing numbered RBS 1000, dated 28 June 2006, by Ritek Building Solutions.
The panels were put up vertically, and were fastened together using 8g x 25-mm long CSK screws at nominally 300-mm centres. The screws were fixed into a 1.2-m thick x 40-mm wide aluminium strip located on the inside of the panel sheeting.
The panels were appropriately braced and 32 Mpa concrete 32-10-160 was pumped in through the top openings in 1500-mm high layers and trowelled off when completely filled.
A total load of 800 kN was applied to the specimen for the duration of the test.
Construction is detailed in drawing numbered RBS 1367, dated 1 October 2007, by Ritek Building Solutions.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated.

Structural Adequacy	-	no failure at 241 minutes
Integrity	-	no failure at 241 minutes
Insulation	-	no failure at 241 minutes

For the purpose of Building Regulations in Australia, a fire-resistance level (FRL) of 240/240/240 was achieved. The FRL is applicable for exposure to fire from either direction.

This certificate is provided for general information only and does not comply with the regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 10 October 2008.
Issued on the 31st day of October 2008 without alterations or additions.

Garry E Collins
Manager, Fire Testing and Assessments

CSIRO

CSIRO Materials Science and Engineering
14 Julius Avenue, Riverside Corporate Park, North Ryde NSW 2113 AUSTRALIA
Telephone: 61 2 9490 5444 Facsimile:61 2 9490 5555

NATA

This document is issued in accordance with NATA's accreditation requirements

Ritek® Wall Systems - Fire Resistance (FRP)

ron marshall
CONSULTANT

Ron Marshall
95/433 Brisbane Road
Coombabah, QLD 4216
1st November 2012

Building Solutions Pty Ltd
PO Box 730
COOROY QLD 4563

Attn. Peter Kelly Re: Fire Compliance of Ritek XL Wall Systems, amended letter 1st June 2015

The BCA requires that a building element meets its requirements for Fire-Resistance. For compliance, a reinforced concrete wall can either satisfy the limitations contained in the BCA 2015, or be designed in accordance with Australian Standard AS3600-2009 Concrete Structures, or by test.

Section C the XL Wall Systems Manual Version 2015.01 summarize the limitations from the BCA2015 and summarizes the values calculated from AS3600-2009. A design example illustrating the calculation method is set out in the Design Examples of the Ritek manual.

Ritek walls that satisfy the minimum thickness requirements are summarized in the following Table. In all practical cases the walls based on minimum wall thickness will be satisfactory, but both the BCA2015 and AS3600-2009 also impose upper limits on design loads and wall heights. These additional limitations need to be checked and reference to Section C in the Ritek manual should be made.

FRP (minutes)	Ritek Wall Type		
	BCA 2015 (deemed to comply)	Designed in accordance with AS3600-2009	
		Wall exposed to fire on one side only	Wall exposed to fire on both sides
60	-	135XL	135XL
90	165XL	135XL	165XL
120	165XL	165XL	200XL
180	165XL	200XL	265XL
240	200XL	265XL	-

Within the load and height limits contained in Section C of the Ritek manual, the walls contained in the above Table are deemed to comply under the BCA 2015.

Ritek 150XL Wall compliance by test:

The Ritek 150XL wall has been submitted for a standard test AS1530.4 (3m high wall with fire on one side) at CSIRO and achieved a fire resistance level (FRL) of 240/240/240.

Yours Sincerely,

Ron Marshall B,E,.M,Eng,Sc.
RPEQ

Ron Marshall Consultant ABN: 41 899 743 080

95/433 Brisbane Road, Coombabah, QLD, 4216
Ph: (07) 5594 0358 Fax: (07) 5594 0358
Mobile: 0412 441 609 e-mail: ronmarshall@masonry.net.au

Ritek® Wall Systems - Effect of Services on Fire Design

Ron Marshall CONSULTANT

Ron Marshall
95/433 Brisbane Road
Coombabah, QLD 4216
18th January 2008

Building Solutions Pty Ltd
PO Box 730
COOROY QLD 4563

Attn. Peter Kelly Re: Effect of services on Fire Design, amended letter 1st June 2015

The BCA requires that, for a building element to meet its requirements for Fire-Resistance, the element be designed in accordance with Australian Standard AS3600 Concrete Structures. Within the design for Fire-Resistance in AS3600, clause 5.12 sets out the limitations for the degree of chasing in walls where their effect on fire resistance can be ignored. The chasing limitations are different for the three criteria of Structural Adequacy, Integrity and Insulation. The effects of chasing in excess of these limits would need to be taken into account.

The Standard has no requirement to take account of services built within the wall and hence their effects could be ignored in design. For the criteria of structural adequacy where internal services would have no significant effect on the buckling strength, it is my view the effects of the services can safely be ignored. However for the criteria of integrity and insulation that depend on the effective thickness of the wall, it is my opinion that it would be prudent to limit the quantity of internal services to those limits set out in the standard for surface chasing.

As Ritek walls are designed in accordance with Australian Standard AS3600, these comments would also apply to the design of Ritek walls for Fire-Resistance.

Yours Sincerely,

Ron Marshall B,E,.M,Eng,Sc.
RPEQ

Ron Marshall Consultant ABN: 41 899 743 080

95/433 Brisbane Road, Coombabah, QLD, 4216
Ph: (07) 5594 0358 Fax: (07) 5594 0358
Mobile: 0412 441 609 e-mail: ronmarshall@masonry.net.au

Ritek® Wall Systems - XL Wall® Acoustic Assessment

Date: Tuesday, 21 August 2012
Project Number: 212 145
Project: Ritek Field Measurements
By Email: peter_kelly@ritek.net.au
File: *212 145 L01*

Ritek Building Solutions
P O Box 730
COOROY QLD 4563

Re: Results of Field Testing of Ritek Wall Systems of our report dated 16th August 2012

Dear Peter,

I wish to confirm that the results of Airborne Sound Transmission Loss of the Ritek 150mm wall system given in Table 1 of the report complies with the BCA 2012 performance requirements of FP5.2 and FP5.5 for airborne sound is by the verification method DnT,w + Ctr not less than 45.

I also wish to confirm that the Airborne Sound Transmission Loss of the Ritek XL wall system, which includes a separate stud wall, as per Table 2 complies with the BCA 2012 performance requirements of FP5.2 and FP5.5 for airborne sound is by the verification method DnT,w + Ctr not less than 45 + discontinuous wall construction.

Yours faithfully,

Peter Knowland
PKA Acoustic Consulting

Peter R Knowland and Associates Pty Ltd T/A PKA Acoustic Consulting ABN. 73 001 594 583 ACN. 001 594 583
PO Box 345, Lane Cove, NSW, 1595 Tel: (612) 9460 6824 Fax: (612) 9460 6823 Email: admin@pka.com.au
Suite 12, 401 Pacific Highway, Artarmon, NSW, 2064
Member Firm of the Australian Association of Acoustical Consultants

Ritek® Wall Systems - XL Wall® Acoustic Assessment

DESIGN INFORMATION

Ritek XL Wall System® Acoustic Performance

BCA 2012 ACOUSTIC COMPLIANCE

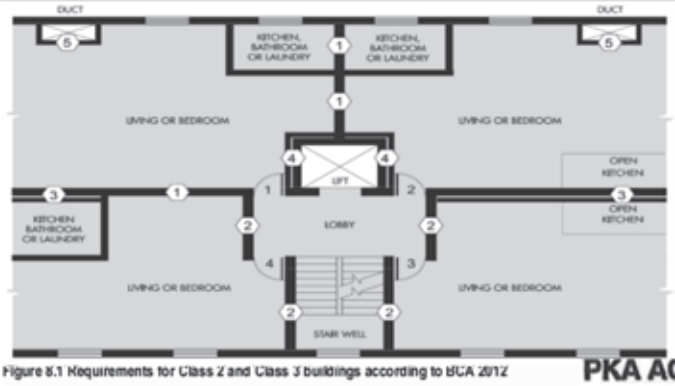


Figure 8.1 Requirements for Class 2 and Class 3 buildings according to BCA 2012

The BCA requirements for the types of wall configurations is shown in **Figure 8.1**

Ritek XL Wall Systems use three configurations to satisfy the requirements of the BCA as shown in **Figure 8.2**

The compliance of these wall configurations to satisfy the requirements for Class 2 and Class 3 buildings is given in **Table 8.1**

PKA ACOUSTIC CONSULTING
PO Box 345
Lane Cove NSW 1595
Ph: 9460 6824 Fax: 9460 6823
Email: admin@pka.com.au

Figure 8.2 Ritek XL Wall Configurations

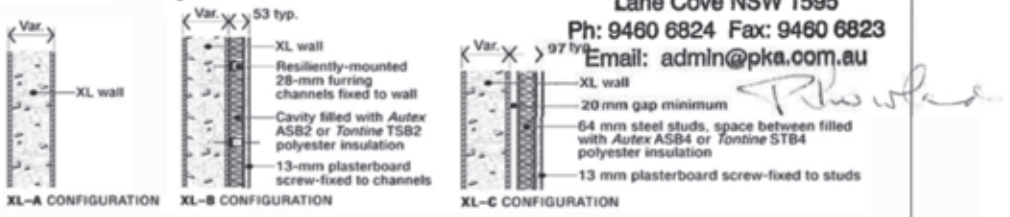


Table 8.1 Compliance of Ritek XL Wall Configurations for Class 2 and Class 3 buildings according to BCA 2012

	Concrete Core	Weighted Sound Reduction	WALL TYPE [1] Separating a Living or Bedroom from a Living or Bedroom	WALL TYPE [2] Separating a Living or Bedroom from a Lobby	WALL TYPE [3] Separating a Kitchen, Bathroom or Laundry from a Living or Bedroom	WALL TYPE [4] Separating a Lift shaft from a Living or Bedroom	WALL TYPE [5] Separating a Duct from a Living or Bedroom
	mm	Rw	Dnt,w +Ctr ≥ 45 or Rw + Ctr ≥ 50	Dnt,w ≥ 45 or Rw ≥ 50	Dnt,w +Ctr ≥ 45 + Impact insulation or Rw + Ctr ≥ 50 + Impact insulation	Dnt,w ≥ 45 + Impact insulation or Rw ≥ 50 + Impact insulation	Rw +Ctr ≥ 40
Ritek Panel (XL-A CONFIGURATION)							
115 XL-A	103	47	Yes – NT only	Yes – NT only	No	No	Yes – All States
135 XL-A	123	51	Yes – NT only	Yes – All States	No	No	Yes – All States
150 XL-A	138	53	Yes – All States	Yes – All States	No	No	Yes – All States
165 XL-A	153	54	Yes – All States	Yes – All States	No	No	Yes – All States
200 XL-A	188	56	Yes – All States	Yes – All States	No	No	Yes – All States
265 XL-A	253	59	Yes – All States	Yes – All States	No	No	Yes – All States
Ritek Panel + Acoustic Insulation (XL-B CONFIGURATION)							
115 XL-B	103	56	Yes – All States	Yes – NT only	Yes – NT only	Yes – NT only	Yes – All States
135 XL-B	123	58	Yes – All States	Yes – All States	Yes – NT only	Yes – NT only	Yes – All States
150 XL-B	138	59	Yes – All States	Yes – All States	Yes – NT only	Yes – NT only	Yes – All States
165 XL-B	153	60	Yes – All States	Yes – All States	Yes – NT only	Yes – NT only	Yes – All States
200 XL-B	188	62	Yes – All States	Yes – All States	Yes – NT only	Yes – NT only	Yes – All States
265 XL-B	253	70	Yes – All States	Yes – All States	Yes – NT only	Yes – NT only	Yes – All States
Ritek Panel + Acoustic Insulation + Discontinuous Wall (XL-C CONFIGURATION)							
115 XL-C	103	60	Yes – All States	Yes – All States	Yes – All States	Yes – All States	Yes – All States
135 XL-C	123	62	Yes – All States	Yes – All States	Yes – All States	Yes – All States	Yes – All States
150 XL-C	138	64	Yes – All States	Yes – All States	Yes – All States	Yes – All States	Yes – All States
165 XL-C	153	65	Yes – All States	Yes – All States	Yes – All States	Yes – All States	Yes – All States
200 XL-C	188	66	Yes – All States	Yes – All States	Yes – All States	Yes – All States	Yes – All States
265 XL-C	253	75	Yes – All States	Yes – All States	Yes – All States	Yes – All States	Yes – All States

ACOUSTIC OPINION PKA-A083 - PKA ACOUSTIC CONSULTING ENGINEERS JULY 2012

Ritek® Wall Systems - XL Wall® Acoustic Assessment

DESIGN INFORMATION

Ritek XL Wall System Acoustic Performance

8. ACOUSTIC PERFORMANCE

PKA ACOUSTIC CONSULTING
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Acoustic Performance BCA 2012 Part F5 - Sound Transmission and Insulation

The BCA requires particular walls in various classes of building (Class 2 or 3 or a Class 9c) to have sound insulation to avoid the airborne transmission of sound through walls.

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*.

BCA 2012 PERFORMANCE REQUIREMENTS

BCA - FP5.2

Class 2 or 3 Buildings
Walls separating sole-occupancy units or a sole occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby, or the like, or parts of a different classification, must provide insulation against the transmission of –

a) **Airborne sound**; and

b) **Impact generated sound**, if the wall is separating a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit,

BCA - FP5.5

Class 9c aged care building
Walls separating sole-occupancy units or a sole occupancy unit from a kitchen, bathroom, sanitary compartment (not being an associated ensuite), laundry, plant room or utilities room, must provide insulation against the transmission of –

a) **Airborne sound**; and

b) **Impact generated sound**, if the wall separates a sole-occupancy unit for a kitchen or laundry,

Airborne Sound

XL WALL SYSTEM - COMPLIANCE
VERIFICATION METHOD

FV5.2
Compliance with FP5.2(a) – airborne sound and FP5.3 to avoid the transmission of airborne sound through walls is verified when it is measured in-situ that –

a) A wall separating sole-occupancy units has a weighted standardised level difference with spectrum adaptation term ($D_{nT,w} + C_{tr}$) not less than 45 when determined under AS/NZS 1276.1 or ISO 717.1; or

b) A wall separating a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby, or the like, or parts of a different classification, has a weighted standardised level difference with spectrum adaptation term ($D_{nT,w}$) not less than 45 when determined under AS/NZS 1276.1 or ISO 717.1; or

c) Any door assembly located in a wall that separates a sole-occupancy unit from a stairway, public corridor, public lobby, or the like, has a weighted standardised level difference with spectrum adaptation term ($D_{nT,w}$) not less than 25 when determined under AS/NZS 1276.1 or ISO 717.1

RITEK XL WALL SYSTEM COMPLIANCE WITH THE BCA 2012 PERFORMANCE REQUIREMENTS OF FP5.2 AND FP5.5 FOR AIRBORNE SOUND IS BY THE VERIFICATION METHOD
$D_{nT,w} + C_{tr}$ NOT LESS THAN 45

Impact generated sound

XL WALL SYSTEM - COMPLIANCE
DEEMED-TO-SATISFY PROVISION

F5.3
Compliance with FP5.2(b) and FP5.5 (b) – impact generated sound is proposed to comply with the deemed to satisfy provisions when –

a) Not applicable

b) 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) Not applicable

c) For the purposes of this part, discontinuous construction means a wall having a minimum 20mm 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.

RITEK XL WALL SYSTEM COMPLIANCE WITH THE BCA 2012 PERFORMANCE REQUIREMENTS OF FP5.2 FOR IMPACT GENERATED SOUND IS BY THE VERIFICATION METHOD
$D_{nT,w} + C_{tr}$ NOT LESS THAN 45 + DISCONTINUOUS WALL

ACOUSTIC OPINION PKA-A083 - PKA ACOUSTIC CONSULTING ENGINEERS JULY 2012

Ritek® Wall Systems - XL Thermal Wall® Compliance Statement for R-Value 1.4

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25 October 2010

BCA 2010 SECTION J1.5 WALLS. RITEK COMPLIANCE STATEMENT

BCA CLASS 2 to CLASS 9 BUILDINGS

This letter provides my assessment that the Ritek XL Thermal Wall systems detailed below having an overall specification as follows:

1. Ritek XL Thermal Wall (XL-T) - **25mm PUR/PIR 35kg/m^3** insulation with **98mm** or thicker concrete core provides a minimum Total R Value:

   Total R1.5 winter and **Total R1.4 summer** (ref. JMF R-CALC # 128.25u1),

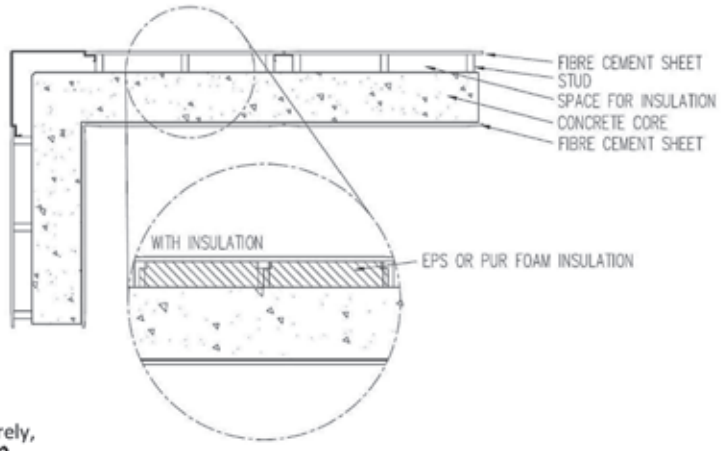
2. Ritek XL Thermal Wall (XL-T) with **50mm 'S-Grade' EPS** insulation with **103mm** or thicker concrete core provides a minimum Total R Value;

   Total R1.6 winter and **Total R1.5 summer** (ref. JMF R-CALC # 128.50e1),

satisfy the **Total R1.4** requirement of the BCA2010 Section J1.5 Walls, Clauses (a) and (b) (i) for climate zones 1 to 6 as the stud of the wall around which insulation fits is equivalent to *"a furring channel, top hat section, batten or the like"*.

Likewise, other Ritek XL Thermal Wall (XL-T) Systems having a greater Total R would similarly comply with these code clauses.

Figure 1 - XL Thermal Wall Configuration Showing Space for Insulation



Yours sincerely,

James Fricker

JAMES M FRICKER
B Mech Eng, CPEng, F.AIRAH, M.IEAust

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Ritek® Wall Systems - XL Wall® – Thermal Assessment

"TOTAL R"
THERMAL PERFORMANCE CALCULATIONS
TO AS/NZS 4859.1:2002/Amdt 1 (Dec 2006)

The following calculations by James M Fricker Pty Ltd are based upon:

a) AS/NZS 4859.1:2002/Amdt 1 (Dec 2006) "Materials for the thermal insulation of buildings. Part 1: General criteria and technical provisions",

b) the Australian Institute of Refrigeration Air-conditioning & Heating (AIRAH) Handbook (2007 Edition), and (if necessary) the ASHRAE Fundamentals Handbook.

Results reported are for the **insulation path** only per the original AS/NZS 4859.1:2002 Clause 1.5.3.3 – *"Total thermal resistance - A total resistance associated with a material or a system or construction of materials, specified as a Total R, including surface film resistances"* to be in alignment with the BCA2009 Specification J1.3 examples.

R-values for parallel-faced air cavities were calculated using the Reflect-3 computer software that is based on Robinson and Powell data and research by Oakridge National Laboratory, USA. These calculations are iterative and only the converged results are shown. (Note that Reflect-3 calculations are limited to a maximum 100mm air gap.)

Total R-values are based on product in-service conditions in accordance with AS/NZS 4859.1:2002/Amdt 1 (Dec 2006) including the alteration of insulation material R for temperature, and derations of reflective foil emittances due to dust as noted. Where a cavity is sealed, it is assumed there is no dust and hence emittance is not derated.

The calculations have not yet been independently verified per requirements of AS/NZS 4859.1:2002/Amdt 1.

Each calculation result is subject to any specific notes and assumptions listed on the calculation.

If a construction differs from the described system, the thermal resistance may be different.

JMF
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Ritek® Wall Systems - XL Wall® – Thermal Assessment

JAMES M FRICKER PTY LTD Report i128E Building Solutions Pty Ltd

JMF Calc.

RITEK XL™ WALLS - SUMMARY

128.02

RITEK XL™ WALL (BARE) COMPRISING 6MM FIBRE CEMENT, CONCRETE, 6MM FIBRE CEMENT

Panel	Panel total thickness, mm	Concrete thickness, mm	Total R, winter	Total R, summer
115XL	115	103	0.28	0.28
135XL	135	123	0.29	0.29
150XL	150	138	0.30	0.30
165XL	165	153	0.31	0.31
200XL	200	188	0.34	0.34
265XL	265	253	0.38	0.38

128.03

RITEK XL™ WALL WITH 50MM H GRADE EPS, 2MM TEXTURE COAT

Panel	Panel total thickness, mm	Concrete thickness, mm	Total R, winter	Total R, summer
115XL	175	103	1.70	1.62
135XL	195	123	1.71	1.63
150XL	210	138	1.72	1.64
165XL	225	153	1.73	1.65
200XL	260	188	1.76	1.67
265XL	325	253	1.80	1.72

128.04

RITEK XL™ WALL WITH 50MM 32KG/M³ XPS, 2MM TEXTURE COAT

Panel	Panel total thickness, mm	Concrete thickness, mm	Total R, winter	Total R, summer
115XL	175	103	2.16	2.05
135XL	195	123	2.18	2.07
150XL	210	138	2.19	2.08
165XL	225	153	2.20	2.09
200XL	260	188	2.22	2.11
265XL	325	253	2.27	2.16

128.05

RITEK XL™ WALL WITH 15MM FOILBOARD™, 28MM REFLECTIVE CAVITY, 10MM PLASTERBOARD

Panel	Panel total thickness, mm	Concrete thickness, mm	Total R, winter	Total R, summer
115XL	168	103	1.60	1.44
135XL	188	123	1.62	1.45
150XL	203	138	1.63	1.46
165XL	218	153	1.64	1.47
200XL	253	188	1.66	1.50
265XL	318	253	1.71	1.54

NOTES: The above shows Total R determinations based upon AS/NZS 4859.1:2002/Amdt 1 2006, Materials for the thermal insulation of buildings. The insulation total thermal resistance is calculated for the Australian air temperature differences (winter: 18°-12°C = 6K, summer: 36°-24°C = 12K) per AS/NZS 4859.1:2002/Amdt 1 2006.

Ritek® Wall Systems - XL Wall® – Thermal Assessment

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THERMAL INSULATION EVALUATION BY CALCULATION

RITEK 115XL™ WALL (BARE) COMPRISING 6MM FIBRE CEMENT, 103MM CONCRETE, 6MM FIBRE CEMENT

Calculation: 128.02

Evaluation for Winter, 12.0°C ambient air temperature, 18.0°C inside air temperature.

Wall Element	m².K/W	°C out	°C in	°C avg	Δt	mm	Note
Outside air film:	0.040	**12.00**	12.86	12.43	0.86		1
6mm fibre cement:	0.024	12.86	13.37	13.12	0.52	6	3
103mm 25MPa Concrete:	0.072	13.37	14.91	14.14	1.54	103	3
6mm fibre cement:	0.024	14.91	15.42	15.17	0.52	6	3
Indoor air film (unreflective surface):	0.120	15.42	**18.00**	16.71	2.58		2
Total Thermal Resistance, R_{Ti} =	**0.28**	m².K/W			6.00	115	

Corresponding Total Conductance (U_{Ti}): 3.58 W/(m².K)

NOTES:

Calculated 22/3/11 13:04 Ref: 128_E.xls

Determinations based upon AS/NZS 4859.1:2002/Amdt 1 2006, Materials for the thermal insulation of buildings

1 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(a)
2 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(b)
3 2007 AIRAH Technical Handbook pages 164-177
4 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1
5 Thermal short-circuiting by frames is not considered here as evaluation is for the insulation path only.
6 This report may not be reproduced except in full. Results may not be quoted without reference to the assumptions.
7 This computation is not compliant for labelling of insulation products to AS/NZS 4859.1:2002 without an independent endorsement from a recognised laboratory per Section 4.3 of the standard.
8 Calculated by James Fricker, M.AIRAH, M.IEAust, CPEng.

CONCLUSION:

For the above Ritek XL bare wall arrangement,
the WINTER Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 is:

R0.28 m².K/W for an air temperature difference of 18°-12° = 6K

Similarly, the SUMMER Total R-value per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1 is:

R0.28 m².K/W for an air temperature difference of 36°-24° = 12K

Signed: James Fricker

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Similarly calculated, the results for other wall thicknesses are:

RITEK XL WALL SYSTEM (BARE)				
Ritek panel type	**Panel total thickness, mm**	**Concrete thickness, mm**	**Total R, winter**	**Total R, summer**
115XL	115	103	0.28	0.28
135XL	135	123	0.29	0.29
150XL	150	138	0.30	0.30
165XL	165	153	0.31	0.31
200XL	200	188	0.34	0.34
265XL	265	253	0.38	0.38

Ritek® Wall Systems - XL Wall® – Thermal Assessment

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THERMAL INSULATION EVALUATION BY CALCULATION

RITEK 115XL™ WALL WITH 50MM H GRADE EPS, 2MM TEXTURE COAT

Calculation: 128.03

Evaluation for Winter, 12.0°C ambient air temperature, 18.0°C inside air temperature.

Wall Element	m².K/W	°C out	°C in	°C avg	Δt	mm	Note
Outside air film:	0.040	**12.00**	12.14	12.07	0.14		1
2mm Texture Coat:	0.005	12.14	12.16	12.15	0.02	2	3
8mm Render:	0.020	12.16	12.23	12.19	0.07	8	3
50mm H Grade EPS:	1.395	12.23	17.15	14.69	4.92	50	4
6mm fibre cement:	0.024	17.15	17.24	17.20	0.08	6	3
103mm 25MPa Concrete:	0.072	17.24	17.49	17.37	0.25	103	3
6mm fibre cement:	0.024	17.49	17.58	17.53	0.08	6	3
Indoor air film (unreflective surface):	0.120	17.58	**18.00**	17.79	0.42		2
Total Thermal Resistance, R_{Ti} =	**1.70**	m².K/W			6.00	175	

Corresponding Total Conductance (U_{Ti}): 0.59 W/(m².K)

NOTES:

Calculated 22/3/11 13:04 Ref: 128_E.xls

Determinations based upon AS/NZS 4859.1:2002/Amdt 1 2006, Materials for the thermal insulation of buildings

1 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(a)
2 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(b)
3 2007 AIRAH Technical Handbook pages 164-177
4 H Grade expaned polystyrene, k=0.037W/m·K @ 23°C.
R adjusted 0.39%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1
5 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1
6 Thermal short-circuiting by frames is not considered here as evaluation is for the insulation path only.
7 This report may not be reproduced except in full. Results may not be quoted without reference to the assumptions.
8 This computation is not compliant for labelling of insulation products to AS/NZS 4859.1:2002 without an independent endorsement from a recognised laboratory per Section 4.3 of the standard.
9 Calculated by James Fricker, M.AIRAH, M.IEAust, CPEng.

CONCLUSION:

For the above Ritek XL wall with 50mm H Grade EPS and render,
the WINTER Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 is:

R1.70 m².K/W for an air temperature difference of 18°-12° = 6K

Similarly, the SUMMER Total R-value per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1 is:

R1.62 m².K/W for an air temperature difference of 36°-24° = 12K

Signed: James Fricker

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James M. Fricker
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Similarly calculated, the results for other wall thicknesses are:

RITEK XL WALL SYSTEM WITH 50MM H GRADE EPS & RENDER				
Ritek panel type	**Panel total thickness, mm**	**Concrete thickness, mm**	**Total R, winter**	**Total R, summer**
115XL	175	103	1.70	1.62
135XL	195	123	1.71	1.63
150XL	210	138	1.72	1.64
165XL	225	153	1.73	1.65
200XL	260	188	1.76	1.67
265XL	325	253	1.80	1.72

Ritek® Wall Systems - XL Wall® – Thermal Assessment

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THERMAL INSULATION EVALUATION BY CALCULATION

RITEK 115XL™ WALL WITH 50MM 32KG/M³ XPS, 2MM TEXTURE COAT

Calculation: 128.04

Evaluation for Winter, 12.0°C ambient air temperature, 18.0°C inside air temperature.

Wall Element	m².K/W	°C out	°C in	°C avg	Δt	mm	Note
Outside air film:	0.040	**12.00**	12.11	12.06	0.11		1
2mm Texture Coat:	0.005	12.11	12.12	12.12	0.01	2	3
8mm Render:	0.020	12.12	12.18	12.15	0.06	8	3
50mm 32kg/m³ extruded polystyrene:	1.857	12.18	17.34	14.76	5.15	50	4
6mm fibre cement:	0.024	17.34	17.40	17.37	0.07	6	3
103mm 25MPa Concrete:	0.072	17.40	17.60	17.50	0.20	103	3
6mm fibre cement:	0.024	17.60	17.67	17.63	0.07	6	3
Indoor air film (unreflective surface):	0.120	17.67	**18.00**	17.83	0.33		2
Total Thermal Resistance, R_{Ti} =	**2.16**	m².K/W			6.00	175	

Corresponding Total Conductance (U_{Ti}): 0.46 W/(m².K)

NOTES:

Calculated 22/3/11 13:04 Ref: 128_E.xls

Determinations based upon AS/NZS 4859.1:2002/Amdt 1 2006, Materials for the thermal insulation of buildings

1 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(a)
2 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(b)
3 2007 AIRAH Technical Handbook pages 164-177
4 32kg/m3 extruded polystyrene (XPS), k=0.028 W/m·K @ 23°C (per 2007 AIRAH Technical Handbook)
R adjusted 0.39%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1 (polystyrene)
5 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1
6 Thermal short-circuiting by frames is not considered here as evaluation is for the insulation path only.
7 This report may not be reproduced except in full. Results may not be quoted without reference to the assumptions.
8 This computation is not compliant for labelling of insulation products to AS/NZS 4859.1:2002 without an independent endorsement from a recognised laboratory per Section 4.3 of the standard.
9 Calculated by James Fricker, M.AIRAH, M.IEAust, CPEng.

CONCLUSION:

For the above Ritek XL wall with 50mm 32kg/m³ extruded polystyrene and render, the WINTER Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 is:

R2.16 m².K/W for an air temperature difference of 18°-12° = 6K

Similarly, the SUMMER Total R-value per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1 is:

R2.05 m².K/W for an air temperature difference of 36°-24° = 12K

Signed: James Fricker

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Similarly calculated, the results for other wall thicknesses are:

RITEK XL WALL SYSTEM WITH 50MM 32KG/M³ XPS & RENDER				
Ritek panel type	**Panel total thickness, mm**	**Concrete thickness, mm**	**Total R, winter**	**Total R, summer**
115XL	175	103	2.16	2.05
135XL	195	123	2.18	2.07
150XL	210	138	2.19	2.08
165XL	225	153	2.20	2.09
200XL	260	188	2.22	2.11
265XL	325	253	2.27	2.16

Ritek® Wall Systems - XL Wall® – Thermal Assessment

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THERMAL INSULATION EVALUATION BY CALCULATION

RITEK 115XL™ WALL WITH 15MM FOILBOARD™, 28MM REFLECTIVE CAVITY, 10MM PLASTERBOARD

Calculation: 128.05

Evaluation for Winter, 12.0°C ambient air temperature, 18.0°C inside air temperature.

						Assumed Cavity Properties				
Wall Element	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm	Heat Flow	Note
Outside air film:	0.040	**12.00**	12.15	12.07	0.15					1
6mm fibre cement:	0.024	12.15	12.24	12.19	0.09			6		3
103mm 25MPa Concrete:	0.072	12.24	12.51	12.37	0.27			103		3
6mm fibre cement:	0.024	12.51	12.60	12.55	0.09			6		3
15mm Foilboard™:	0.459	12.60	14.32	13.46	1.72			15		5
Unventilated 28mm reflective airspace:	***0.804***	14.32	17.33	15.82	3.01	**0.03**	0.87	28	Wall	4
10mm plasterboard:	0.059	17.33	17.55	17.44	0.22			10		3
Indoor air film (unreflective surface):	0.120	17.55	**18.00**	17.78	0.45					2
Total Thermal Resistance, R_{TI} =	**1.60**	m².K/W			6.00			168		

Corresponding Total Conductance (U_{TI}): 0.62 W/(m².K)

NOTES:

Calculated 22/3/11 13:04 Ref: 128_E.xls

Determinations based upon AS/NZS 4859.1:2002/Amdt 1 2006, Materials for the thermal insulation of buildings

1 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(a)
2 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(b)
3 2007 AIRAH Technical Handbook pages 164-177
4 Cavity air space insulation values (shown in italics) were estimated using Reflect3 software.
These are iterative calculations per the USA Division of Housing Research Paper 32.
The cavity R calculation assumes an air cavity of the gap shown with uniform parallel surfaces.
The calculations incorporate the dust assumptions of AS/NZS 4859.1:2002/Amdt 1 2006, Clauses K3.2 & K4.2
5 FOILBOARD 15mm foil based SL Grade polystyrene (R&D Services tested k=0.0339 W/m·K @ 23°C).
R adjusted 0.39%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1 (polystyrene)
5 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1
6 Thermal short-circuiting by frames is not considered here as evaluation is for the insulation path only.
7 This report may not be reproduced except in full. Results may not be quoted without reference to the assumptions.
8 This computation is not compliant for labelling of insulation products to AS/NZS 4859.1:2002 without an independent endorsement from a recognised laboratory per Section 4.3 of the standard.
9 Calculated by James Fricker, M.AIRAH, M.IEAust, CPEng.

CONCLUSION:

For the above Ritek XL wall with 15mm Foilboard™, 28mm reflective airspace and plasterboard, the WINTER Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 is:

R1.60 m².K/W for an air temperature difference of 18°-12° = 6K

Similarly, the SUMMER Total R-value per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1 is:

R1.44 m².K/W for an air temperature difference of 36°-24° = 12K

Signed: James Fricker

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Similarly calculated, the results for other wall thicknesses are:

RITEK XL WALL WITH 15MM FOILBOARD, 28MM AIRSPACE & PLASTERBOARD				
Ritek panel type	Panel total thickness, mm	Concrete thickness, mm	Total R, winter	Total R, summer
115XL	168	103	1.60	1.44
135XL	188	123	1.62	1.45
150XL	203	138	1.63	1.46
165XL	218	153	1.64	1.47
200XL	253	188	1.66	1.50
265XL	318	253	1.71	1.54

Ritek® Wall Systems - XL Thermal Wall® – Thermal Assessment

"TOTAL R"
THERMAL PERFORMANCE CALCULATIONS
TO AS/NZS 4859.1:2002/Amdt 1 (Dec 2006)

The following calculations by James M Fricker Pty Ltd are based upon:

a) AS/NZS 4859.1:2002/Amdt 1 (Dec 2006) "Materials for the thermal insulation of buildings. Part 1: General criteria and technical provisions",

b) the Australian Institute of Refrigeration Air-conditioning & Heating (AIRAH) Handbook (2007 Edition), and (if necessary) the ASHRAE Fundamentals Handbook.

Summary results with thermal bridging calculations give **Surface Average Total R** per AS/NZS 4859.1:2002 / Amdt 1 2006.

Total R-values are based on product in-service conditions in accordance with AS/NZS 4859.1:2002/Amdt 1 (Dec 2006) including the alteration of insulation material R for temperature.

The calculations have not yet been independently verified per requirements of AS/NZS 4859.1:2002/Amdt 1.

Each calculation result is subject to any specific notes and assumptions listed on the calculation.

If a construction differs from the described system, the thermal resistance may be different.

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XL-T WALL SYSTEM

(A) For PUR 35kg/m3, k = 0.0200 W/m·K

Insulation Thickness	25	25	25	25	25	35	35	35	35	35	50	50	50	50	50	63	63	63	63	63	88	88	88	88	88
Concrete	98	113	128	163	213	103	118	153	203	253	103	138	188	238	288	125	175	225	275	325	100	150	200	250	300
Total Wall Thickness	135	150	165	200	250	150	165	200	250	300	165	200	250	300	350	200	250	300	350	400	200	250	300	350	400
Insulation R Value at 23°C	1.25	1.25	1.25	1.25	1.25	1.75	1.75	1.75	1.75	1.75	2.50	2.50	2.50	2.50	2.50	3.15	3.15	3.15	3.15	3.15	4.40	4.40	4.40	4.40	4.40
Path Total R-Value, winter	1.59	1.60	1.61	1.64	1.67	2.12	2.13	2.16	2.19	2.22	2.91	2.94	2.97	3.00	3.04	3.61	3.64	3.68	3.71	3.75	4.91	4.94	4.98	5.01	5.05
Reduction due to bridging	4.5%	4.5%	4.5%	4.4%	4.3%	4.7%	4.7%	4.7%	4.6%	4.5%	4.9%	4.9%	4.8%	4.8%	4.7%	5.0%	5.0%	4.9%	4.9%	4.8%	5.1%	5.1%	5.1%	5.0%	5.0%
Total R Value (Winter)	**1.52**	**1.53**	**1.54**	**1.56**	**1.60**	**2.02**	**2.03**	**2.05**	**2.09**	**2.12**	**2.77**	**2.79**	**2.83**	**2.86**	**2.89**	**3.43**	**3.46**	**3.50**	**3.53**	**3.57**	**4.65**	**4.69**	**4.72**	**4.76**	**4.79**
Total R Value (Summer)	**1.41**	**1.42**	**1.43**	**1.46**	**1.49**	**1.86**	**1.88**	**1.90**	**1.94**	**1.97**	**2.55**	**2.57**	**2.61**	**2.64**	**2.68**	**3.15**	**3.19**	**3.22**	**3.26**	**3.29**	**4.27**	**4.31**	**4.34**	**4.37**	**4.41**
Ref JMF calc:	128.25u1	128.25u2	128.25u3	128.25u4	128.25u5	128.35u1	128.35u2	128.35u3	128.35u4	128.35u5	128.50u1	128.50u2	128.50u3	128.50u4	128.50u5	128.63u1	128.63u2	128.63u3	128.63u4	128.63u5	128.88u1	128.88u2	128.88u3	128.88u4	128.88u5

(B) For PIR 35kg/m3, k = 0.0220 W/m·K

Insulation Thickness	25	25	25	25	25	35	35	35	35	50	50	50	65	65	85	85
Concrete	98	113	128	163	228	103	118	153	218	103	138	203	123	188	103	168
Total Wall Thickness	135	150	165	200	265	150	165	200	265	165	200	265	200	265	200	265
Insulation R Value at 23°C	1.14	1.14	1.14	1.14	1.14	1.59	1.59	1.59	1.59	2.27	2.27	2.27	2.95	2.95	3.86	3.86
Path Total R-Value, winter	1.47	1.48	1.49	1.52	1.56	1.95	1.96	1.99	2.03	2.67	2.69	2.74	3.40	3.45	4.34	4.39
Reduction due to bridging	4.0%	4.0%	4.0%	3.9%	3.8%	4.2%	4.2%	4.2%	4.1%	4.4%	4.4%	4.3%	4.5%	4.4%	4.6%	4.6%
Total R Value (Winter)	**1.41**	**1.42**	**1.43**	**1.46**	**1.50**	**1.87**	**1.88**	**1.91**	**1.95**	**2.55**	**2.58**	**2.62**	**3.25**	**3.29**	**4.14**	**4.19**
Total R Value (Summer)	**1.31**	**1.32**	**1.33**	**1.36**	**1.40**	**1.73**	**1.74**	**1.77**	**1.81**	**2.35**	**2.38**	**2.42**	**2.99**	**3.03**	**3.80**	**3.85**

Ref JMF calc: = 128.25i1 = 128.25i1 = 128.25i1 = 128.25i4 = 128.25i6 = 128.35i2 = 128.35i3 = 128.35i4 = 128.35i6 = 128.50i3 = 128.50i4 = 128.50i5 = 128.50i6 = 128.65i4 = 128.65i5 = 128.88i4 = 128.88i5

(C) For EPS k = 0.0379 W/m·K

Insulation Thickness	25	25	25	25	25	35	35	35	35	35	50	50	50	50	50	63	63	63	63	63	88	88	88	88	88
Concrete	98	113	128	163	213	103	118	153	203	253	103	138	188	238	288	125	175	225	275	325	100	150	200	250	300
Total Wall Thickness	135	150	165	200	250	150	165	200	250	300	165	200	250	300	350	200	250	300	350	400	200	250	300	350	400
Insulation R Value at 23°C	0.66	0.66	0.66	0.66	0.66	0.92	0.92	0.92	0.92	0.92	1.32	1.32	1.32	1.32	1.32	1.66	1.66	1.66	1.66	1.66	2.32	2.32	2.32	2.32	2.32
Path Total R-Value, winter	0.96	0.97	0.98	1.00	1.04	1.23	1.24	1.27	1.30	1.34	1.64	1.66	1.70	1.73	1.77	2.01	2.04	2.08	2.11	2.15	2.67	2.71	2.74	2.78	2.81
Reduction due to bridging	1.9%	1.8%	1.8%	1.8%	1.7%	2.0%	2.0%	2.0%	1.9%	1.9%	2.2%	2.1%	2.1%	2.1%	2.0%	2.2%	2.2%	2.2%	2.1%	2.1%	2.3%	2.3%	2.3%	2.3%	2.2%
Total R Value (Winter)	**0.94**	**0.95**	**0.96**	**0.98**	**1.02**	**1.21**	**1.22**	**1.24**	**1.28**	**1.31**	**1.60**	**1.63**	**1.66**	**1.70**	**1.73**	**1.96**	**2.00**	**2.03**	**2.07**	**2.10**	**2.61**	**2.64**	**2.68**	**2.71**	**2.75**
Total R Value (Summer)	**0.90**	**0.91**	**0.92**	**0.95**	**0.98**	**1.16**	**1.17**	**1.19**	**1.23**	**1.26**	**1.53**	**1.56**	**1.59**	**1.63**	**1.66**	**1.87**	**1.91**	**1.94**	**1.98**	**2.01**	**2.48**	**2.52**	**2.55**	**2.58**	**2.62**
Ref JMF calc:	128.25e1	128.25e2	128.25e3	128.25e4	128.25e5	128.35e1	128.35e2	128.35e3	128.35e4	128.35e5	128.50e1	128.50e2	128.50e3	128.50e4	128.50e5	128.63e1	128.63e2	128.63e3	128.63e4	128.63e5	128.88e1	128.88e2	128.88e3	128.88e4	128.88e5

NOTES:

Overall resulting Total R for the wall panel surface calculated by Isothermal Planes Method per AS/NZS 4859.1:2002/Amdt 1/2006

Calculated for:
- (A) PUR 35kg/m3, k=0.020 W/m·K @ 23°C (per RigiTech's claim of 12/1/2010 for HCFC-141B blown rigid pour 35kg/m3 polyurethane)
  (R adjusted 0.65%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1)
- (B) PIR (polyisocyanurate), tested k=0.022 W/m·K @ 23°C
  (R adjusted 0.65%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1)
- (C) EPS with k=0.0379 W/m·K @ 23°C (as tested 2010)
  (R adjusted 0.39%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1)
  Concrete conductivi 1.44 W/m·K
  Fibre cement claddi 12 mm total (6mm sheet each side)

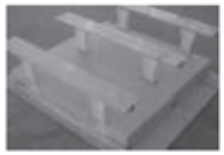
Calculations marked with green highlight have been independently verified by R&D Services, U.S.A. per AS/NZS 4859.1:2002/Amdt 1

Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1, Clause K3.1

Calculated by James Fricker, F.AIRAH, M.EngAust, CPEng.

Calculations updated 17/2/12 14:43

SPACER



before concrete fill

Ritek® Wall Systems - XL Thermal Wall® – Thermal Assessment

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THERMAL BRIDGING CALCULATION

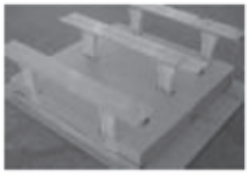
XL-T WALL SYSTEM - 25mm PIR on 98mm concrete panel

Calc: 128.25i1

	WINTER (heat flow out)		SUMMER (heat flow in)		
	Insul.	**Spacer**	**Insul.**	**Spacer**	
Thermal path area (sqm):	0.032800	0.000200	0.032800	0.000200	
Thermal path area ratio:	99.39%	0.61%	99.39%	0.61%	Notes
	R (m².K/W)		R (m².K/W)		
Outside air film:	0.040		0.040		
6mm fibre cement sheet:	0.024		0.024		3
25mm PIR insulation:	1.195		1.085		4
25mm of plastic spacer:	-	0.125	-	0.125	
98mm concrete core	0.068		0.068		3
6mm fibre cement sheet"	0.024		0.024		5
Indoor air film:	0.120		0.120		
Path Total R:	1.472	0.401	1.361	0.401	a
Overall Total R:	**R1.41**		**R1.31**		b
% Total R reduction due to bridging:	4.0%		3.5%		=(a-b)/a•100%

NOTES: Calculated 17/2/12 14:43 Ref: 128_F.xls

1 The above estimates the resulting (overall) Total R from the two parallel heat paths -
a. through the insulation, b. through plastic spacers (voids having negligible effect as air is an insulator)
2 Overall resulting Total R calculated by Isothermal Planes Method per AS/NZS 4859.1:2002/Amdt 1/2006
3 FC sheet & concrete core assumed to be relevant isothermal planes.
4 **PIR (polyisocyanurate), tested k=0.022 W/m·K @ 23°C**
R adjusted 0.65%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1



before concrete fill

5 Refer AS/NZS 4859.1:2002/Amdt 1 2006 for assumptions.
6 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1, Clause K3.1
7 For insulation product labelling to AS/NZS 4859.1:2002, this calculation requires an endorsement from a recognised laboratory per Section 4.3 of the standard.
8 Calculated by James Fricker, F.AIRAH, M.EngAust, CPEng.

CONCLUSION:

For the XL-T WALL SYSTEM - 25mm PIR on 98mm concrete panel (total thickness 135mm),
the WINTER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 18°-12° = 6K) is:

R1.41 m².K/W after considering thermal bridging for this specific case.

Similarly,
the SUMMER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 36°-24° = 12K) is:

R1.31 m².K/W after considering thermal bridging for this specific case.

Signed: James Fricker

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Ritek® Wall Systems - XL Thermal Wall® – Thermal Assessment

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THERMAL BRIDGING CALCULATION

XL-T WALL SYSTEM - 35mm PIR on 103mm concrete panel

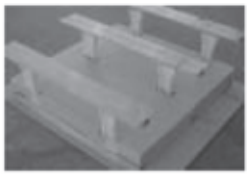
WINTER (heat flow out) **SUMMER** (heat flow in)

Calc: 128.35i2

	Insul.	Spacer	Insul.	Spacer	Notes
Thermal path area (sqm):	0.032800	0.000200	0.032800	0.000200	
Thermal path area ratio:	99.39%	0.61%	99.39%	0.61%	
	R (m².K/W)		R (m².K/W)		
Outside air film:	0.040		0.040		
6mm fibre cement sheet:	0.024		0.024		3
35mm PIR insulation:	1.674		1.519		4
35mm of plastic spacer:	-	0.175	-	0.175	
103mm concrete core	0.072		0.072		3
6mm fibre cement sheet"	0.024		0.024		5
Indoor air film:	0.120		0.120		
Path Total R:	1.953	0.455	1.798	0.455	a
Overall Total R:	**R1.87**		**R1.73**		b
% Total R reduction due to bridging:	4.2%		3.8%		=(a-b)/a•100%

NOTES: Calculated 17/2/12 14:43 Ref: 128_F.xls

1 The above estimates the resulting (overall) Total R from the two parallel heat paths - a. through the insulation, b. through plastic spacers (voids having negligible effect as air is an insulator)
2 Overall resulting Total R calculated by Isothermal Planes Method per AS/NZS 4859.1:2002/Amdt 1/2006
3 FC sheet & concrete core assumed to be relevant isothermal planes.
4 **PIR (polyisocyanurate), tested k=0.022 W/m·K @ 23°C**
R adjusted 0.65%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1


before concrete fill

5 Refer AS/NZS 4859.1:2002/Amdt 1 2006 for assumptions.
6 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1, Clause K3.1
7 For insulation product labelling to AS/NZS 4859.1:2002, this calculation requires an endorsement from a recognised laboratory per Section 4.3 of the standard.
8 Calculated by James Fricker, F.AIRAH, M.EngAust, CPEng.

CONCLUSION:

For the XL-T WALL SYSTEM - 35mm PIR on 103mm concrete panel (total thickness 150mm),
the WINTER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 18°-12° = 6K) is:

R1.87 m².K/W after considering thermal bridging for this specific case.

Similarly,
the SUMMER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 36°-24° = 12K) is:

R1.73 m².K/W after considering thermal bridging for this specific case.

Signed: James Fricker

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Ritek® Wall Systems - XL Thermal Wall® – Thermal Assessment

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THERMAL BRIDGING CALCULATION

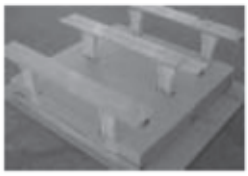
XL-T WALL SYSTEM - 50mm PIR on 103mm concrete panel

Calc: 128.50i3

	WINTER (heat flow out)		SUMMER (heat flow in)		
	Insul.	**Spacer**	**Insul.**	**Spacer**	
Thermal path area (sqm):	0.032800	0.000200	0.032800	0.000200	
Thermal path area ratio:	99.39%	0.61%	99.39%	0.61%	Notes
	R (m².K/W)		R (m².K/W)		
Outside air film:	0.040		0.040		
6mm fibre cement sheet:	0.024		0.024		3
50mm PIR insulation:	2.391		2.169		4
50mm of plastic spacer:	-	0.250	-	0.250	
103mm concrete core	0.072		0.072		3
6mm fibre cement sheet"	0.024		0.024		5
Indoor air film:	0.120		0.120		
Path Total R:	2.670	0.530	2.449	0.530	a
Overall Total R:	**R2.55**		**R2.35**		b
% Total R reduction due to bridging:	4.4%		3.9%		=(a-b)/a•100%

NOTES: Calculated 17/2/12 14:43 Ref: 128_F.xls

1 The above estimates the resulting (overall) Total R from the two parallel heat paths -
a. through the insulation, b. through plastic spacers (voids having negligible effect as air is an insulator)
2 Overall resulting Total R calculated by Isothermal Planes Method per AS/NZS 4859.1:2002/Amdt 1/2006
3 FC sheet & concrete core assumed to be relevant isothermal planes.
4 **PIR (polyisocyanurate), tested k=0.022 W/m·K @ 23°C**
R adjusted 0.65%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1



before concrete fill

5 Refer AS/NZS 4859.1:2002/Amdt 1 2006 for assumptions.
6 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1, Clause K3.1
7 For insulation product labelling to AS/NZS 4859.1:2002, this calculation requires an endorsement from a recognised laboratory per Section 4.3 of the standard.
8 Calculated by James Fricker, F.AIRAH, M.EngAust, CPEng.

CONCLUSION:

For the XL-T WALL SYSTEM - 50mm PIR on 103mm concrete panel (total thickness 165mm),
the WINTER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 18°-12° = 6K) is:

R2.55 m².K/W after considering thermal bridging for this specific case.

Similarly,
the SUMMER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 36°-24° = 12K) is:

R2.35 m².K/W after considering thermal bridging for this specific case.

Signed: James Fricker

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Ritek® Wall Systems - XL Thermal Wall® – Thermal Assessment

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THERMAL BRIDGING CALCULATION

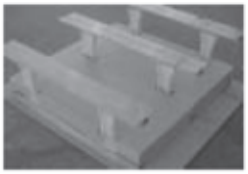
XL-T WALL SYSTEM - 65mm PIR on 123mm concrete panel

WINTER (heat flow out) **SUMMER** (heat flow in)

	Insul.	Spacer	Insul.	Spacer	Calc: 128.65i4
Thermal path area (sqm):	0.032800	0.000200	0.032800	0.000200	
Thermal path area ratio:	99.39%	0.61%	99.39%	0.61%	Notes
	R (m².K/W)		R (m².K/W)		
Outside air film:	0.040		0.040		
6mm fibre cement sheet:	0.024		0.024		3
65mm PIR insulation:	3.108		2.820		4
65mm of plastic spacer:	-	0.325	-	0.325	
123mm concrete core	0.085		0.085		3
6mm fibre cement sheet"	0.024		0.024		5
Indoor air film:	0.120		0.120		
Path Total R:	3.402	0.618	3.114	0.618	a
Overall Total R:	**R3.25**		**R2.99**		b
% Total R reduction due to bridging:	4.5%		4.0%		=(a-b)/a•100%

NOTES: Calculated 17/2/12 14:43 Ref: 128_F.xls

1 The above estimates the resulting (overall) Total R from the two parallel heat paths -
a. through the insulation, b. through plastic spacers (voids having negligible effect as air is an insulator)
2 Overall resulting Total R calculated by Isothermal Planes Method per AS/NZS 4859.1:2002/Amdt 1/2006
3 FC sheet & concrete core assumed to be relevant isothermal planes.
4 **PIR (polyisocyanurate), tested k=0.022 W/m·K @ 23°C**
R adjusted 0.65%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1



before concrete fill

5 Refer AS/NZS 4859.1:2002/Amdt 1 2006 for assumptions.
6 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1, Clause K3.1
7 For insulation product labelling to AS/NZS 4859.1:2002, this calculation requires an endorsement from a recognised laboratory per Section 4.3 of the standard.
8 Calculated by James Fricker, F.AIRAH, M.EngAust, CPEng.

CONCLUSION:

For the XL-T WALL SYSTEM - 65mm PIR on 123mm concrete panel (total thickness 200mm),
the WINTER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 18°-12° = 6K) is:

R3.25 m².K/W after considering thermal bridging for this specific case.

Similarly,
the SUMMER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 36°-24° = 12K) is:

R2.99 m².K/W after considering thermal bridging for this specific case.

Signed: James Fricker

http://fricker.net.au

The Institution of Engineers, Australia

James M. Fricker
MIEAust CPEng
Chartered Professional Engineer
Membership No. 1179647

Ritek® Wall Systems - XL Thermal Wall® – Thermal Assessment

JAMES M FRICKER PTY LTD | Report 128f | Building Solutions Pty Ltd

THERMAL BRIDGING CALCULATION

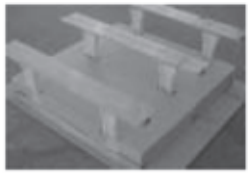
XL-T WALL SYSTEM - 85mm PIR on 103mm concrete panel

WINTER (heat flow out) SUMMER (heat flow in)

	Insul.	Spacer	Insul.	Spacer	Calc: 128.85i4
Thermal path area (sqm):	0.032800	0.000200	0.032800	0.000200	
Thermal path area ratio:	99.39%	0.61%	99.39%	0.61%	Notes
	R (m².K/W)		R (m².K/W)		
Outside air film:	0.040		0.040		
6mm fibre cement sheet:	0.024		0.024		3
85mm PIR insulation:	4.065		3.688		4
85mm of plastic spacer:	-	0.425	-	0.425	
103mm concrete core	0.072		0.072		3
6mm fibre cement sheet"	0.024		0.024		5
Indoor air film:	0.120		0.120		
Path Total R:	4.344	0.705	3.967	0.705	a
Overall Total R:	**R4.14**		**R3.80**		b
% Total R reduction due to bridging:	4.6%		4.1%		=(a-b)/a•100%

NOTES: Calculated 17/2/12 14:43 Ref: 128_F.xls

1 The above estimates the resulting (overall) Total R from the two parallel heat paths - a. through the insulation, b. through plastic spacers (voids having negligible effect as air is an insulator)
2 Overall resulting Total R calculated by Isothermal Planes Method per AS/NZS 4859.1:2002/Amdt 1/2006
3 FC sheet & concrete core assumed to be relevant isothermal planes.
4 **PIR (polyisocyanurate), tested k=0.022 W/m·K @ 23°C**
R adjusted 0.65%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1
5 Refer AS/NZS 4859.1:2002/Amdt 1 2006 for assumptions.
6 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1, Clause K3.1
7 For insulation product labelling to AS/NZS 4859.1:2002, this calculation requires an endorsement from a recognised laboratory per Section 4.3 of the standard.
8 Calculated by James Fricker, F.AIRAH, M.EngAust, CPEng.


before concrete fill

CONCLUSION:

For the XL-T WALL SYSTEM - 85mm PIR on 103mm concrete panel (total thickness 200mm),
the WINTER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 18°-12° = 6K) is:

R4.14 m².K/W after considering thermal bridging for this specific case.

Similarly,
the SUMMER overall Total R-value per AS4859.1:2002/Amdt 1 2006, Clause K3.1 (air Δt of 36°-24° = 12K) is:

R3.80 m².K/W after considering thermal bridging for this specific case.

Signed: James Fricker

http://fricker.net.au

The Institution of Engineers, Australia
James M. Fricker
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Membership No. 1179647

Ritek XL Wall – Use of Fibre Cement

Fibre cement sheeting material specification for the Ritek XL Wall and XL Thermal Wall Systems

James Hardie Fibre Cement Sheeting

The Ritek uses the James Hardie fibre cement sheeting for the manufacture of the XL Wall and XL Thermal Wall Systems for internal and external wall applications. James Hardie fibre cement sheeting meets the test standards of AS/NZS 2908.2:2000 for cellulose-cement products. This International Standard specifies the characteristics and establishes methods of control and test as well as acceptance conditions for fibre-cement flat sheets. It covers sheets intended for external applications such as cladding facades, curtain walls, soffits, lost casing, etc., and sheets intended for internal use such as partitions, floors, ceilings, etc., with a wide range of properties appropriate to the type of application. These sheets may have either a smooth or textured surface.

The AS/NZS 2908.2:2000 standard provides information on the types of fibre cement boards and categories. James Hardie fibre cement sheeting is a type B sheet, which is accepted for use in internal and external applications when they are directly exposed to the weather they shall be protected by a coating system; the weather resistance of the product is determined by the quality of the protection applied to the board.

External coating system specifications are provided and warranted by reputable texture coating system manufacturers such as Dulux, Rockcote, RSA, Wattyl etc.

Fire Rating

Ritek Wall Systems are manufactured with cellulose fibre reinforced cement sheeting which is a non-combustible sheeting material.

Durability

Some of the hidden factors that determine the true environmental impact of a product are its serviceable life, maintenance and disposal requirements. Ritek XL Wall and XL Thermal Wall Systems have a proven durability record for use in residential and commercial wall and column applications. It is used in fire and acoustic walls, high traffic areas and wet areas. When installed and maintained correctly, it is resistant to damage from fire, impact, moisture, rotting and termites.

The following tests are carried out on the fibre cement sheeting to test their real life durability and performance:

- Water permeability – testing weather resistance of an exterior product
- Heat rain – testing the product performance in varying dry or wet conditions
- Mould resistant – test results in accordance with ASTM D3273-00 no mould growth

Ritek® Wall Systems - Use of Fibre Cement Linings

The durability properties of James Hardie fibre cement sheeting used for the Ritek Wall Systems include:

DURABILITY		
Heat-Rain Durability	Passes	AS/NZS 2908.2
Warm Water Resistance	Passes	AS/NZS 2908.2
Freeze-Thaw Resistance	Passes	AS/NZS 2908.2
Soak-Dry	N/A	AS/NZS 2908.2

THERMAL PROPERTIES		
Combustibility	Suitable where non-combustible materials are required in accordance with C1.12 of the BCA	Deemed to comply with BCA
Early Fire Hazard Indices Ignitability Index Spread of Flame Index Heat Evolved Index Smoke Developed Index	**Lower Values Are Better** 0 0 0 0-1	**AS1530.3**
Fire Propagation Index	0	BS476.6
Spread of Flame Index	Class 1	BS476.7
Surface Burning Characteristics Flame Spread Index Fuel Contributed Smoke Developed Index Class	**Lower Values Are Better** 0 0 5 A	**ASTM E84**
Thermal Conductivity	0.33W/m °K	ASTM C177

Good Environmental Choice Australia (GECA)

The commonly used Fibre Cement Sheeting Sheeting is the most energy efficient of the James Hardie product range. James Hardie products require lower maintenance when compared to some other conventional building materials. Lower maintenance generally means you'll need to paint less frequently = greater ecological sustainability over the life of a building.

The Ritek XL Wall Systems use James Hardie fibre cement board which has been verified by an independent conformity assessment body that the product meets the environmental performance criteria of a GECA standard.

Mould Resistance

Independent laboratory tests were conducted on James Hardie Fibre Cement Sheeting to determine its resistance to mould growth in a severe interior environment in accordance with ASTM D3273-00 – 'Standard Test Method for Resistance to Growth of Mould on the Surface of Interior Coatings in an Environmental Chamber.'

The test results are reported using a scale of zero to ten, with ten representing no mould growth on the surface of the sample. Independent test results in accordance with ASTM D3273-00 concluded that there was no mould growth on the Fibre Cement Sheeting resulting in a perfect rating of 10.

The mould resistant properties of James Hardie fibre cement sheeting coupled with its proven durability characteristics, combine to give unique advantages for use in wet areas where mould resistance is important.

Ritek® Wall Systems - Use of Fibre Cement Linings

CERTIFICATE OF PHYSICAL PROPERTIES
SystemBoard™ Sheets

SystemBoard™ sheets have been comprehensively tested and displays the following typical physical properties.

STRENGTH AND MOISTURE RELATED			
PHYSICAL PROPERTY	**SATURATED CONDITION**	**EQUILIBRIUM CONDITION 23ºC – 50% RH**	**STANDARD**
Minimum Bending Strength Category Type	>7.0 Mpa 3 A		AS/NZS 2908.2
Average Density in kg/m³ (Oven Dry)	1300		AS/NZS 2908.2
Watertightness		Passes	AS/NZS 2908.2
Water Absorption		32.7%	ASTM C1186
EQ Moisture Content		3.8%	ASTM C1186
Moisture Movement 30-90% relative humidity*		A direction 0.06% B direction 0.06%	ASTM C1186
Dimensional Conformance		Passes	AS/NZS 2908.2

DURABILITY		
Heat-Rain Durability	Passes	AS/NZS 2908.2
Warm Water Resistance	Passes	AS/NZS 2908.2
Freeze-Thaw Resistance	Passes	AS/NZS 2908.2
Soak-Dry	Passes	AS/NZS 2908.2

MISCELLANEOUS PROPERTIES		
Termite resistance	Resistance to damage from termite attack.	Based on testing completed by CSIRO Division of Forest Products and Ensis Australia James Hardie building products have demonstrated resistance to termite attack.

*The way fibre cement sheets are produced, the grain direction of the cellulose fibre is typically along the direction of the sheet. That means that typically the fibre direction is in the same direction as the long edge of the sheet. The characteristic flexural strength in the 'a' direction is typically stronger, as the rupture is occurring across the grain length. The 'b' direction is tested along the length of the cellulose fibres, therefore is typically lower than the 'a' direction.

THERMAL PROPERTIES		
Combustibility	Suitable where non-combustible materials are required in accordance with C1.12 of the BCA	Deemed to comply with BCA
Sample Classification Average Specific Extinction Area	Group 1 6.8m²/Kg	AS/NZS 3837
Fire Propagation Index	0	BS476.6
Spread of Flame Index	Class 1	BS476.7
Surface Burning Characteristics Flame Spread Index Fuel Contributed Smoke Developed Index Class	**Lower Values Are Better** 0 0 5 A	ASTM E84
Thermal Conductivity	0.329W/m ºK	ASTM C 518

Ask James Hardie™
CUSTOMERLINK® SERVICE CENTRE
Call 13 11 03
www.jameshardie.com.au

James Hardie

TECHNICAL SUPPLEMENT

MOULD RESISTANCE

James Hardie® Villaboard® lining

INTRODUCTION

James Hardie's Villaboard® lining is a versatile flush jointed product used in residential and commercial walls, ceilings and soffits. It's used in fire and acoustic walls, high traffic and wet areas. When installed and maintained correctly, it is resistant to damage from fire, impact, moisture, rotting and termites.

MOULD RESISTANT

Independent laboratory tests were conducted on James Hardie Villaboard lining to determine its resistance to mould growth in a severe interior environment in accordance with ASTM D3273-00 – '*Standard Test Method for Resistance to Growth of Mould on the Surface of Interior Coatings in an Environmental Chamber.*'

The test results are reported using a scale of zero to ten, with ten representing no mould growth on the surface of the sample.

CONCLUSION

Independent test results in accordance with ASTM D3273-00 concluded that there was no mould growth on the Villaboard lining resulting in a perfect rating of 10.

The mould resistant properties of James Hardie Villaboard lining coupled with its proven durability characteristics, combine to give unique advantages for use in wet areas where mould resistance is important.

Ask James Hardie™
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Call 13 11 03
www.jameshardie.com.au

James Hardie®

1/1

THIS TECHNICAL SUPPLEMENT MUST BE READ IN CONJUCTION WITH THE CURRENT TECHNICAL PRODUCT LITERATURE. JAMES HARDIE BUILDING PRODUCTS MUST BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE TECHNICAL PRODUCT LITERATURE. ALL COMPONENTS AND ACCESSORIES MUST BE INSTALLED IN ACCORDANCE WITH THE RESPECTIVE MANUFACTURER'S SPECIFICATIONS. FOR THE PRODUCT WARRANTY, TERMS AND CONDITIONS REFER TO THE APPLICABLE JAMES HARDIE TECHNICAL PRODUCT LITERATURE.

Ritek® Wall Systems - Use of Aluminium Extrusions

ron marshall
CONSULTANT

Ron Marshall
95/433 Brisbane Road
Coombabah, QLD 4216
23rd November 2007

Building Solutions Pty Ltd
PO Box 730
COOROY QLD 4563

Attn. Peter Kelly Re: Amended letter of opinion, 24th February 2015

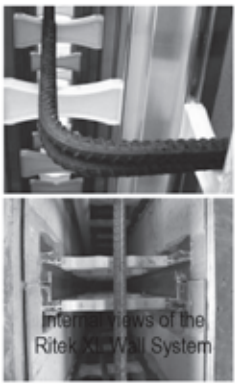
The Australian Standard AS3600 Concrete structures requires that "Metals such as aluminium shall not be embedded in structural concrete unless effectively coated, covered, or treated to prevent chemical action between the metal and the concrete and electronic action between the metal and steel."

I have assessed the use of aluminium extrusions as part of Ritek XL Wall concrete panel system and whether the Chromate plating applied by the aluminium manufacturer will be adequate.

Based on research of all technical research papers and specifications available to me, I am able to conclude that the chromate plated aluminum extrusions can safely be used as part of the Ritek XL Wall concrete panel system.

Regarding corrosion, even without the coating, the corrosion if any, would only be minimal. The chemical action only takes place with the fresh wet concrete and this condition only lasts for a relatively short time. Further, the use of a Chromate protective coating on the extrusions is sufficient in its own right to inhibit corrosion of the aluminum.

For electrolytic action to take place the concrete need to be wet and aluminium generally to be in contact with the reinforcement. Electrolytic action does not occur as once the concrete has cured and remain dry. Additionally for electrolytic action to take place dissimilar metals need to be in contact. There is no contact between the extrusions and the reinforcement due to the design of the Ritek system.



Internal views of the Ritek XL Wall System

Finally as they serve no structural purpose once the concrete is in place, even if the extrusions were to corrode completely away, this would have no detrimental effect on the strength of the walls.

Hence I am able to say that the Chromate plated aluminium extrusions that form part of the Ritek XL Wall System can safely be used and imbedded in concrete.

Yours Sincerely,

Ron Marshall B,E,.M,Eng,Sc.
REPQ

Ron Marshall Consultant ABN: 41 899 743 080

95/433 Brisbane Road,
Coombabah, QLD, 4216

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Ritek® Wall Systems - Use of Plastic Spacers

Ron Marshall
95/433 Brisbane Road
Coombabah, QLD 4216
21st December 2013

Building Solutions Pty Ltd
PO Box 730
COOROY QLD 4563

Attn: Peter Kelly Re: Use of plastic spacers in the Ritek XL Formwork System.

You have sought my expert advice about the use of plastic spacers as part of the Ritek formwork system for the construction of concrete walls and columns. I understand that a question has arisen as to the likely effect on the strength of Ritek walls using the plastic spacers.

I am of the view that the plastic spacers used in the Ritek formwork system will not be detrimental to the strength or fire performance of the concrete wall or column.

Overall, embedded items are permitted in concrete standards in Australia and also internationally. Plastic reinforcement chairs and spacers are necessary and are communally used for the construction of slabs, walls and columns without the designer reducing the strength of the structural member. The suppliers of proprietary chairs make no recommendations to consider the strength effect of the chairs or spacers on the concrete strength.

Structurally the material strength of the plastic joiner in the Ritek panel in both compression and tension is higher than that of the concrete. As the failure mechanism of concrete in a typical column application under a compressive load is that of tensile splitting, in inclusion of a high tensile strength element (Ritek's spacers have a tensile strength of 44MPa some 10 times that of concrete) is likely to be beneficial rather than detrimental. Even if the plastic spacer had no strength, the quantity used (less than 1%) in the walls is so small that the effect on the overall strength of the wall or column would be covered by the design factors.

The Ritek formwork system (type150XL) has been submitted for a standard fire test at CSIRO to AS/NZS 1530.4 and achieved a fire resistance level (FRL) of 240/240/240, exceeding the requirements set out in AS3600-2009 Concrete Standards.

Hence it is my opinion that the plastic spacers that form part of the Ritek formwork system can safely be used without compromising the strength and performance of walls or columns formed using the system.

Yours Sincerely,

Ron Marshall B,E,.M,Eng,Sc.
REPQ

Ron Marshall Consultant ABN: 41 899 743 080

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Ritek® Wall Systems - Notes

Ritek® Wall Systems - Notes

Ritek® Wall Systems - Notes

CERTIFICATION H

James Hardie Systems
www.jhsritek.com.au
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Version 2015.01

Design, Detailing & Installation Guide

Ritek® XL Wall® and XL Thermal Wall® Systems

Version 2015.01

Ritek® - the alternative, innovative & cost effective building method.

RECESSED JOINTS

STEPS

STEPS 5 - 8 ARE NOT REQUIRED FOR TILED WALLS

1 PREPARATION

Ensure that the recesses are clean and free of dust and contaminants. If working conditions are warm and dry, dampen the area around the joint prior to working with clean cold water.

2 FIRST COAT

Apply **James Hardie™ Base Coat** to fill the recess with a 150 mm broadkife.

3 EMBED TAPE

Firmly embed the fibafuse tape centrally into the joint using a 150 mm broadknife. Ensure that there are no voids under the tape and remove excess compound.

4 THIN LAYER

Immediately cover tape with a thin layer of **James Hardie™ Base Coat** applied with a 150 mm broadknife.

5 FASTENER HEADS

Cover all fastener heads with **James Hardie™ Base Coat.** Allow to dry before applying a second coat.

6 SECOND COAT

When the base coat is fully dry, use a 200 mm wide second coat trowel to apply the **James Hardie™ Base Coat.** Apply this coat approximately 180 mm wide, laid down over the recess and feather the edges.

7 FASTENER HEADS

Ensure the second coat is fully dry. Using a finishing trowel, apply a coat **Plaster Finishing Compound** 280mm wide centrally over the joint and feather out the edges. Allow to dry fully before sanding.

8 FINISHING COAT

Ensure the second coat is fully dry. Apply a thin layer finishing coat of **Plaster Finishing Compound** over fastener heads, feathering out the edges. Allow to fully dry before sanding.

BUTT JOINTS

STEPS

STEPS 5 AND 6 ARE NOT REQUIRED FOR TILED WALLS

1 PREPARATION

When jointing un-recessed sheet joint, ensure that sheet edges are clean and free of dust and contaminants. If working conditions are hot and dry, dampen the area around the joint prior to working.

2 FIRST COAT

Apply **James Hardie™ Base Coat** centrally over butt joint to 200 mm wide with a 150mm broadknife.

3 EMBED TAPE

Firmly embed the fibafuse tape centrally using a 150 mm broadknife. Ensure that there are no voids under the tape and remove excess compound.

4 THIN LAYER

Immediately cover tape with a thin layer of **James Hardie™ Base Coat** applied with a 150 mm broadknife.

5 SECOND COAT UNTILED WALLS ONLY

When the first coat is fully dry, use a 200 mm wide second coat trowel to apply the **James Hardie™ Base Coat.** Apply this coat approximately 300 mm wide.

6 FINISHING COAT

Ensure the second coat is fully dry. Using a finishing trowel, apply a thing layercoat of **Plaster Finishing Compound** 500 mm wide centrally over the joint and feather out the edges. Allow to fully dry before sanding.

INTERNAL CORNERS

Settings of internal corners are required for untiled applications only as follows:

- Apply James Hardie Base Coat to both sides of the corner using a 70mm broadknife.
- Fold fibafuse tape to form an angle and embed into the corner of **James Hardie™ Base Coat.**
- Allow base coat to dry, then apply a thin layer of **Plaster Finishing Compound** over the angle and smoothing with the corner tool.
- Allow to fully dry before sanding.

EXTERNAL CORNERS

Setting of external corners is required for untiled applications only as follows:

- Fit a perforated corner angle over the external corner angle and ensure straightness before fixing with fibre cement nails at 300mm centres.
- Apply Lanko 124 or Davco Ultraprime to the PVC angle to ensure strong adhesion of **James Hardie™ Base Coat** to PVC.
- Apply bedding compound to both sides of the corner angle to a width of 150mm using a broadknife.
- Allow to dry before applying a second coat.
- If required using a straight trowel, build up the edges to 250mm from the corner. Allow to dry.
- When dry, use the straight trowel to apply a thin finishing coat, 300mm wide, to both sides of the corner angle, feathering out the edges.
- Allow to fully dry before sanding.

Intex GROUP
BUILDING EXCELLENCE

Fibafuse
paperless plasterboard tape

- Flat joints, corners & square set
- Stronger joints
- Lighter to handle
- Mould resistant
- Easy to use

PREMIUM
PLASTERBOARD ACCESSORIES, TOOLS & EQUIPMENT

Revolutionary Paperless Plasterboard Tape

FibaFuse's open fiber structure allows the joint compound to penetrate the tape, creating a strong bond that dramatically reduces the potential for cracks.

- **Mold-resistant – Increased mold protection for a safer environment**
- **Open fiber design – Fuses with compound to create stronger joints compared to paper tape or fibreglass**
- **Pre-creased – For easy installation in corners**
- **Crack-resistant – Superior to paper tape or fibreglass.**
- **Smooth finish – Eliminates blisters and bubbles that are common with paper tape**
- **Professional-grade performance – A superior option to paper tape or fibreglass for demanding applications**

Ritek® | JH®

Ritek® Wall Systems - Technical Updates

FibaFuse is easy to work with

- Designed for professional tradesman, and DIY , FibaFuse is a mold-resistant glass mat drywall tape that is ideal for high-humidity and moisture-prone applications.
- FibaFuse is easy to cut and designed to retain its folds, making it efficient to install by hand on joints and in corners. Taping tools, banjos and automatic tapers also work well in applying FibaFuse and compound to seams.
- FibaFuse is porous, allowing the joints and corners compound to become part of the tape for a stronger bond and reducing the possibility of loose tape and air bubbles.

FibaFuse is a superior option to paper tape for demanding applications

- FibaFuse is mold resistant.
- Testing concludes that FibaFuse scores a perfect "10" rating on ASTM D3273 mold test.
- FibaFuse is lighter than paper tape.
- A 76m roll of FibaFuse is 62% lighter than an equivalent roll of paper tape.
- FibaFuse is stronger than paper tape.
- 24 hrs after applying a second coat of compound, FibaFuse's crack strength is 76% stronger than paper tape.

FibaFuse Weights & Dimensions

INTEX RE-ORDER CODE	Size	Product Description	Color	Case Pack	Case Description	Product Dimension	Product Weight	Case Weight
5FF76	52 mm x 76 m	FibaFuse	White	20	Corrugated Box	230mm x 230mm x 52 mm	200g	5.5 kg

FibaFuse - available in other sizes on request

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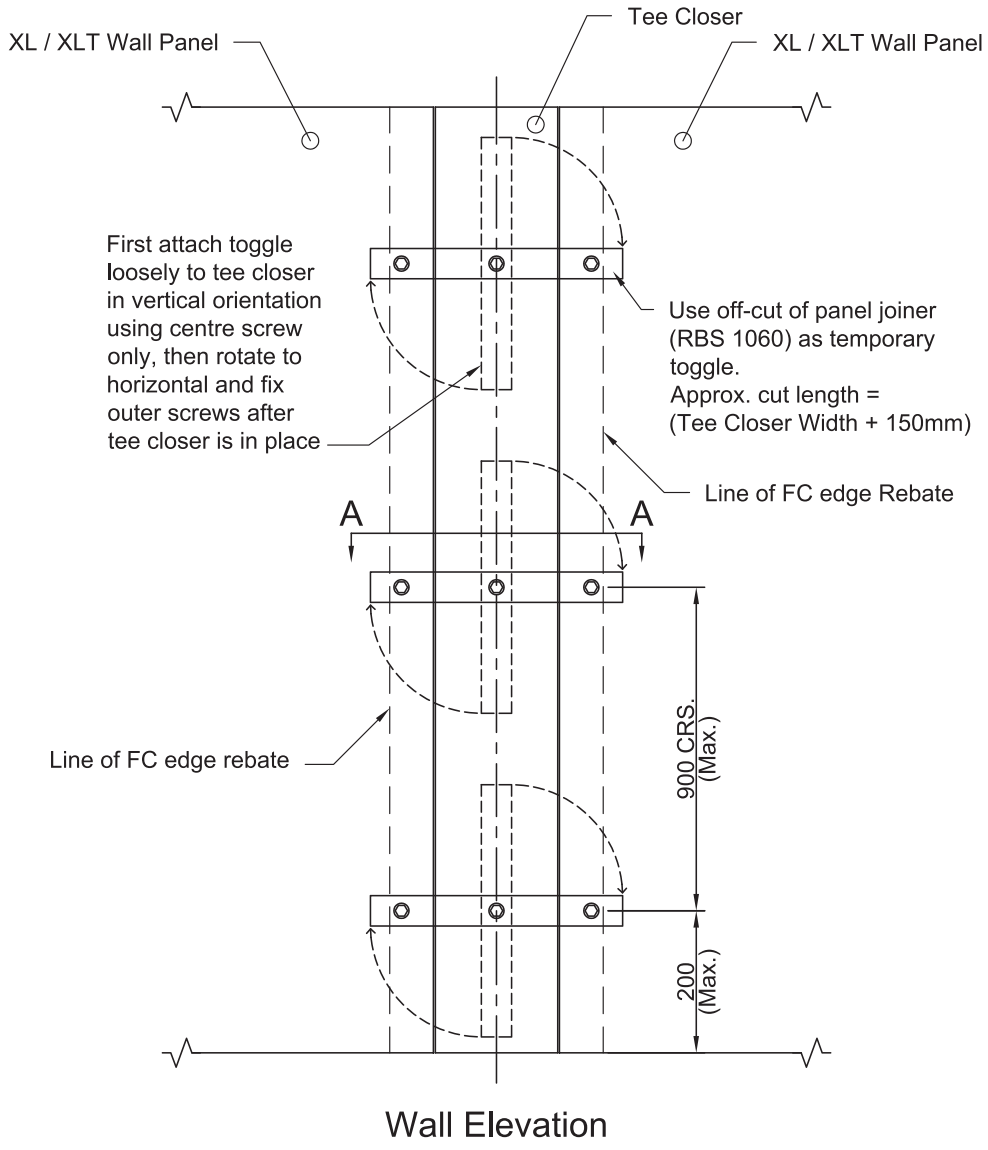
Ritek®

Typical details are shown in Figure 8.1.

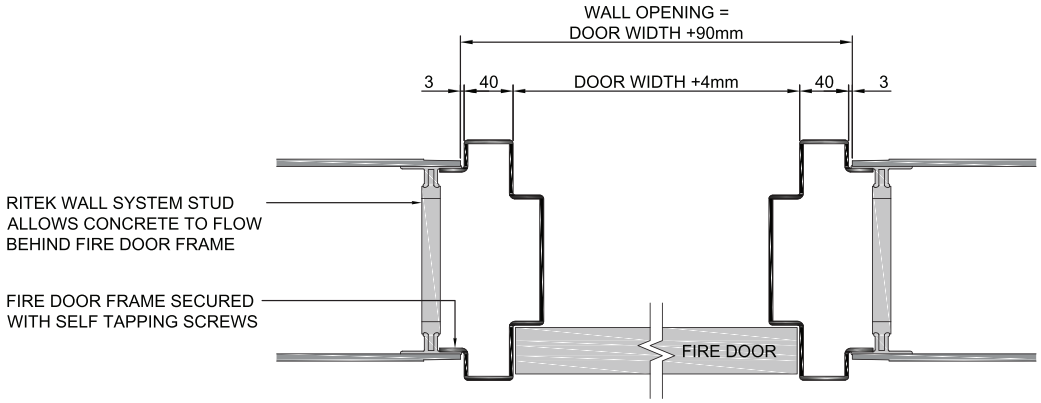
TEMPORARY TEE JUNCTION TEE TOGGLE **FIGURE 8.1**



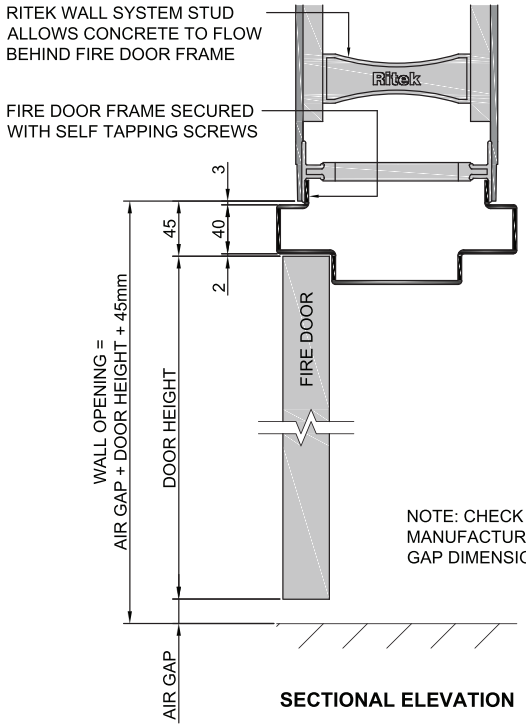
Ritek® Wall Systems - Technical Updates

Standard Details Fire Door Frame [Internal Fit]

Standard details are shown in Figure 8.2 for fire door frame



SECTIONAL PLAN

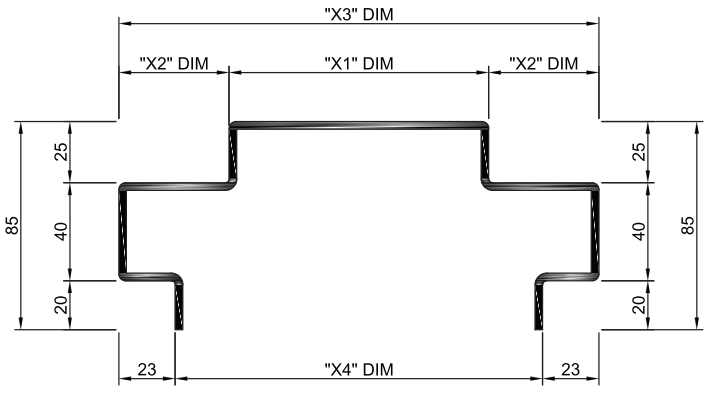


SECTIONAL ELEVATION

38mm FIRE DOOR FRAME TABULATED DIMENSIONS				
WALL SIZE	"X1" DIM	"X2" DIM	"X3" DIM	"X4" DIM
XL**115** 115mm	56mm	45mm	146mm	100mm
XL**135** 135mm	76mm	45mm	166mm	120mm
XL**150** 150mm	91mm	45mm	181mm	135mm
XL**165** 165mm	106mm	45mm	196mm	150mm
XL**200** 200mm	141mm	45mm	231mm	185mm
XL**265** 265mm	206mm	45mm	296mm	250mm

47mm FIRE DOOR FRAME TABULATED DIMENSIONS				
WALL SIZE	"X1" DIM	"X2" DIM	"X3" DIM	"X4" DIM
XL**115** 115mm	44mm	51mm	146mm	100mm
XL**135** 135mm	64mm	51mm	166mm	120mm
XL**150** 150mm	79mm	51mm	181mm	135mm
XL**165** 165mm	94mm	51mm	196mm	150mm
XL**200** 200mm	129mm	51mm	231mm	185mm
XL**265** 265mm	194mm	51mm	296mm	250mm

NOTE: CHECK FLOOR COVERINGS, MANUFACTURER TO PROVIDE AIR GAP DIMENSIONS



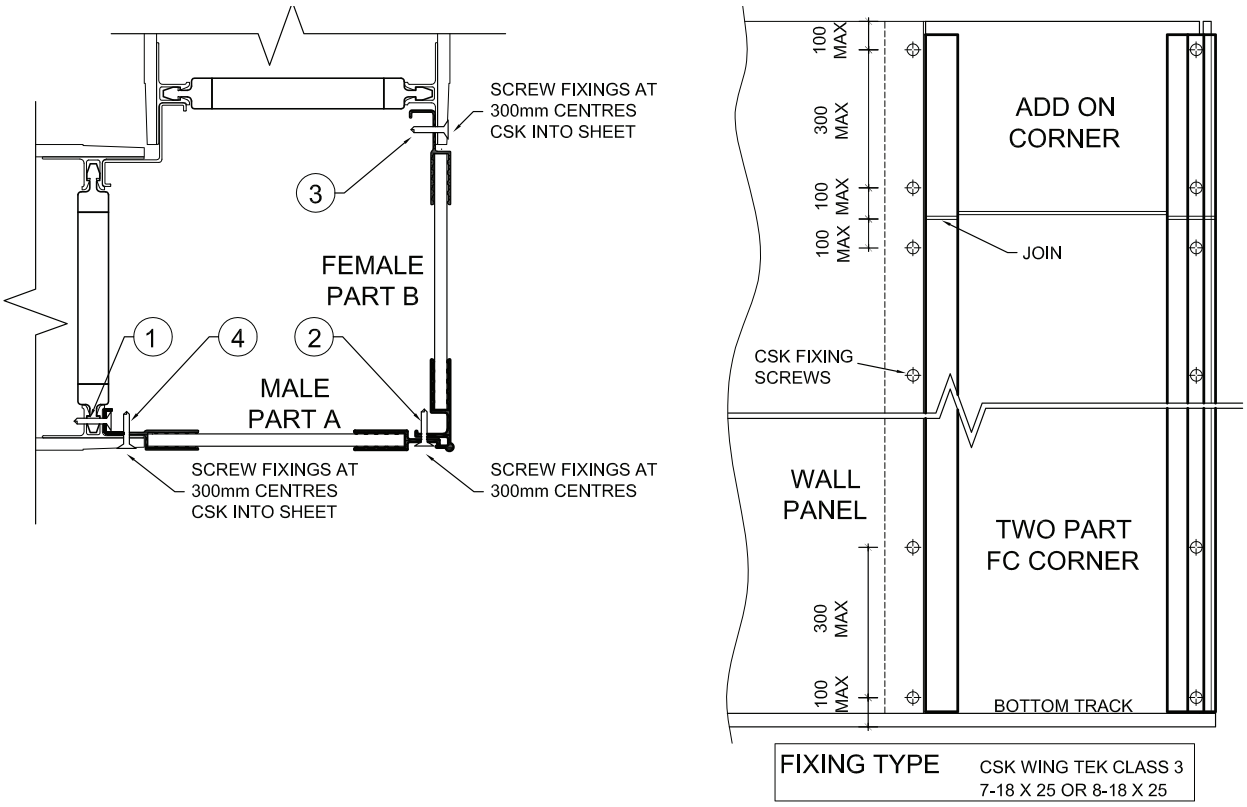
FIRE DOOR FRAME [INTERNAL FIT]
SCALE 1:2

Ritek® Wall Systems - Technical Updates

XL Wall® Two Part FC External Corner - Fixing Details

Typical details are shown in Figure 8.3 for XL Wall® Two Part FC External Corner - Fixing Details.

XL WALL® TWO PART FC EXTERNAL CORNER - FIXING DETAILS **FIGURE 8.3**



INSTALLATION METHOD

OPTION 1
INSTALL MALE PART A AND SCREW FIX TO ADJACENT PANEL ON INSIDE INTO STUD ALUMINIUM POSITION (1) . INSTALL FEMALE PART B AND SCREW FIX TO BOTH MALE PART A AND ADJACENT PANEL ON OUTSIDE POSTIONS (2) & (3) .

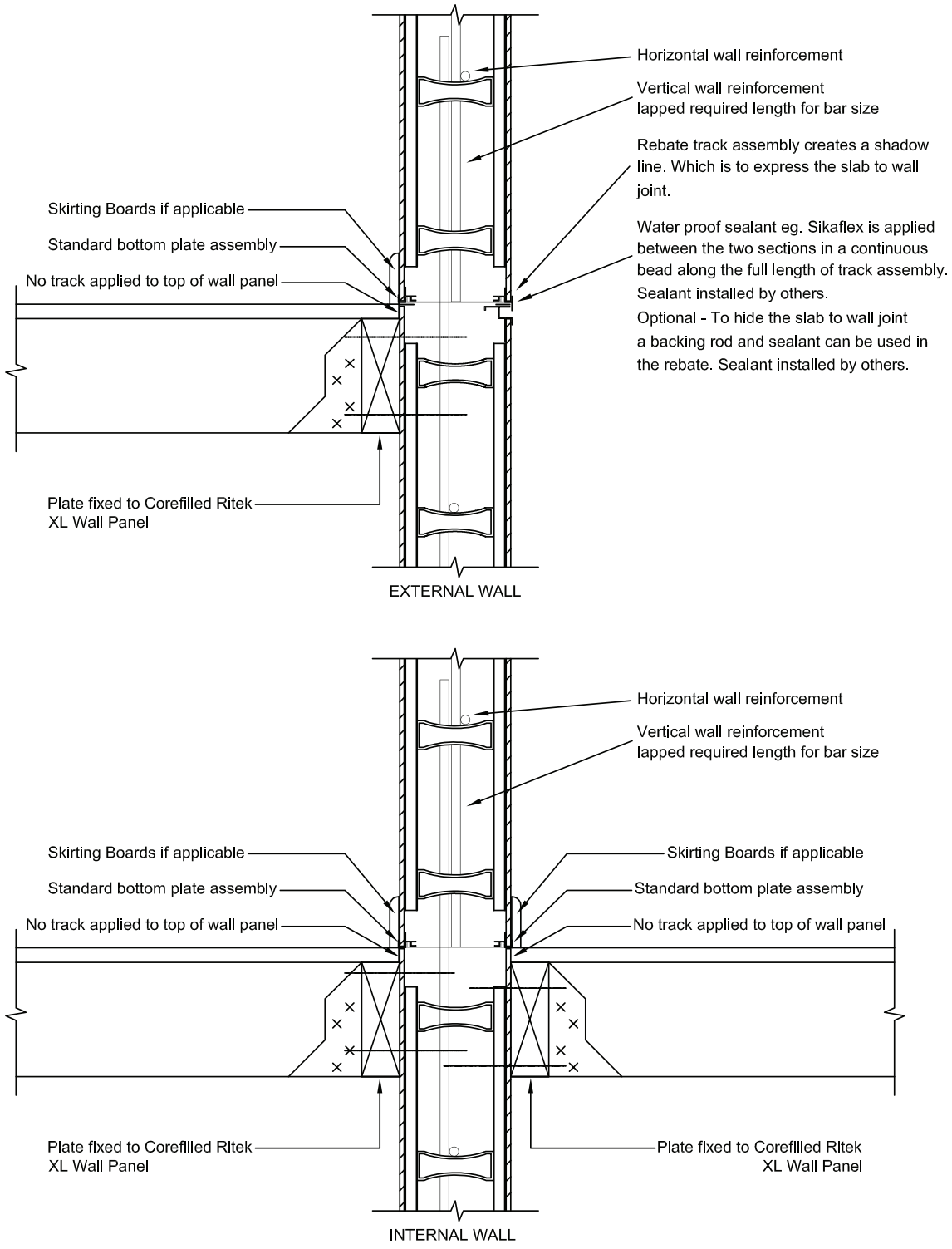
OPTION 2
CORNER PANELS MALE PART A AND FEMALE PART B CAN BE PRE-ASSEMBLED AND SCREW FIXED TOGETHER AT POSITION (2) THEN SLID INTO PLACE FROM ABOVE THE WALL. FIX TO ADJACENT PANELS ON OUTSIDE AT POSITIONS (3) & (4).

Ritek® Wall Systems - Technical Updates

Typical Wall Junctions for Timber Floors

Standard details are shown in Figure 8.4 for typical wall junctions for timber floors

TYPICAL WALL JUNCTIONS FOR TIMBER FLOORS **FIGURE 8.4**



Ritek® Wall Systems - Notes

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TECHNICAL UPDATES I

James Hardie Systems
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Version 2015.01

Ritek® XL Wall® System
Multi-residential
Rumba Resort, Caloundra, QLD

The luxury 5-Star Rumba Resort in Caloundra was built using 13,000m^2 of Ritek® XL Wall® System. The main structure consists of three buildings over one podium; two four storey and one five storey. Other structural elements which used the Ritek® Wall System included three levels of basement perimeter walls, lift shafts, balustrades and a suspended pool. The Lower basement was constructed 1.5 metres under the water table and was designed in conjunction with a solid core crack injection system for water tightness. The project was completed on-time and to budget.

I am very pleased with the savings I made from the reduced interest (as a result of the speed of construction and being able to construct during 'the wet') which amounted to well over $500k. The building has also been finished beautifully which is a testament to the performance of the new panel design.

Michael Milatos, Director
CENTO Builders and Developers
Project: Oasis on Woods St, Darwin CBD

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