



Australia & New Zealand Fire Design Guide

Use of this guide

Thank you for choosing to design with mass timber. XLam manufacture Cross Laminated Timber (CLT) from one hundred percent natural and renewable radiata pine. Each lamella and panel is unique, even with great care by XLam, slight deviations in grain pattern, knot location and colour will occur. By choosing to design in mass timber you are embracing the natural beauty of a renewable building material, its perfection is in its natural imperfection.

The information in this guide is based on testing methodology and certification owned by XLam. The information is provided for use in the design and specification of XLam manufactured Cross Laminated Timber (CLT) only. The guide is not intended as general information and guidance for all manufactured Cross Laminated Timber (CLT). The guide and information is specific to XLam CLT and no warranty is given to the suitability and application of the information to other manufacturers CLT.

Application

This design guide has been prepared for use by suitably qualified construction professionals to assist in the design and specification of XLam panels. Products referred to in this document other than XLam panels are presented for information purposes only and due regard should be given to the relevant Australian and New Zealand Standards and other manufacturer literature. Advice on overall building design issues including, but not limited to stability, loading, temporary stability during construction, fixings, waterproofing, fire engineering and overall acoustic performance are not covered by this guide and advice should be sought from suitably qualified professionals.

It is the responsibility of the user to ensure that the use of this design guide is appropriate and to exercise their own professional judgement when using the document. Full responsibility for the design and compliance with the Building Code of Australia (BCA) and the New Zealand Building Code (NZBC) and all relevant Australian and New Zealand Standards, rests with the design professional specifying the product. XLam will not accept any liability for the failure of any other elements of the building which cause a subsequent failure of an XLam product.

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Fire Design

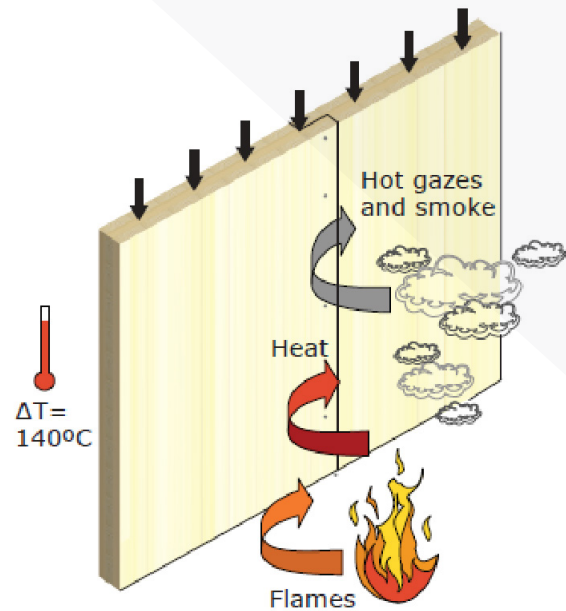
Fire Resistance Ratings

The BCA and NZBC requires structures to be designed for both protection of property and means of escape. For fire design, building elements are required to have a specific fire resistance rating, and in some locations interior surface finishes may be restricted.

The fire resistance rating (FRL/FRR) refers to the fire exposure time during which a building assembly or element can prevent structural collapse or perform as a barrier to prevent the fire spreading. FRL/FRR is expressed as the resistance period (in minutes) for three separate criteria; structural adequacy, integrity, and insulation.

- Structural adequacy refers to the ability of the element to maintain its stability and load-bearing capacity for the stated resistance period. The structural adequacy of an element is assessed based on its strength capacity to resist the post fire design loads ($G + \psi_i Q$). All wall elements must also support a post fire face loading.
- Integrity refers to the ability of the element to resist the passage of flames and hot gases. For the stated period, the assembly must prevent a cotton pad igniting when applied to the unexposed side of the element.
- Insulation refers to the ability of the element to maintain a temperature below a specified limit on the unexposed surface. Over the stated period the assembly must prevent the temperature on the unexposed surface from rising above 180°C measured at a number of locations.

As an example, FRL/FRR 30/90/60 means that the element must achieve structural adequacy for 30 minutes, integrity for 90 minutes and insulation for 60 minutes. If the FRL/FRR contains a “_”, then this criteria does not need to be achieved. For example, for a non-bearing fire door the element could require a FRL/FRR of $-/60/-$ meaning that it only needs to achieve integrity performance for 60 minutes.



Because CLT generally forms the load-bearing structure, panels are often required to meet all three FRL/FRR criteria. The fire rating performance of CLT is one of its greatest attributes and panels often provide the required fire rating without any additional protective linings.



Char Behaviour of CLT

Solid timber chars at a constant rate. As the fire is fuelled, the temperature increases, but the growing char layer also increases the thermal insulation. The protected uncharred timber retains its load-bearing capacity.

For XLam CLT panels the char rate is altered to allow for glue-line failure above 180° Celsius and for a zero strength/stiffness heated zone protruding from the

char front. Fire rated plaster boards can be applied to the face of the panel to further increase the fire rating capacity. Full scale testing has been carried out on both protected and unprotected CLT panels under loaded conditions. This testing has verified complex step-wise equations which form the basis of the XLam fire span tables.



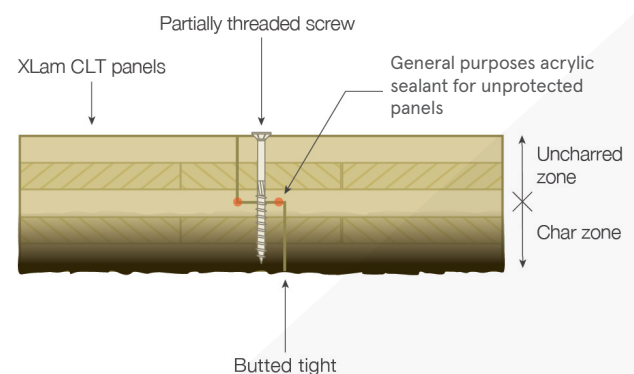
Sample cut from an unlined XLam intermediate floor/ceiling, still structurally intact after total building burnout.

Fire Rated Joints

Correct detailing of joints between panels and at wall/floor junctions is necessary to maintain integrity and insulation performance. Panel joints shall be screw fixed together using partially-threaded screws to ensure the joint is pulled tight onsite. At lap joints, the screw shall be sufficiently embedded into the adjacent lap, but only remains effective outside of the char zone.

Unprotected panels should have beads of general purpose acrylic sealant placed in the joints. At junctions between different materials and where construction tolerance is required, sealants are required to maintain integrity and insulation performance at the joint.

Typical Fire Rated Lap Joint



Service Penetrations, Control Joints and Connections

Penetrations through fire rated wall or floor assemblies require fire stops to maintain the integrity and insulation ratings of the building element. XLam panels have been subjected to fire penetration testing in accordance with AS 1530.4. A summary of these results and allowable variations as assessed and certified by an accredited testing laboratory is provided in the following tables. For expanded details contact XLam. Note these penetrations are currently limited to panels with a minimum thickness.

In all instances it is the responsibility of the Project Fire Engineer to review and certify the proposed detail meets the requirements of either NZBCC or NCC under the estimated fire load. Penetration details should be considered as part of the overall design and included in drawings which are handed to XLam for production as per the XLam Shop Drawing Guide. Failure to do this may lead to additional costs in testing, assessments and XLam personnel time for coordinating additional certification requirements, drawings and may lead to a delay in manufacture and hence delivery.

Summary of Pipe Penetrations Through XLam CLT Panels

Penetration	Bare Floor	Bare Wall	PB on ceiling side of floor	PB on both sides of the wall
uPVC Pipe 40-110mm	-/60/60	-/60/60		
uPVC Pipe 40-165mm			-/90/90	-/120/120
UPVC pipe 43 -110mm	-/90/90			
uPVC pipe 250mm	-/60/60		-/90/90	-/120/120
Copper or steel pipes 6.4- 12.7mm with 13mm FR Armaflex	-/60/60	-/60/60	-/60/60*	-/60/60*
1/4" x 1/2" F pair coil with 13mm insulation	-/90/90			
Steel pipes 48-165mm protected with Rockwool	-/60/60		-/60/60*	
Steel pipes 33-164mm protected with Rockwool		-/60/60		-/60/60*
Steel pipe 110mm protected with Promashield 100	-/60/60		-/60/60*	
Insulated copper pipes 9-16mm				-/120/120
Copper or steel pipe 102mm			-/90/90	
Insulated copper pipes 19-100mm				-/120/120
DN100 Type B Copper pipe 100mm				-/120/90
Galvanised steel pipe up to 165mm			-/90/90	-/120/120
Steel pipe 32mm protected with Promashield 100	-/90/90			
Steel pipe 102mm protected with Promashield 100	-/60/60			
Black PEX Pipe 20mm-25mm			-/90/90	
Black PEX Pipe 20mm				-/120/30
Black PEX Pipe 25mm				-/120/60
Yellow PEX Pipe 20mm			-/90/30	-/120/120
PE-X-Al-PEX pipe 20-25mm				-/120/120
PP-RCT pipe up to 20mm	-/30/30	-/60/30	-/30/30*	-/60/30*
PP-RCT pipe 20-125mm	-/30/-	-/30/30	-/30/-*	-/30/30*
PPR/PPR-GF/PPR pipe 20-25mm	-/60/60	-/60/60	-/60/60*	-/60/60*
PE-X-AL-PEX pipe 25mm	-/60/60		-/90/90	
PE-Xa pipe 25mm	-/90/60			
PE-X-AL-PE Pipe 25mm	-/90/90			
PPP/PPR-GF/PPR pipe 25mm	-/90/90			

*Use the same detail as for bare floor (plasterboard lining still required)

Summary of Electrical Penetrations Through XLam CLT Panels

Penetration	Bare Floor	Bare Wall	PB on ceiling side of floor	PB on both sides of the wall
Bundle of cables	-/60/60	-/60/60	-/60/60*	-/60/60*
TPS electrical cables			-/90/90	-/120/120
Communication cables			-/90/90	-/120/120
Copper power cable 46mm		-/60/60		-/60/60*
Electrical Cables – PVC sheathed up to 70mm		-/60/60		-/60/60*
uPVC conduit with 1-3 CAT 6 cables 20-25mm	-/60/60		-/90/90	-/120/120
uPVC conduit communication cables 32mm	-/90/90			
uPVC conduit with CAT 6, Cat 5 & TPS cables 32mm	-/90/90			

* Use the same detail as for bare floor (plasterboard lining still required)

Summary of Seals, Control Joints & Connection Details XLam CLT Panels

Penetration	Bare Floor	Bare Wall	PB on ceiling side of floor	PB on both sides of the wall
Blank Seal FulaFoam or SikaBoom FR up to 40mm diameter	-/90/90	-/90/90	-/90/90	-/120/120
Blank Seal 25mm plug/foam/25mm plug up to 40mm diameter	-/90/90	-/90/90	-/90/90	-/120/120
Blank Seal timber plug up to 40mm diameter	-/60/60	-/60/60	-/90/90	-/120/120
Blank Seal timber plug up to 125mm diameter	-/90/90	-/90/90		
Control joint CLT/CLT & CLT/Concrete up to 60mm wide	-/60/60	-/60/60	-/90/90	-/120/120
Control joint CLT/CLT & CLT/Concrete up to 20mm wide	-/60/60	-/60/60	-/90/90	-/120/120
Control joint between timber, concrete or plasterboard gap up to 35mm	-/90/90	-/90/90		
Control joint between timber, concrete or plasterboard gap up to 10mm	-/90/90	-/90/90		
Concrete/timber column maximum size 290mm by 290mm	-/60/60	-/60/60	-/90/90	-/120/120
CLT floor to timber/concrete column gap up to 10mm	-/90/90	-/90/90		
CLT floor to timber/concrete column gap up to 35mm	-/90/90	-/90/90		
CLT /plasterboard wall intersection	-/90/90	-/90/90		
CLT /plasterboard ceiling side	-/90/90	-/90/90		
CLT Wall/Concrete/Timber floor intersection with Acoustic Treatment		-/90/90		
M16x20mm RAMPA type SKL22x75mm	-/60/60		-/90/90	
Promat bulkhead Batt Edge seal	-/90/90	-/90/90		
Promat bulkhead Batt Blank Seal	-/90/90	-/90/90		
Promat bulkhead Batt Blank seal with timber veneer at ceiling	-/90/90	-/90/90		

Summary of Damper Penetrations Through XLam CLT Panels

Penetration	Bare Floor	Bare Wall	PB on ceiling side of floor
Kilargo IFD-O Intumescent fire damper up to 250mm		-/60/30	
Ravenscroft BS C fire damper Up to 300mm		-/30/-	
Holyoake IBD-FS-H Fire Damper 600x600mm maximum	-/60/-		-/90/-

TBA Firefly Fire Stopping Systems Through XLam CLT Panels

TBA Firefly have tests and assessment of penetrations through TBA Intubatt Batts installed in XLam CLT panels and of penetrations directly through XLam CLT panels. These solutions are provided courtesy of TBA, and details need to be confirmed with TBA. See www.tbafirefly.com.au before being specified for your project.

Indication of Penetrations Through TBA Intubatt installed in XLam CLT*

Penetration through TBA Intubatt	Protected CLT wall/floor CL3/110mm minimum	Bare wall/floor CL3/130mm minimum
PVC insulated copper power cables	-/90/90	-/90/90
Cable trays or bundles of cables	-/90/90	-/90/90
Busways	-/90/90	-/90/90
Busducts	-/90/90	-/90/90
Lagged copper pipes Various	-/90/90	-/90/90
Fire alarm cables Various	-/90/90	-/90/90
Communication cables Various	-/90/90	-/90/90
Cables Various	-/90/90	-/90/90
PVC Pipes 40-150mm	-/90/90	-/90/90
Brass, copper & steel pipes 8-200mm	-/90/90	-/90/90
HDPE pipes 50, 58, 63, 75, 90 & 110mm	-/90/90	-/90/90
Beer line Various	-/90/90	-/90/90
Gas PEX Al pipe Various	-/90/90	-/90/90
Water PEX pipe Various	-/90/90	-/90/90
Lorient fire damper 450mm by 450mm	-/90/90	
150 UB up to 200Ub steel beam	-/90/90	-/90/90
200 x 45 timber joist	-/90/90	-/90/90
Steel C or Z purlin	-/90/90	-/90/90
Blank seal	-/90/90	-/90/90

*There are many more systems than can be listed in a table. Please download the TBA Firefly app or contact TBA Firefly to review current available

Summary of TBA Penetrations Through XLam CLT Panels

	Protected wall CL3/110	Protected floor CL3/110	Bare wall CL3/130	Bare floor CL3/130
Control joint 75-100mm	-/90/90			
Bundle of up to 11 x 1.5mm ² 2c fire alarm cables core hole up to 40mm	-/90/90	-/90/90		
Bundle of up to 11 x 1.5mm ² TPS electrical cables		-/90/90		
Up to 2 ardent pair coil bundles with up to 4 TPS cables 75mm core hole	-/90/90			
PEX-AL Gas pipe Up to 40mm OD	-/90/90	-/90/90		
PEX pipe Up to 40mm OD	-/90/90			
PE-Xa Water pipe Up to 40mm		-/90/90		
2 X XLPE Copper Pair Coils	-/90/90	-/90/90		
1 X XLPE Copper Pair Coils	-/90/90	-/90/90		
uPVC pipe 40, 50, 56, 65, 80mm, 100mm	-/90/90	-/90/90		
uPVC pipe 40, 50, 56 65, 80mm, 100mm, 150mm			-/90/90	-/90/90
Steel pipes 8-50mm OD			-/90/90	-/90/90
Bundle of up to 12 x 1.5mm ² Red fire Alarm cables			-/90/90	-/90/90
Bundle of up to 12 x 1.5mm ² TPS electrical cables			-/90/90	-/90/90
Single 16mm ² 3CE+ 20mm OD orange power cable			-/90/90	-/90/90
HDPE pipe 40,50, 56, 63, 75, 90, 110 mm OD			-/90/90	-/90/90
Aircon Bundle			-/90/90	-/90/90
Multiple Service Bundle			-/90/90	-/90/90

Promat Bulkhead Batt System

Promat have tests and assessment of penetrations through Promat Bulkhead Batts installed in XLam CLT panels. These solutions are provided courtesy of Promat, details need to be confirmed with Promat. See www.promat.com/en-au/ before being specified for your project.

Indication of Penetrations Through Promat Bulkhead Batt Installed in XLam CLT*

	Bare wall CL3/130mm minimum	Bare floor CL3/130mm minimum
Brass pipes 32-100mm	-/90/90	-/90/90
Copper or Steel pipes 32-150mm	-/90/90	-/90/90
Insulated Copper Pipes Varies	-/90/90	-/90/90
uPVC Pipes 40-100 mm	-/90/90	-/90/90
HDPE Pipes 40-100mm	-/90/90	-/90/90
Various power & communication cables	-/90/90	-/90/90
PEX Pipe	-/90/90	-/90/90
TPS Pipes	-/90/90	-/90/90
PEX/Al/PEX Pipe	-/90/90	-/90/90
Type B Copper Pipe up to 80mm	-/90/90	-/90/90

*Other services may also be covered off. Please check with Promat for overview of all options and installation details

Ryanfire Systems Available Only in New Zealand

Ryanfire have tests and assessment of penetrations through Ryanfire 502 board installed in XLam CLT panels and of penetrations directly through XLam CLT panels. These solutions are provided courtesy of [Ryanfire](#) and details need to be confirmed with Ryanfire before being specified for your project.

Summary of Penetrations Through Ryanfire 502 Board Installed in XLam CLT

System	Bare wall CL3/130mm minimum	Bare wall CL3/130mm minimum
32mm & 150mm Copper/steel pipes	-/60/60	
32-150mm copper/steel pipes	-/60/-	-/60/-
32mm copper/steel + 38mm Fibreglass insulation	-/60/60	
32mm copper/steel + 50mm Fibreglass insulation	-/60/60	
32mm copper/steel + 19mm Nitrile rubber insulation	-/60/60	
32mm copper/steel + 38mm Nitrile rubber insulation	-/60/60	
32mm copper/steel + 20-40mm thick Thermobreak (XPLE)	-/60/60	
100mm copper/steel + 20-40mm thick Thermobreak (XPLE)	-/60/30	
32mm PVC pipe	-/60/60	-/60/60
40mm PVC pipe	-/60/60	-/30/30
50 & 80mm PVC pipe	-/60/60	-/60/60
100mm PVC pipe	-/60/-	-/30/30
16mm PEX pipe	-/60/30	-/60/60
32mm PEX pipe	-/60/-	
16mm PEX Al Gas pipe	-/60/60	-/60/60
40mm PEX Al Gas pipe	-/60/60	-/60/30
AS1530.4 Appendix D1	-/60/60	-/60/60
AS1530.4 Appendix D2	-/60/60	-/60/60
20-50mm PVC Conduits	-/60/60	
A/C pair coils pipes	-/60/60	
5x A/C pair coil pipes	-/60/60	
200ub	-/60/60	
32-150mm Copper/Steel pipes		-/60/60
32mm copper/steel pipes 38-50 Fibreglass Insulation		-/60/60
32mm copper/steel pipes 19-38 Nitrile rubber Insulation		-/60/60
40mm HDPE pipes		-/60/60
60 & 150mm HDPE pipe		-/60/-
150mm PVC pipe		-/30/30
100mm PVC + Socket Joint		-/60/60
32mm PE-RT pipe (Kelox)		-/60/60
Bank of 4# 25mm PPR pipe		-/60/60
90mm PPR pipe + 33mm Nitrile Rubber insulation		-/60/60
28mm Polybutylene pipe		-/60/60
80mm dia fibre Optic cable bundle		-/60/60
20 & 50mm PVC conduit		-/60/60
20 & 50mm Flexi PVC conduit		-/60/60
bundle of 3 PVC conduits		-/60/60
bundle of 3 Flexi PVC conduits		-/60/60
200-410UB		-/60/60
300 DHS Purlin		-/60/60
200 Timber Purlins		-/60/60

*Other services may also be covered off. Please check with Ryanfire for overview of all options and installation details

Summary of Ryanfire Penetrations Through XLam CLT Panel

System	Bare floor CL3/130mm minimum
40mm PVC pipe	-/60/30
50mm, 65, 80, 100 & 150 PVC pipe	-/60/60
100mm PVC FwG (ceramic Grate)	-/60/60
32mm PPR pipe	-/30/30
20-50mm PVC Conduits	-/60/60
20-50mm PVC conduits	-/60/60
100mm dia cable bundle	-/60/60
25mm mains cable	-/60/30
50mm Flexi PVC conduit	-/60/60

*Other services may also be covered off. Please check with Ryanfire for overview of all options and installation details

Hilti

Hilti have tests and assessment of penetrations directly through XLam CLT panels. These solutions are provided courtesy of Hilti and details need to be confirmed with Hilti [Home - Hilti Australia](#) before being specified for your project.

Summary of Hilti Penetrations Through XLam CLT Panel

	Bare floor CL5/180mm minimum	Bare wall CL5/180mm minimum
Optic fibre cable bundle, up to 100 % filled	-/90/90	
Cable tray stop short - PVC sheathed copper core cables	-/90/90	
Cable tray stop short - D1 cable config, cover TPS, Submian, single core	-/90/90	
Cable tray stop short - Aluminium core cables	-/90/90	
Cable tray stop short - ICN and DAS cable, CAT6, optic fibre and Coaxial	-/90/90	
Cable bundle up to 50 mm	-/90/90	
Single cable	-/90/90	
uPVC pipe - 40-160 mm	-/90/90	
HDPE pipe - 110, 160 mm	-/90/90	
copper pipe - 25-125 mm	-/90/90	
Hydrant, Galvanised steel pipe - 25-125 mm	-/90/90	
UPVC pipe DN 100 floor waste	-/90/90	
optic fibre cable bundle, up to 100 % filled	-/90/90	
cable tray stop short - PVC sheathed copper core cables	-/90/90	
Galvanised steel pipe - 40-100 mm		-/90/90
HDPE pipe - 110 mm		-/90/90

*Hilti has additional data for more services and thinner CLT wall and floor. Please check with Hilti for overview of all options and installation details

Bossfire Systems

Bossfire have tests and assessment of penetrations through the BOSS FyreBox BFB-300 installed in XLam CLT panels and of penetrations directly through XLam CLT panels. These solutions are provided courtesy of Bossfire. See [BOSS Passive Fire \(bossfire.com.au\)](https://bossfire.com.au). Details need to be confirmed with Bossfire before being specified for your project.

Summary of Penetrations Through BOSS FyreBox BFB-300 Installed in XLam CLT*

	Bare wall CL3/130mm minimum
48.4mm steel sprinkler pipe	-/90/90
2 x 22mm stainless steel pipes with 20mm Thermobreak 9705 lagging	-/90/90
2 x 25mm Kelox plus pipes	-/90/90
25mm condensation drain pipe	-/90/90
16mm ² 3C+E cable	-/90/90
50mm ² 2C+E cable	-/90/90
3 x fire alarm cable	-/90/90
4 x Cat 6 cable	-/90/90
2.5mm ² 2C+E TPS cable	-/90/90
2.5mm ² 3C+E TPS cable	-/90/90
2 x RG6 coax cable	-/90/90
Fig 8 cable	-/90/90
Security cable	-/90/90

*Note further options of penetrations through the Bossfire box are under assessment

Summary of Bossfire Penetrations Through XLam CLT Panel

	Bare wall CL3/130 minimum
DN 50 mm steel sprinkler pipe	-/90/60
16mm ² 3C+E cable	-/90/90
2 x CAT 6 cables	-/90/90
2 x RG6 coax cable	-/90/90
Security cable	-/90/90
Fig 8 cable	-/90/90
20mm Pex-Xa pipe	-/90/90
20mm Pex/Al/Pex pipe	-/90/60
25mm Kelox plus pipes	-/90/90
3/8 x 3/4 pair coil w/19mm insulation	-/90/90
20mm condensation drain pipe	-/90/90

Mass Timber Connections

The connection of mass timber elements to other mass timber elements, concrete and steel needs to be evaluated for the impact of fire on their structural performance. A method for ensuring the connections do not heat up and lose strength before the required FRL needs to be selected. XLam has had a range of options assessed by Warringtonfire in assessment FAS210134. Generally a minimum Effective Depth of Connector (EDC), the depth of timber required as sacrificial charring layer to protect the connections, is specified. Alternatively, additional protection can be provided by two or three layers of plasterboard to minimise EDC. Assessment FAS210134 also includes various options for gap and void filling between mass timber connections. In all instances it is the responsibility of the Project Fire Engineer to review and certify the proposed detail meets the requirements of either NZBCC or NCC under the estimated fire load. Connection details should be considered as part of the overall design and included in drawings which are handed to XLam for production as per the XLam Shop Drawing guide. Failure to do this may lead to additional costs in testing, assessments and XLam personnel time for coordinating additional certification requirements, drawings and may lead to a delay to manufacture and hence delivery.

	Max FRL Structural
Mass timber beam to mass timber column	120 minutes
Mass timber beam to concrete column	120 minutes
Mass timber beam to steel column	120 minutes
Mass timber beam to CLT wall	120 minutes
Mass timber beam to mass timber beam	120 minutes
Mass timber beam to concrete beam	120 minutes
Mass timber beam to steel beam	120 minutes
Mass timber column through CLT floor	90 minutes
Concrete column through CLT floor	90 minutes
Steel column through CLT floor	90 minutes

Reaction to Fire Properties

To ensure occupants can safely escape the building in the event of a fire, the BCA and NZBC impose limitations on the use of lining materials which are conducive to flame spread. Limitations are expressed as Group Number. Group Numbers scale from 1 (good) to 4 (bad) which are related to the time it takes for the test room fire cell to reach flashover (the point where there is near simultaneous ignition of all combustible materials). The lower the Group Number, the greater the time the test room takes to reach flashover, which corresponds with a longer escape time.

In some locations which are not protected by sprinklers there are also requirements to limit the development of smoke. In NZCB this is identified as “s” with a limitation of an average specific extinction of less than 250m²/kg. In the BCA either a SMOGRA less than 100 or an average specific extinction of less than 250m²/kg is generally required if the compartment does not have a sprinkler.

Time to Flashover TFO < 2 minutes	Group 4
2 minutes > TFO < 10 minutes	Group 3
10 minutes > TFO < 20 minutes	Group 2
TFO < 20 minutes	Group 1

XLam CLT Panel Group Number Performance: Bare XLam CLT panels achieve a Group 3 Rating with an Average Extinction Area Less than 250m²/kg. Where Group 1 or Group 2 ratings are required, CLT panels will need to be lined with plasterboard, similar non-combustible lining or painted with an intumescent paint system. Note in Australia the use of intumescent paint to meet BCA Fire Hazard Properties performance requirements is prohibited under the deemed to satisfy provisions. A performance solution would need to be developed and certified by a fire engineer. For NZBC the paint/coating supplier would need to provide testing information to show compliance.

Reaction to Fire & Fire Hazard Properties Floor Coverings/Linings

To limit the spread of flames there are also restrictions on the performance of floor linings and coverings in the BCA and NZBC, whilst XLam CLT floors would be expected to be lined with another covering, the Critical Heat Flux as per ISO 9239.1 has been evaluated to assist designers & fire engineers in situations where bare CLT floors occur.

AS ISO 9239.1 Critical Heat Flux: XLam CLT panel (achieve a Critical Radiant Flux greater than or equal to 2.2 and less than 4.5 kW/m²).

Summary of Wall Systems FRL Australia

Option	Layup	Thickness	Bare	Protected with one layer of 16mm or two layers of 13mm Boral FIRESTOP or GIB Fyrelite on both sides, direct fix.
CL3/100	32.5/35/32.5	100mm	60/60/60	120/120/120
CL3/110	32.5/45/32.5	110mm	60/60/60	120/120/120
CL3/120	42.5/35/42.5	120mm	60/60/60	120/120/120
CL3/130	42.5/45/42.5	130mm	60/60/60	120/120/120
CL5/140	32.5/20/35/20/32.5	140mm	*90/90/90	120/120/120
CL5/155	32.5/35/20/35/32.5	155mm	*90/90/90	120/120/120
CL5/170	32.5/35/35/35/32.5	170mm	*90/90/90	120/120/120
CL5/190	42.5/35/35/35/42.5	190mm	120/120/120	120/120/120
CL5/200	42.5/35/45/35/42.5	200mm	120/120/120	120/120/120
CL5/220	42.5/45/45/45/42.5	220mm	120/120/120	120/120/120
CL7/240	32.5/35/35/35/35/32.5	240mm	120/120/120	120/120/120
CL7/260	42.5/35/35/35/35/42.5	260mm	120/120/120	120/120/120
CL7/270	42.5/35/35/45/35/42.5	270mm	120/120/120	120/120/120
CL7/290	42.5/35/45/45/45/42.5	290mm	120/120/120	120/120/120
CL7/310	42.5/45/45/45/45/42.5	310mm	120/120/120	120/120/120

*90/90/90 only applies to walls with CLT floor above and below for other floor options is limited to 60/60/60

Summary of Wall Systems FRR New Zealand

Option	Layup	Thickness	Bare	Protected with one layer of 16mm or two layers of 13mm Boral FIRESTOP or GIB Fyrelite on both sides, direct fix.
CL3/100	32.5/35/32.5	100mm	60/60/60	120/120/120
CL3/110	32.5/45/32.5	110mm	60/60/60	120/120/120
CL3/120	42.5/35/42.5	120mm	60/60/60	120/120/120
CL3/130	42.5/45/42.5	130mm	60/60/60	120/120/120
CL5/140	32.5/20/35/20/32.5	140mm	90/90/90	120/120/120
CL5/155	32.5/35/20/35/32.5	155mm	90/90/90	120/120/120
CL5/170	32.5/35/35/35/32.5	170mm	120/120/120	120/120/120
CL5/190	42.5/35/35/35/42.5	190mm	120/120/120	120/120/120
CL5/200	42.5/35/45/35/42.5	200mm	120/120/120	120/120/120
CL5/220	42.5/45/45/45/42.5	220mm	120/120/120	120/120/120
CL7/240	32.5/35/35/35/35/32.5	240mm	120/120/120	120/120/120
CL7/260	42.5/35/35/35/35/42.5	260mm	120/120/120	120/120/120
CL7/270	42.5/35/35/45/35/42.5	270mm	120/120/120	120/120/120
CL7/290	42.5/35/45/45/45/42.5	290mm	120/120/120	120/120/120
CL7/310	42.5/45/45/45/45/42.5	310mm	120/120/120	120/120/120

Fire Span Tables

The XLam fire capacity tables have been derived by a certified fire testing laboratory based on reference to various full-scale tests of loaded floors and walls, either protected by plasterboard linings or unprotected. The span tables are therefore based not only on theoretical material properties but also on the tested performance of XLam CLT under load and subjected to char-reduced cross section. The span tables relate to protected and unprotected panels - for full details of limitations refer to FCO 3337 Revision C for Australia or FCO 3336 Revision E for New Zealand.

The application of these tables requires knowledge of the loads to which the panels will be subjected to once installed in the completed project and should only be used by a suitably qualified person. The project engineer needs to determine what loads will be applied before specifying panel sizes based on these tables. The fire resistance rating of the CLT building element relies on appropriate design and construction detailing. It is intended that these tables will be used by engineers to assist in the preliminary design of CLT structural floor and wall elements. Other design variables such as vibration and deflection limitations should be considered in addition to the fire design requirements.

The Fire Load Capacity kN/m of walls will vary with; wall height; CLT panel thickness; live load and dead load. The maximum span of floors will vary with CLT panel thickness; whether it is single or multi span application; live load and dead load. For full span tables refer to Appendix 1 NZ and Appendix 2 Aus. Due to minor variations in AS 1720.1 & NZS 3603 different span tables are applicable in each country. When miscellaneous items are to be fixed to the underside of CLT floors or to walls the designer shall make allowance for an increased char depth in fixing length - refer to Appendix 3 for details. Variations across the CLT layup range will occur based on both total thickness and the thickness of each lamella, and the orientation of the panel.

Summary of Floor Systems FRL Australia

Option	Layup	Thickness	Bare	Protected with one layer of 16mm or two layers of 13mm Boral FIRESTOP or GIB Fyreline on fire exposed side, direct fix.
CL3/100	32.5/35/32.5	100mm	60/60/60	120/120/120
CL3/110	32.5/45/32.5	110mm	*90/90/90	120/120/120
CL3/120	42.5/35/42.5	120mm	*90/90/90	120/120/120
CL3/130	42.5/45/42.5	130mm	*90/90/90	120/120/120
CL5/140	32.5/20/35/20/32.5	140mm	*90/90/90	120/120/120
CL5/155	32.5/35/20/35/32.5	155mm	*90/90/90	120/120/120
CL5/170	32.5/35/35/35/32.5	170mm	90/90/90	120/120/120
CL5/190	42.5/35/35/35/42.5	190mm	90/90/90	120/120/120
CL5/200	42.5/35/45/35/42.5	200mm	*120/120/120	120/120/120
CL5/220	42.5/45/45/45/42.5	220mm	*120/120/120	120/120/120
CL7/240	32.5/35/35/35/35/32.5	240mm	120/120/120	120/120/120
CL7/260	42.5/35/35/35/35/42.5	260mm	120/120/120	120/120/120
CL7/270	42.5/35/35/45/35/42.5	270mm	120/120/120	120/120/120
CL7/290	42.5/35/45/45/45/42.5	290mm	120/120/120	120/120/120
CL7/310	42.5/45/45/45/45/42.5	310mm	120/120/120	120/120/120

*Spline joint only

Summary of Floor Systems FRR New Zealand

Option	Layup	Thickness	Bare	Protected with one layer of 16mm or two layers of 13mm Boral FIRESTOP or GIB Fyreline on both sides, direct fix.
CL3/100	32.5/35/32.5	100mm	60/60/60	120/120/120
CL3/110	32.5/45/32.5	110mm	*90/90/90	120/120/120
CL3/120	42.5/35/42.5	120mm	*90/90/90	120/120/120
CL3/130	42.5/45/42.5	130mm	*90/90/90	120/120/120
CL5/140	32.5/20/35/20/32.5	140mm	*90/90/90	120/120/120
CL5/155	32.5/35/20/35/32.5	155mm	*90/90/90	120/120/120
CL5/170	32.5/35/35/35/32.5	170mm	90/90/90	120/120/120
CL5/190	42.5/35/35/35/42.5	190mm	90/90/90	120/120/120
CL5/200	42.5/35/45/35/42.5	200mm	*120/120/120	120/120/120
CL5/220	42.5/45/45/45/42.5	220mm	*120/120/120	120/120/120
CL7/240	32.5/35/35/35/35/32.5	240mm	120/120/120	120/120/120
CL7/260	42.5/35/35/35/35/42.5	260mm	120/120/120	120/120/120
CL7/270	42.5/35/35/45/35/42.5	270mm	120/120/120	120/120/120
CL7/290	42.5/35/45/45/45/42.5	290mm	120/120/120	120/120/120
CL7/310	42.5/45/45/45/45/42.5	310mm	120/120/120	120/120/120

*Spline joint only

Using Fire Load Capacity Span Tables Floors

The capacity of the floor will vary dependent on the FRL/FRR, thickness of the panels, span required and applied live and dead loads. In some instances it may be more efficient to have thicker panels with a longer span over thinner panels with a smaller span.

Determining Thickness From Tables

- Step 1 Determine FRL/FRR Requirements, review BCA, NZBC or specific project requirements for the building element in question.
- Step 2 Determine if the CLT ceiling will be protected with fire grade plasterboard or bare.
- Step 3 Determine floor spans & whether single or multi span is required.
- Step 4 Select appropriate table.
- Step 5 Determine loads which will be applied both permanent and imposed according to either AS 1720.1-2010 or NZ 3603-1993.
- Step 6 Determine thickness of CLT required.

Worked example 1 using data from the table below

FRL 60/60/60 New Zealand Application

Floor application, bare with a minimum double span of 3m

Q of 3 kPa & G of 1 kPa

The minimum thickness is CL3/120mm see cells highlighted in yellow

Determining Span

- Step 1 Determine FRL/FRR Requirements, review BCA, NZBC or specific project requirements for the building element in question.
- Step 2 Determine if the CLT ceiling will be protected with fire grade plasterboard or bare, if will be single or double span.
- Step 3 Select appropriate table.
- Step 4 Determine CLT panel thickness.
- Step 5 Determine loads which will be applied both permanent and imposed according to either AS 1720.1 or NZ and AS 1170.1.
- Step 6 Determine maximum span of CLT.

Worked example 2 using data from the table below

FRL 60/60/60 New Zealand Application

Floor application, protected with a double span

Panel thickness specified CL3/130

Q of 5 kPa & G of 2kPa

The maximum single span is 2.5m see cells highlighted in green

New Zealand Unprotected Span Table FRR 60/60/60 (maximum span in metres)

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	2.95	2.60	2.15	2.65	2.40	2.00	2.25	2.10	1.80
CL3/110	3.05	2.70	2.25	2.75	2.50	2.10	2.35	2.15	1.90
CL3/120	3.80	3.35	2.80	3.45	3.10	2.60	2.90	2.70	2.35
CL3/130	3.90	3.45	2.90	3.50	3.15	2.70	3.05	2.80	2.50

Using Fire Load Capacity Span Tables Walls

- Step 1 Determine FRL/FRR Requirements, review BCA, NZBC or specific project requirements for the building element in question. Select appropriate table.
- Step 2 Determine if the CLT will be protected with fire grade plasterboard or bare.
- Step 3 Determine wall height.
- Step 4 Determine if the floor above and below will be CLT or other.
- Step 5 Determine loads which will be applied both permanent and imposed according to either AS 1720.1-2010 or NZ 3603-1993.
- Step 6 Determine thickness of CLT required.

Worked example 1 using data from the table below

FRL 60/60/60 New Zealand Application

Bare wall 3m high, CLT floor above and below

Maximum imposed load 40kN/m

The minimum thickness is CL3/120mm see cells highlighted in yellow

Worked example 2 using data from the table below

FRL 60/60/60 New Zealand Application

Lined wall 4m high, CLT floor above and below

Maximum imposed load 350kN/m

The minimum thickness is CL3/130mm see cells highlighted in green

New Zealand Axial Capacity tables FRR 60/60/60 (maximum axial capacity in kN per metre) CLT floor above and below

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRR 60/60/60				FRR 60/60/60 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	22	20	17	14	263	245	209	178
CL3/110	23	21	17	14	308	290	255	220
CL3/120	44	40	34	29	413	393	349	307
CL3/130	45	41	35	30	457	443	403	361

Supply Chain Compliance

Due to a spate of non-compliance issues the inclusion of additional legislation to ensure that each part of the building supply chain is held responsible for the installation of compliant building systems is either being considered or has been enacted across Australia^{1,2}, and New Zealand³. In Queensland legislation⁴ has been enacted which highlights that the whole supply chain is responsible for the installation of compliant and safe building systems, NSW⁵ has duty of care legislation.

All parts of the supply chain are all responsible for compliance of installed products and may be found liable if non-compliant building systems are installed. When comparing XLam CLT panels with alternative materials and suppliers, specifiers should consider how compliance with the BCA or NZBC has been or will be demonstrated and what the ramifications of non-compliance may be – specifically checking:

- Documentation supplied to support compliance to BCA/NZBC requirements
- Applicability of information provided in regards to the supplied goods
- Traceability and quality assurance
- Provision of local technical support
- Technical literature supplied
- Additional expenses which may be incurred to ensure installed systems are compliant

BCA Compliance – Fire Protected Timber Where Non-Combustible Construction is Required

In some buildings due to the height and purpose of the building the use of a combustible building element may be prohibited, where this is the case Specification 10 Fire-protected timber covers the use of fire-protected timber in buildings up to 25m high. It provides a DTS pathway for the use of CLT in these buildings when they are: a) protected from fire with direct fixed fire-rated coverings and achieves a certain level of performance and b) the building is sprinklered.

Should the building fall outside the scope of the DTS provisions then an appropriately experienced fire engineer would be required to work together with the design team, building certifier and fire brigade to develop a Performance Solution or Alternative Solution. XLam will provide relevant testing information to fire engineers upon request.

¹ https://www.industry.gov.au/sites/default/files/July%202018/document/pdf/building_ministers_forum_expert_assessment_-_building_confidence.pdf

² <https://www.abcb.gov.au/Initiatives/All/building-confidence-report-implementation-team>

³ <https://www.building.govt.nz/building-code-compliance/product-assurance-and-multiproof/product-assurance/products-and-building-code-compliance/>

⁴ <https://www.qbcc.qld.gov.au/non-conforming-building-products/non-conforming-building-products>

⁵ <https://www.fairtrading.nsw.gov.au/trades-and-businesses/construction-and-trade-essentials/building-products/non-conforming-building-products>

General Design Considerations

- At the design stage the requirement for and location of penetrations, doors and services should be considered in relationship to the fire and structural performance of XLam CLT panels.
- Penetrations through fire rated walls and floors should be avoided where possible.
- Avoid having penetrations within 200mm of joints or panel ends.
- Review impact of penetrations on structural performance under both static and fire conditions.
- Do NOT use butt joints.
- Construction details restricted to those tested/assessed.
- Penetration details restricted to those tested/assessed.
- Allow additional fixing length if attaching ancillary items to allow for char depth.
- Lap joints are limited in the FRL/FRR and panel thickness they can be used in.
- Increased requirements for fire resistance may be compensated by the following measures:
 - Increase the thickness of the CLT element.
 - Increase the number of layers of the CLT element.
 - Applying a non-combustible cladding.

List of Appendixes

Appendix 1: Span Tables for New Zealand

Appendix 2: Span Tables for Australia

Appendix 3: Additional fixing length to allow for char of CLT

Appendix 4: XLam CLT Band Beams

Appendix 5: XLam CLT Blade Walls

New Zealand Unprotected Span Table FRR 30/30/30 (maximum span in metres)

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

New Zealand Unprotected Span Table FRR 30/30/30 (maximum span in metres)

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.60	4.00	4.70	4.40	3.80	4.10	3.90	3.60
CL3/110	5.50	5.00	4.30	5.10	4.70	4.20	4.40	4.20	3.80
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

New Zealand Unprotected Span Table FRR 60/60/60 (maximum span in metres)

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
CL3/110	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
CL3/120	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
CL3/130	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

New Zealand Unprotected Span Table FRR 60/60/60 (maximum span in metres)

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	2.95	2.60	2.15	2.65	2.40	2.00	2.25	2.10	1.80
CL3/110	3.05	2.70	2.25	2.75	2.50	2.10	2.35	2.15	1.90
CL3/120	3.80	3.35	2.80	3.45	3.10	2.60	2.90	2.70	2.35
CL3/130	3.90	3.45	2.90	3.50	3.15	2.70	3.05	2.80	2.50
5 Layer Panels									
CL5/140	6.75	6.00	5.05	6.15	5.55	4.80	5.25	4.90	4.35
CL5/155	6.65	5.95	5.00	6.10	5.50	4.70	5.25	4.90	4.35
CL5/170	7.60	6.80	5.80	7.00	6.35	5.50	6.05	5.60	5.00
CL5/190	8.35	7.00	6.35	7.60	7.00	6.05	6.65	6.25	5.30
CL5/200	8.60	7.90	6.80	8.10	7.50	6.50	7.10	6.65	5.90
CL5/220	8.90	8.50	7.30	8.70	7.90	6.90	7.60	7.10	6.35
7 Layer Panels									
CL7/240	9.10	8.70	8.30	8.80	8.40	7.90	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.60	8.80	8.50	7.90
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.65
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

New Zealand Unprotected Span Table FRR 90/90/90 (maximum span in metres)
Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/110	2.80	2.45	2.05	2.50	2.25	1.90	2.15	2.00	1.75
CL3/120	3.60	3.20	2.65	3.25	2.90	2.50	2.80	2.60	2.30
CL3/130	3.55	3.15	2.65	3.25	2.95	2.50	2.80	2.55	2.25
5 Layer Panels									
CL5/140	4.10	3.65	3.10	3.75	3.35	2.90	3.25	3.00	2.65
CL5/155	5.00	4.45	3.70	4.55	4.15	3.50	3.95	3.65	3.25
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.35
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Shaded Cells – Spline joint only

New Zealand Unprotected Span Table FRR 90/90/90 (maximum span in metres)
Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/110	2.80	2.45	2.05	2.50	2.25	1.90	2.15	2.00	1.75
CL3/120	3.60	3.20	2.65	3.25	2.95	2.50	2.80	2.60	2.30
CL3/130	3.50	3.15	2.60	3.20	2.95	2.50	2.80	2.55	2.25
5 Layer Panels									
CL5/140	4.15	3.70	3.10	3.70	3.30	2.95	3.25	3.00	2.65
CL5/155	5.00	4.45	3.75	4.55	4.15	3.55	3.95	3.65	3.25
CL5/170	6.60	5.90	5.05	6.10	5.50	4.80	5.20	4.90	4.20
CL5/190	8.00	7.20	6.10	7.30	6.70	5.80	6.40	5.95	5.30
CL5/200	8.50	7.80	6.60	7.90	7.20	6.30	6.80	6.40	5.70
CL5/220	8.90	8.45	7.20	8.55	7.85	6.85	7.55	6.95	6.30
7 Layer Panels									
CL7/240	9.10	8.75	7.55	8.90	8.25	7.15	7.80	7.35	6.55
CL7/260	9.80	9.30	8.80	9.40	9.00	8.40	8.80	8.55	7.70
CL7/270	10.00	9.50	8.80	9.60	9.20	8.67	9.00	8.90	8.00
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.65
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.95

Shaded Cells – Spline joint only

New Zealand Unprotected Span Table FRR 120/120/120 (maximum span in metres)

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
5 Layer Panels									
CL5/200	5.20	4.75	4.05	4.85	4.45	3.85	4.25	3.95	3.50
CL5/220	7.10	6.40	5.50	6.50	6.00	5.25	5.75	5.35	4.75
7 Layer Panels									
CL7/240	7.05	6.40	5.50	6.55	6.05	5.25	5.80	5.40	4.80
CL7/260	7.80	7.05	6.10	7.10	6.55	5.80	6.35	5.95	5.35
CL7/270	7.75	7.10	6.15	7.20	6.65	5.80	6.40	5.95	5.35
CL7/290	8.50	8.10	7.45	8.20	8.00	7.10	7.70	7.30	6.50
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Shaded Cells – Spline joint only

New Zealand Unprotected Span Table FRR 120/120/120 (maximum span in metres)

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
5 Layer Panels									
CL5/200	5.25	4.75	4.05	4.85	4.45	3.85	4.25	3.95	3.50
CL5/220	7.10	6.40	5.45	6.55	6.00	5.25	5.75	5.40	4.80
7 Layer Panels									
CL7/240	7.10	6.45	5.50	6.55	6.00	5.25	5.75	5.40	4.85
CL7/260	7.80	6.90	6.10	7.20	6.50	5.80	6.35	5.95	5.35
CL7/270	7.75	7.00	6.15	7.20	6.60	5.80	6.20	6.00	5.35
CL7/290	9.40	8.50	7.45	8.70	8.10	7.10	7.70	7.30	6.55
CL7/310	10.80	9.90	8.65	10.10	9.30	8.25	9.00	8.45	7.50

Shaded Cells – Spline joint only

New Zealand Protected Span Table FRR 30/30/30 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

New Zealand Protected Span Table FRR 30/30/30 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.60	4.00	4.70	4.40	3.80	4.10	3.90	3.60
CL3/110	5.50	5.00	4.30	5.10	4.70	4.20	4.40	4.20	3.80
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

New Zealand Protected Span Table FRR 60/60/60 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

New Zealand Protected Span Table FRR 60/60/60 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.60	4.00	4.70	4.40	3.80	4.10	3.90	3.60
CL3/110	5.50	5.00	4.30	5.10	4.70	4.20	4.40	4.20	3.80
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

New Zealand Protected Span Table FRR 90/90/90 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

New Zealand Protected Span Table FRR 90/90/90 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.60	4.00	4.70	4.40	3.80	4.10	3.90	3.60
CL3/110	5.50	5.00	4.30	5.10	4.70	4.20	4.40	4.20	3.80
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

New Zealand Protected Span Table FRR 120/120/120 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

New Zealand Protected Span Table FRR 120/120/120 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.40	3.70	4.60	4.15	3.50	3.90	3.60	3.15
CL3/110	5.50	5.00	4.15	5.10	4.60	3.90	4.35	4.05	3.50
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

New Zealand Axial Capacity Tables FRR 30/30/30 (maximum axial capacity in kN per metre) CLT floor above and below

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRR 30/30/30				FRR 30/30/30 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	63	57	47	40	224	198	154	122
CL3/110	76	69	58	49	275	245	192	154
CL3/120	212	199	173	151	355	319	254	205
CL3/130	246	233	207	182	411	374	304	248
5 Layer Panels								
CL5/140	208	197	176	156	443	414	344	283
CL5/155	203	195	177	159	451	450	391	334
CL5/170	258	251	417	214	562	525	462	402
CL5/190	425	427	420	400	727	684	613	546
CL5/200	457	461	458	441	784	739	667	598
CL5/220	469	479	486	479	843	802	734	668

New Zealand Axial Capacity tables FRR 60/60/60 (maximum axial capacity in kN per metre) CLT floor above and below

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRR 60/60/60				FRR 60/60/60 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	22	20	17	14	263	245	209	178
CL3/110	23	21	17	14	308	290	255	220
CL3/120	44	40	34	29	413	393	349	307
CL3/130	45	41	35	30	457	443	403	361
5 Layer Panels								
CL5/140	120	113	99	87	413	400	366	329
CL5/155	147	139	124	110	448	446	430	401
CL5/170	210	203	212	168	504	505	663	467
CL5/190	236	230	216	198	639	650	654	639
CL5/200	275	270	257	239	675	689	698	686
CL5/220	289	288	279	265	677	699	723	726

**New Zealand Axial Capacity tables FRR 90/90/90 (maximum axial capacity in kN per metre)
CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRR 90/90/90				FRR 90/90/90 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100					172	159	135	115
CL3/110					207	194	167	144
CL3/120					314	297	263	229
CL3/130					356	342	308	274
5 Layer Panels								
CL5/140	18	17	14	12	315	302	274	245
CL5/155	18	17	14	12	342	337	318	292
CL5/170	20	18	16	14	393	391	541	350
CL5/190	127	121	110	99	535	542	541	524
CL5/200	172	167	154	141	568	578	581	567
CL5/220	238	235	223	209	576	592	608	607

**New Zealand Axial Capacity tables FRR 120/120/120 (maximum axial capacity in kN per metre)
CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRR 120/120/120				FRR 120/120/120 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100					82	75	63	53
CL3/110					101	93	78	67
CL3/120					228	215	187	163
CL3/130					264	251	224	197
5 Layer Panels								
CL5/140					226	215	192	171
CL5/155					230	222	203	183
CL5/170	7	6	5	4	282	276	436	237
CL5/190	21	20	17	15	443	446	439	138
CL5/200	29	27	24	21	475	480	478	461
CL5/220	30	28	25	23	486	497	506	500

**New Zealand Axial Capacity tables FRR 30/30/30 (maximum axial capacity in kN per metre)
Other than CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRR 30/30/30				FRR 30/30/30 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	52	47	38	32	224	198	154	122
CL3/110	64	58	48	40	275	245	192	154
CL3/120	185	170	145	124	355	319	254	205
CL3/130	218	203	175	151	411	374	304	248
5 Layer Panels								
CL5/140	184	173	151	131	443	414	344	283
CL5/155	183	173	153	134	451	450	391	334
CL5/170	236	227	368	184	562	525	462	402
CL5/190	405	401	381	355	727	684	613	546
CL5/200	437	436	419	394	784	739	667	598
CL5/220	455	460	456	437	843	802	734	668

**New Zealand Axial Capacity tables FRR 60/60/60 (maximum axial capacity in kN per metre)
Other than CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRR 60/60/60				FRR 60/60/60 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	19	17	13	11	225	205	171	144
CL3/110	19	17	14	11	269	250	212	180
CL3/120	37	34	28	24	365	342	294	253
CL3/130	39	35	29	25	415	393	347	301
5 Layer Panels								
CL5/140	105	98	84	72	372	355	315	277
CL5/155	130	122	107	93	421	412	382	347
CL5/170	191	182	185	144	478	472	589	409
CL5/190	218	210	191	173	616	620	607	574
CL5/200	256	249	230	210	652	659	651	622
CL5/220	274	269	254	236	662	677	688	675

**New Zealand Axial Capacity tables FRR 90/90/90 (maximum axial capacity in kN per metre)
Other than CLT floor above and below**

Wall Capacity ϕN_c

	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
Panel Designation	Unprotected Walls				Protected Walls			
	FRR 90/90/90				FRR 90/90/90 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100					146	133	110	92
CL3/110					179	164	138	117
CL3/120					277	257	221	189
CL3/130					319	301	263	228
5 Layer Panels								
CL5/140	16	14	12	10	282	267	235	206
CL5/155	16	14	12	10	317	306	280	251
CL5/170	17	16	13	11	369	360	478	305
CL5/190	115	108	96	85	513	514	498	467
CL5/200	158	151	136	122	547	551	539	511
CL5/220	224	218	202	185	561	572	576	561

**New Zealand Axial Capacity tables FRR 120/120/120 (maximum axial capacity in kN per metre)
Other than CLT floor above and below**

Wall Capacity ϕN_c

	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
Panel Designation	Unprotected Walls				Protected Walls			
	FRR 120/120/120				FRR 120/120/120 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100					69	62	51	42
CL3/110					85	78	64	54
CL3/120					199	184	157	134
CL3/130					235	219	189	163
5 Layer Panels								
CL5/140					200	188	164	143
CL5/155					208	197	175	155
CL5/170	6	5	4	3	260	251	385	205
CL5/190	18	17	15	12	422	419	400	138
CL5/200	26	24	21	18	455	454	439	412
CL5/220	27	25	22	19	472	478	476	457

Australian Unprotected Span Table FRL 30/30/30 (maximum span in metres)

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Australian Unprotected Span Table FRL 30/30/30 (maximum span in metres)

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.60	4.00	4.70	4.40	3.80	4.10	3.90	3.60
CL3/110	5.50	5.00	4.30	5.10	4.70	4.20	4.40	4.20	3.80
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

Australian Unprotected Span Table FRL 60/60/60 (maximum span in metres)

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	2.85	2.50	2.10	2.55	2.30	1.95	2.20	2.00	1.75
CL3/110	2.95	2.60	2.15	2.65	2.40	2.00	2.25	2.10	1.85
CL3/120	3.65	3.25	2.70	3.35	3.00	2.55	2.85	2.60	2.30
CL3/130	3.75	3.35	2.80	3.40	3.10	2.65	2.95	2.70	2.40
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Australian Unprotected Span Table FRL 60/60/60 (maximum span in metres)

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	2.85	2.50	2.10	2.55	2.30	1.90	2.20	2.00	1.75
CL3/110	2.90	2.60	2.15	2.65	2.40	2.05	2.25	2.10	1.85
CL3/120	3.65	3.25	2.70	3.35	3.00	2.50	2.80	2.65	2.30
CL3/130	3.75	3.35	2.80	3.40	3.05	2.65	2.95	2.70	2.40
5 Layer Panels									
CL5/140	6.55	5.85	4.90	6.00	5.40	4.65	5.10	4.75	4.20
CL5/155	6.50	5.80	4.90	5.90	5.35	4.60	5.10	4.75	4.20
CL5/170	7.40	6.60	5.60	6.80	6.15	5.30	5.90	5.40	4.80
CL5/190	8.10	7.30	6.20	7.40	6.80	5.90	6.45	6.05	5.30
CL5/200	8.60	7.70	6.60	7.90	7.30	6.30	6.90	6.45	5.75
CL5/220	8.90	8.30	7.10	8.45	7.70	6.75	7.40	6.90	6.15
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.60	7.80	7.60	7.00
CL7/260	9.80	9.30	8.60	9.40	9.00	8.35	8.80	8.50	7.65
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	7.90
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

Australian Unprotected Span Table FRL 90/90/90 (maximum span in metres)

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/110	2.70	2.40	2.00	2.40	2.20	1.85	2.10	1.90	1.70
CL3/120	3.50	3.10	2.60	3.15	2.85	2.45	2.70	2.50	2.20
CL3/130	3.45	3.05	2.55	3.15	2.85	2.40	2.70	2.50	2.20
5 Layer Panels									
CL5/140	4.00	3.60	3.00	3.65	3.30	2.85	3.10	2.90	2.60
CL5/155	4.80	4.30	3.60	4.40	4.00	3.40	3.80	3.50	3.15
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.20
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Shaded Cells – Spine joint only

Australian Unprotected Span Table FRL 90/90/90 (maximum span in metres)

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
CL3/110	2.70	2.40	2.00	2.40	2.20	1.85	2.10	1.90	1.70
CL3/120	3.50	3.10	2.60	3.15	2.85	2.40	2.70	2.50	2.20
CL3/130	3.40	3.05	2.50	3.10	2.85	2.40	2.70	2.50	2.20
5 Layer Panels									
CL5/140	4.00	3.60	3.00	3.65	3.30	2.85	3.10	2.90	2.55
CL5/155	4.80	4.30	3.65	4.40	4.00	3.40	3.80	3.50	3.10
CL5/170	6.40	5.75	4.90	5.90	5.30	4.60	5.10	4.75	4.20
CL5/190	7.75	7.00	5.90	7.10	6.50	5.60	6.20	5.80	5.10
CL5/200	8.35	7.50	6.40	7.70	7.00	6.10	6.65	6.20	5.50
CL5/220	8.90	8.15	7.00	8.30	7.60	6.60	7.30	6.80	6.10
7 Layer Panels									
CL7/240	9.10	8.50	7.30	8.65	7.90	6.90	7.60	7.10	6.35
CL7/260	9.80	9.30	8.55	9.40	9.00	8.10	8.80	8.30	7.45
CL7/270	10.00	9.50	8.80	9.60	9.20	8.45	9.00	8.65	7.70
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.40
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.70

Shaded Cells – Spine joint only

Australian Unprotected Span Table FRL 120/120/120 (maximum span in metres)

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
5 Layer Panels									
CL5/200	5.10	4.60	3.90	4.70	4.30	3.70	4.10	3.80	3.40
CL5/220	6.90	6.20	5.30	5.00	5.80	5.10	5.60	5.20	4.00
7 Layer Panels									
CL7/240	6.80	6.00	5.00	6.30	5.80	5.10	5.60	5.20	4.60
CL7/260	7.50	6.80	5.90	7.00	6.45	5.60	6.15	5.80	5.20
CL7/270	7.50	6.80	5.90	6.00	6.40	5.60	6.20	5.80	5.10
CL7/290	8.50	8.10	7.20	8.20	7.80	6.80	7.50	7.00	6.35
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Shaded Cells – Spline joint only

Australian Unprotected Span Table FRL 120/120/120 (maximum span in metres)

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
5 Layer Panels									
CL5/200	5.10	4.60	3.90	4.70	4.30	3.70	4.10	3.80	3.40
CL5/220	6.90	6.20	5.30	6.30	5.85	5.10	5.55	5.20	4.60
7 Layer Panels									
CL7/240	6.90	6.20	5.30	6.35	5.85	5.10	5.60	5.20	4.65
CL7/260	7.55	6.85	5.90	7.00	6.40	5.65	6.15	5.80	5.20
CL7/270	7.50	6.80	5.90	7.00	6.40	5.65	6.20	5.80	5.20
CL7/290	9.10	8.30	7.20	8.40	7.80	6.80	7.00	7.00	6.35
CL7/310	10.50	9.60	8.40	9.80	9.05	8.00	8.70	8.20	7.30

Shaded Cells – Spline joint only

Australian Protected Span Table FRL 30/30/30 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Australian Protected Span Table FRL 30/30/30 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.60	4.00	4.70	4.40	3.80	4.10	3.90	3.60
CL3/110	5.50	5.00	4.30	5.10	4.70	4.20	4.40	4.20	3.80
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

Australian Protected Span Table FRL 60/60/60 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Australian Protected Span Table FRL 60/60/60 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.60	4.00	4.70	4.40	3.80	4.10	3.90	3.60
CL3/110	5.50	5.00	4.30	5.10	4.70	4.20	4.40	4.20	3.80
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

Australian Protected Span Table FRL 90/90/90 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Australian Protected Span Table FRL 90/90/90 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	5.10	4.60	4.00	4.70	4.40	3.80	4.10	3.90	3.60
CL3/110	5.50	5.00	4.30	5.10	4.70	4.20	4.40	4.20	3.80
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

Australian Protected Span Table FRL 120/120/120 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Simply Supported

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	3.90	3.50	3.10	3.60	3.30	3.00	3.20	3.00	2.70
CL3/110	4.20	3.80	3.30	3.90	3.60	3.20	3.50	3.30	3.00
CL3/120	4.60	4.20	3.70	4.30	4.00	3.60	3.80	3.60	3.30
CL3/130	4.90	4.50	4.00	4.60	4.30	3.80	4.10	3.90	3.50
5 Layer Panels									
CL5/140	5.10	4.70	4.20	4.80	4.50	4.00	4.30	4.10	3.80
CL5/155	5.40	5.00	4.40	5.10	4.70	4.30	4.60	4.30	4.00
CL5/170	5.80	5.40	4.80	5.50	5.10	4.60	5.00	4.70	4.30
CL5/190	6.60	6.10	5.50	6.20	5.80	5.30	5.60	5.40	4.90
CL5/200	6.80	6.40	5.70	6.50	6.10	5.50	5.90	5.60	5.20
CL5/220	7.30	6.80	6.10	6.90	6.50	5.90	6.30	6.00	5.50
7 Layer Panels									
CL7/240	7.50	7.00	6.30	7.10	6.70	6.10	6.50	6.20	5.70
CL7/260	8.00	7.70	7.00	7.70	7.40	6.80	7.20	6.90	6.40
CL7/270	8.20	7.80	7.20	7.90	7.60	6.90	7.40	7.10	6.50
CL7/290	8.50	8.10	7.60	8.20	7.90	7.40	7.70	7.50	7.00
CL7/310	8.70	8.40	7.80	8.40	8.10	7.60	7.90	7.70	7.20

Australian Protected Span Table FRL 120/120/120 (maximum span in metres)
Time for interface to reach 300° > 30mins

Floor – Double Span

Panel Designation	Q = 2.0 kPa			Q = 3.0 kPa			Q = 5.0 kPa		
	SDL			SDL			SDL		
	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa	0.5 kPa	1.0 kPa	2.0 kPa
3 Layer Panels									
CL3/100	4.95	4.30	3.60	4.40	4.00	3.40	3.80	3.50	3.05
CL3/110	5.50	4.85	4.05	4.95	4.45	3.80	4.25	3.90	3.40
CL3/120	6.10	5.50	4.80	5.60	5.20	4.60	4.90	4.70	4.30
CL3/130	6.40	5.90	5.20	6.00	5.60	4.90	5.30	5.00	4.60
5 Layer Panels									
CL5/140	6.80	6.20	5.50	6.30	5.90	5.30	5.30	5.20	4.90
CL5/155	7.10	6.60	5.80	6.70	6.20	5.60	5.70	5.50	5.20
CL5/170	7.60	7.10	6.30	7.20	6.70	6.00	6.10	5.90	5.60
CL5/190	8.30	7.90	7.20	8.00	7.60	6.90	7.10	6.80	6.40
CL5/200	8.60	8.10	7.50	8.20	7.80	7.20	7.30	7.10	6.70
CL5/220	8.90	8.50	7.80	8.60	8.20	7.60	7.80	7.60	7.10
7 Layer Panels									
CL7/240	9.10	8.70	8.00	8.80	8.40	7.80	7.80	7.60	7.20
CL7/260	9.80	9.30	8.60	9.40	9.00	8.40	8.80	8.50	8.00
CL7/270	10.00	9.50	8.80	9.60	9.20	8.60	9.00	8.70	8.20
CL7/290	10.40	9.90	9.20	10.00	9.60	9.00	9.40	9.10	8.60
CL7/310	10.60	10.20	9.40	10.20	9.80	9.20	9.60	9.30	8.80

**Australian Axial Capacity Tables FRL 30/30/30 (maximum axial capacity in kN per metre)
CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRL 30/30/30				FRL 30/30/30 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	45	40	32	26	224	198	154	122
CL3/110	55	49	40	33	275	245	192	154
CL3/120	166	152	126	106	356	319	254	205
CL3/130	198	182	154	130	411	374	304	248
5 Layer Panels								
CL5/140	167	155	132	113	451	414	344	283
CL5/155	167	156	135	117	485	450	391	334
CL5/170	219	208	323	163	562	525	462	402
CL5/190	375	371	351	320	727	684	613	546
CL5/200	406	404	388	358	784	739	667	598
CL5/220	422	425	420	402	843	802	734	668

**Australian Axial Capacity tables FRL 60/60/60 (maximum axial capacity in kN per metre)
CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRL 60/60/60				FRL 60/60/60 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	15	14	11	9	202	182	149	123
CL3/110	16	14	11	9	246	224	186	155
CL3/120	32	29	23	19	338	310	261	220
CL3/130	33	30	25	20	384	362	310	265
5 Layer Panels								
CL5/140	94	86	72	61	346	324	282	243
CL5/155	118	109	93	80	388	379	350	310
CL5/170	175	165	161	127	442	436	523	370
CL5/190	201	192	172	153	571	571	557	526
CL5/200	239	229	209	188	606	609	599	571
CL5/220	255	250	232	212	615	626	631	617

**Australian Axial Capacity tables FRL 90/90/90 (maximum axial capacity in kN per metre)
CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRL 90/90/90				FRL 90/90/90 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	-	-	-	-	129	116	94	78
CL3/110	-	-	-	-	161	146	120	100
CL3/120	-	-	-	-	161	231	120	164
CL3/130	-	-	-	-	295	274	234	199
5 Layer Panels								
CL5/140	13	12	9	8	259	242	209	180
CL5/155	13	12	10	8	293	283	253	222
CL5/170	15	13	11	9	342	334	423	273
CL5/190	104	97	85	74	475	474	458	427
CL5/200	145	137	122	108	508	509	497	469
CL5/220	208	201	184	166	521	528	529	514

**Australian Axial Capacity tables FRL 120/120/120 (maximum axial capacity in kN per metre)
CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRL 120/120/120				FRL 120/120/120 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	-	-	-	-	60	53	43	35
CL3/110	-	-	-	-	75	67	54	44
CL3/120	-	-	-	-	75	164	54	115
CL3/130	-	-	-	-	214	197	167	142
5 Layer Panels								
CL5/140	-	-	-	-	182	169	145	124
CL5/155	-	-	-	-	191	179	156	135
CL5/170	-	-	-	-	242	230	339	181
CL5/190	16	15	12	10	391	387	369	138
CL5/200	23	21	18	15	422	421	405	375
CL5/220	24	22	19	16	438	442	438	420

**Australian Axial Capacity tables FRL 30/30/30 (maximum axial capacity in kN per metre)
Other than CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRL 30/30/30				FRL 30/30/30 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	36	31	24	20	224	198	154	122
CL3/110	45	39	31	25	275	245	192	154
CL3/120	137	124	101	83	356	319	254	205
CL3/130	165	150	124	104	411	374	304	248
5 Layer Panels								
CL5/140	141	129	108	91	451	414	344	283
CL5/155	143	132	112	95	485	450	391	334
CL5/170	191	179	271	134	562	525	462	402
CL5/190	344	333	301	269	727	684	613	546
CL5/200	376	367	336	302	784	739	667	598
CL5/220	398	396	377	346	843	802	734	668

**Australian Axial Capacity tables FRL 60/60/60 (maximum axial capacity in kN per metre)
Other than CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRL 60/60/60				FRL 60/60/60 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	12	11	8	7	163	145	117	95
CL3/110	13	11	9	7	201	181	147	121
CL3/120	26	23	18	15	279	253	209	173
CL3/130	27	24	19	16	327	300	251	211
5 Layer Panels								
CL5/140	79	71	59	49	293	271	230	195
CL5/155	100	92	76	64	350	332	291	253
CL5/170	152	142	134	104	403	388	437	305
CL5/190	178	167	146	127	532	525	492	443
CL5/200	212	202	179	158	568	563	534	486
CL5/220	232	223	202	181	584	589	579	547

**Australian Axial Capacity tables FRL 90/90/90 (maximum axial capacity in kN per metre)
Other than CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRL 90/90/90				FRL 90/90/90 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	-	-	-	-	104	93	74	60
CL3/110	-	-	-	-	131	118	95	78
CL3/120	-	-	-	-	131	189	95	129
CL3/130	-	-	-	-	248	227	189	159
5 Layer Panels								
CL5/140	-	-	-	-	220	202	171	145
CL5/155	-	-	-	-	258	242	210	181
CL5/170	-	-	-	-	307	291	354	225
CL5/190	90	83	71	60	441	433	399	359
CL5/200	127	119	103	89	475	469	438	397
CL5/220	187	178	159	141	494	496	483	450

**Australian Axial Capacity tables FRL 120/120/120 (maximum axial capacity in kN per metre)
Other than CLT floor above and below**

Wall Capacity ϕN_c

Panel Designation	Wall Height							
	2.75m	3.00m	3.50m	4.00m	2.75m	3.00m	3.50m	4.00m
	Unprotected Walls				Protected Walls			
	FRL 120/120/120				FRL 120/120/120 time for interface to reach 300° > 30mins			
3 Layer Panels								
CL3/100	-	-	-	-	48	42	33	26
CL3/110	-	-	-	-	60	53	42	34
CL3/120	-	-	-	-	60	134	42	90
CL3/130	-	-	-	-	179	163	135	112
5 Layer Panels								
CL5/140	-	-	-	-	154	141	118	99
CL5/155	-	-	-	-	163	151	129	110
CL5/170	-	-	-	-	211	198	284	149
CL5/190	13	12	10	8	360	349	317	138
CL5/200	19	17	14	12	392	383	352	318
CL5/220	20	19	16	13	414	412	394	363

Miscellaneous fixtures to CLT floors

Where miscellaneous items are fixed to the underside of CLT floors, the fixing design shall make allowance for a char depth of at least that listed in the table below. This value includes the 7.5mm zero strength layer.

Additional fixing length to allow for char of CLT

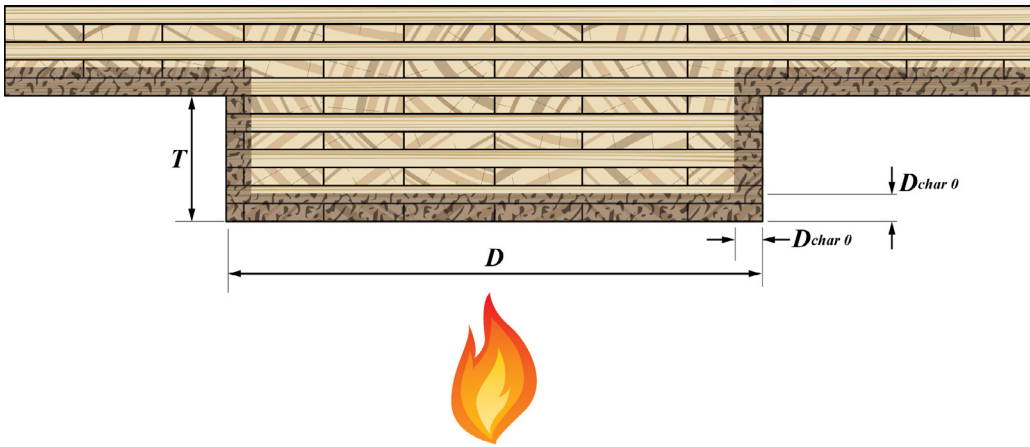
Section	Unprotected				Protected			
	30 min	60 min	90 min	120 min	30 min	60 min	90 min	120 min
CL3/85	20	46	81	115	0	13	21	29
CL3/105								
CL3/115								
CL3/125								
CL3/135								
CL5/100								
CL5/130								
CL5/145								
CL5/150								
CL5/160								
CL5/165								
CL5/175								
CL5/195								
CL5/205								
CL5/225								
CL7/245								
CL7/265								
CL7/275								
CL7/295								
CL7/315								

Expected char depths for various XLam Band Beam configurations

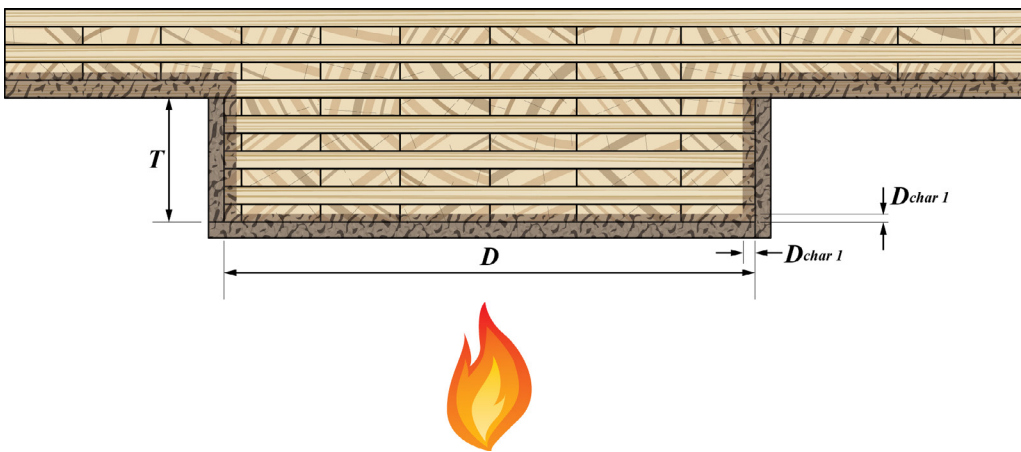
XLam CLT Band Beam configuration	Exposed ($D_{char,D}$)				1 x 16 plasterboard ($D_{char,1}$)				2 x 16 plasterboard ($D_{char,2}$)			
	30 (minutes)	60 (minutes)	90 (minutes)	120 (minutes)	30 (minutes)	60 (minutes)	90 (minutes)	120 (minutes)	30 (minutes)	60 (minutes)	90 (minutes)	120 (minutes)
CL7/240	29.5	64.5	99.5	-	7.0	17.5	28.0	65.0	7.0	7.0	7.0	17.5
CL7/260	29.5	54.5	89.5	124.5	7.0	17.5	28.0	55.0	7.0	7.0	7.0	17.5
CL7/270	29.5	54.5	89.5	124.5	7.0	17.5	28.0	55.0	7.0	7.0	7.0	17.5
CL7/290	29.5	54.5	89.5	122.0	7.0	17.5	28.0	55.0	7.0	7.0	7.0	17.5
CL7/310	29.5	54.5	87.0	122.0	7.0	17.5	28.0	55.0	7.0	7.0	7.0	17.5
CL7/340	29.5	54.5	87.0	122.0	7.0	17.5	28.0	55.0	7.0	7.0	7.0	17.5
CL7/350	29.5	54.5	87.0	122.0	7.0	17.5	28.0	55.0	7.0	7.0	7.0	17.5

Note: For determining the residual section of the XLam CLT Band Beam, the char depth should be applied to the soffit and sides shown in the figures below.

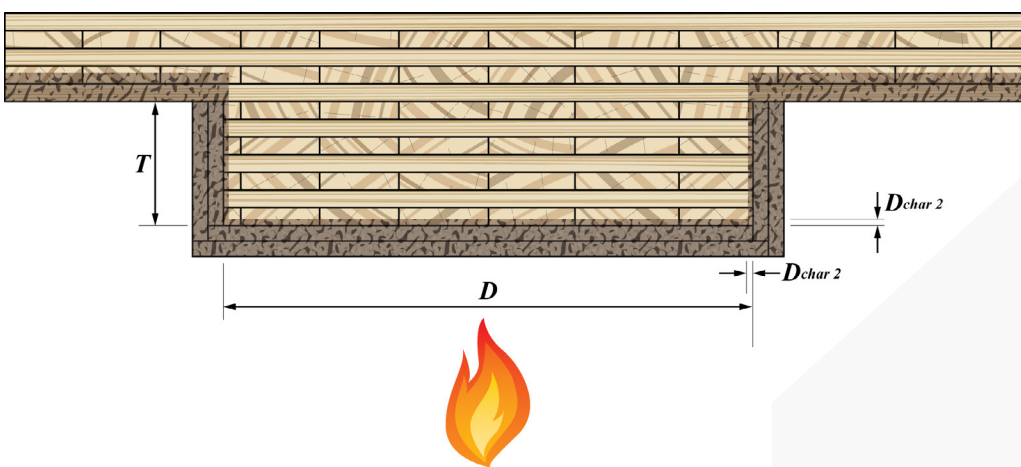
Exposed CLT Band Beam



CLT Band Beam Protected with One Layer of Fire Rated Plasterboard



CLT Band Beam Protected with Two Layers of Fire Rated Plasterboard

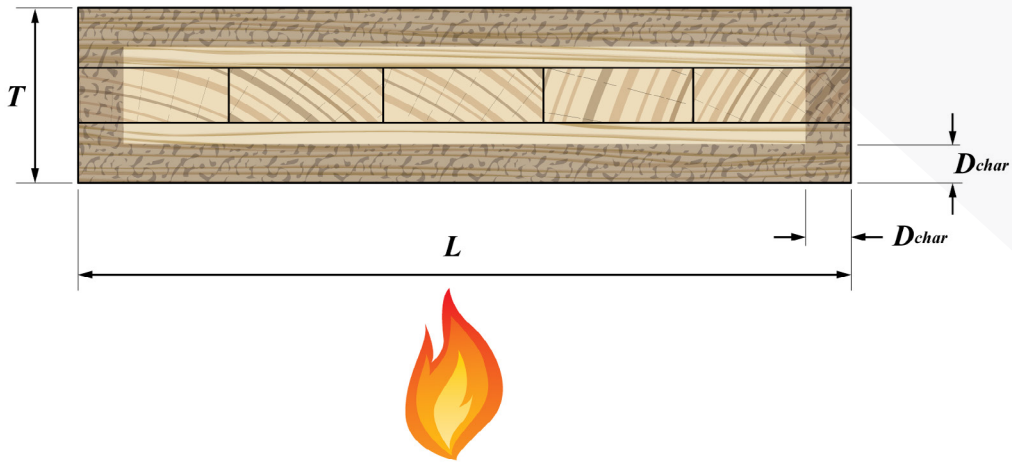


Expected char depths for various XLam CLT blade wall configurations

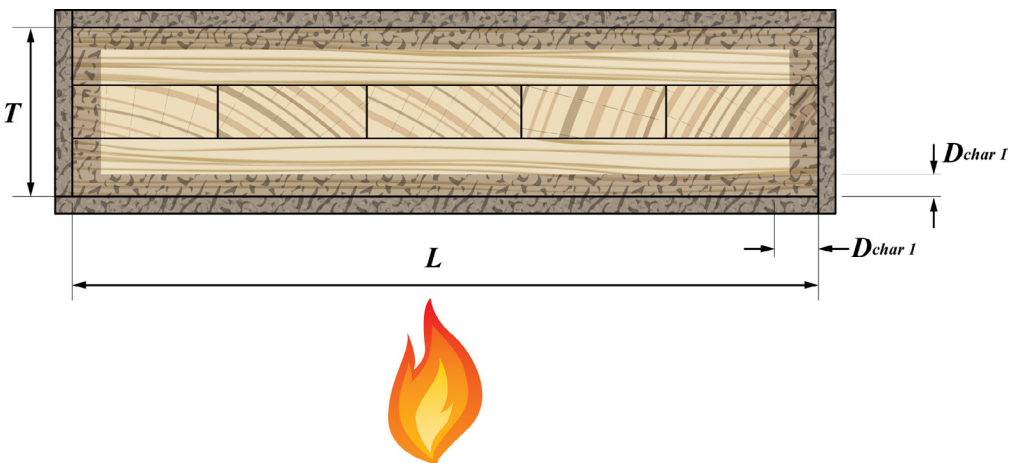
CLT configuration	Exposed ($D_{char,D}$)				1 x 16 plasterboard ($D_{char,1}$)				2 x 16 plasterboard ($D_{char,2}$)			
	30 (minutes)	60 (minutes)	90 (minutes)	120 (minutes)	30 (minutes)	60 (minutes)	90 (minutes)	120 (minutes)	30 (minutes)	60 (minutes)	90 (minutes)	120 (minutes)
CL3/90	29.5	-	-	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL3/100	29.5	-	-	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL3/110	29.5	54.5	-	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL3/120	29.5	54.5	-	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL3/130	29.5	64.5	-	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL5/140	29.5	64.5	-	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL5/155	29.5	64.5	-	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL5/170	29.5	54.5	-	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL5/190	29.5	54.5	89.5	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL5/200	29.5	54.5	89.5	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL5/220	29.5	54.5	87.0	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL7/240	29.5	54.5	99.5	-	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL7/260	29.5	54.5	89.5	124.5	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL7/270	29.5	54.5	89.5	124.5	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL7/290	29.5	54.5	89.5	122.0	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5
CL7/310	29.5	54.5	87.0	122.0	7.0	17.5	28.0	38.5	7.0	7.0	7.0	17.5

Note: For determining the residual section of the XLam CLT Blade Walls, the char depth should be applied to all sides of the blade wall.

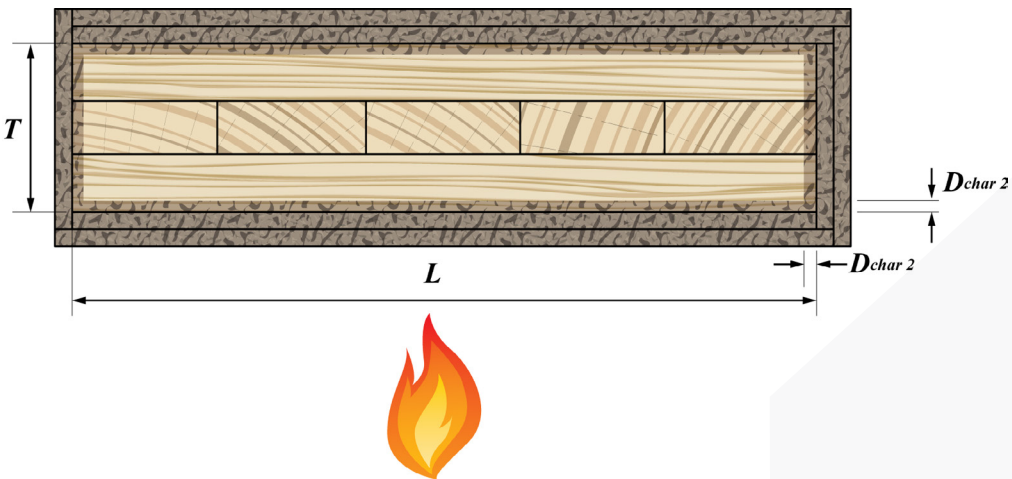
Exposed Blade Wall



Blade Wall Protected with One Layer of Fire Rated Plasterboard



Blade Wall Protected with Two Layers of Fire Rated Plasterboard



User feedback

Cross Laminated Timber (CLT) is relatively new to Australasia. Building with XLam CLT brings many benefits to the construction market. The overriding aim of this design guide is to make an easy pathway for designers. Its success is best judged by you as users. XLam welcomes all user feedback for future improvements.

Disclaimer

This Fire Design Guide summarises testing and assessment of XLam's CLT panels under fire conditions, it is not intended to be used for certification purposes. Fire test reports and assessments are available separately. Information provided in this document is supplied in good faith and to the best of our knowledge was correct at the time of preparation. No responsibility can be accepted by XLam, its staff or its agents for any errors or omissions. Users are advised to make their own determination as to the suitability of this information in relation to their purposes and specific circumstances. No warranty or assurance can be given that XLam CLT panels and the installation details provided will suit individual projects. XLam disclaims all liability and responsibility for any loss or damage, direct or indirect, which may be suffered by any person acting in reliance on anything contained in or omitted from this Fire Design Guide.



XLam Australia
19 Bilston Drive
Barnawartha
North Victoria 3691
AUSTRALIA

enquiries@xlam.com.au
xlam.co

XLam New Zealand
53 Tidal Road
Mangere
Auckland 2022
NEW ZEALAND

enquiries@xlam.co.nz
xlam.co