MASSLAM

ASH

Your mass timber solution

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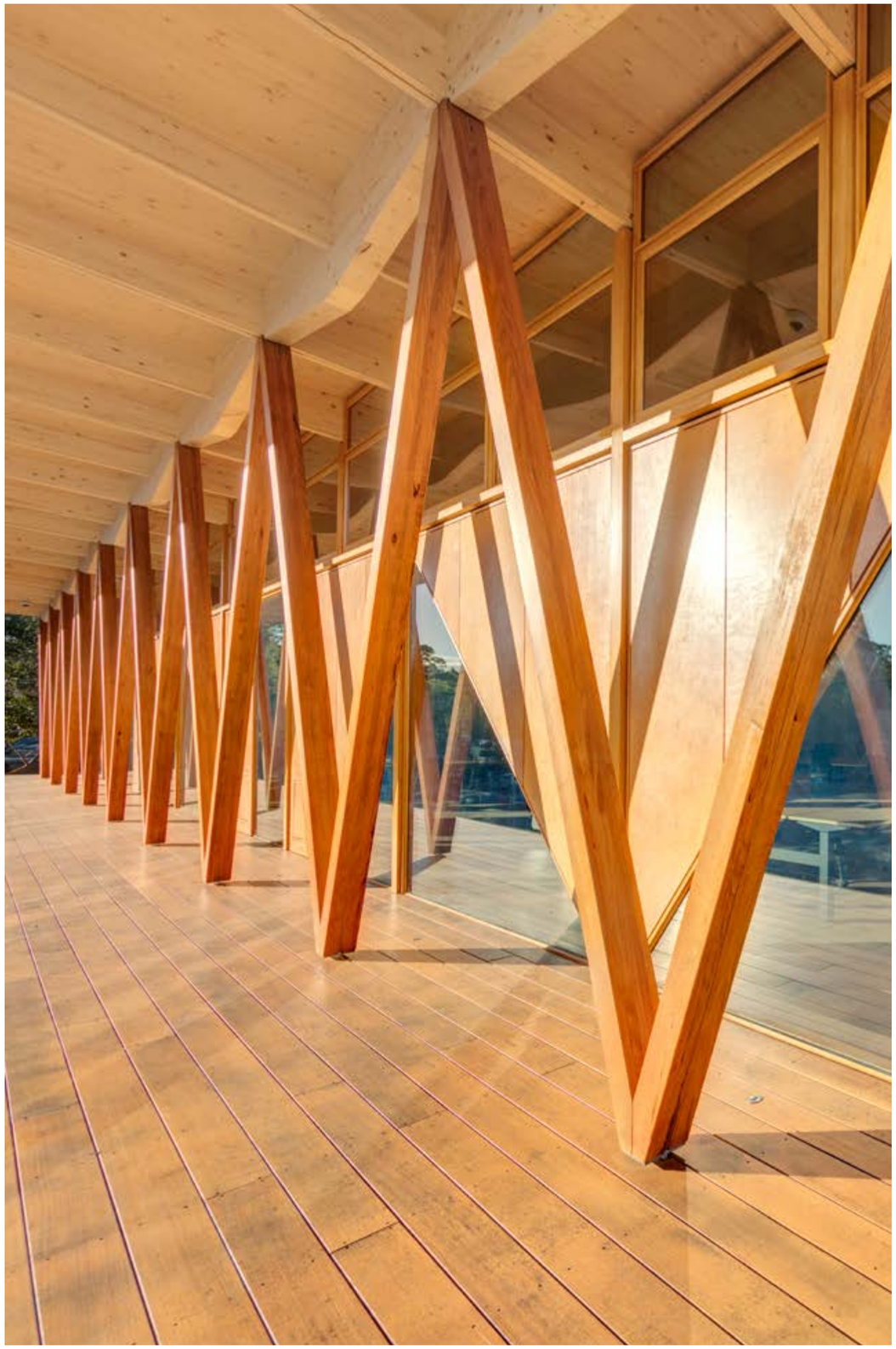


1. INTRODUCTION TO MASSLAM

1.1 What is MASSLAM?

MASSLAM is Australian Sustainable Hardwoods' (ASH) range of mass-timber solutions.

Grown, owned and produced in Victoria, MASSLAM is a range of glue-laminated timber systems (including columns, beams and floors); intended for large domestic and commercial structures; designed and manufactured for assembly.

Utilising uniquely attractive Australian timbers, chosen because they have some of the best strength-to-weight ratios of any timber species worldwide, MASSLAM has advantages that allow longer spans, higher ceilings, increased floor space, lesser beam depth and lower associated installation costs.

Better still, MASSLAM is cheaper to construct than concrete and steel, looks better, is safe, sustainable and efficient.

1.2 WHY MASS TIMBER?

Population growth and urban sprawl across major centres around the globe is placing increased pressure on the need for housing and infrastructure; demanding an ever-increasing appetite for resource and finite materials.

Traditional construction is reponsible for anywhere up to 50% of the world's CO2 emissions through embodied energy. In a sustainability conscious world, the construction industry is diverting its focus toward reducing the impact on waste and climate change. As our cities increase in size and height, our thirst for robust materials will continue to grow. As a result, a disconnect with nature and associated psychological impacts will intensify. Thanks to technological advances and continuous improvement in manufacturing, one material has emerged with the opportunity to reverse this trend and is gaining international recognition as the solution to our modern day needs: mass-timber construction.

MASSLAM utilises massive sections of glue laminated timber in structural applications – replacing finite materials such as concrete and steel.

Having significantly lower embodied energy to produce a solution, combined with CO2 sequestration during growth, mass-timber is truly 'better than carbon neutral'. The amount of CO2 stored within one cubic metre of MASSLAM after embodied energy is deducted equals approximately 673kg. A 1,000 cubic metre project will store 673 tonnes of CO2 and can be regrown in as little as 5 minutes in Victorian forests. Sustainable forest certification ensures the forests are responsibly managed in perpetuity and with fewer lasting environmental impacts, the construction industry can now be the answer.

Better still, MASSLAM used in visual applications doesn't just look great but adds to biophilia in the built environment – helping humans feel more connected to nature and subsequently creating happier work places, increasing productivity and lowering stress.

INTRODUCTION TO AUSTRALIAN SUSTAINABLE HARDWOODS (ASH)

ASH is a privately owned Australian timber sawmill and manufacturer. Established over 30 years ago, the operation has grown to become one of the largest timber mills in Australia and operate the largest hardwood manufacturing facility. Automated manufacturing efficiencies, innovation and economy of scale allows ASH to compete with international markets.

ASH are at the forefront of construction innovation in Australia. ASH have a history of developing new markets and innovations while manufacturing to the highest standards possible; by utilising the latest and most efficient automation technology, innovative new glue and coating systems and passing independent tests against Australia's strict building standards.

ASH process 80,000m3 of regrowth Victorian ash sawlogs per annum and purchase additional import feedstock as required for specific markets. This combined feedstock is used as the supply for ASH's 6 timber manufacturing lines and creates a competitive advantage.

The operation is based in Heyfield, Victoria and directly employs more than 170 people.

ASH is situated on two sites in Heyfield and process from regrowth log to finished component – true vertical integration.

Products include mass-timber solutions, components for windows, doors, staircases, furniture and many other products including glue laminated timber panels, structural beams, engineered flooring and cladding. These products are distributed throughout Australia and the world.

1.3 THE GLULAM SPECIALISTS

ASH has produced glulam products since 1996 and is the largest and one of the most experienced producers in Australia. ASH now produce more than 100m3 per day.

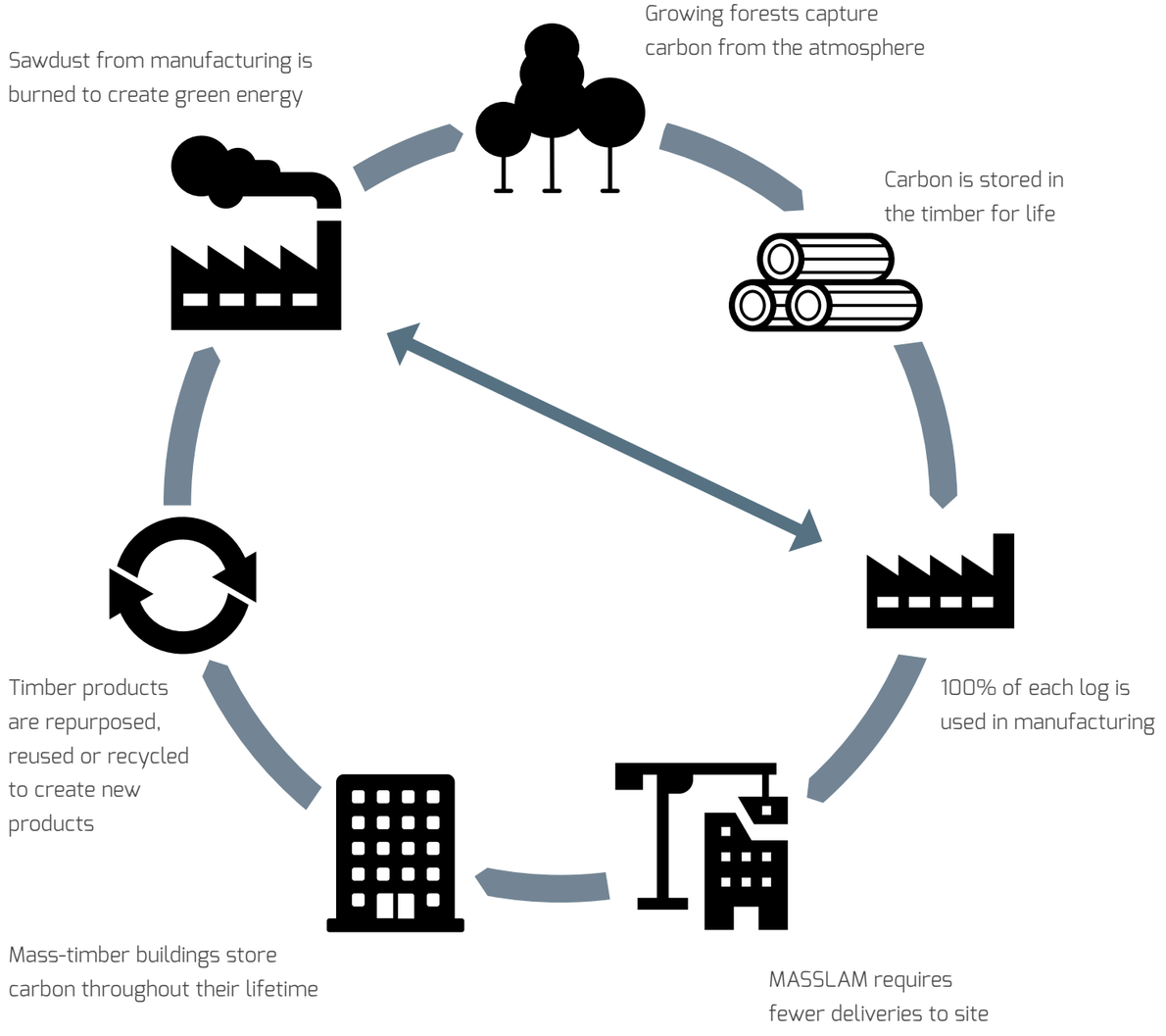
The MASSLAM line extends on this experience by utilising the most advanced, automated finger jointing and laminating equipment available, the largest 4-side moulder in the world, the largest and most efficient new generation Hundegger K2i (CNC) available, an automated coating and production line and connector assembly.

With our experience, technology and unique machinery, ASH can produce the best mass timber value proposition in the world.

2. BENEFITS OF PREFABRICATED MASSLAM

2.1 SUSTAINABILITY

Timber is one of the few building materials with the ability to create a closed loop, circular economy. The very existence of sustainable timber production helps reverse anthropogenic climate change. No other commercially available building material boasts the renewable characteristics of timber. Timber is The Ultimate Renewable and MASSLAM is third party certified for sustainability by PEFC.



2.2 COST SAVINGS

According to detailed studies by WoodSolutions, commercial structures built with mass timber offer cost savings over concrete and steel. Speak to your MASSLAM specialist for the detailed report.

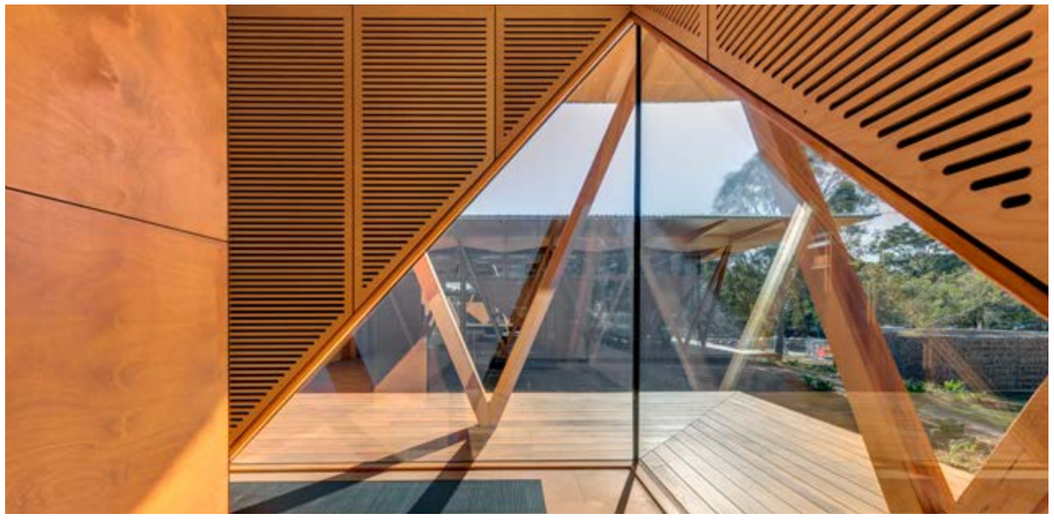
2.3 SPEED

Consistently installing faster than traditional construction, recent mass timber case studies comparing multiple projects in Australia have shown up to 30% faster construction times. Much of this can be attributed to early services rough-in and assembly. This speed and efficiency comes from the fact that mass timber is lighter, easier, safer to handle and install than concrete and steel.

Speed of construction is a substantial consideration in cost assessment due to time related expenses such as crane and other plant hire; wages for on-site workforce; insurances premiums; permits and certifications. The reduced program offered by timber structures can also enable time critical projects to be realised. This can be a crucial consideration for many projects, including schools and student accommodation buildings, for which funding periods can be set and term dates fixed.

2.4 SAFETY

The constructability of mass-timber builders are safer in general. Tier 1 builders are reported as stating many projects show no Lost Time Injuries. Part of the reason for this is the elimination of on-site risks with prefabrication. Prefabricating or pre-attaching connectors in an automated assembly off-site before delivery reduces the need for working at heights as well as the time required to assemble. Smaller and easier hand tools are utilised, as are smaller crews. Additionally, there is less need for welding or hot works, easier anchoring of safety harnesses, the ability to pre assemble safety barriers and eliminate live-edges before craning.



2.5 ACCURACY

All MASSLAM members uniquely pass through the world's largest four-side planer to ensure clean surface and squareness before machining. ASH's Hundegger (CNC) then machines to within +/-1mm accuracy to the parameters drawn out in earlier 3D design model. With the ability to efficiently and automatically process up to 1,300 x 450mm end sections, MASSLAM does not need to be block laminated. Block laminating requires two halves (or more) to be CNC profiled and then joined together – often creating misalignment of profiles and negating the millimetre accuracy of the CNC or four-side planer. ASH's process eliminates this risk. Given some MASSLAM products are ~40% stronger than international mass-timber, there's no need to design with members thicker than 450mm or to block laminate.

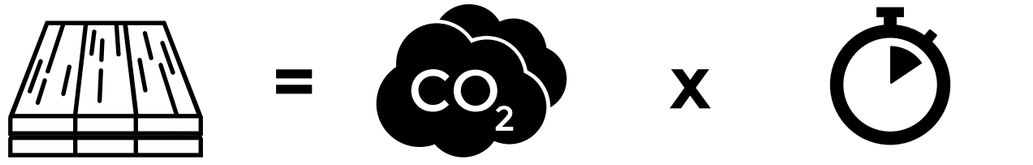
Comparatively, concrete and steel tolerances can be +/-15mm.

The benefits of accuracy in MASSLAM are far and wide but can be critical for air tightness, installation, energy efficiency, constructability and overall building performance.

2.6 LIGHTER

MASSLAM is 18% the weight of concrete and 80% the weight of steel for the same structural requirement. This means there is less need for expensive foundations. It also means more material can reach site with fewer deliveries. Lifting is quicker and can be done with smaller cranes. Less noise, dust, vibrations and truck movements result in less disruption of neighbourhoods and existing activities or tenants.

2.7 CARBON CALCULATOR



1,000m3 wood stack

673,000kg stored carbon

Regrown in as little as 5 minutes

3. (DfMA) - DESIGN FOR MANUFACTURE & ASSEMBLY

3.1 A different way of building, a different way of designing

Prefabrication and off-site assembly will increase speed and quality of a build but requires a complete change in thinking. Design teams are required to put in more work up front so that the desired prefabrication and assembly efficiencies can be realised. Buildings cannot be partially designed before fabrication – prefabrication of each element is governed by the digital 3D design model. The building must be considered 100% complete before processing. There can be no change of design once manufacturing has commenced. An example of the benefits of DfMA is shown below.

The process begins with your plans where ASH offer a basic 'reverse engineered' guide of various products to narrow in on the best outcome for the clients' needs. Once the MASSLAM products and system are selected, the engineering team create a digital 3D model detailing all of the chosen components with intricate details including connection types, sizes, screws, CNC requirements and the exact locations of every detail. Potential issues with the plans can be addressed during this detailed 3D model by the engineering team – rather than being fixed on site by an expensive labour force or holding up the critical path.

Once the client signs off on the 3D model the project is considered 'effectively built' and cannot be altered. This information feeds the MASSLAM automated production and CNC line where coatings, attaching of connectors and labelling of each member ensures superior on-site installation efficiencies. ASH can even deliver in order of lifting sequence (subject to prior approval).

TRADITIONAL SITE BUILT CONSTRUCTION –CHRONOLOGICAL PROCESS

OFF-SITE CONSTRUCTION – SIMULTANEOUS PROCESS

3.2 Engage with your MASSLAM specialist early

Get in early. Do not design too far down the path before talking with your MASSLAM specialist.

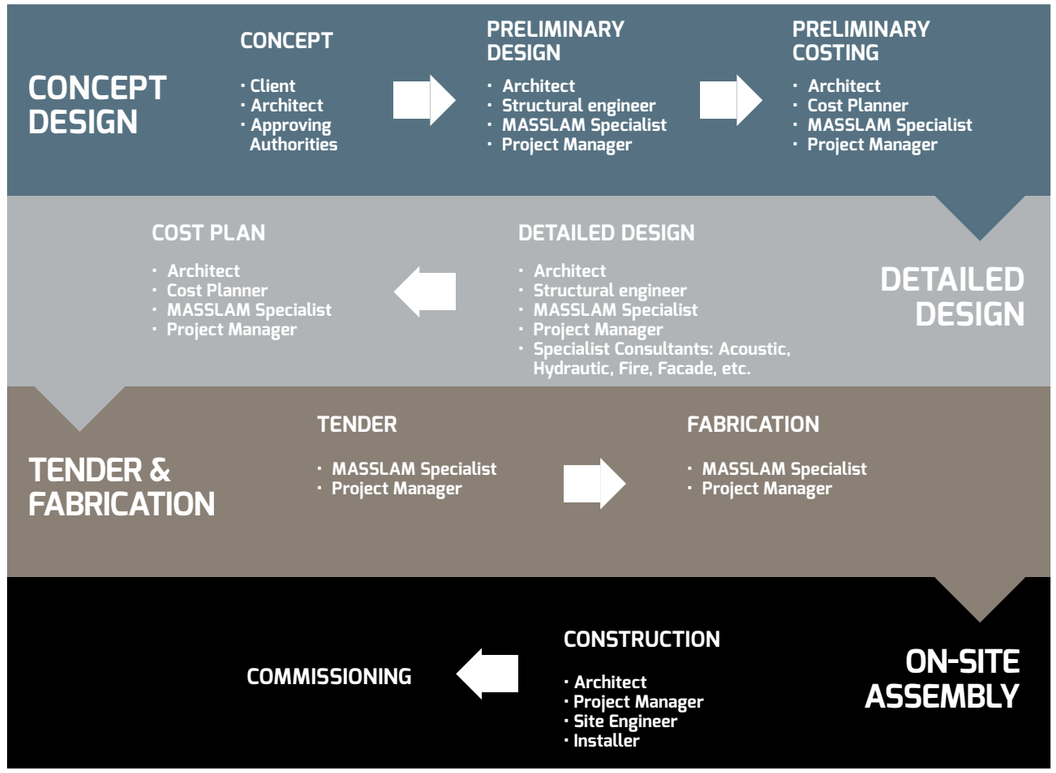
MASSLAM is available in uniquely high strength materials that can offer:

- **smaller columns with increased usable floor space**
- **larger grids with fewer columns per floor**
- **alignment with basement parking (eliminating expensive transfer slabs) - ie – 9x9m, 9x12m or 12x12m**
- **shallower beams for additional floor to ceiling heights**
- **longer spans without lowering ceiling height**
- **additional joint strength for smaller and more competitive connectors**
- **less overall weight resulting in reduced foundations**
- **In some cases, additional levels**
- **better fire performance**

All construction materials require unique consideration of their strength and weakness in order to maximise cost efficiency. MASSLAM can be the most cost effective of all systems but this may not be the case if you design for concrete or imported mass timber and hope to compare price.

It is for these reasons why it is imperative to get your MASSLAM specialist in early. See Design and Construction chain below.

3.3 MASSLAM DESIGN & CONSTRUCTION CHAIN



4. MASSLAM PROCESS / SERVICE

SHOP DRAWINGS	GLUE LAMINATE	CNC	COATINGS/FIXINGS	DELIVER
Completed Design used to create shop drawings. Building is considered 'complete' from a design perspective. Shop drawings determine prefabrication process.	Chosen species used as feedstock to create glue laminated components. Each species has its own unique strength and appearance.	Robotic CNC profiling performed on each member per design and fixing requirement The initial expense here is rewarded with great on-site savings later. Largest K2i in the world	A factory coat/ primer is applied to mitigate risk of damage from weather during construction. Fixings are factory connected so members assemble together on site.	Deliveries are performed in order of lifting sequence to greatly increase on-site productivity.

5. STRENGTH CHARACTERISTICS TABLE

PROPERTY	MASSLAM 50	MASSLAM 45	MASSLAM 33	MASSLAM 30
Species	Mountain Grey Gum	Victorian Ash	Hybrid Pine (Pinus elliotti x Pinus caribaea)	Radiata
Stress Grade	GL21 (as per AS1720.1) or GL45 per EN14080 : 2013	GL18 (as per AS1720.1) or GL45 per EN14080 : 2013	GL17 (as per AS1720.1) or GL40 per EN14080 : 2013	GL13 (as per AS1720.1) or GL40 per EN14080 : 2013
Bending Strength	F'b = 50MPa	F'b = 45MPa	BF'b = 40MPa	BF'b = 33MPa
Tension Strength	F't = 25MPa (parallel) F'tp = 0.8MPa (perpendicular)	F't = 25MPa (parallel) F'tp = 0.8MPa (perpendicular)	F't = 20MPa (parallel) F'tp = 0.5MPa (perpendicular)	F't = 16MPa (parallel) F'tp = 0.5MPa (perpendicular)
Shear Strength	F's = 5.0MPa	F's = 5.0MPa	F's = 4.2MPa	F's = 4.2MPa
Compression Strength	F'c = 50MPa	F'c = 45MPa	F'c = 33MPa	F'c = 26MPa
Bearing Strength	F'l - 67MPa (parallel) F'p = 23MPa (perpendicular)	F'l - 59MPa (parallel) F'p = 19MPa (perpendicular)	F'l - 40MPa (parallel) F'p = 13MPa (perpendicular)	F'l - 30MPa (parallel) F'p = 10MPa (perpendicular)
Modulus of Elasticity	E= 21,000MPa	E= 18,500MPa	FE= 16,700MPa	FE= 13,300MPa
Modulus of Rigidity	G= 1,400MPa	G= 1,230MPa	G= 1,1110MPa	G= 900MPa
Strength Group	SD2	SD3	SD5	SD6
Joint Group	JD2	JD3	JD3	JD4
Design Density	850kg/m3	650kg/m3	650kg/m3	550kg/m3
Service Class	1, 2 & 3 only if untreated (3 in IRON ASH treatment with limitations)	1 & 2 only if untreated (3 in IRON ASH treatment with limitations)	1 & 2 only if untreated (3 in IRON ASH treatment with limitations)	1 & 2 only if untreated (3 in IRON ASH treatment with limitations)
Adhesive	Externally rated, high temperature PUR	Externally rated, high temperature PUR	Externally rated, high temperature PUR	Externally rated, high temperature PUR
Formaldehyde Emissions	None (E-0)	None (E-0)	None (E-0)	None (E-0)
Certification	PEFC	PEFC	PEFC	PEFC
Char rate*	0.4523mm per min	0.4765mm per min	0.62mm per min	0.9582mm per min
Movement in Service -Axial	0.02% per 1% change in MC	0.02% per 1% change in MC	0.02% per 1% change in MC	0.02% per 1% change in MC
Movement in Service - Radial	0.20% per1% change in MC	0.20% per1% change in MC	0.27% per1% change in MC	0.20% per1% change in MC
Movement in Service - Tangent	0.31% per 1% change in MC	0.31% per 1% change in MC	0.31% per 1% change in MC	0.27% per 1% change in MC

*Char rate is not linear. Speak to your MASSLAM specialist for details

6. MASSLAM APPEARANCE

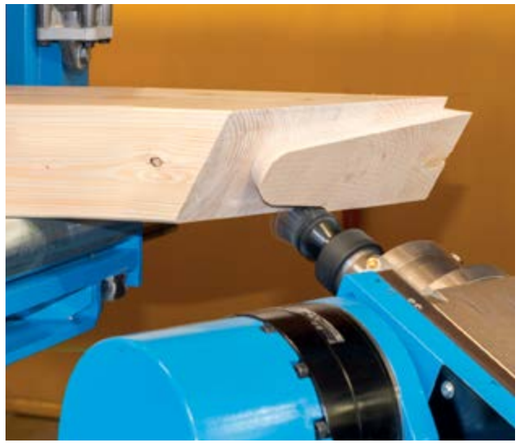
CHARACTERISTIC	MASSLAM 50	MASSLAM 45	MASSLAM 33	MASSLAM 30
Machine finish	≡ 60 grit	≡ 60 grit	≡ 60 grit	≡ 60 grit
Machine tolerance	As per AS2796	As per AS2796	As per AS2796	As per AS2796
Grain structure of feedstock	Quarter sawn for stability	Quarter sawn for stability	Back sawn	Back sawn
Gum Vein – Tight	No limit	No limit	NA	NA
Gum Vein – Loose	No limit	No limit	NA	NA
Gum Pockets	No greater than 7mm wide and 4mm deep	No greater than 7mm wide and 4mm deep	NA	NA
Sound Knots/Burls	No limit	No limit	No limit	No limit
Loose Knots	Nil	Nil	Filled	Filled
Pinhole	No limit	No limit	No limit	No limit
Hobnail	No limit	No limit	No limit	No limit
Black Speck	No limit	No limit	No limit	No limit
Rot/Decay	Nil	Nil	Nil	Nil
Heartwood	Nil	Nil	Nil	Nil
Checking	No limit	No limit	No limit	No limit

7. GLULAM AND CNC CAPACITY

The MASSLAM line operates the largest and most efficient glulam CNC in the world with precision accuracy. This machine can process end sections up to 1,300 x 450mm with millimetre accuracy in one automated pass. The Hundegger K2i has over 160 tools and 6-axis machining. Tools available include saws, chain saws, routers and drills – to name a few. Tools chosen for use are determined by the 3D model and construction requirements. A full CNC Machining Capability Brochure is available for download on the MASSLAM webpage.

7.1 CONNECTION TYPES

CNC Machining makes for efficient and attractive profiling of members but they also cater to an infinite number of connection possibilities. These include concealed dovetail connections, birdsmouth connections, steel plates, mortise and tenon joints, pilot screw holes, char plugs and processing for all proprietary connection types. Talk to your MASSLAM specialist about preferred connection types specific to your project.



8. COATING

MASSLAM members can be coated or stained to meet the design intent. Critically, coating is required to protect members from damage due to variations in humidity or exposure to UV and weather. The MASSLAM line is equipped with a coating line to allow members be delivered with at-least one protective coating before delivery. Final coats are required after installation for adequate protection. For more detail, see the MASSLAM Design Guide and MASSLAM Coating Guide – available for download on the MASSLAM webpage.

Below are some examples of the colour range available for MASSLAM. Talk with a MASSLAM specialist to get the right colour for your design.

9. KEY CONSIDERATIONS

Clients should also read the following MASSLAM documents for long term satisfaction of MASSLAM solutions and design considerations. All are available for download on the MASSLAM webpage:

- MASSLAM Design Guide
- MASSLAM Span tables
- MASSLAM Machining Capability Brochure
- MASSLAM Coating Guide

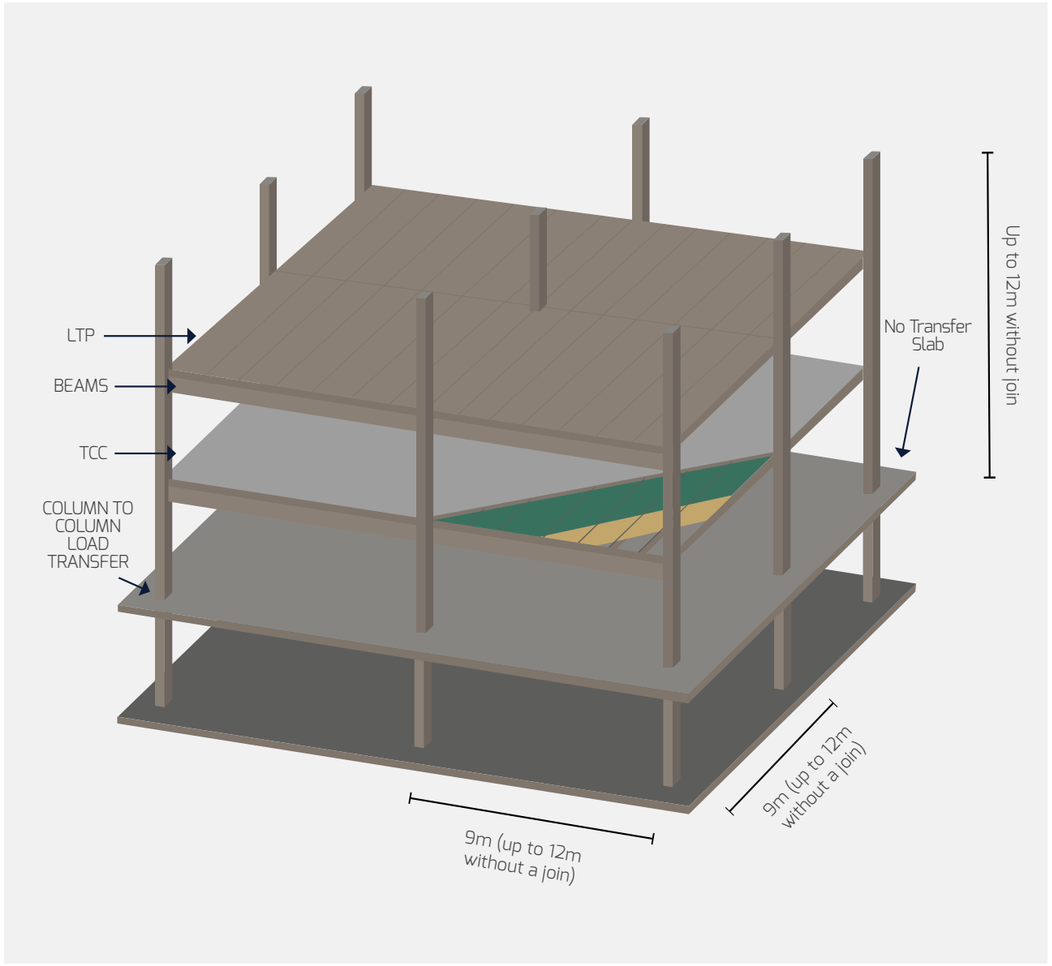
10. APPLICATIONS

a. Columns

b. Beams

c. Timber/Concrete Composite (TCC) floors

d. Laminated Timber Panels (LTP)



11. ADVANTAGES OF MASSLAM OVER TRADITIONAL MASS TIMBER

Longer spans/grids

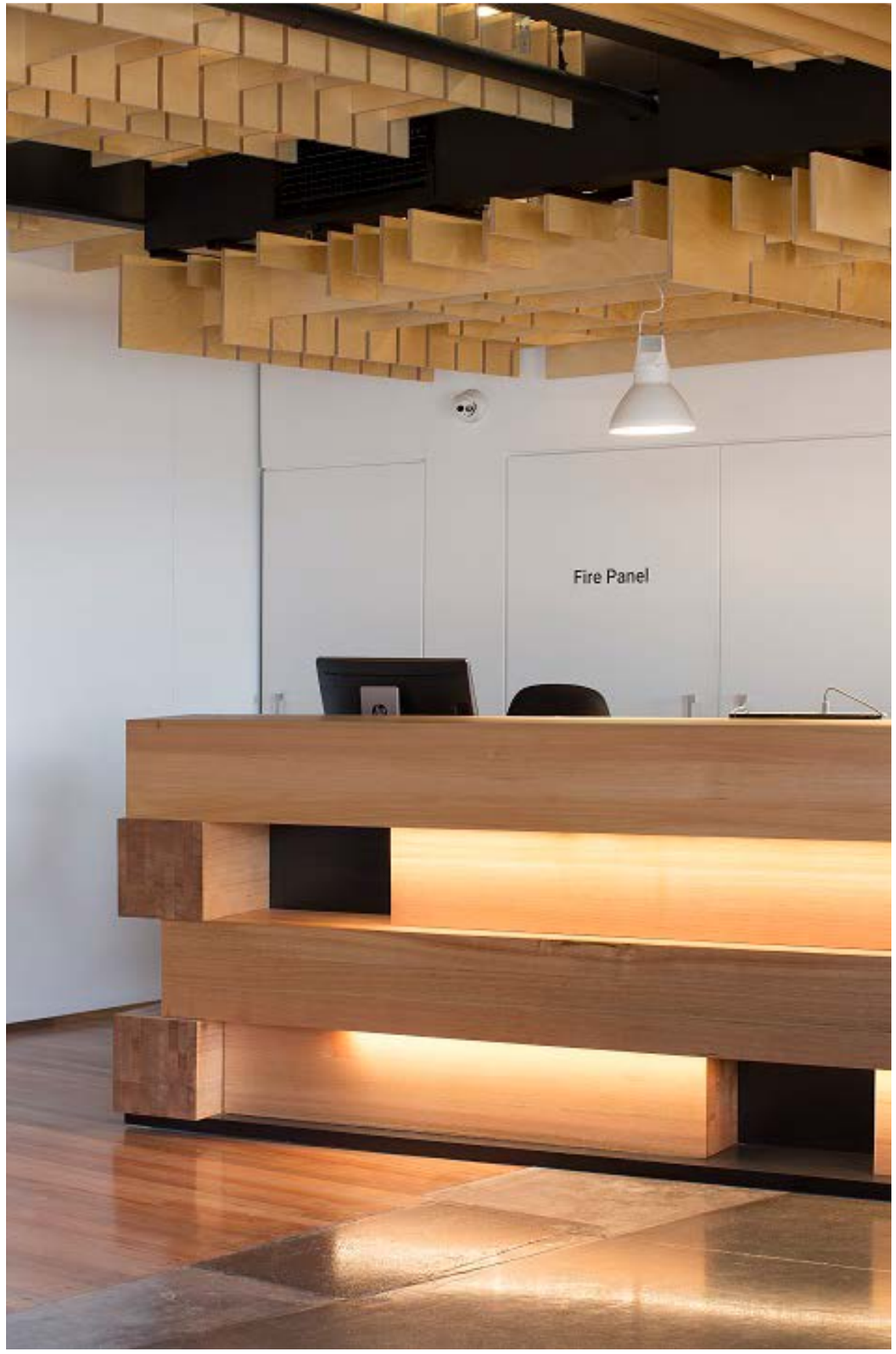
Can match basement grid - 9x9m, 9x12m and 12x12m

Smaller end sections with same structural strength – additional floors, higher celings or less wood fibre

No misaligned profiles

Certified against AS1530.4

ADVANTAGE OF LOCAL	LOCAL	IMPORTED
No hidden costs such as fumigation	✔	✘
No shipping damage	✔	✘
No additional transport and insurances	✔	✘
No stamp duty and exchange rates	✔	✘
No cost of tying up money	✔	✘
No risks of poor communication or reaction times	✔	✘
No international law commercial risks	✔	✘
No blown out lead times or priority as an international customer	✔	✘



12. FIRE RESISTANCE

Mass timber buildings can be safer than traditional builds under fire, particularly sprinklered buildings. Large sections of timber are very hard to burn. Imagine trying to start a fire with a large log!?! (You can't).

Even under extreme fire, MASSLAM has calculable performance and maintains structural integrity. As MASSLAM is exposed to fire, a level of char is created on the fire-affected surface while maintaining structural strength behind this 'char layer'. The structural strength is directly proportionate to the unaffected wood. Concrete with steel connections will buckle under the same heat.

MASSLAM is independently fire tested under load and for char against AS1530.4 for up to 120 minutes. With the char rate being predictable and known, designing for fire to meet the code can be as simple as adding a sacrificial char layer equivalent to the FRL requirements. See Figure 12.1 below.

For example, if a 300mm x 300mm MASSLAM 45 column in a commercial building is required to achieve a FRL of 60min, the column could be supplied in one of the following options:

- additional wood fibre equivalent to 60 minutes on each fire-exposed surface of the post. Becoming 360 x 360mm
- 300 x 300 + two layers of overlapping fire proof plasterboard (meeting the DtS provisions of the NCC)
- Using a fire engineers 'Performance Solution'

12. COMPLIANCE

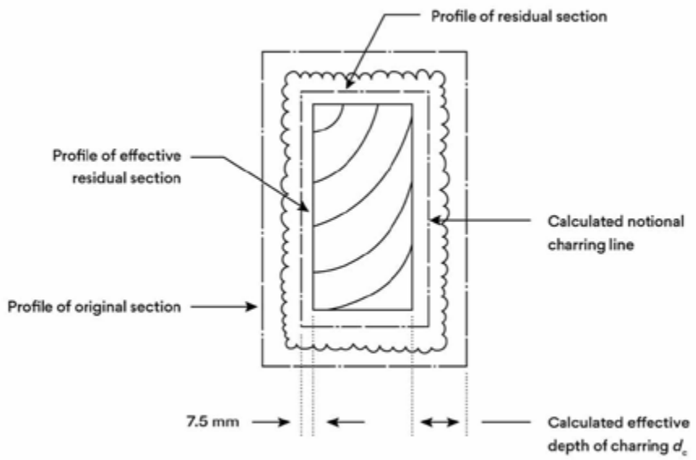


FIGURE 12.1 LOSS OF SECTION DUE TO CHARRING

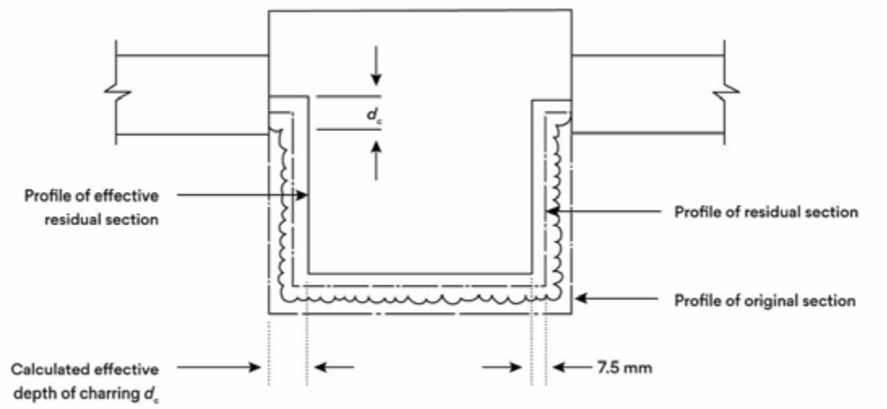


FIGURE 12.2 DETAILS OF CHARRING AT JUNCTION WITH FIRE PROOF BARRIER

For more detail around how to design for fire, refer to the MASSLAM FRL certificates or contact your MASSLAM specialist. Above: Copy of diagrams from AS1720.4 showing the charring effect of fire. Note: The 'Calculated effective depth of charring d_c' is equal to the 'Calculated notional charring line'

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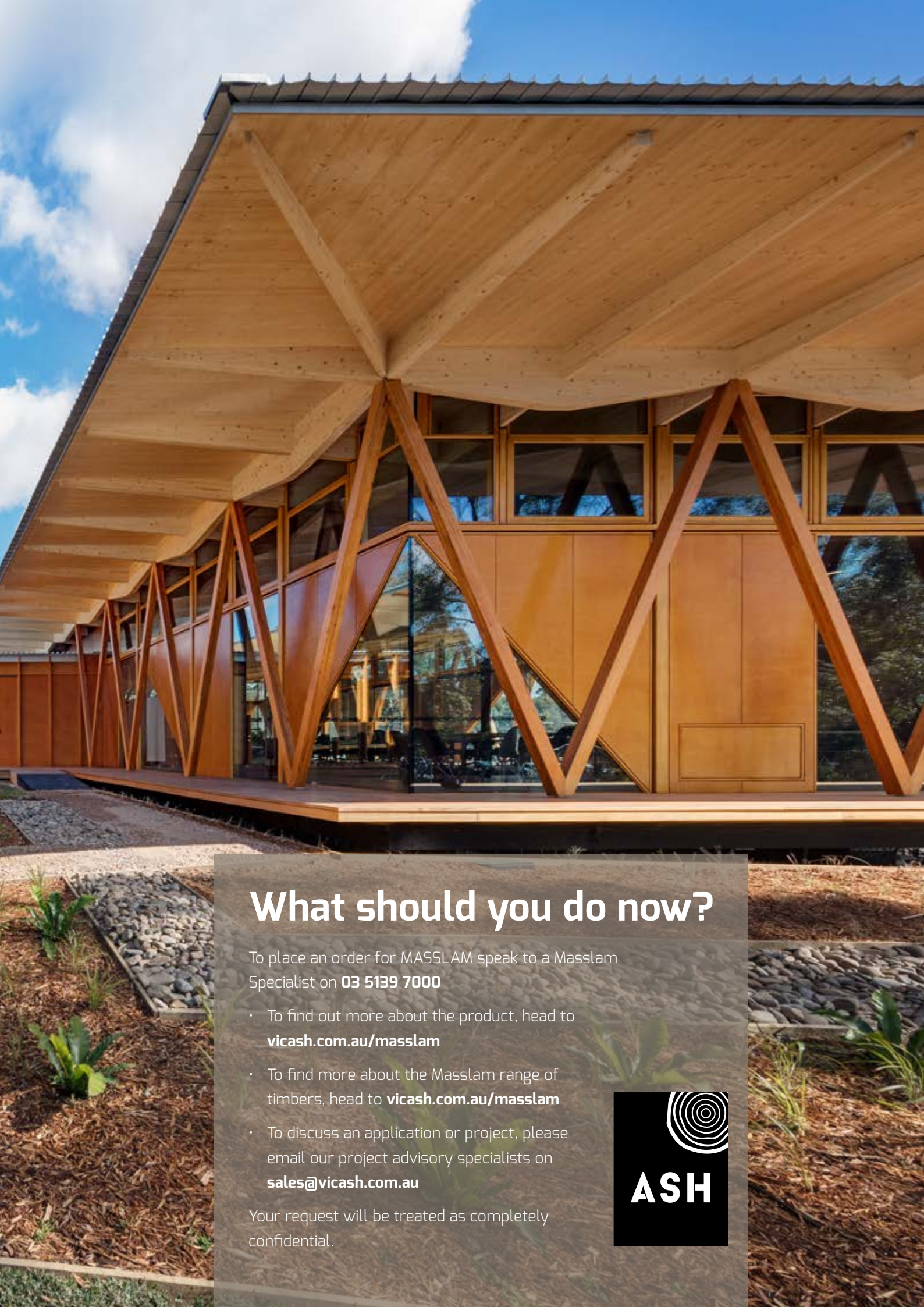

What should you do now?

To place an order for MASSLAM speak to a Masslam Specialist on **03 5139 7000**

- To find out more about the product, head to **vicash.com.au/masslam**
- To find more about the Masslam range of timbers, head to **vicash.com.au/masslam**
- To discuss an application or project, please email our project advisory specialists on **sales@vicash.com.au**

Your request will be treated as completely confidential.

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