

MASS TIMBER MEMBERS.

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WHAT IS MASSLAM?

MASSLAM is Australian Sustainable Hardwoods Pty Ltd (ASH) range of massive timber members – also known as Glue Laminated Timber, GLT or glulam.

MASSLAM is a high strength, visually appealing, affordable, 'ready to construct' column and beam system for domestic and large commercial buildings.

Manufactured in Heyfield, using Australian grown, superior strength timber, the MASSLAM range of products offer significant benefits when comparing with other mass timber options worldwide.



IRON ASH treated MASSLAM 45 V-Columns at Macquarie University, 'Incubator', NSW, Australia.



SPECIFICATIONS & CHARACTERISTICS

MASSLAM members have some of the highest strength to weight characteristics of all ‘mass-timber’ options worldwide. They are made using the PEFC certified and sustainably grown Australian species.

Property	MASSLAM 50	MASSLAM 45	MASSLAM 40	MASSLAM33
Species	Mountain Grey Gum	Victorian Ash	Hybrid Pine (Pinus elliottii x Pinus caribaea)	Radiata Pine
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 GL33 per EN14080 : 2013
Bending Strength	F'b = 50MPa	F'b = 45MPa	F'b = 40 MPa	F'b = 33MPa
Tension Strength	F't = 25MPa (parallel) F'tp = 0.8MPa (perpendicular)	F't = 25MPa (parallel) F'tp = 0.6MPa (perpendicular)	F't = 20 MPa (parallel) F'tp = 0.5 MPa (perpendicular)	F't = 16MPa (parallel) F'tp = 0.5MPa (perpendicular)
Shear Strength	F's = 5.0MPa	F's = 5.0MPa	F's = 4.2 MPa	F's = 4.2MPa
Compression Strength	F'c = 50MPa	F'c = 45MPa	F'c = 33 MPa	F'c = 26MPa
Bearing Strength	F'l – 67MPa (parallel) F'p = 23MPa (perpendicular)	F'l – 59MPa (parallel) F'p = 19MPa (perpendicular)	F'l – 40 MPa (parallel) F'p = 13 MPa (perpendicular)	F'l – 30MPa (parallel) F'p = 10MPa (perpendicular)
Modulus of Elasticity	E = 21,000MPa	E = 18,500MPa	E = 16,700 MPa	E = 13,300MPa
Modulus of Rigidity	G = 1,400MPa	G = 1,230MPa	G = 1110 MPa	G = 900MPa
Strength Group	SD2	SD3	SD5	SD6
Joint Group	JD2	JD3	JD3	JD4
Design Density	850kg/m3	650kg/m3	600kg/m3	550kg/m3
Service Class	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)	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
Maximum char rate 120 minute FRL	0.4523mm per min	0.4765mm per min	TBA	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% per 1% change in MC	0.20% per 1% change in MC	0.27% per 1% change in MC	0.20% per 1% 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

COATINGS & APPEARANCE

ASH operates a four sided planer that enables members up to 1300mm x 450mm x 12,000mm to be dressed square and with an arris prior to the CNC process. Pencil round corners or square edges can be produced on request. This ensures an exceptionally accurate building product. MASSLAM is intended for use in stained or coated applications where the member is part of the aesthetics. Occasional skips in the surface are permissible and minor blemishes, checking and voids in timber shall be acceptable.

MASSLAM is available and recommended to be supplied with a protective primer before leaving the processing plant. It will require sanding and polishing to achieve a furniture finish. Talk to your MASSLAM specialist about coating options.

CHARACTERISTIC	MASSLAM 33	MASSLAM 40	MASSLAM 45	MASSLAM 50
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	Back sawn	Back sawn	Quarter sawn for stability	Quarter sawn for stability
Gum Vein – Tight	NA	NA	No limit	No limit
Gum Vein – Loose	NA	NA	No limit	No limit
Gum Pockets	NA	NA	No greater than 7mm wide and 4mm deep	No greater than 7mm wide and 4mm deep
Sound Knots/Burls	No limit	No limit	No limit	No limit
Loose Knots	Filled	Filled	Nil	Nil
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

SPAN CAPACITY

MASSLAM is produced in lengths up to 12m in the factory. Beam connections can be utilised when longer lengths are required. For Class 5 Office builds with large spanning 'grids', beams can span up to 12 metres without the need for additional columns in-between. Heavy loads can be accommodated which makes this beam suitable for use in multi storey building applications.

MASSLAM columns are also capable of being supplied up to 12 metres. This means each member is capable of bearing heavy loads in four storey multiples to increase construction speed.

MASSLAM columns exceeding a clear height of 5m within one storey can be designed to bear high loads without the need of restraints.

STRUCTURAL DESIGN

MASSLAM span tables and suggested sizes are available for download at vicash.com.au/masslam-span-tables

DURABILITY, WEATHER EXPOSURE AND SUITABILITY

Service Class 1

Characterised by moisture content in the material corresponding to a temperature of 20 °C and relative humidity of the surrounding air only exceeds 65% for a few weeks per year – i.e. Indoor, controlled environment.

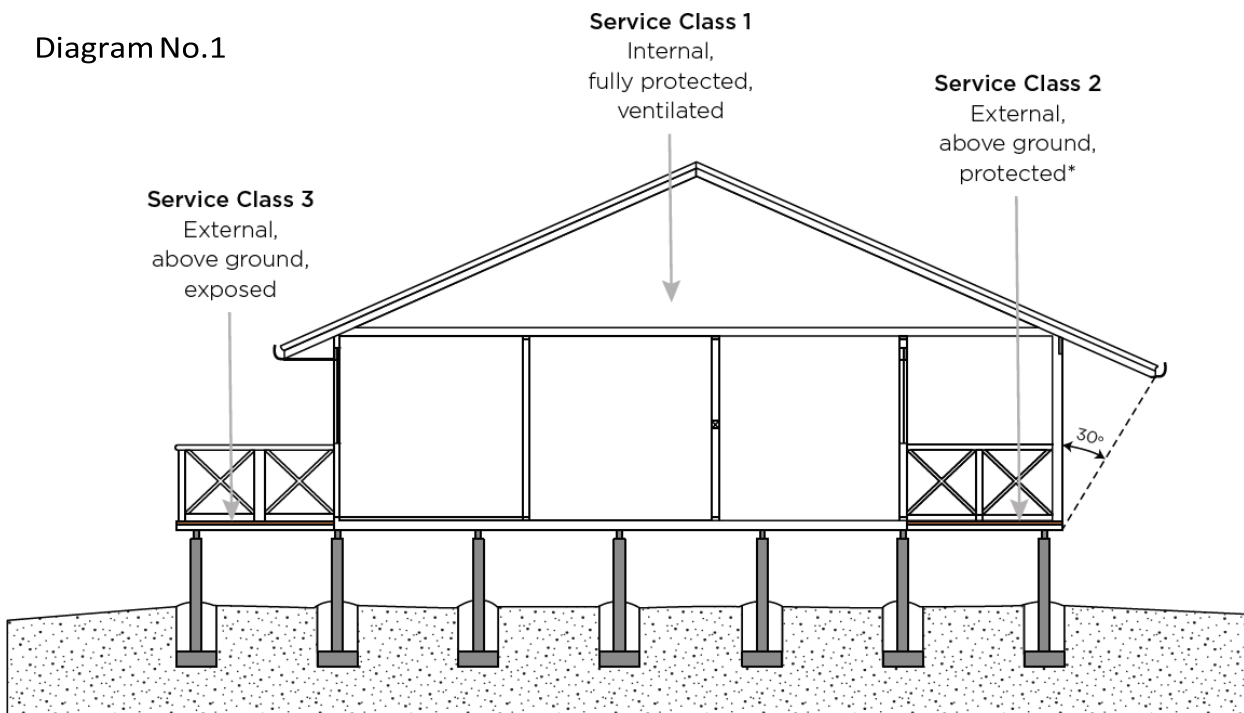
Service Class 2

Characterised by moisture content in the material corresponding to a temperature of 20 °C and relative humidity of the surrounding air only exceeds 85% for a weeks per year – i.e. protected from weather but exposed to environment.

Service Class 3

Characterised by climatic conditions leading to higher moisture contents than Service Class 2, or where timber is directly exposed to sun and/or rain– i.e. fully exposed.

Diagram No.1



* External timbers are regarded as protected in AS 1684 if they are covered by a roof projection (or similar) at 30° to the vertical and they are well detailed and maintained (coated and kept well ventilated).

MASSLAM is manufactured from kiln dried timber with a target moisture content of 10% and therefore requires protection from moisture that can occur from:

- Exposure to direct sun and rain (including during construction)
- Contact or close exposure with moisture laden, porous material (e.g. Concrete blocks)
- Exposure to extreme environments such as dry heating systems (e.g. slow combustion wood heaters), air conditioning, large north or west facing windows or moisture laden environments such as pool enclosures

MASSLAM PROTECTION METHODS

During Construction

All MASSLAM is 'end sealed' prior to leaving the Processing Plant. It is mandatory that all end grain be sealed permanently. ASH recommends MASSLAM products be sealed on all surfaces to protect them from the environment during construction prior to leaving the ASH Processing Plant. If MASSLAM is not supplied coated and is expected to be exposed for an extended period or become wet, it is recommended that the member be sealed with a construction sealer that is compatible with the final paint or varnish finish, or wrapped in plastic to provide protection (note: plastic is a temporary protection measure only and must allow for drainage and the timber to breathe).

For example:

- If the member is installed inside a building without direct exposure to air-conditioning such as in a wall cavity, protection to the beam is not necessary.
- If the member is installed inside a building with direct exposure to air conditioning or dry heat, then a permeable moisture limiting sealer is required.
- If the member is under the eaves and protected from direct rain and sun, it is recommended that a premium quality sealer be applied and maintained (in accordance with coating manufacturer's specifications).
- If the member is exposed to the sun or weather, refer to "Exterior Applications" below.

Exterior Applications

MASSLAM is only recommended to be used in external, above-ground, protected applications (Service Class 2) when special consideration is given to level of weather and UV exposure; coating, maintenance of coating and joint detailing is adequate; durable species is selected.

MASSLAM members used in protected exterior applications must be correctly detailed and protected by fully encapsulating the member with a physical barrier:

- correctly coated with a premium quality protective finish (e.g. light coloured pigmented external paint system or penetrating oil) to prevent moisture infiltration. It is important that an inspection and maintenance programme, based on exposure level and the paint manufacturer's recommendations, be prepared, implemented and maintained accordingly.
- such as fibre-cement sheet if it is likely to get wet or experience direct sun and not intended to be a visual beam.

MASSLAM is not recommended to be used in fully weather exposed, exterior applications (Service Class 3). If it is, Service Class 2 principles apply with the added requirements that joint detailing must prevent trapping of moisture and allow moisture to drain; and members are required to be top and end-capped (see diagram 2 below).

MASSLAM is not to be used for in-ground applications.

Design & Construction

Detailing tips for Service Class 2 applications:

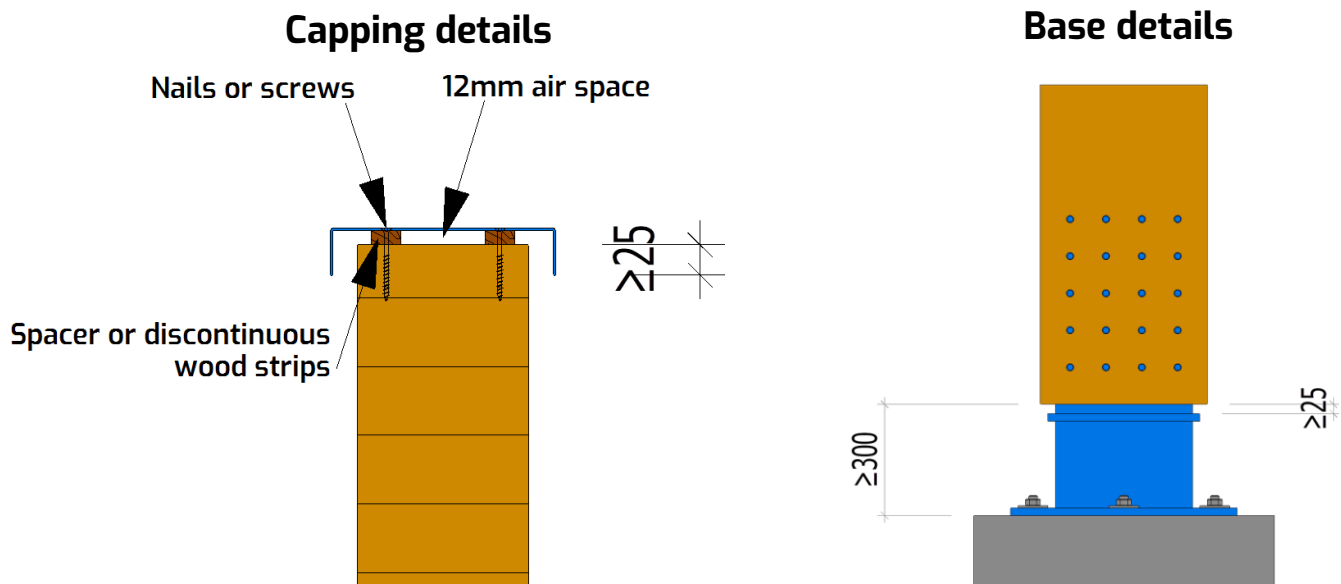
- Use building overhangs and other structures, which protect the members from excessive moisture and sun exposure
- Directly shield the members from moisture or direct sun. The use of metal, fibro or plastic shields on the exposed faces or ends of beams is required to help maintain the member in an unstressed dry condition.
- All members should be provided with adequate ventilation so that moisture content within timber will not exceed 15% and moisture gradients across the member will not occur.
- Use arrised or pencil round corners on members to reduce the likelihood of coating failures on sharp edges.
- Use drip edges or other devices which provide a path for free moisture to flow away from the timber beam. Refer to the 'base details' diagram below.
- Columns should be elevated greater than or equal to >300mm above ground level and with adequate drainage. Refer to the 'base details' diagram below.

For example:

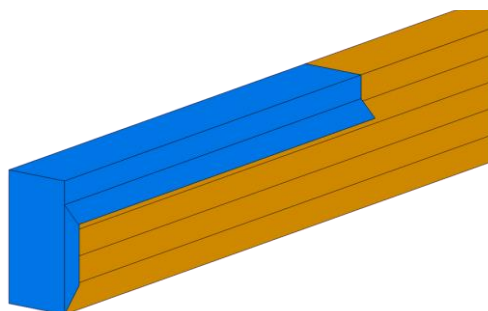
- If the member is installed inside a building without direct exposure to air-conditioning such as in a wall cavity, protection to the beam is not necessary.
- If the member is installed inside a building with direct exposure to air conditioning or dry heat, then a permeable moisture limiting sealer is required.
- If the member is under the eaves and protected from direct rain and sun, it is recommended that a premium quality sealer be applied and maintained (in accordance with coating manufacturer's specifications).

- If the member is exposed to the sun or weather, refer to “Exterior Applications” below.
- Joint detailing should, wherever possible, comply with the following:
 - Consider movement in service of members and attach connectors in a way that prevents splitting of wood fibre caused by rigid mechanical fixings.
 - Keep horizontal contact areas to a minimum, in favour of self- draining vertical surfaces.
 - Ventilate joint surfaces by using spacers, wherever possible.
 - Always use compatible fasteners which have adequate corrosion protection and do not cause splitting during installation e.g. galvanised coatings or stainless steel.
 - Ensure any moisture entering a joint is not trapped and can adequately drain away from the joint.

Diagram No. 2



Typical end protection



VIBRATION

The human body is very sensitive to low frequency vibration within a building. Due to the lightweight nature of timber, careful consideration is required during design and construction. However, with the help of an accredited engineer and in combination with other materials, this issue is easily resolved. High density timbers used in MASSLAM can offer an acoustic advantage compared to low density timber species.

SEISMIC PERFORMANCE

MASSLAM posts and beams exhibit a high strength to weight ratio which will enhance the seismic performance. Their elasticity and weight compared to steel or concrete help withstand greater deformations without damage.

This means MASSLAM posts and beams can be economically restored again after an earthquake whereas a concrete structure would likely be demolished.

DEFLECTION AND CREEP

When designing a timber beam, deflection is the governing factor in most cases. This is especially true in a Mid-Rise building where high standards need to be met or long spans between columns are required. MASSLAM offers the perfect solution considering the unique stiffness.

There are many reasons that influence creep. Creep is mostly caused through a long-term and constant application of load. Further, this complex phenomenon is influenced by the moisture content, ambient condition, size and load history. As part of the serviceability deflection calculations, the load factor for creep deformation ($j^2 = 2$) has been included into the equation to consider the effect of creeping. The stiffness of MASSLAM and the consideration above ensure that the requirement on deflection are always secured and will never fall below the deflection requirement.

CONNECTIONS

The range of connectors available is wide and varied. The designer has an opportunity to be creative in their joint design. The nature of one particular connector is not only dependant on load capacity but will also require consideration for fire resistance, aesthetics, cost effectiveness and fabrication/installation process. With the benefit of CNC machining there are no boundaries limiting the innovation of an engineer or architect. Possibilities include concealed connectors, dovetail timber joints, mortice and tenon joints, bolts, plugged screws, and more.

FIRE RESISTANCE

When timber burns, a char will develop around the exposed surface. Unlike steel, timber will maintain its strength for a determined amount of time due to the charring that insulates and protects the inner fibres. The charring rate, which determines the speed for which timber combusts, is low in MASSLAM 50 and MASSLAM 45 compared to common softwood species. The charring rate for MASSLAM is based on third party tests using ASH's specific construction methods.

COMPLIANCE

MASSLAM is certified by the Engineered Wood Products Association of Australasia (EWPAA) as being manufactured in accordance with AS 1328 – ‘Glued-laminated structural timber’. The EWPAA is accredited for product certification by the Joint Accreditation System of Australia and New Zealand (JASANZ).

MASSLAM’s char rate and glue lamination formula is third party tested at Warrington Fire (Australia) in accordance with AS 1530.4

H1, H2, H3 and IRON ASH® treatments are treated to the requirements of AS1604.1:2012 and is tested for penetration and retention by NATA accredited laboratory, AgriSolutions, to comply with AS/NZS 1605.3:2006 Section 15 – ‘Determination of Tebuconazole and Propiconazole in Preservative-Treated Timber’ and AS/NZS 1605.3:2006 – Section 16 ‘Determination of Permethrin in Timber Extracts’

STORAGE, HANDLING & MOISTURE CONTROL

Follow the guidelines outlined below to ensure your MASSLAM members are protected prior to, and during installation.

Delivery and Protection

ASH can deliver members to site wrapped in plastic or by other arrangement. Members will require a forklift, crane or hand unload on site. It is essential that members be protected from weathering. Carefully store members once delivered to prevent damage or surface marks. Minor damage or marking cannot always be prevented during delivery and assembly. Planing, sanding or re-working any marks should be taken into consideration when calculating costs and are not considered grounds for a complaint.

Storage

MASSLAM members need to be stored in a dry area, protected from all direct weather. If members are not used immediately, dunnage should be used to support

them. Dunnage needs to be evenly spaced to supply adequate support and airflow. If a dry place is not available, dunnage should allow for drainage.

MASSLAM is delivered with a temporary wrapping which, if stored, should be placed with the material 'edge face' down. At all times the members need good air circulation whilst protected from moisture. Protect MASSLAM from dirt, abrasions, footprints or damage to corners. See Diagrams 3 & 4 for detail.

Handling

MASSLAM should be lifted and secured by strategically placed lifting points; or with fabric or plastic slings and edge protectors to avoid slipping and marking of members. To guarantee the members are not overstressed, spreader bars should be used on members longer than 5.4m. Do not drop or drag MASSLAM as this will damage the surface and possibly effect the structural integrity of the product.

Diagram No. 3

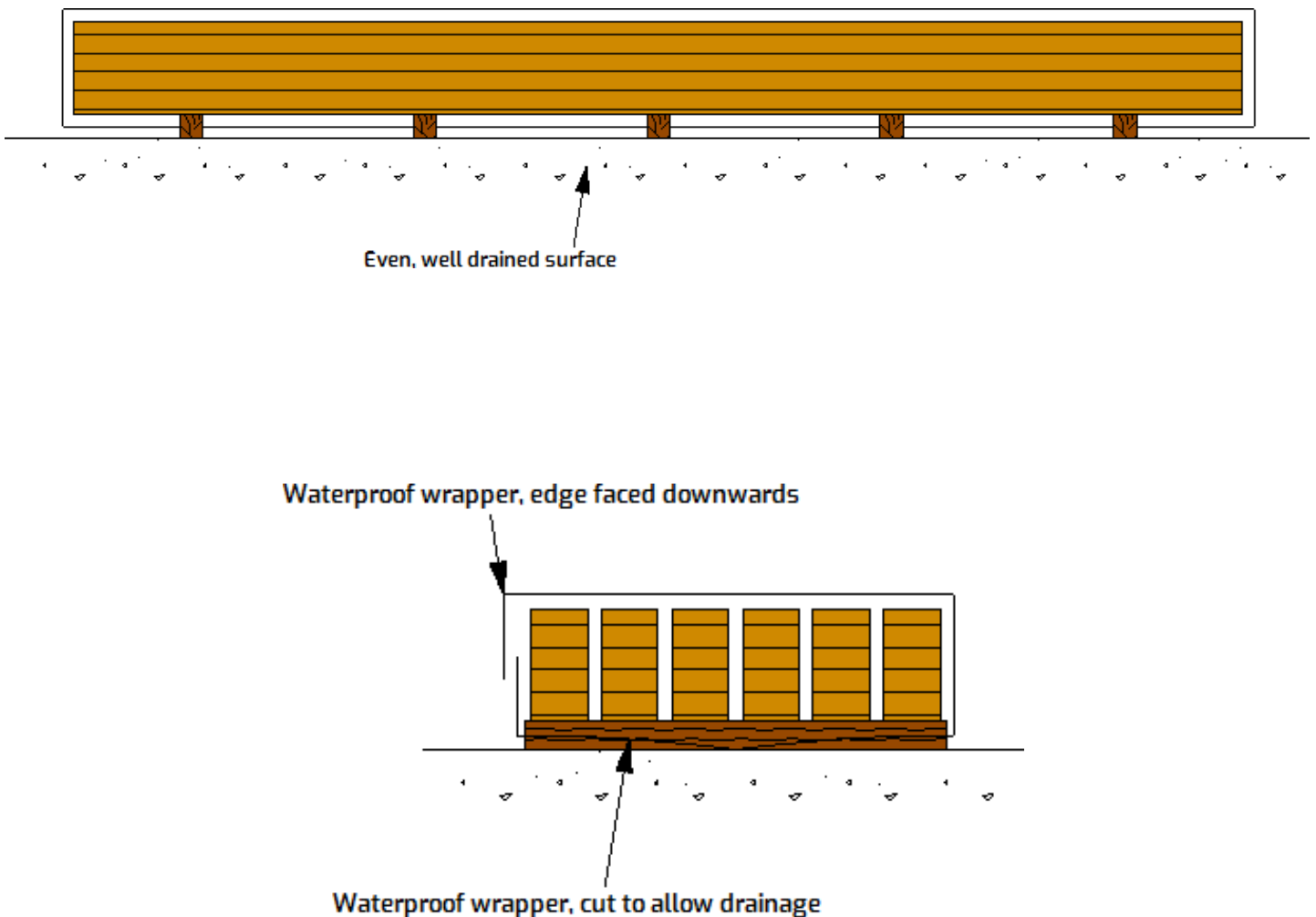
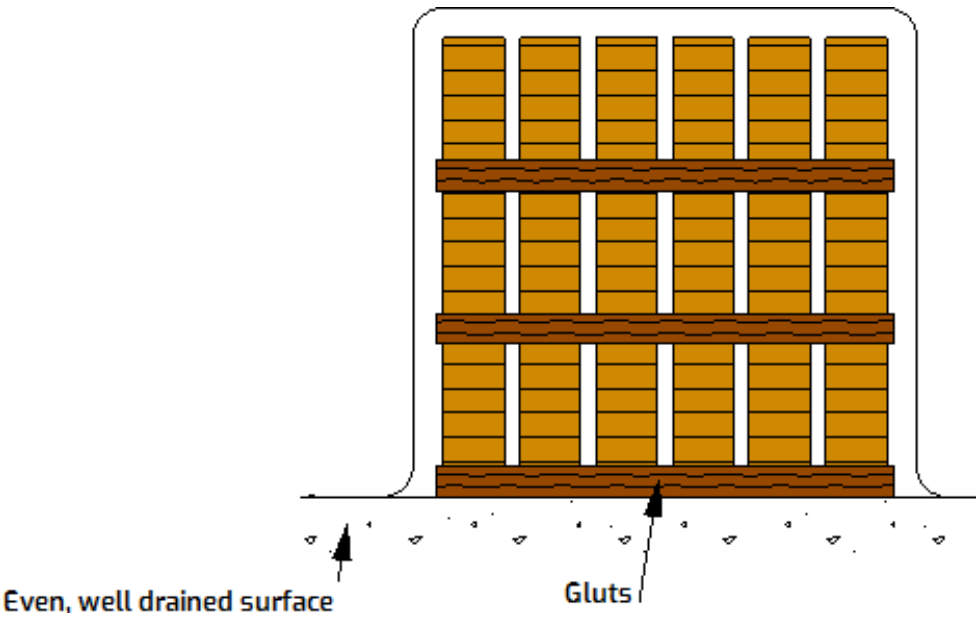
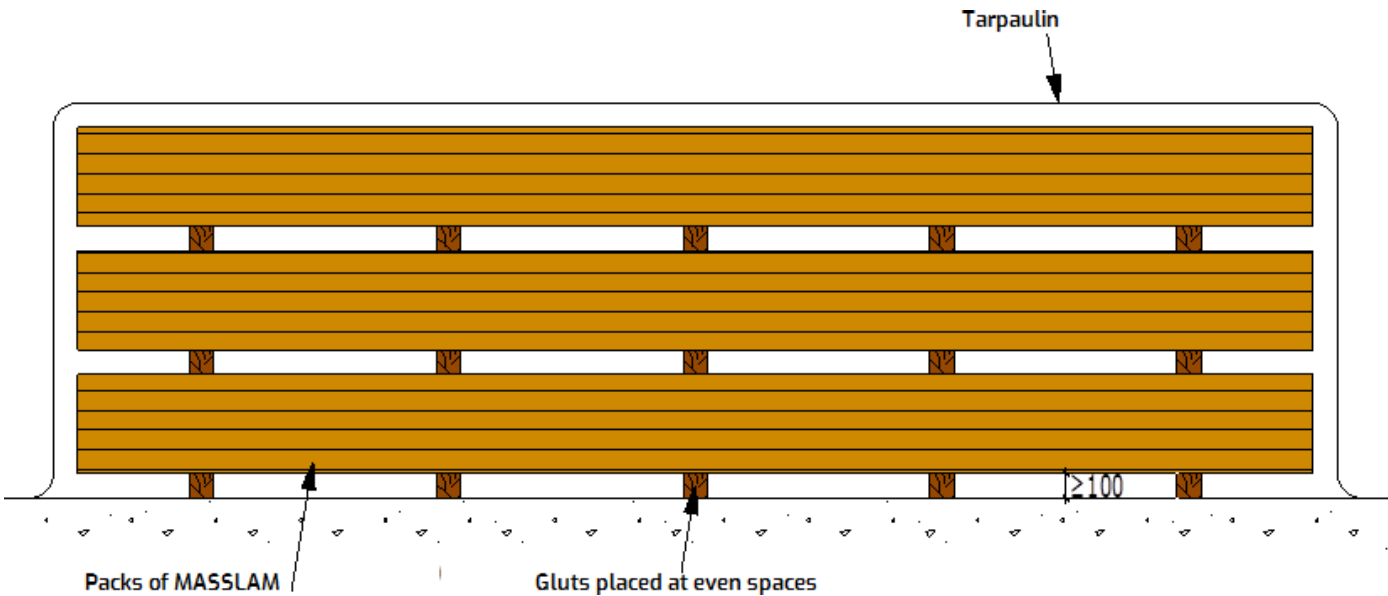


Diagram No. 4

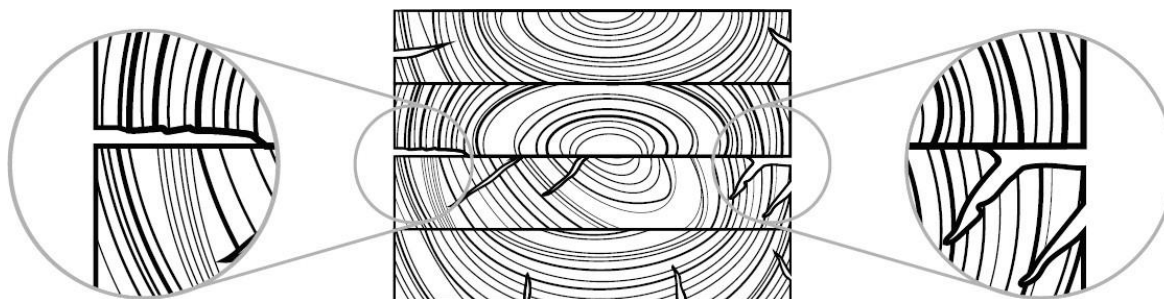


CHECKING IN MASSLAM

MASSLAM is dried to a target of 10% Moisture Content (MC) as the Equilibrium Moisture Content (EMC) of an indoor environment is typically 10-12% MC. When a MC within timber matches the EMC of an environment, timber is in its most stable form.

In drier conditions, timber loses moisture to the surrounding atmosphere and the outer fibres of the member shrink at a more rapid rate than do the inner fibres. As outer fibres contract, they are restrained by the inner portion of the member that has a higher moisture content. The more rapid the rate of drying, the greater differential in shrinkage between the outer and inner fibres - resulting in fibre stress. These resultant stresses to the grain can cause characteristic wood seasoning 'checks'. The influence of checks on the structural performance of glued laminated timber members is generally minor. See Diagram 5 below. Checking can be minimized by adding a protective coating and with careful installation practices that avoid prolonged exposure of the members during construction.

Diagram No. 5



Checking often occurs along the first glue line adjacent to the outer lamination that may dry more rapidly because a larger surface area of that lamination is exposed to the elements. In general, checks have little to no effect on the strength of glued laminated members. Seasoning checks in bending members affect only the horizontal shear capacity. In establishing allowable horizontal shear values, normal checking due to seasoning has been considered.

Checks are usually not of structural importance unless:

- They are significant in depth
- They occur in the mid-height of the member near the supports, and
- The design of the member is governed by shear

If these conditions exist, the reduction in shear strength is directly proportional to the ratio of the depth of checks to the width of the bending member. Checks in columns are not of structural importance unless the check develops into a split, thereby increasing the slenderness (L/d) ratio of the column.

While checking is not considered to be of structural significance, the reason for the checking and the means by which further checking may be minimized should be determined. If there is concern regarding structural adequacy, advice can be obtained from a structural engineer experienced and qualified in glued laminated timber. They should evaluate the significance of the checking.

I, _____ of _____
understand and accept the advice given in this MASSLAM Design Guide from Australian Sustainable Hardwoods and understand the level of manufacturing, coating technology, design advice, storage and handling options that ASH have made available to me. Failing to adhere to these recommendations may result in reduced performance of members.

Dated _____

DISCLAIMER

The MASSLAM Design Guide provides general advice based on current information and industry practices. ASH acknowledges that these recommendations will not suit every possible project. If in doubt, ASH recommends that independent expert advice is obtained. ASH accepts no responsibility for the performance of members in every possible application in accordance with these recommendations or otherwise. If you have any questions about these guidelines, contact a MASSLAM specialist on 03 5139 7001.