Building
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Prolam®
Engineered Laminated Timber

Environmental Product Declaration

Prolam Glulam PLX20H1 (240x90)

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

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AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION

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Programme Information

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Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☑ EPD verification by individual verifier

Third Party Verifier: Claudia A. Peña, PINDA LCT SpA, **Approved by:** EPD Australasia

Procedure for follow-up of data during EPD validity involves third party verifier: Yes ☐ No ☑

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

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Building better together for a sustainable future

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About Prolam

Prolam operates with a strong sense of responsibility to the environment and stands by our commitment to sustainable products and practices. Considering the impact of every facet of our production processes on the environment, we continue to innovate and evolve our products and practices to support our own (and our customers') sustainability goals. As part of this process, we acknowledge the significance of providing clear and independently validated environmental impact data regarding our engineered timber products. An Environmental Product Declaration (EPD) is a reliable, scientifically grounded, independently verified, and standardised approach for conveying the environmental effects of systems. This Environmental Product Declaration (EPD) assesses the environmental impact of Prolam PLX20 240x90.

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PLX20

https://www.prolamnz.com/products/beams/plx20

About Prolam Engineered Timber Solutions

By **building better together**, Prolam has been empowering engineers, architects, and builders for over 20 years with engineered timber solutions in New Zealand. As a family-owned business, we specialise in design, manufacture and supply of glulam timber beams, posts, and portals, providing optimal design freedom and flexibility, ensuring integrity in our products and services.

We're more than just suppliers; we're trusted advisors and partners, simplifying the construction process for professionals and merchants alike. With a focus on innovation, technical expertise, and responsive service, we facilitate the realisation of architectural visions and trends while meeting compliance standards and environmental regulations.

Our streamlined approach simplifies engineering sign-off requirements, saving time and costs. Leveraging our extensive industry experience, we tackle challenges from design complexity to supply chain logistics. Our commitment to end-to-end ease is evident through online tools, efficient processes, and fast turnaround times.

At Prolam, we envision a thriving building industry supported by high-quality, sustainable products. We prioritise customer confidence and ease, offering leading-edge solutions, exceptional service, and genuine care. With a strong sense of responsibility to our people, community, and environment, we champion sustainability, local jobs, and safety.

This EPD builds upon our commitment to continuous improvement and certification of performance. We continue to implement various sustainable initiatives and introduce new product lines. Through this EPD, Prolam remains dedicated to ongoing enhancements, ensuring that we consistently strive to make our operations more sustainable for today and future generations.

Products covered in this EPD

Products description

This EPD covers Prolam PLX20 240x90, referred to as “Prolam PLX20” in this EPD.

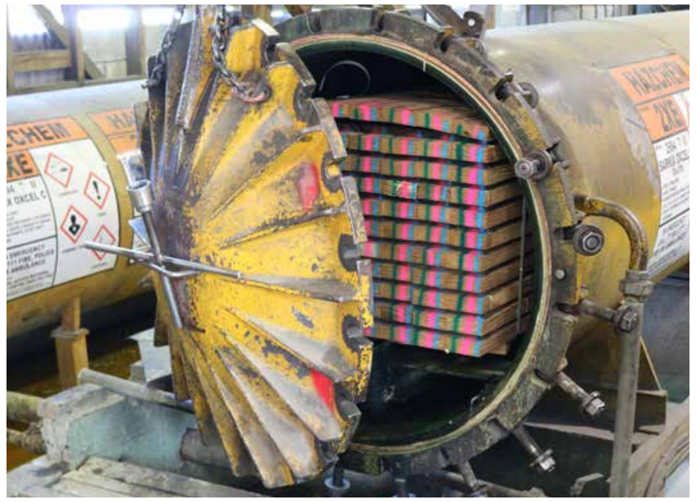
Glue laminated timber (Glulam - ANZSIC code: 1493 – Venner and Plywood Manufacturing; UN CPC code: 31211 – Wood, is an engineered timber product comprised of multiple layers of timber fused together with adhesives. The thickness of the laminates depends on the intended application and the specific species utilised.

The Prolam glulam is range of structural members manufactured from finger-jointed (usually), glue laminated New Zealand grown Radiata Pine. The Prolam PLX20 includes steel laminated into the top and bottom laminates of an H1.2 treated beam for extra strength and stiffness. (Refer to H1.2 EPD for further information). Prolam is labelled by identification tags that contain a detailed product specification stapled to the end of each individual member.

Prolam maintains a rigorous internal framework of documented quality processes and procedures, which encompass our primary breakdown, drying, processing, and preservation processes. Our quality assurance program ensures that every piece timber leaving our site is compliant to the applicable New Zealand standards.

Every day structural timber is subjected to mechanical testing to ensure it meets and exceeds the requirements of the following standards.

Standard	Title
AS/NZS 1748 including 3640	Chemical Preservation of Round and Sawn Timber
AS/NZS 1604.1	Specification for preservative timber - Sawn and Round
AS/NZS 1604.5	Specification for preservative timber - Glue Laminated
AS/NZS 1328.1	Glued laminated structural timber
AS 5068	Timber - Finger joints in structural products



Product applications

Prolam PLX20 products serve structural purposes, catering to a wide range of applications in domestic, commercial, and industrial settings, for internal use only. While the manufacturing process for both structural and decorative glulam remains the same, structural products undergo grading against standardised properties such as strength, stiffness, and dimensional stability.

Typical use of the PLX20 is as structural members for Garage lintels, Ridge beams, Floor beams, wide openings and Rafters in light commercial, education and residential projects. Mass timber including glulam is increasingly utilised in mid-rise residential apartments and commercial construction projects.

PLX20 240x90 is used to support applied loads as direct substitutes to members specified in NZS 3604, or as subject to specific engineering design (SED) by the way of the Prolam Specifier software, Prolam span tables or by way of calculations prepared by a Chartered Professional Engineer (CPEng).

Technical disclaimer

Prolam Glulam products must adhere to the specifications outlined in NZS 3604 or undergo specific engineering design using AS/NZS 1170 and either NZS 3603:1993 or NZS AS 1720.1:2022.

Prolam Glulam should not undergo any dimensional alteration that reduce its structural integrity. The stability and strength depend on maintaining consistent width and thickness. Structural connection methods must comply with NZS 3604, the Prolam structural timber guide, or specific engineering designs. Steel fixings and fastenings in contact with Prolam should be chosen following the guidelines outlined in section 4 of NZS 3604. The PLX20 is available in non-visual grade and is H1.2 treated for use within the building envelope only.

Manufacturing process

Figure 1 A1-A3 process flow chart.

A1 + A2

Procurement

Logs sourced from nearby sustainable plantation forests and transported to Prolams mill via road. The bark is removed and the logs are sorted based on species and grade.

A3

Harvest

We prioritise cutting the premium sections of logs for structural timber for glulam. Lower grade products are repurposed for products like landscaping, building and beehive products. Untreated residue is utilised as bio-fuel for operating our kilns.

Kiln drying

Sophisticated drying technology dries timber while maintaining timber stability with accurate moisture control.

Optimising

Timber is planed smooth an stiffness tested to determine the structural grades. Advanced technology "Optimises" timber as it passes through the machine to cut it into shook, the most effective pieces of the board for our glulam products, reducing waste.

Finger-jointing

Shook are finger jointed togetherwith glues to make a more stable and even board. The shorter pieces of timber joined together mean the board is less likely to twist and warp because each shook piece has less of an influence on the whole board when it moves.

A3

Preservation

Optional Boron, MCA or CCA Preservation treatments are used as appropriate ensuring maximum durability and compliance within or outside the building envelope. (For H1.2 this is after Planing)

Transport

Transport of timber feed-stock from processing facilitating to lamination plant.

Lamination

Lamella are laminated together using MUF or PRF adhesive and "cooked" using a high-frequency RF press. This speeds up the curing process of the glue and increases production efficiency.

Planing and Steel Insertion

Planing takes Prolam from its "nominal size" down to the final product size giving it a smooth machined finish and an aesthetically pleasing look. A steel bar is embedded in top and bottom laminates.

Finishing & Packaging

Optionally Prolam visual finishes are applied (Sanded and Sealed, Pre-primed, Bandsawn). Prolam is packaged using low-density recyclable polyurethane to uphold moisture levels and provide protection during storage and transportation.

Product technical specification

Table 1 - Physical specifications of PLX20 240x90 Dry Use

Specification	PLX20 240x90
Bending (MPa)	40
Tension parallel to grain (MPa)	4
Shear in Beam (MPa)	3.7
Compression parallel to grain (MPa)	18
Short modulus of elasticity parallel to grain (MPa)	20 000
Short duration modulus of rigidity for beams (MPa)	480

Table 2 - Content declaration of 1 m^3 of PLX20 240x90 and range for the other products included where relevant

Product component	Weight, kg	Biogenic material weight %	Biogenic material kg C/m^3
H1.2 beam	470.26	0	98.22%
Steel bar	1264	0	0%
Epoxy adhesive	2.68	0	0%
Sum = PLX20 beams – 240x90	**1 736.94**	**0**	**26.59%**

Table 3 - Content declaration of the product range's packaging for 1 m^3 of PLX20 240x90

Packaging material	Weight (kg)	Weight % (versus the product)	Weight biogenic carbon (kg C/m^3) FINAL PRODUCT
Cardboard core	0.27	<1%	0.11
Plastic film	0.52	<1%	0
Labels	0.06	<1%	0.02
Buckles	0.17	<1%	0
Straps	0.42	<1%	0
Marking paint – paint	0.08	<1%	0
Marking paint – steel cans	0.02	<1%	0
Spiral wrap	0.48	<1%	0
Cardboard corners	0.059	<1%	0.013
Total	2.06	<1%	0.140

The product range was tested against the substances in the Candidate List of Substances of Very High Concern in the European Chemicals Agency. No substances on that list are present in concentrations >0.1% of the weight of the products. This being said, the H1.2 beam the PLX20 is built from contains a maximum of 0.47% w/w boric acid.

OTHER ENVIRONMENTAL INFORMATION

Our dedication to sustainability: Forest & Timber Certification

Prolam operations and sales offices are certified to the chain of custody (COC) standards of the global responsible forest management scheme Forest Stewardship Council® (FSC®), accredited by SCS Global Services. Our FSC licence code is FSC-C181652.

PLX20 240x90 is manufactured from radiata pine, sourced from responsibly managed plantations certified to FSC's forest management standard, in addition to other controlled sources within New Zealand.

Upon request, we provide FSC's certified products with FSC's 100% or Mix claim, meeting the requirements of Green Star and various other sustainable procurement policies and programs.

Green Star and Homestar New Zealand

This EPD complies with the requirements for a product specific EPD under the Green Building Council of New Zealand's Green Star and Homestar sustainable building rating systems:

- Conforms with ISO 14025 and EN 15804
- Verified by an independent third party
- Cradle-to-gate with options and module D (see "Scope of EPD" section for more details on what is included an excluded from the EPD scope)

The use of Prolam may assist projects in New Zealand seeking Green Star or Homestar accreditation with the gaining of credits in these categories:

- Indoor Pollutants / Healthy Materials
- Life Cycle Impact / Embodied Carbon
- Responsible Building Materials
- Sustainable Products
- Construction Demolition Waste
- Earthquake Resilience

Quality accreditations

Prolam employs a thorough Quality Assurance Framework, encompassing stringent QA procedures. Prolam Glulam undergoes meticulous testing of both the timber and glue bond, in accordance with ISO standards, prior to dispatch. The Prolam quality assurance process has been audited by the EWPAA to ensure compliance with certification requirements.

Health and safety

Prolam is fully committed to upholding New Zealand's health and safety regulations, including the Health and Safety at Work Act 2015 (HSWA) and Health and Safety at Work (Hazardous Substances) Regulations 2017. Our dedication to the health, safety, and wellbeing of our personnel is at the core of our business values, influencing every aspect of our operations. We prioritise cultivating a strong safety culture within Prolam, recognising its utmost importance. Compliance with legal requirements and established industry standards is fundamental and non-negotiable. Prolam provides comprehensive guidelines, along with ongoing training and monitoring, to ensure the safe handling and manufacture of Prolam Beams.

Prolam Glulam: New Zealand grown and manufactured

Prolam glulam products are produced in Motueka, in the Nelson/Tasman region of New Zealand, utilising local New Zealand-grown timber. Prolam is dedicated to employing responsibly sourced timber, supporting the local economy, generating employment opportunities, and maximising the utilisation of precious renewable resources as part of a vertically integrated operation.

Scope of EPD

This Environmental Product Declaration presents the performance of PLX20 240x90.

The system boundary describes the process steps included in the LCA. This LCA will cover 'cradle to gate with options, module C1-C4, module D and optional modules' (modules A1-A5, C1-C4, D). Construction/ installation activities of within module A5 and modules B1-B7 are excluded from this study as these activities are best modelled at the final construction/building project level.

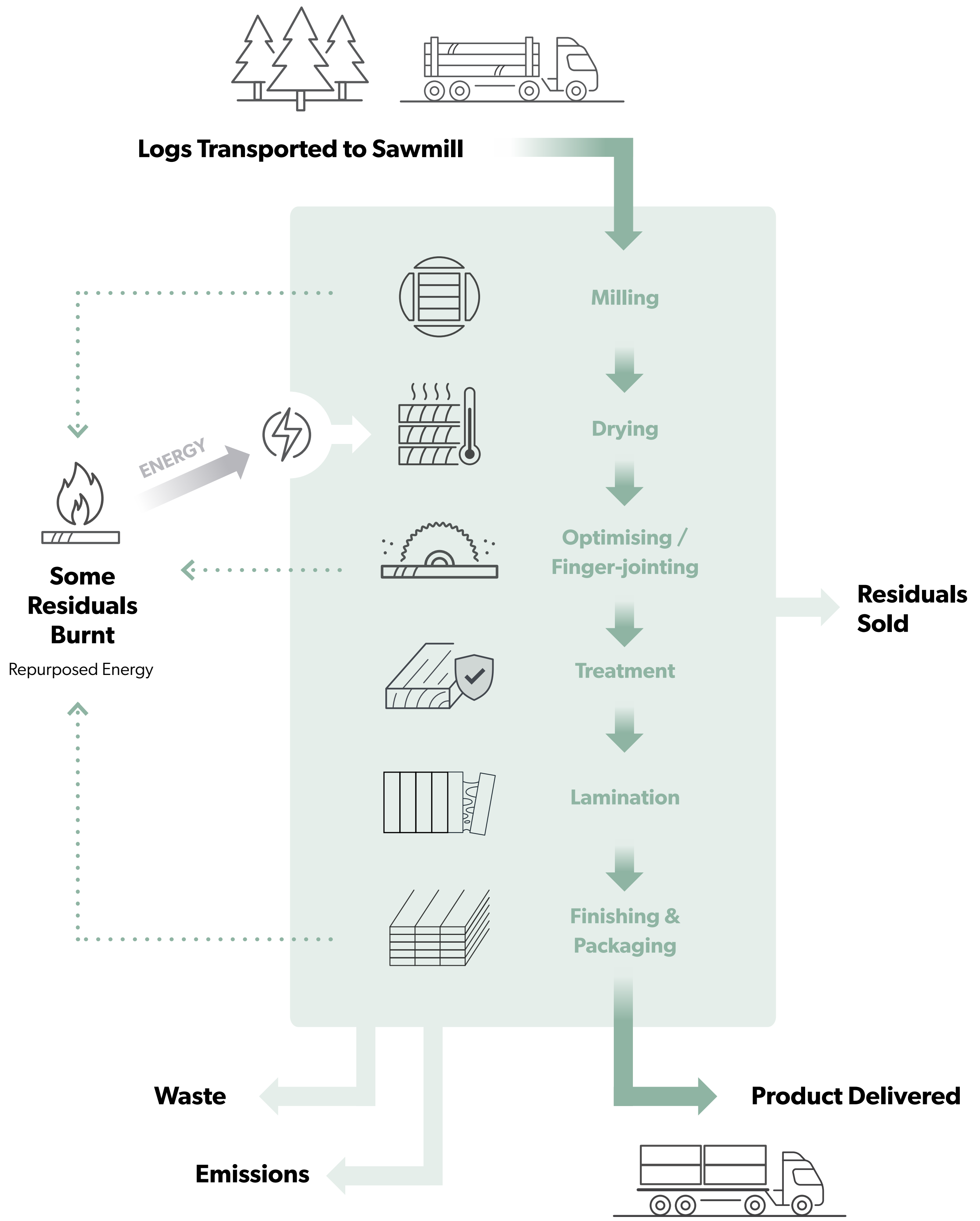
Geographical scope: Global for the steel inputs and New Zealand for everything else
Infrastructure/capital goods: excluded

Table 4 - System boundaries

STAGES	Product			Construction Process		Use							End of life				Resource Recovery
	Raw material supply	Transport	Manufacturing	Transport	Consturction installtion	Use	Maintennce	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste Processing	Disposal	Reuse / Recovery / Recycling potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	NZ/ GLO	NZ	NZ	NZ	NZ	-	-	-	-	-	-	-	NZ	NZ	NZ	NZ	NZ
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
H1.2 beams, all finishes	0.3%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

With X = module declared in this study and ND = module not declared in this study.

Procurement, manufacturing and transport to client



Procurement, manufacturing and transport to client

Module A1: Production/extraction of raw materials used to manufacture the products and associated packaging. This includes the forestry activities for wood raw material as well as all cardboard or paper packaging; mining activities for the steel production; fossil fuel extraction activities and all transformation of these raw materials into the materials bought by Prolam.

Module A2: Transport of each raw material to (and between) the processing sites.

Module A3: Electricity (residual grid mix) and other fuel/inputs of production, transport, and manufacturing at Prolam processing sites. Waste generated from the manufacturing process include wood shavings and chemical losses. The wood shavings are either burned on site for heat generation (untreated and MCA treated shavings) or sent to landfill (CCA treated shavings).

Module A4: Transport of the product, and its packaging, to the construction site. An average distance for truck transport to construction sites was calculated at 750km based on the share of Prolam's sales between New Zealand's north island and south island.

Module A5: This module was included only to comply with the EPD requirements around the biogenic carbon balance. Hence, impacts related to the installation/construction activities were not included in the model (believed to be better represented at the specific construction project level) and only the end-of-life processes for packaging, including the release of any stored biogenic carbon, were included here. Lacking detailed information on the packaging components' fate at the construction site level, these are assumed to be sent to landfill.

End-of-life

Module C: Demolition of the construction at the end of life of the beam/post (**C1**): Demolition was modelled as the average 42.28 MJ of liquid fuel per ton of resulting waste required to demolish a building according to Rakesh and Keshava [1].

Transportation of demolished beam/post (**C2**): The average distance from construction site to landfill was determined to be around 100km based on a map of landfill sites in New Zealand [2].

Waste processing (**C3**): The end-of-life of the product range is known with a high level of certainty to be landfill. Indeed, New Zealand struggles with a lack of alternatives to landfill when it comes to wood waste – which represent about 13% of the total landfill mass [2]. Although downcycling and incineration are technically alternatives, they are not currently in use at wide enough scale in New Zealand to be significant. To be as true to the reality of the system as possible, no alternative end-of-life fates were modelled.

Disposal (landfilling – **C4**): Where available, Rest-of-World Ecoinvent sanitary landfill waste treatment processes were used to model the various materials performance in landfill. The electricity input was adjusted to the New Zealand electricity grid. For the treated wood products, bespoke processes were modelled using the Doka Landfill tool [3]. For the components with biogenic carbon, an artificial release of the biogenic carbon stored within the relevant component was added to the model (so the total biogenic carbon over the product's lifecycle is neutral).

Module D: Reuse-recovery-recycling potential. This module is empty as no realistic alternative end-of-life to landfilling was identified. This absence of alternative fate modelling results in null values for modules C3 and D.

LCA methodological information

Declared unit

One cubic metre (m^3) of PLX20 beams, 240x90

Background data

Primary data covering the manufacturing processes (A3) was collected and provided by Prolam and represents the primary production data for period September 2022 to August 2023.

The LCA specialist software SimaPro® v9.6.0.1 was used for the LCA modelling. All global background data are taken from Ecoinvent v3.8 allocation recycling cut-off model [4]. Background data for Australian material inputs, energy use, waste treatment and trucks are all sourced from the AusLCI database v2.42 [5]. Additional EN 15804:2012+A4:2019+AC:2021 indicators for resource use, waste categories, and output flows were manually added in relevant processes using data from the allocation recycling cut-off, EN 15804 Ecoinvent database. Background data is less than 10 years old or have been updated within this timeframe.

Electricity modelling

The electricity used at Prowood facilities (module A3) is New Zealand grid electricity. As Prowood does not purchase any renewable energy, the residual market mix for New Zealand was used. The modelled residual mix results in a climate change impact of 0.182 kg CO_2eq/kWh against the GWP GHG indicator.

Other modelling information

In line with the EPD International rules, a cut-off criterion of 1% was applied to the inventory. In accordance with this cut-off criterion, bandsawn finish, visual machine finish, non-visual finish and red dye were excluded from our system boundaries.

It is important to note that this EPD's underlying LCA, like all LCAs, is a model which relies on assumptions and approximations. The ability to use these assumptions and approximations appropriately is what allows us to complete an LCA. We rely on their robustness to provide the closest representation possible of the system under study. This reliance comes with restrictions as regard the interpretation of results.

To identify, transparently communicate and address these limitations, a data quality assessment was carried out on the main contributing processes to assess the data's reliability as well as time-related, geographical and technological coverage. This assessment showed that the most critical aspects of the model were modelled from good to very good quality data, minimizing uncertainty and any risks of misrepresentation as much as feasible within the life cycle analysis exercise inherent limitations.

Prolam's system generates several co-products and the question of allocation must thus be addressed. Part of the co-products generated are used within Prolam as an energy source, the rest is being sent sold. As EN 15804 postulates, the allocation of these co-products that leave Prolam's boundaries is based on economic values (provided by Prolam), as the difference in revenue from these co-products is high.

Environmental impact indicators

Table 5 - Mandatory potential environmental impact indicators according to EN 15804:2012+A2:2019 – EF3.0 package

Indicator	Abbreviation	Description	Characterisation model
Global warming potential – fossil fuels	GWP-fossil	Measured in kg of carbon dioxide equivalence (kg CO_2 eq.). This is governed by the increased concentration of gases in the atmosphere that trap heat and lead to increasing global temperatures. These gases are principally carbon dioxide, methane and nitrous oxide.	IPCC model based on 100-year timeframe based on IPCC 2013 [6]
Global warming potential – biogenic	GWP-biogenic		
Global warming potential - land use and land use change	GWP-luluc		
Global warming potential - total	GWP-total		
Ozone depletion potential	ODP	Measured in kg CFC 11 eq. This calculates the destructive effects in the stratospheric ozone layer over a time horizon of 100 years.	Steady-state ODPs [11]
Acidification potential	AP	Measured in mol H+ eq. This assesses the change in critical load exceedance of the sensitive area in terrestrial and main freshwater ecosystems, to which acidifying substances deposit.	Accumulated exceedance, CML 2001 non-baseline (fate not included) [12], [13]
Eutrophication potential – freshwater	EP-freshwater	Measured in kg of phosphorus equivalents (kg P eq.). Expresses the degree to which the emitted nutrients reach the freshwater end compartment.	EUTREND model [14], as implemented in ReCiPe
Eutrophication potential – marine	EP-marine	Measured in kg of nitrogen equivalents (kg N eq.). Expresses the degree to which the emitted nutrients reach the marine end compartment.	EUTREND model [14], as implemented in ReCiPe
Eutrophication potential – terrestrial	EP-terrestrial	Measured in mol N eq. This expresses the degree to which nutrients reach sensitive terrestrial environments, resulting in changes in species composition, such as increased invasive species, reed growth, and dieback in tree species.	Accumulated Exceedance based on Seppälä, Posch [12], and Posch, Seppälä [13]
Photochemical ozone creation potential	POCP	Measured in kg NMVOC eq. This measures harmful air pollutant creation by primary pollutants such as nitrous oxides and volatile organic compounds when they interact under the influence of the sun and form chemicals toxic to humans and ecosystems, including ozone.	LOTOS-EUROS [15]
Abiotic depletion potential – minerals & metals*	ADP-minerals & metals	Measured in mg of antimony equivalence (kg Sb eq.). This measures the depletion of minerals based on the concentration of currently economic reserves and rate of de-accumulation.	CML-IA V4.8 [16]
Abiotic depletion potential – fossil fuels	ADP-fossil	Measured in MJ Nett Calorific Value (NCV). This measures the depletion of fossil fuels based on energy content.	CML-IA V4.8 [16]
Water deprivation potential*	WDP	Measured in cubic metres of water equivalence deprived (m^3 H2O eq.). This quantifies the relative available water remaining per area once the demand of humans and aquatic systems has been met.	Available water remaining (AWARE) method [17]
Global warming potential - excluding biogenic uptake, emissions, and storage*	GWP-GHG	kg CO_2 eq.	IPCC model based on 100-year timeframe based on IPCC 2013

* Disclaimer: In this LCA, capital goods and infrastructure have been excluded in accordance with the EPD rules.

Table 6 - Use of resources, waste production, and output flows

Indicator		Abbreviation	Units
RESOURCE USE			
Primary energy resources – Renewable	Use as energy carrier	PERE	MJ, net calorific value
	Used as raw materials	PERM	
	Total	PERT	
Primary energy resources – Non-renewable	Use as energy carrier	PENRE	
	Used as raw materials	PENRM	
	Total	PENRT	
Use of secondary materials		SM	kg
Use of renewable secondary fuels		RSF	MJ, net calorific value
Use of non-renewable secondary fuels		NRSF	MJ, net calorific value
Net use of fresh water		FW	m^3
WASTE PRODUCTION			
Hazardous waste disposed		HWD	kg
Non-hazardous waste disposed		NHWD	kg
Radioactive waste disposed		RWD	kg
OUTPUT FLOWS			
Components for reuse		CRU	kg
Material for recycling		MFR	kg
Materials for energy recovery		MER	kg
Exported energy – electrical and thermal		EE	MJ per energy carrier

The indicators presented in Table7 are voluntary additional indicators that have been included in this EPD. Table 8 lists the outdated indicators of EN15804+A1 which were included here for comparability purposes. The results of these additional indicators are presented in the Appendices. Please note that although the indicators and characterisation methods are from EN15804:2012+A1:2013, other LCA rules (system boundaries, allocation, etc.) are according to EN 15804:2012+A2:2019; i.e., the results of the "A1 indicators" shall not be claimed to be compliant with EN 15804:2012+A1:2013.

Table 7 - Additional voluntary indicators included in this assessment

Indicator	Abbreviation	Units	Characterisation model
POTENTIAL ENVIRONMENTAL IMPACTS			
Particulate Matter emissions	PM	Disease incidence (due to kg of PM2.5 emitted).	SETAC-UNEP [14]
Ionising Radiation – human health**	IRP	kBq U-235-eq.	Human health effect model as developed by Dreicer and Tort [15] update by Frischknecht and Braunschweig [16]
Eco-toxicity – freshwater***	ETPF	Comparative Toxic Unit for ecosystems (CTUe)	USEtox version 2 [17]
Human toxicity – cancer***	HTPC	Comparative Toxic Unit for human (CTUh)	USEtox [17]
Human toxicity – non-cancer***	HTPNC	CTUh	USEtox [17]
Land use related impacts / soil quality***	SQP	Dimensionless	Soil quality index based on LANCA [18]

** Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

*** Disclaimer: The results of this impact category may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes. This being said, infrastructure and capital goods were not included here in accordance with the EPD scheme requirements.

Table 8 - EN15804+A1 indicators included in this assessment

Indicator	Abbreviation	Units	Characterisation model
Global warming potential	GWP	kg CO_2 eq.	IPCC model based on 100-year timeframe based on IPCC 2007 [19]
Ozone depletion potential	ODP	kg CFC 11 eq.	CML-IA V4.1 [20]
Acidification potential	AP	kg SO2 eq.	CML-IA V4.1 [20]
Eutrophication potential	EP	kg $PO_{4^{3-}}$ eq.	CML-IA V4.1 [20]
Photochemical ozone creation potential	POCP	kg C_2H_4 eq.	CML-IA V4.1 [20]
Abiotic depletion potential – minerals & metals	ADPE	kg Sb eq.	CML-IA V4.1 [20]
Abiotic depletion potential – fossil fuels	ADPF	MJ (NCV)	CML-IA V4.1 [20]

Results tables - per declared unit

Disclaimers: The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.
The use of the results of modules A1-A3 without considering the results of module C are discouraged.

Table 9 - Core Environmental Impact Indicator Results for 1 m³ of PLX20 240x90

Indicator	Unit	Modules A1 - A3	Module A4 Transport to construction site	Module A5 Construction/ installation	Module C1 De-construction/ demolition	Module C2 Transport	Module C3	Module C4 Disposal	Module D
GWP - fossil	kg CO_2 eq.	5 515	148.7	14.7	9.9	19.8	0	25.6	0
GWP - biogenic	kg CO_2 eq.	-838	6.7E-02	2.1	2.6E-03	8.9E-03	0	1 157	0
GWP - luluc	kg CO_2 eq.	5.4	9.8E-02	1.0E-02	1.1E-03	1.3E-02	0	4.0E-03	0
GWP - total	kg CO_2 eq.	4 683	149	16.8	9.9	19.9	0	1 183	0
ODP	kg CFC 11 eq.	1.9E-04	2.3E-06	1.5E-06	1.5E-07	3.1E-07	0	3.9E-07	0
AP	mol H+ eq.	25.1	0.81	0.11	9.0E-02	0.11	0	0.11	0
EP - freshwater	kg P eq.	2.2	1.3E-02	3.9E-03	3.0E-04	1.8E-03	0	2.2E-02	0
EP - marine	kg N eq.	5.8	0.22	4.0E-02	4.2E-02	2.9E-02	0	0.38	0
EP - terrestrial	mol N eq.	59.8	2.4	0.42	0.45	0.32	0	0.33	0
POCP	kg NMVOC eq.	21.9	0.95	0.14	0.13	0.13	0	0.13	0
ADP - minerals & metals*	kg Sb eq.	3.4E-02	6.0E-04	3.1E-05	3.4E-06	8.0E-05	0	3.0E-05	0
ADP - fossil*	MJ (NCV)	61 100	2 121	318	127	283	0	324	0
WDP*	m^3	1 075	13.7	13.9	0.33	1.82	0	-98.5	0
GWP-GHG	kg CO_2 eq.	5 724	149	16.5	9.9	19.8	0	103	0

*Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.

Results Continued

Table 10 - Resource Use Indicators, Waste, and Output Flows for 1 m³ of PLX20 240x90

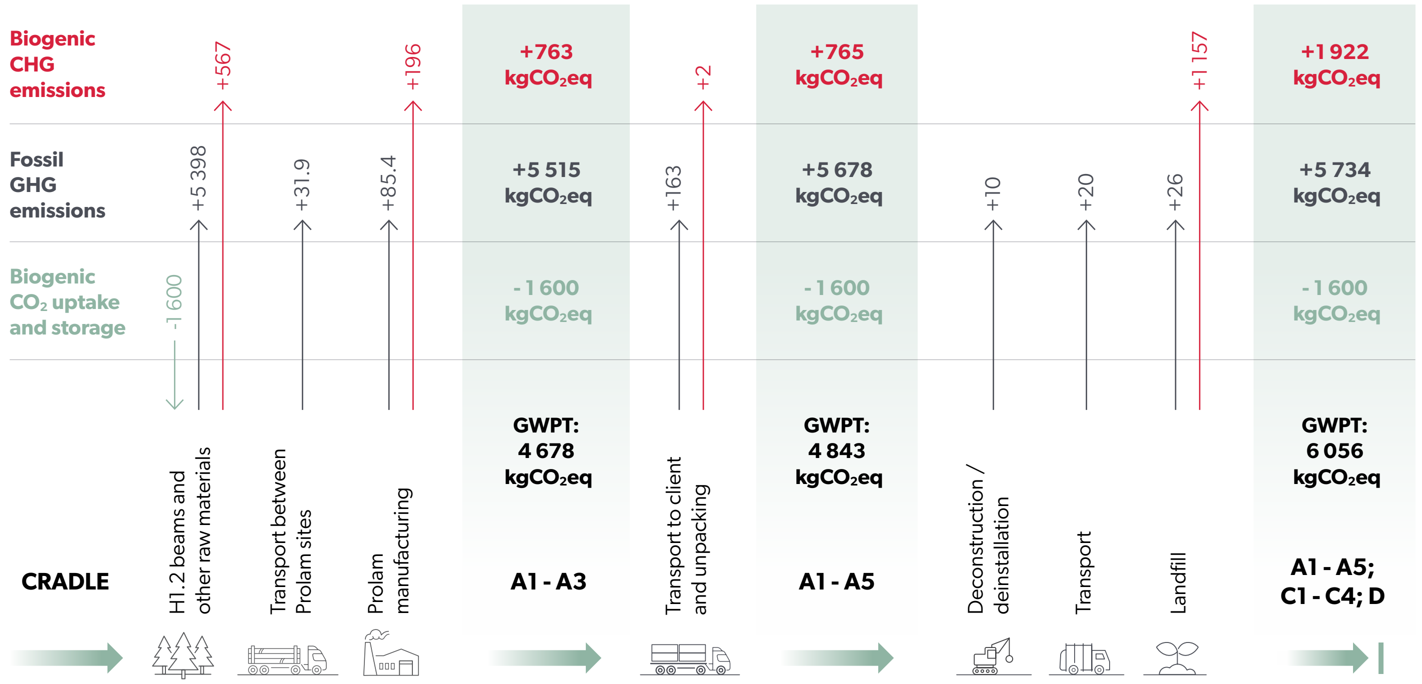
Indicator	Unit	Modules A1 - A3	Module A4 Transport to construction site	Module A5 Construction/ installation	Module C1 De-construction/ demolition	Module C2 Transport	Module C3	Module C4 Disposal	Module D
RESOURCE USE									
PERE	MJ NCV	25 451	1.3	-6.6E-02	0.72	0.17	0	-9 994	0
PERM	MJ NCV	6.2	0	5.5	0	0	0	9 998	0
PERT	MJ NCV	25 458	1.25	5.5	0.72	0.17	0	3.7	0
PENRE	MJ NCV	60 035	86.1	324	128	11.5	0	82.2	0
PENRM	MJ NCV	186	0	0	0	0	0	108	0
PENRT	MJ NCV	60 221	86.1	324	128	11.5	0	190	0
SM	kg	576	3.6E-02	0.12	5.2E-02	4.8E-03	0	7.2E-02	0
RSF	MJ NCV	1.5	4.6E-04	4.3E-03	1.4E-04	6.2E-05	0	2.5E-03	0
NRSF	MJ NCV	0	0	0	0	0	0	0	0
FW	m³	-10.8	1.2E-02	0.33	6.8E-03	1.6E-03	0	0.19	0
WASTE FLOWS									
HWD	kg	549	6.3E-02	0.28	5.9E-02	8.4E-03	0	0.18	0
NHWD	kg	8 358	2.0	8.3	1.2	0.27	0	5.4	0
RWD	kg	5.9E-02	1.9E-05	9.9E-05	1.4E-05	2.5E-06	0	6.7E-05	0
OUTPUT FLOWS									
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	3.7	6.7E-04	2.3E-03	4.0E-04	9.0E-05	0	1.6E-03	0
MER	kg	1.7E-02	3.6E-06	1.0E-05	1.6E-06	4.8E-07	0	6.7E-06	0
EE	MJ	40.0	1.5E-02	5.3E-02	8.3E-03	2.0E-03	0	3.5E-02	0

Contribution analysis on climate change

From a climate change perspective, the main driver behind the results is the steel which makes up the majority of the beams by weight. Not accounting for biogenic flows of carbon, the main source of emissions of greenhouse gas from fossil sources (GWPF) are the steel bars (5 309 kg CO_2eq /m³); H1.2 beams (211 kg CO_2eq /m³) and transport (200 kg CO_2eq /m³).

Please note that although informative, the use of the results of modules A1-A3 without considering the results of the entire module C are discouraged.

The EN 15804 standard does not allow for the storage of biogenic carbon in a product at end-of-life. As such, the biogenic carbon in the timber and other biogenic materials must be modelled as being emitted during the end-of-life modules (C3-4). When looking at the Global Warming Potential total, the whole system results in an increase of 6 056 kg CO_2eq /m³ of Prolam MCA H3.2 and H5 Glulam.



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Appendices

Additional indicators results

The following tables provide results against additional, non-mandatory, impact categories. Table 11 below provides the results of the system against the additional voluntary indicators described above in Table 7.

Table 11 - Additional Environmental Impact Indicator Results for 1m³ of PLX20 240x90

Indicator	Unit	Modules A1 - A3	Module A4 Transport to construction site	Module A5 Construction/ installation	Module C1 De-construction/ demolition	Module C2 Transport	Module C3	Module C4 Disposal	Module D
PM	Disease incidence	4.5E-04	1.6E-05	2.3E-06	2.5E-06	2.1E-06	0	1.5E-06	0
IRP**	kBq U-235 eq.	260	2.3	0.71	6.0E-02	0.31	0	0.16	0
ETPF*	CTUe	93 547	975	168	53.3	130	0	152	0
HTPC*	CTUh	1.2E-05	4.3E-08	5.4E-09	1.6E-09	5.7E-09	0	3.2E-07	0
HTPNC*	CTUh	1.3E-04	6.4E-07	1.1E-07	4.8E-08	8.5E-08	0	2.1E-05	0
SQP*	Dimensionless	160 970	2 334	738	8.5	311	0	385	0

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.
** Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Table 12 below gives the results of the representative product against the EN15804+A1 impact categories for comparability purposes. Please note that although the indicators and characterisation methods are from EN15804:2012+A1:2013, other LCA rules (system boundaries, allocation, etc.) are according to EN 15804:2012+A2:2019; i.e., the results of the "A1 indicators" shall not be claimed to be compliant with EN 15804:2012+A1:2013.

Table 12 - EN15804+A1 Results for 1m³ of PLX20 240x90

Indicator	Unit	Modules A1 - A3	Module A4 Transport to construction site	Module A5 Construction/ installation	Module C1 De-construction/ demolition	Module C2 Transport	Module C3	Module C4 Disposal	Module D
GWP	kg CO_2 eq.	5 410	143	15.2	9.6	19.0	0	77.0	0
ODP	kg CFC 11 eq.	1.8E-04	1.9E-06	1.2E-06	1.3E-07	2.6E-07	0	3.2E-07	0
AP	kg SO2 eq.	20.1	0.47	8.1E-02	6.3E-02	6.2E-02	0	9.1E-02	0
EP	kg PO_4^{3-} eq.	10.5	0.12	2.8E-02	1.5E-02	1.6E-02	0	0.51	0
POCP	kg C_2H_4 eq.	2.1	3.2E-02	4.1E-03	1.7E-03	4.3E-03	0	1.7E-02	0
ADPE	kg Sb eq.	3.4E-02	6.0E-04	3.1E-05	3.4E-06	8.0E-05	0	3.0E-05	0
ADPF	MJ (NCV)	60 640	2 207	330	134	294	0	343	0

Appendices

Product Dimensions

Table 13 - PLX20H1 (240x90), product codes

THICKNESS (mm)	WIDTH (mm) 240
3.6	PLX20H1-250100-3.6
4.2	PLX20H1-250100-4.2
4.8	PLX20H1-250100-4.8
5.4	PLX20H1-250100-5.4
6.0	PLX20H1-250100-6.0
6.6	PLX20H1-250100-6.6

Table 14 - To obtain volumes in m^3 for all available widths and thicknesses, multiply number provided below with beam length (available in 3.6; 4.2; 4.8; 5.4; 6.0; 6.6; 7.2m)

THICKNESS (mm)	WIDTH (mm) 240
3.6	7.78E-02
4.2	9.07E-02
4.8	1.04E-01
5.4	1.17E-01
6.0	1.30E-01
6.6	1.43E-01

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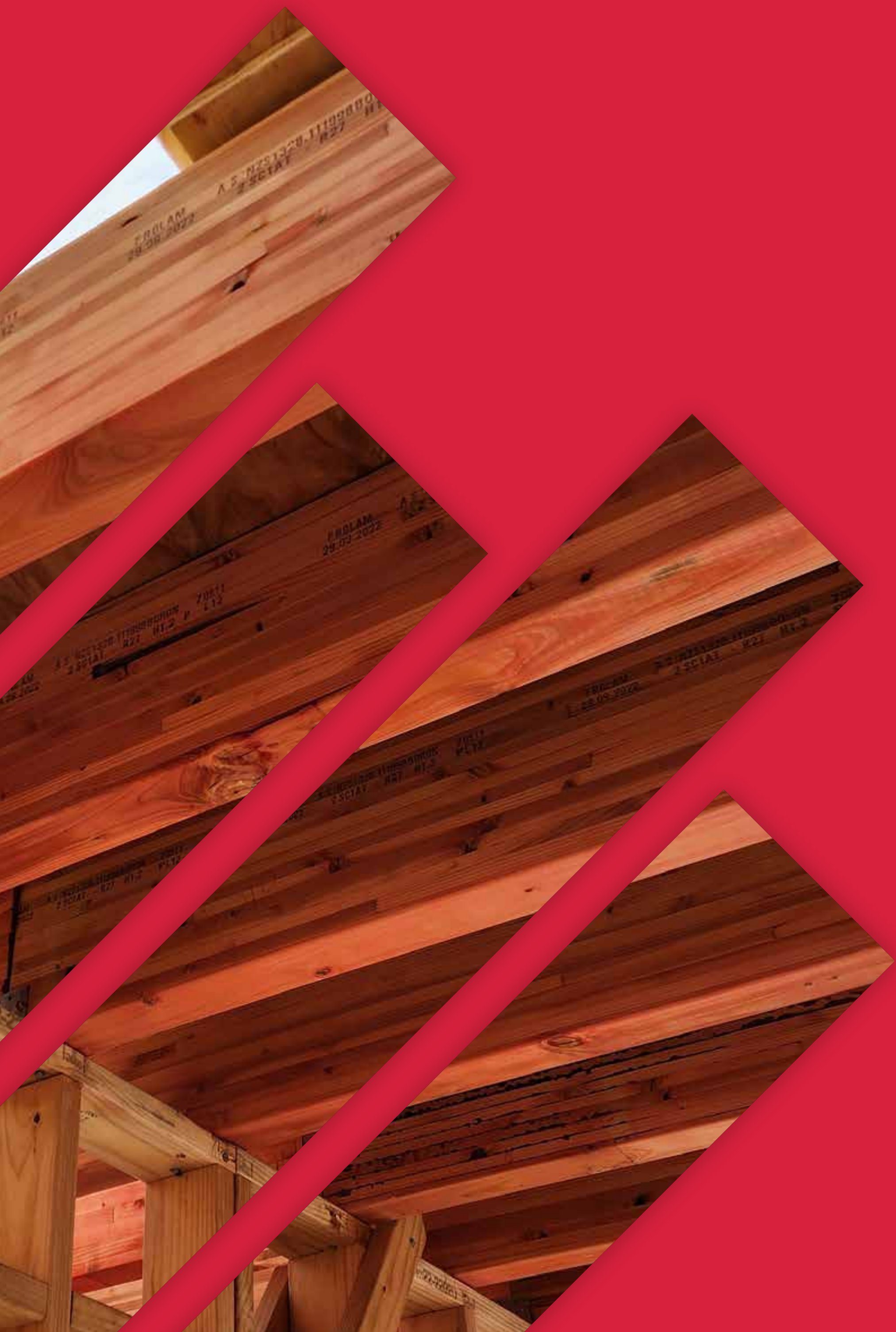

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