CARBON FOOTPRINT ASSESSMENT

TAG WALL PANEL

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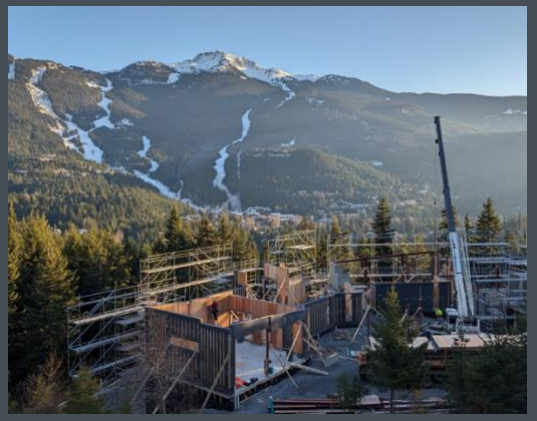

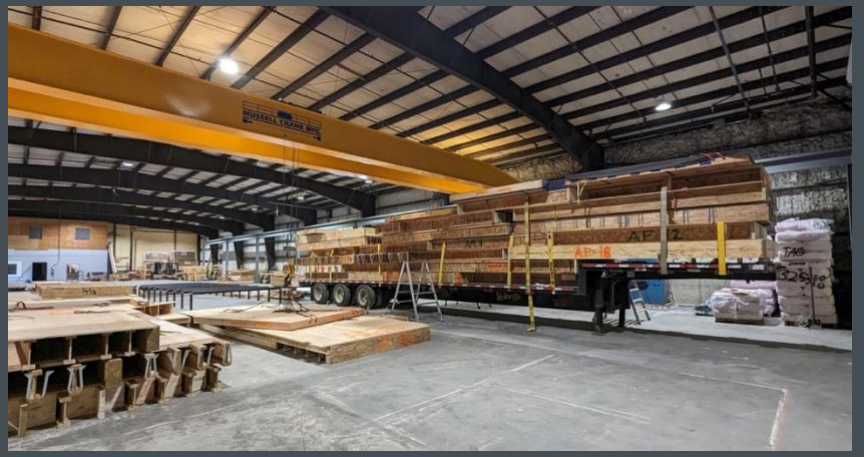

PHOTOS FROM TAGPANELS.COM

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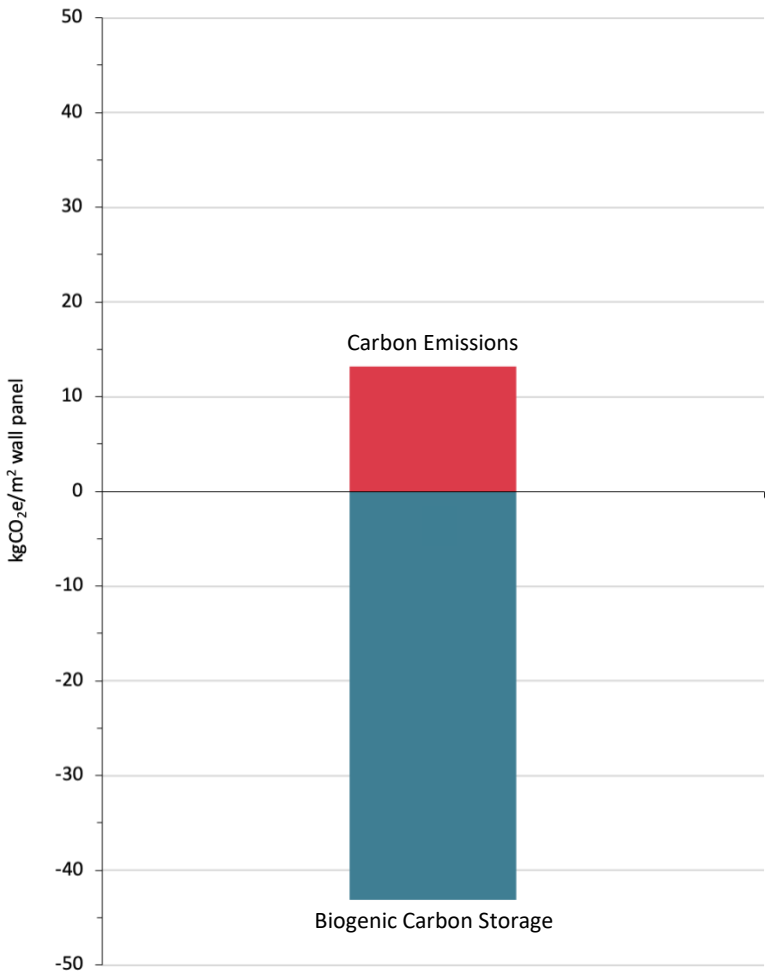
EXECUTIVE SUMMARY

The objective of this study was to quantify the carbon footprint of the materials used in the TAG wall panel assembly. The study includes the carbon footprint related to the product stage (raw material supply, transport, and manufacturing) and the transportation of the materials to the TAG facility.

The results show that the TAG wall panel is a net carbon storing wall assembly. The table and figure present the carbon emissions and the biogenic carbon stored in the biobased materials.

SUMMARY OF CARBON FOOTPRINT RESULTS	
Carbon Emissions	13.2 $kgCO_2e/m^2$ panel
Biogenic Carbon Storage	43.1 $kgCO_2e/m^2$ panel



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BACKGROUND & METHODOLOGY

BUILDINGS & CLIMATE IMPACT

As we build more energy-efficient buildings and move to low-carbon energy sources, the material-related emissions become the largest contributor to the carbon footprint of our new buildings. Architecture 2030 has estimated that three quarters of the climate impact from a project built today, and over the next two decades, will be from the materials selected for its construction. By conscious material-selection, the climate impact of buildings can be significantly reduced. Selecting low-carbon and biobased materials can even enable our buildings to serve as carbon storage throughout their lifespan.

OBJECTIVE

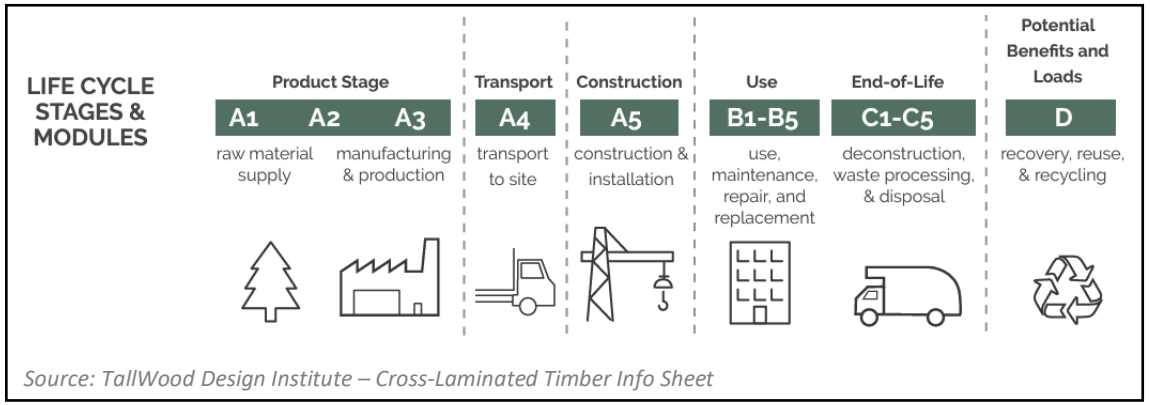
The intent of this study was to quantify the carbon footprint associated with the materials used in the TAG wall panel assembly.

This report summarizes the methodology for the carbon footprint assessment and the results.

SCOPE

To determine the carbon footprint of the TAG wall panel, a life cycle assessment (LCA) model was developed using the software OneClick LCA. LCA is the standardized process of evaluating the environmental impact of a system or product during its life cycle. An LCA quantifies multiple different environmental impacts, however, this assessment focuses on the Global Warming Potential indicator (carbon footprint). The LCA model was developed following the *National guidelines for whole-building life cycle assessments*[1] *and* ISO 21930.

An LCA can include multiple stages and modules. The diagram below shows the different stages and system boundaries that may be included in an LCA.



Source: TallWood Design Institute – Cross-Laminated Timber Info Sheet

[1] NRC – National Guidelines for Whole-Building LCA, 2022.

The full life cycle of building systems and products spans from the raw materials extraction through to end-of-life disposal. This study includes the emissions related to the product stage of the life cycle (so called A1 – A3) and the transportation stage (so called A4). These stages have been shown to be the largest contributors to material-related life cycle emissions for building products, with A1 – A3 contributing to 65-85% of the total material-related emissions and A4 with 5-10%. The emissions estimated at these stages are relatively accurate compared to emissions in the future stages which require many assumptions to estimate.

The carbon footprint of the TAG wall panel is normalized by area and the declared unit is one square meter (1 m^2) of wall panel.

DATA SOURCES

The carbon emissions associated with each material was quantified by using product specific and industry average Environmental Product Declarations (EPDs). EPDs are third party-verified documents written in conformance with regional and international standards that report the environmental impact of a product.

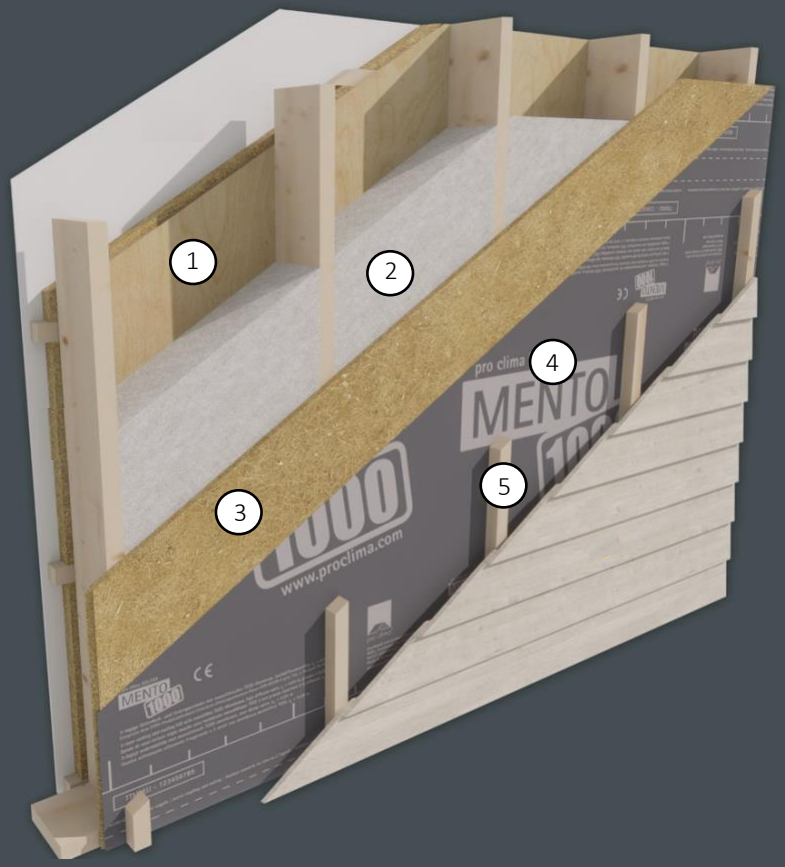
The carbon footprint assessment inputs, including EPDs, material origins, and transportation methods are summarized in Appendix A.

ASSEMBLY

The materials included in the TAG wall panel assembly and this carbon footprint assessment are presented on the next page.

Cladding materials and interior finishes are excluded from this study as they are project specific.

TAG WALL PANEL ASSEMBLY



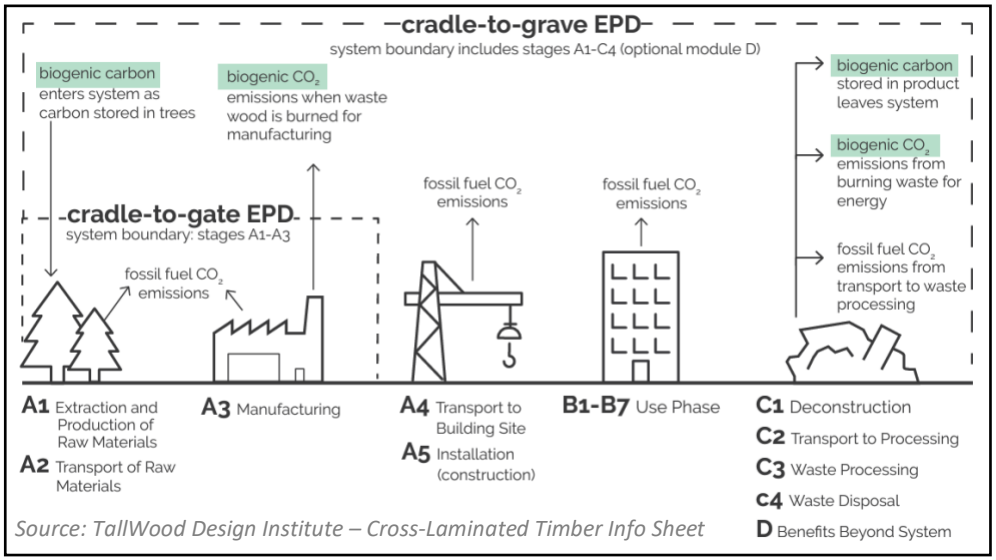
1. 5/8” PLYWOOD TAPED WITH PRO-CLIMA TESCON VANA
2. 2x8 SPF STUDS WITH SOPRA CELLULOSE BLOWN- IN INSULATION
3. 22mm AGEPAN WOOD FIBER BOARD INSULATION
4. MENTO 1000 WRB MEMBRANE TAPED WITH PRO-CLIMA TESCON VANA
5. 1x4 SPF STRAPPING

TREATMENT OF BIOGENIC CARBON STORAGE

Biogenic carbon is carbon stored in biomaterials. By using biobased materials in buildings, the natural carbon cycle and the carbon dioxide return to the atmosphere is interrupted. This gives us the opportunity to draw carbon dioxide from the atmosphere and store it for the next decades.

Following the NRC guidelines and ISO 21930, this assessment accounts for carbon storage in products that contain biobased materials. The biogenic carbon is accounted for in the LCA stage in which the flow take place and is determined according to the product EPDs. The diagram below shows the biogenic carbon flows in the different LCA stages.

The TAG wall panel includes both biobased products manufactured from waste fiber (cellulose and wood fiber board insulation) and virgin wood (framing lumber and plywood). Although there is standard methodology outlined in ISO 21930 for determining biogenic carbon storage credits for virgin forest products, some industry experts are concerned that the current methodology do not adequately assess the climate impacts of forestry practices. Some of the concerns include uncertainties about the amount of carbon returning to the atmosphere from the roots, slash, and mill waste; the lag time for newly planted trees to begin absorbing significant amounts of atmospheric carbon dioxide etc. For this reason, we have reported on the biogenic carbon storage for virgin wood products separately. If possible, selecting wood products that are re-used or that come from trees that are harvested primarily for reasons other than producing building materials (fire prevention, storm damage, etc.) is recommended.



Source: TallWood Design Institute – Cross-Laminated Timber Info Sheet

Because the end-of-life processes (disposal in landfill, incineration, recycling/re-use etc.) are outside the system boundary for this carbon footprint assessment, the potential release of the biogenic carbon back to the atmosphere at the end-of-life is not accounted for in the carbon footprint results presented in this report.

The intent of illustrating the biogenic carbon stored in the panels over their lifetime is to show the benefit of using biobased materials and to encourage thoughtful end-of-life processing to keep the carbon-storing materials in use for as long as possible.

CARBON FOOTPRINT RESULTS

TAG WALL PANEL

Table 1 summarizes the carbon emissions associated with the materials used in the TAG wall panel and the biogenic carbon stored in the biobased materials.

Figure 1 shows a breakdown of the material contributions. The carbon footprint of each material is provided in Appendix A.

TABLE 1. SUMMARY OF CARBON FOOTPRINT RESULTS (A1 – A4)	
Carbon Emissions	13.2 $kgCO_2e/m^2$ panel
Biogenic Carbon Storage (excl. virgin wood)	17.6 $kgCO_2e/m^2$ panel
Biogenic Carbon Storage (incl. virgin wood)	43.1 $kgCO_2e/m^2$ panel

The net carbon footprint is the result of carbon emissions minus the biogenic carbon storage. The results indicate that the biogenic carbon storage is greater than the up-front carbon emissions for the TAG wall panel and that it is a carbon storing wall assembly as long as it is in use.

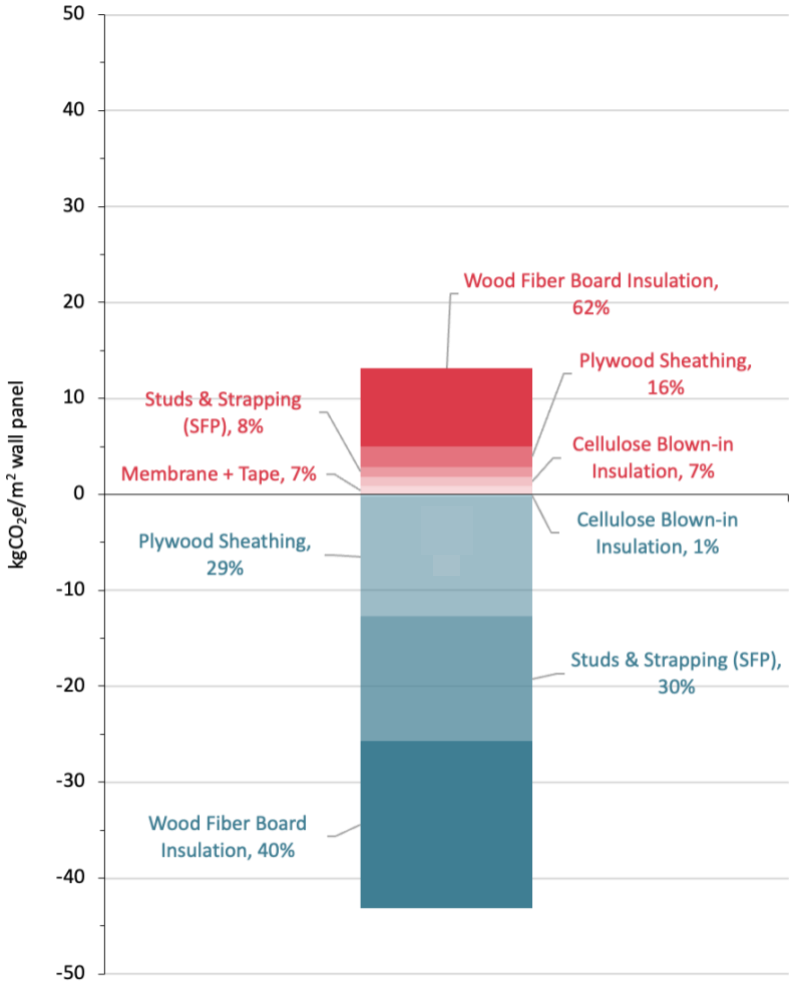


Figure 1. Breakdown of material contribution to total carbon emissions and biogenic carbon storage.

COMPARABLE WALL ASSEMBLY

Table 2 shows the materials included in a typical wall assembly that is comparable to the TAG wall panel in terms of thermal performance. The carbon footprint comparison indicates that the up-front carbon emissions of the TAG wall panel is more than 40% lower than the typical wall assembly and that the TAG wall panel stores close to 100% more biogenic carbon.

TABLE 2. SUMMARY OF WALL ASSEMBLY COMPARISON

TYPICAL WALL ASSEMBLY				**TAG WALL PANEL**			
	Carbon Footprint ($kgCO_2e/m^2$ wall panel)				Carbon Footprint ($kgCO_2e/m^2$ wall panel)		
	Carbon Emissions	Biogenic Carbon Storage (excl. virgin wood)	Biogenic Carbon Storage (incl. virgin wood)		Carbon Emissions	Biogenic Carbon Storage (excl. virgin wood)	Biogenic Carbon Storage (incl. virgin wood)
Sheathing: 5/8" Plywood	2.1	-	12.5	**Sheathing:** 5/8" Plywood	2.1	-	12.5
Membrane & Tape: Industry average	0.9	-	-	**Membrane & Tape:** Industry average	0.9	-	-
Framing & Strapping: 2x6 SPF stud & 1x4 SFP strapping	0.8	-	9.9	**Framing:** 2x8 Studs & 1x4 SFP strapping	1.1	-	13.0
Cavity Insulation: Mineral wool batt	7.2	-	-	**Cavity Insulation:** Cellulose	0.9	0.2	0.2
Exterior Insulation: Mineral wool board	11.9	-	-	**Exterior Insulation:** Wood fiber board	8.2	17.4	17.4
TOTAL	22.9	0	22.4	**TOTAL**	13.2	17.6	43.1

APPENDIX A – INPUTS AND RESULTS

TABLE A.1 SUMMARY OF CARBON ASSESSMENT INPUTS AND RESULTS					
Product	**Environmental Product Declaration (EPD) Resource**	**Material Origin**	**Primary Transportation Method**	**Carbon Footprint ($kgCO_2e/m^2$ wall panel)**	
				Carbon Emissions	Biogenic Carbon Storage
5/8" Plywood Sheathing	Industry average EPD[2]: Link.	BC Canada	Truck	2.1 (16%)	12.5 (29%)
Pro-Clima Tescon Vana Tape	Industry average EPD[3].	Schwetzingen Germany	Ship + Train	0.2 (1%)	-
2x8 Studs and 1x4 Strapping (SPF)	Industry average EPD[2]: Link.	BC Canada	Truck	1.1 (8%)	13.0 (30%)
Sopra Cellulose Blown-in Insulation	Product Specific EPD: Link.	Sainte-Julie QC Canada	Truck/Train	0.9 (7%)	0.2 (1%)
22mm Agepan Wood Fiber Board	Product Specific: Link.	Meppen Germany	Ship + Train	8.2 (62%)	17.4 (40%)
Mento 1000 WRB Membrane	Industry average EPD[2].	Schwetzingen Germany	Ship + Train	0.8 (6%)	-

[2] Wood products shall reference relevant industry-wide EPDs from the Canadian Wood Council or other relevant organizations per the City of Vancouver Embodied Carbon Guidelines v.1.
[3] No product specific EPD available.