
MASS TIMBER PERFORMANCE INDEX

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Growing regional mass timber ecosystems

INTRODUCTION

The Mass Timber Performance Index's intent is twofold. First, our aim is to provide an estimate of Cross-Laminated Timber (CLT) market prices in North America. Readers should understand that, although CLT is a lumber- or veneer-based product, CLT's market price is affected by its own set of supply-and-demand dynamics. CLT manufacturers price their product on a whole project basis, given project-specific requirements, rather than focusing on a cost-per-unit-of-production basis. Thus, it is helpful to think of CLT as a custom building component rather than a commodity product.

Second, this index provides an estimate of demand for mass timber across the US and Canada, the corresponding volume of lumber used in mass timber construction, and the associated utilization of existing CLT manufacturing capacity.

CLT PRICE INDEX

Putting a firm number to CLT market prices is a tall task. Accurate market price reporting is challenged by the relatively small number of producers, the lack of publicly available data on market pricing, and perhaps most importantly, the fact that all CLT manufactured in North

America is custom-made on a project basis. Accordingly, when reviewing the CLT Product Price Index, please consider the values as indications of likely pricing. Actual market prices will reflect project-specific factors, the size and structure of the manufacturer's business, and how strongly a manufacturer desires to win the work.

In **Figure 1**, we update the CLT price information (the blue line with units that correspond to the left axis) that first appeared in the 2022 edition of the *International Mass Timber Report*. The CLT Product Price Index is meant to serve as a general guide to CLT panel pricing, with values based on a financial model of a prototypical CLT manufacturing plant that includes estimates of the cost of producing CLT, and a profit-and-risk allowance. This year, the model incorporates a more accurate representation of administrative overhead costs, escalation and inflation for all labor and materials beginning in 2016, and 3D modeling and Computer Numerical Control (CNC) fabrication costs to transform billets into custom components. Excluded from the market price estimate is the cost to transport the finished product to customers.

Although the model is a work in progress, this update more closely aligns with market conditions during the 7-year period. Still, it is important to remember that the figure shows modeled CLT panel market prices rather than prices reported from actual transactions between manufacturers and their customers. Also shown in the figure is an estimated lumber market price, which is discussed in greater detail in the next section (the orange line with units that correspond to the right

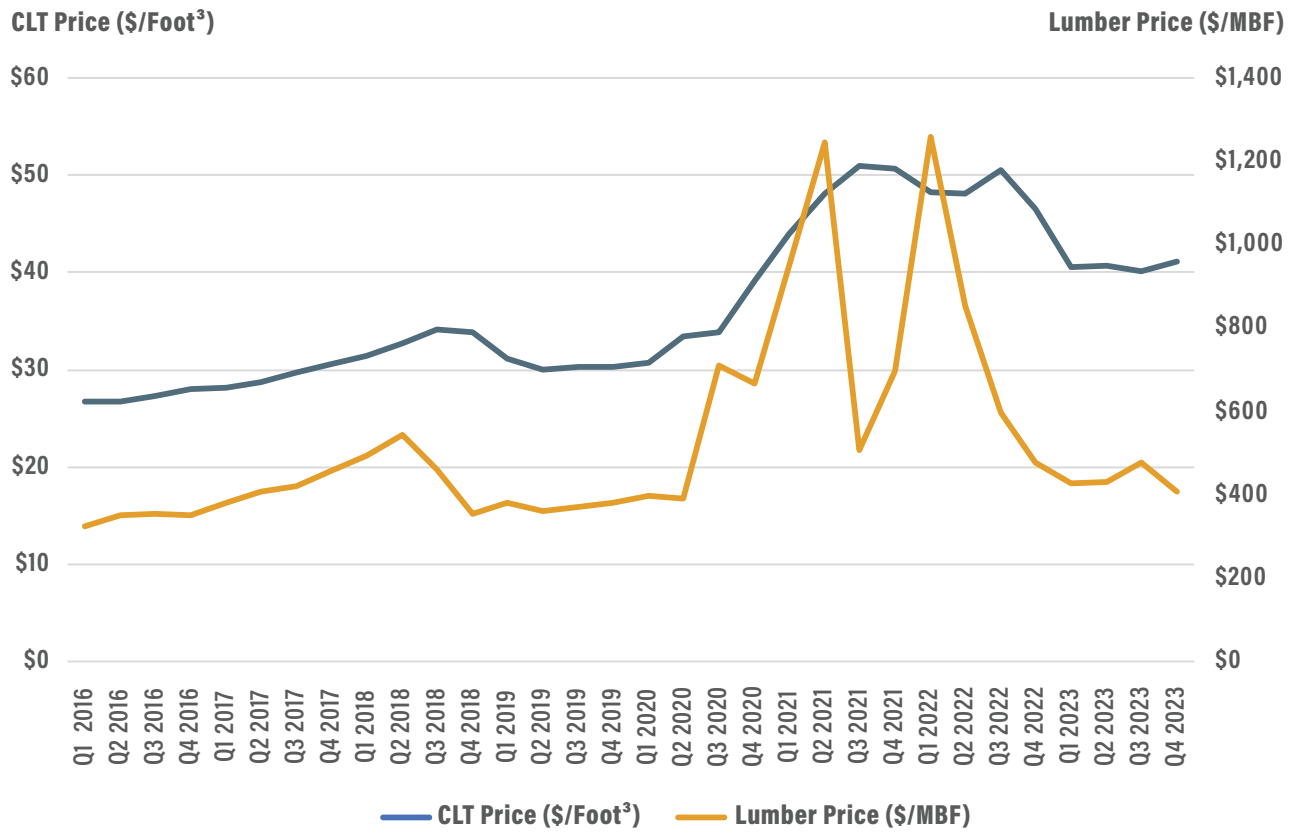


FIGURE 1: CLT PRODUCT PRICE INDEX

axis). Importantly, market research identified a lag in the relationship between CLT price and lumber price, as CLT manufacturers are usually selling off lumber inventory accrued over several months. This lag is reflected in the CLT pricing shown in Figure 1.

LUMBER PRICE DISCUSSION

Despite 2023 lumber prices falling more in line with historical norms, lumber cost remains a primary driver for CLT manufacture. According to the financial model used to estimate CLT prices shown in the preceding figure, lumber costs ranged between 40 percent and 60 percent of the total CLT manufacturing cost.

Lumber prices are likely to remain at historical norms for the foreseeable future because high interest rates and high inflation have dampened demand for new residential housing, a leading market segment for softwood lumber.

When the housing market strengthens, however, lumber prices are likely to quickly return to higher levels due to log supply shortages in key lumber-producing regions. For example, the government of British Columbia has limited future timber harvests to allow forests in the region to recover from recent wildfires and the mountain pine beetle epidemic. Similarly, in Coastal Oregon and Coastal Washington, both major US lumber-producing regions, new forest management policies have reduced timber harvests on

state-owned and privately owned lands. These policies are beneficial to forest ecosystems, but they negatively affect lumber production.

This leaves Eastern Canada and the Southeastern US as the major lumber-producing regions in North America with the ability to increase production to meet increased demand. The Southeastern US has significantly expanded its lumber production capacity over the last 5 to 10 years. However, Southern Yellow Pine (SYP) lumber is not ideal for all traditional residential construction applications. A potential “release valve” on upward lumber price pressure is importing more softwood lumber from Europe. In fact, European softwood lumber imports have been trending upward for several years with over 3 billion board feet imported in 2022 and likely a similar amount in 2023 (final numbers have yet to be published).

In the foreseeable future, lumber prices are likely to remain at the levels observed for much of 2023. An increase in demand, however, associated with stronger US housing starts could quickly cause significant spikes in lumber prices because key producing regions are constrained in their log supply.

OTHER FACTORS AFFECTING CLT PRICE

Although lumber is the primary driver, several other factors also contribute to the CLT market price. Below, we offer a list of these factors to help project teams understand both the impacts of their design decisions and other supply-chain factors outside of their control.

- **Panel thickness:** The ability of a manufacturer to produce a greater number of thinner (3-ply)

panels at a time, compared to thicker (5-ply or 7-ply) panels, will often result in different pricing for panels of different thicknesses. This ability is a function of press bed height.

- **Strength grade:** Mechanically rated (E-series) panels will be more expensive than visually grade (D-series) panels, as they are manufactured with stronger and stiffer lumber that is more costly than visually graded lumber.
- **Species:** CLT is manufactured with lumber from a variety of tree species including Douglas-fir; SYP; and spruce, pine, fir (SPF). Each species has its own supply-and-demand dynamics that impact market pricing.
- **Visual classification:** For many manufacturers, architectural or visual-grade CLT will be more expensive to produce given the higher grade of lumber on exposed surfaces, and the added cost of sanding (if in-line sanding is not part of the production process, but rather done manually).
- **Billet utilization (waste):** Billet utilization will fluctuate depending on the geometry of a mass timber building, resulting in waste material as CLT panels are transformed (via CNC machine) from rectangular billets into custom components. Manufacturers will include the cost of unused waste material in their pricing.
- **Project complexity:** CLT manufacturers do not estimate the cost of individual CLT panels. Rather, they estimate the cost of delivering a project. Design assist and 3D modeling (detailing) costs rise as project complexity increases. Thus, buildings with complex designs are more expensive to produce.

STATE OF THE MARKET IN NORTH AMERICA

2023 turned out to be a year of extremes, with company transitions and project delays on one hand, and the delivery of projects on an unprecedented scale on the other.

We witnessed the closing of Structurlam Mass Timber Corporation, a pioneering company that blazed a trail for mass timber construction in North America and set industry standards for every aspect of project delivery from design assistance to production quality. Structurlam was purchased by Mercer International, a global forest products company headquartered in Germany, that in 2021 purchased Katerra's Spokane CLT facility and is now one of the largest manufacturers on the continent with 3 production facilities.

Structurlam's closure did not, however, reflect a slowing of demand for mass timber. Rather, projects of unprecedented scale broke ground in 2023, including the new 2.4 million-square-foot campus at Walmart's headquarters in Bentonville, Arkansas. Meanwhile, in Oakland, California, Mass Plywood Panels (MPP) and columns rose 16 stories tall in the 19-story mixed-use multifamily building at 1510 Webster, setting a record for point-supported (no beam) construction in the United States. According to data provided by WoodWorks and by estimates of the authors, 279 mass timber projects were constructed in the US and Canada in 2023.

MASS TIMBER DEMAND

In 2023, the demand for mass timber continued to grow amid a contraction of the US construction industry caused by inflation, higher interest rates,

and labor shortages. According to WoodWorks data, roughly 190 mass timber projects either began construction or were built in 2023 in the US, and approximately 168 projects were in the design stage, indicating that there are plenty of projects at all stages of the development pipeline.

As the demand for mass timber grows, keeping track of completed projects becomes more challenging. For this reason, we ask our readers to review the WoodWorks Wood Innovation Network (WIN) database—the best source of industry information on the demand for mass timber in North America—and ensure that all their mass timber projects are listed.

Notably, the WIN database tells us that the demand for mass timber is not equal across the continent, and that certain states are far outpacing others in the use of mass timber to construct future skylines. This year, California, Georgia, Missouri, and Tennessee led the charge in new mass timber projects in design and construction. Office buildings continue to be the leading market sector, accounting for 45 percent of new mass timber construction in 2023.

WoodWorks's – Wood Products Council provides free project support to the Architecture, Engineering, and Construction (AEC) community on multifamily, institutional, and commercial buildings. Growing the mass timber market is the objective of the organization, and they have been a driver of the market since mass timber began in the US. Feel free to reach out to them for any assistance. Readers can also find the latest data and trends at <https://www.woodworks.org/resources/mapping-mass-timber/>. They can also see details about most of the projects at <https://www.woodworksinnovationnetwork.org/>

YEAR	ESTIMATED NUMBER OF MASS TIMBER BUILDINGS CONSTRUCTED	ESTIMATED BOARD FEET OF LUMBER USED IN MASS TIMBER (MBF LUMBER/YEAR)	ESTIMATED MASS TIMBER PRODUCTION, EXCLUDING IMPORTS (CUBIC METERS/YEAR)	ESTIMATED MASS TIMBER MANUFACTURING CAPACITY IN PANELS USED FOR CONSTRUCTION (CUBIC METERS/YEAR)	ESTIMATED PERCENT OF PRACTICAL BUILDING PANEL MASS TIMBER MANUFACTURING CAPACITY UTILIZED
2019	151	129,000	158,000	355,000	45%
2020	177	148,000	174,000	443,000	39%
2021	183	167,000	205,000	491,000	42%
2022	215	252,000	336,000	602,000	54%
2023	279	308,000	393,000	604,000	65%

TABLE 1: ESTIMATED MASS TIMBER LUMBER USAGE AND PRODUCTION IN THE US AND CANADA (2019 TO 2023)

MBF = 1,000 board feet

LUMBER USAGE

As **Table 1** indicates, it is estimated that 308 million board feet of softwood lumber were consumed in North America’s mass timber construction in 2023, an increase of 22 percent from 2022. For context, this total is approximately equal to the annual output of a single, modern North American softwood sawmill.

The increased lumber consumption is driven by the year-over-year growth in the number of mass timber buildings completed in North America; that number grew from 215 in 2022 to 279 in 2023. All other things being equal, the number of buildings completed per year would need to grow to about 900 for annual lumber consumption to reach 1 billion board feet consumed in mass timber construction. As a point of reference, North America has consumed roughly 60 billion board feet of lumber annually for the last several years (2023 was slightly lower).

Several key factors inform the lumber consumption referenced in the preceding paragraph. First, the average building size, which has increased from 35,000 square feet in 2016 to 60,000 square feet in 2023. Second, a mass timber usage factor per square foot of building area was reduced from 0.9 cubic feet per square foot of building in earlier editions of this report to 0.625 in this version of the report. Third, an estimate of the total number of buildings constructed from mass timber that are *not* publicly reported, which was reduced in the current model compared to prior editions.

The latter 2 of the 3 factors described above negatively affect estimated lumber consumption volume. However, the increased average size of mass timber buildings is a large lever impacting lumber consumption in the opposite direction. As a result, despite several new modeling assumptions in this update that reduced estimated lumber use, the total usage estimate for 2023 grew. (Note that the values in the table for prior years

have all been updated to reflect the new modeling assumptions.)

Although mass timber accounts for less than 1 percent of total softwood lumber consumption in North America, the manufacturing of glulam (roughly one-third of the total volume of mass timber consumed) demands a stronger, drier, and more square board that's sold by a smaller number of sawmills for a significant premium over the standard KD19 2-by-6 board. For sawmills focused on quality over quantity, glulam manufacturing represents a strong and growing market, and a chance to differentiate themselves from competitors.

MANUFACTURING CAPACITY

In 2023, manufacturing capacity for mass timber components remained consistent with 2022 capacity, with DR Johnson's CLT manufacturing capacity roughly replaced in volume by Boise Cascade's new VersaWorks products, including Veneer Laminated Timber (VLT) panels and Laminated Veneer Lumber (LVL) beams and columns. Although the data used to calculate the capacities shown in **Table 1** is representative only of manufacturers that produce some form of mass timber panel, roughly one-third of mass timber is glulam, and glulam-only producers are not represented in the capacity calculations. In the future, this report hopes to secure more complete information on the glulam manufacturing capacity in the market, as there is a growing concern around the availability of glulam billets, and glulam fabrication continues to be a pinch point impacting manufacturers' ability to deliver mass timber projects. Another factor that affects estimates of structural CLT production capacity is that some panel manufacturers are also producing panels for

industrial applications (ground mats for temporary roading). At this time, informed assumptions have been made regarding the relative production of CLT for structural and industrial applications.

When looking at manufacturing capacity on a regional basis, the authors found that plants located in the Western US and Canada accounted for 48 percent of all capacity; manufacturers in the Northeastern US (including Illinois) and Eastern Canada accounted for 27 percent of capacity; and manufacturers in the Southeastern US accounted for 27 percent of all capacity.

CONCLUSION

Despite the challenging financial landscape for projects that hoped to get off the ground in 2023, demand for mass timber continued to rise, with the total number of publicly reported mass timber buildings constructed in the US and Canada greater in 2023 than in the year prior, based on data made available by WoodWorks. The industry is also working hard to stay ahead of the demand; operating manufacturers are expanding their existing facilities, and new mass timber companies are expected to come online in the near future. 🌱