

FIRE HARDENING WITH **MASS TIMBER** CONSTRUCTION



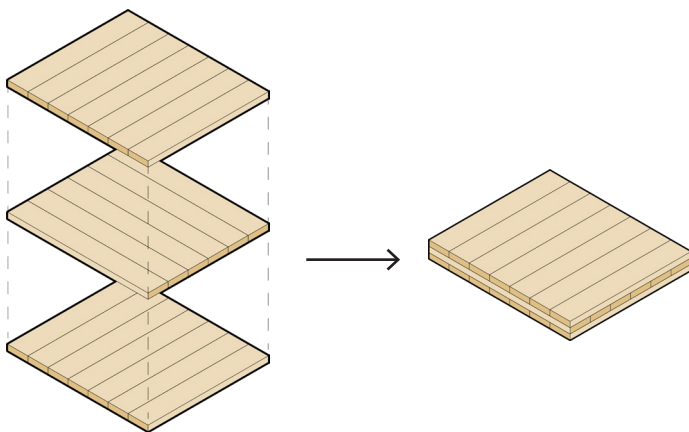
Sierra Institute
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A CLT home under construction

What is mass timber and its fire resistant properties?

In addition to the careful selection and design of exterior or fire-resistant components such as siding, windows, and vents, the structural system itself can increase a home's overall fire resistance. Mass timber, an umbrella term for **structural, engineered wood products**, is a construction type that utilizes solid wood elements, such as layers of dimensional lumber or veneer, to create robust panels or columns and beams.



CLT consists of perpendicularly laminated layers of dimensions lumber.

Cross laminated timber (CLT) in particular is a prefabricated, panelized mass timber system for wall, floor, and roof elements composed of several layers of dimensional lumber that are laminated perpendicular to one another. The result is a solid panel that is both structurally sound and more fire-resistant than stick frame homes [note: prefabricated homes are also typically stick built]. When exposed to flames, the panel chars on its exterior layers protecting the panel's interior layers and the home from burning; where steel will deform at high temperatures and stick framing will combust, CLT's natural ability to char protects the panel's structural integrity.

CLT manufacturers are required to adhere to stringent fire testing measures to ensure panels can withstand prescribed exposure times to fire such as one or two hours. When layered with additional forms of protection such as fire resistant mineral wool insulation and noncombustible metal siding, the home has a dramatically higher chance of withstanding a fire event compared to standard stick frame construction. The 2022 California Building Code Chapter 7A designates glue laminated wood, such as

CLT, as an appropriate fire resistant material for several applications, including wall assemblies, in Wildland Urban Interface (WUI) designated areas. WUI designated areas are zones where human development interacts with undeveloped wildland such as forests; these areas are at high risk for wildfires and typically require specific building standards in order to mitigate fire-related damage.

What are other advantages of mass timber?

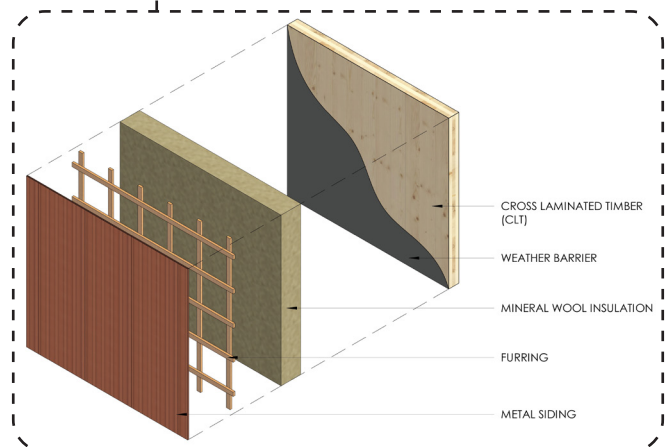
Another advantage of building with CLT is the increased thermal performance due to a lack of “thermal bridging.” Thermal bridging occurs when there is a break in an insulative layer, such as a stick framed wall with insulation in between studs, causing poorer thermal performance because the insulation is interrupted by lower performing components; this results in undesirable heat loss or heat gain and, thus, higher energy bills. A solid panelized structure of CLT with no cavities mitigates these gaps because insulation is continuously installed over panels with little to no breaks in the thermal barrier. This results in a continuous envelope that is crucial for preventing fire spread. The continuous structural and thermal layers and lack of wall cavities create a monolithic wall assembly that makes it much more difficult for flames to spread and ignite individual components.

What is mass timber’s future in residential construction?

One of the challenges of CLT is its newness in the United States, especially in single-family home construction. Since CLT is not a commodity product like dimensional lumber, it requires specialized manufacturing and significant coordination between the design team and manufacturer. This, however, also ensures a high quality product with less in-field coordination than conventionally built on-site

homes and can result in in-field cost savings and speedier construction.

Choosing fire-resistant and noncombustible products for the siding, insulation, and structure itself increases the likelihood that a home can survive a wildfire event as they act as fail safe mechanisms in the event that fire or embers make it past the defensible space. Mass timber construction is one way of achieving this. While single family CLT homes are less common due to the market's focus on multi-story structures, there is increasing enthusiasm for its use as an appropriate fire hardening measure for new construction homes and should be considered when building in wildfire vulnerable regions. No home is fire-proof, but CLT and mass timber products dramatically increase home fire resistance. To learn more about mass timber housing, visit www.sierrainstitute.us.



Noncombustible and fire resistant components, such as metal siding and mineral wool insulation, are layered over the CLT to add further layers of protection.



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