

COMPARATIVE STUDY OF GLULAM-MEMBERS AND STEEL-MEMBERS USED IN THE CONSTRUCTION FIELD

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DEFINITIONS

GLULAM

Glue laminated timber, or Glulam, is a type of engineered wood made of short pieces of sawn lumber which are laminated together using a high strength, water resistant adhesive. Glulam is most commonly used for long-span beams but is also used for trusses and columns (7).

STEEL

Steel is a ferrous metal. Its high strength in relation to its weight makes it the material of choice for skyscrapers, and long-span structures such as bridges. Its malleability and weldability allow it to be shaped, bent, and made into different types of components (7).

STRENGTH AND SUSTAINABILITY

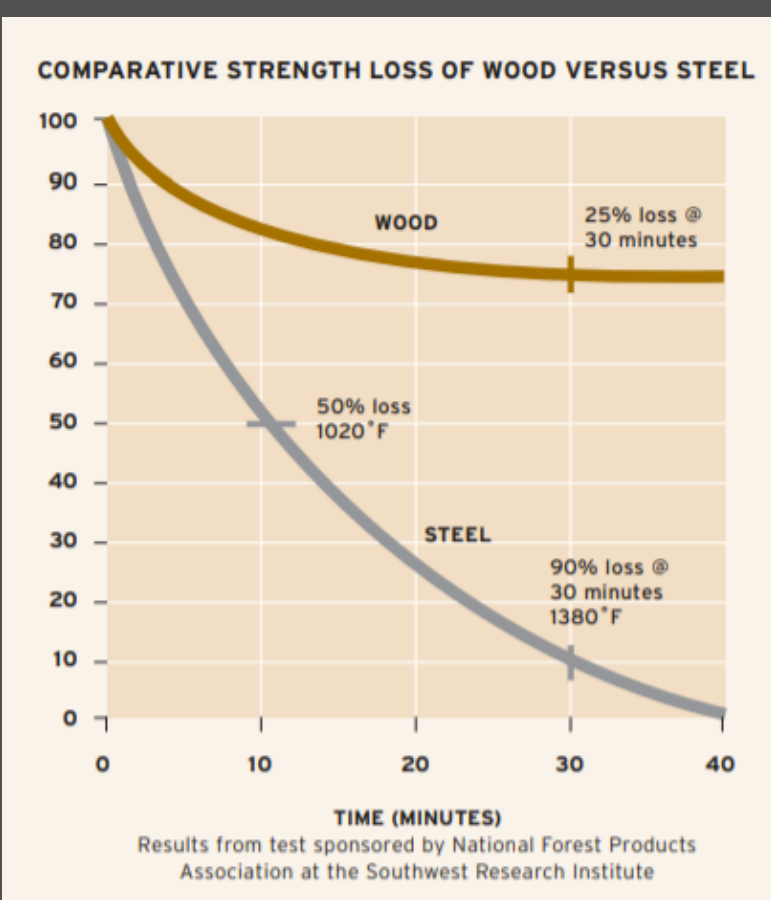
STRENGTH

Glulam has 1.5 to 2 times the strength to weight ratio than that of steel (11).

RECYCLABILITY

Both steel and glulam are completely recyclable. However, at this juncture, steel is much more easily recyclable (5)(10).

ENVIRONMENTAL IMPACTS



Fire Rating

Glulam members have a much lower strength loss in comparison to steel members when exposed to fire, providing them with a greater fire rating (1).

Carbon Storage

A five-story residential building made of glulam could store up to 37 pounds of carbon per square foot (2).

Manufacturing

The manufacturing of steel beams results in energy consumption 2-3 times greater and fossil fuel use 6-12 times higher than during the manufacturing of glulam beams (9).



Mjøstårnet by Voll Arkitekter in Brumunddal, Norway. This is the worlds tallest timber building. Made using CLT and Glulam in place of steel and concrete (6).

Works Cited

(1) "American Institute of Timber Construction Superior Fire Resistance." American Institute of Timber Construction.

(2) "Buildings Can Become a Global CO2 Sink If Made out of Wood Instead of Cement and Steel." ScienceDaily, ScienceDaily, 27 Jan. 2020, www.sciencedaily.com/releases/2020/01/200127134828.htm.

(3) Dennehy, Kevin. "Using More Wood for Construction Can Slash Global Reliance on Fossil Fuels." YaleNews, Yale, 2 Apr. 2014, news.yale.edu/2014/03/31/using-more-wood-construction-can-slash-global-reliance-fossil-fuels.

(4) Green, Michael, director. Why We Should Build More Wooden Skyscrapers. TED, 2013, www.ted.com/talks/michael_green_why_we_should_build_wooden_skyscrapers/transcript.

(5) Ike. "Recycling Timber: Wasting Away." Building, 28 Oct. 2015, www.building.co.uk/focus/recycling-timber-wasting-away/5078393.article.

(6) India Block | 19 March 2019 Leave a comment. "Mjøstårnet in Norway Becomes World's Tallest Timber Tower." Dezeen, 2 Aug. 2019, www.dezeen.com/2019/03/19/mjostarne-worlds-tallest-timber-tower-voll-arkitekter-norway/.

(7) Mehta, Madan, et al. Building Construction: Principles, Materials, and Systems. Pearson., 2018.

(8) Oliver, Chadwick Dearing. "Carbon, Fossil Fuel, and Biodiversity Mitigation With Wood and Forests." Taylor & Francis, 28 Mar. 2014, www.tandfonline.com/doi/full/10.1080/10549811.2013.839386.

(9) Petersen, K A, and B Solberg. "Greenhouse Gas Emissions, Life-Cycle Inventory and Cost-Efficiency of Using Laminated Wood Instead of Steel Construction." Ohiolink, 2002, rave.ohiolink.edu/ejournals/article/322357757.

(10) "Steel." Recycling | Steel, www.recycle-more.co.uk/recycling/steel.

(11) "Why Glued Laminated Timber Beams Are So Popular in the Construction Industry?" Epic Home Ideas, 18 Apr. 2019, www.epichomeideas.com/glued-laminated-timber-beams-in-the-construction-industry/.