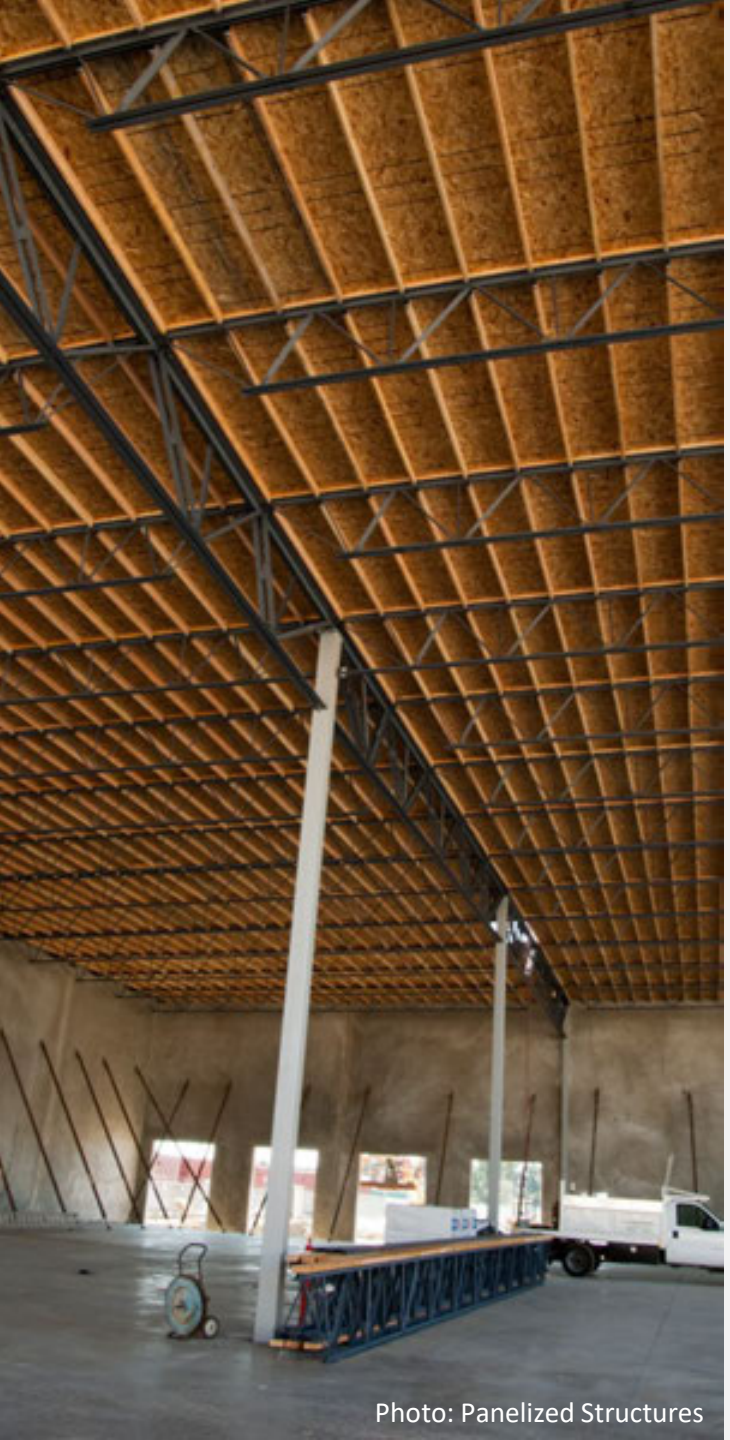

Photo: Panelized Structures

Moisture Control and Durability in Hybrid Light-Frame Panelized Roof Systems

Part 1: An Introduction to Panelized Roof Systems

TAYLOR LANDRY, PE, MLSE

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Course Description

Hybrid light-frame panelized roof systems are widely used throughout the U.S. in large industrial warehouses and distribution centers for their economy, constructability, and repeatability—especially when paired with panelized construction. However, long-term performance depends on a clear understanding of the complete roof assembly and its interaction with climate-specific moisture conditions.

This webinar provides a building science–based overview of hybrid light-frame panelized roof assemblies, clarifying how and where moisture accumulation and condensation can occur, and why long-term performance depends on enclosure design rather than material choice alone. Participants will examine detailing and control-layer strategies that support effective drying, prevent mold growth, and protect indoor environmental quality. Through real-world case studies, the session offers actionable approaches that support code compliance, occupant health, and long-term durability across multiple climate zones.

Learning Objectives

1. Understand the mechanisms of moisture transport (air leakage, vapor diffusion, and bulk water) in hybrid light-frame panelized roof assemblies and their impact on condensation risk and indoor environmental quality.
2. Differentiate material misconceptions from system-level causes of moisture failures, demonstrating why trapped moisture is not a wood-specific issue.
3. Assess regional climate considerations when designing hybrid panelized roof assemblies, including vapor control, insulation placement, and drying potential in cold, mixed, hot-humid, and marine climates.
4. Apply transferable design strategies that enable hybrid light-frame panelized roof systems to perform reliably across diverse U.S. regions, supporting broader adoption beyond traditional West Coast markets.

Outline

- Part 1: Introduction to panelized roof systems
- Part 2: Building science primer
- Part 3: Lessons from the field

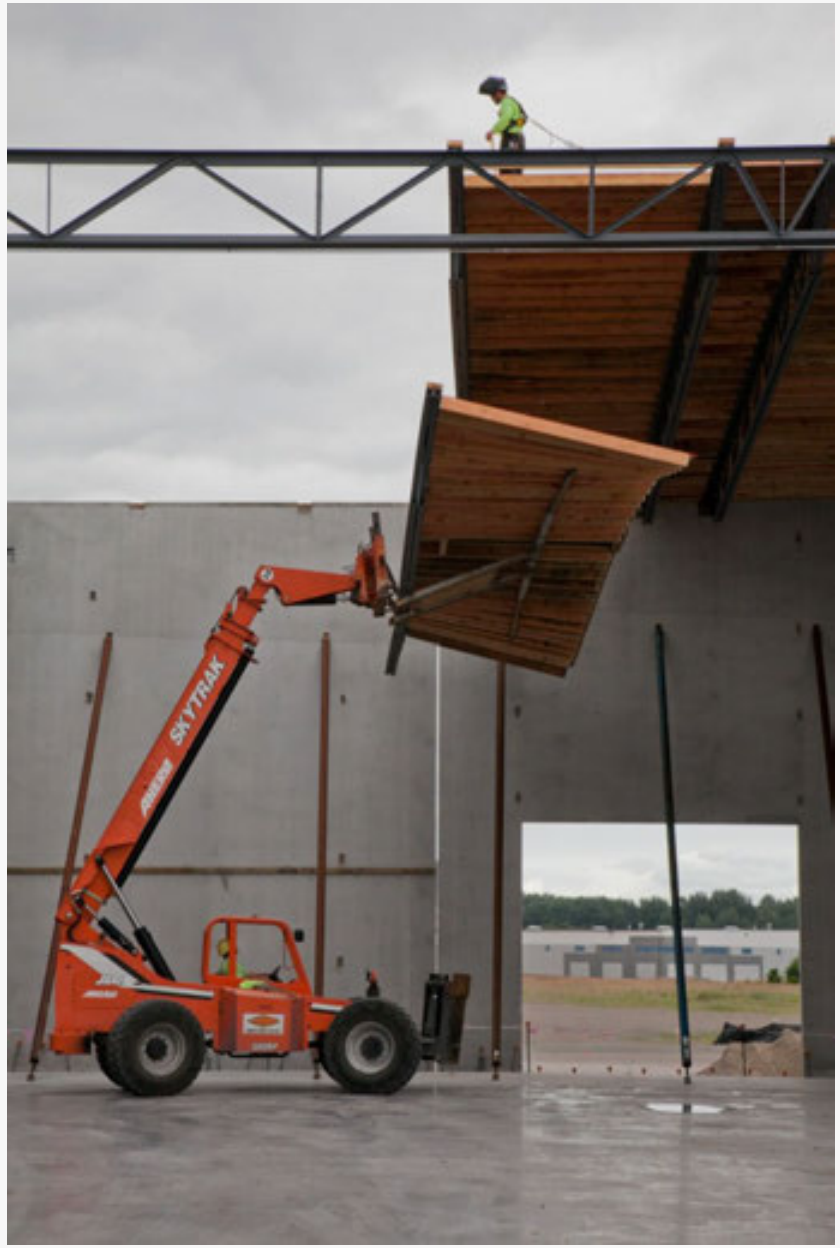


Photo: Panelized Structures

Photo: Panelized Structures

Panelized Roof System

- Pre-fabricated roof sections that are lifted into place
- Drivers are Safety, Cost, and Speed
- Two common types
  - All wood
  - Hybrid

Photo: Redbuilt

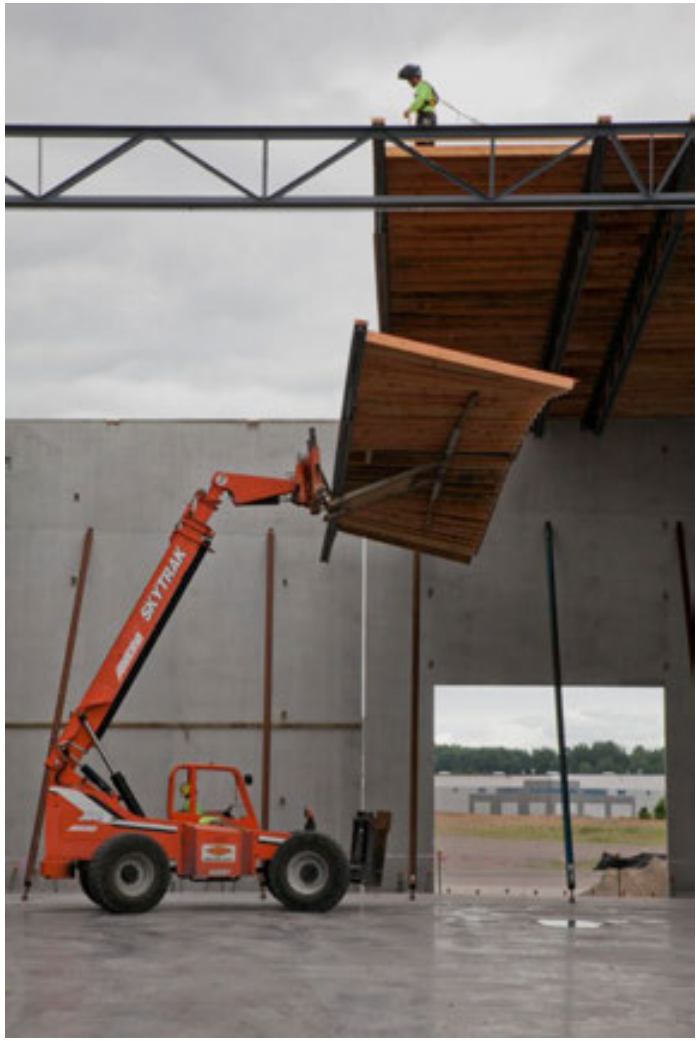


Photo: Panelized Structures

Mass Timber Light Frame Hybrid

- Mass timber roof panels
- Light frame trusses

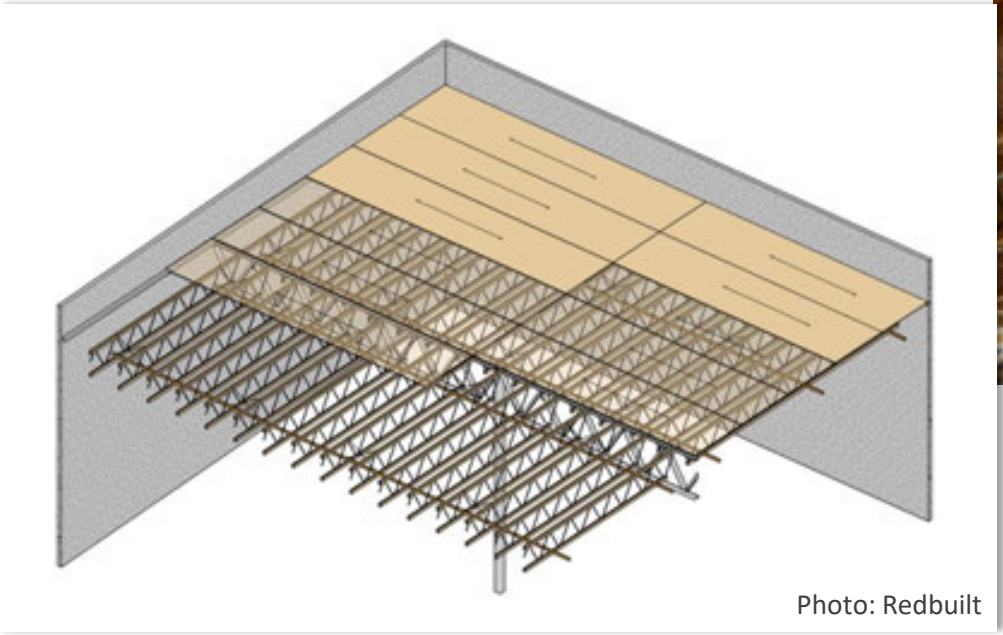


Photo: Redbuilt

Photo: Redbuilt

When are Panelized Roofs used?

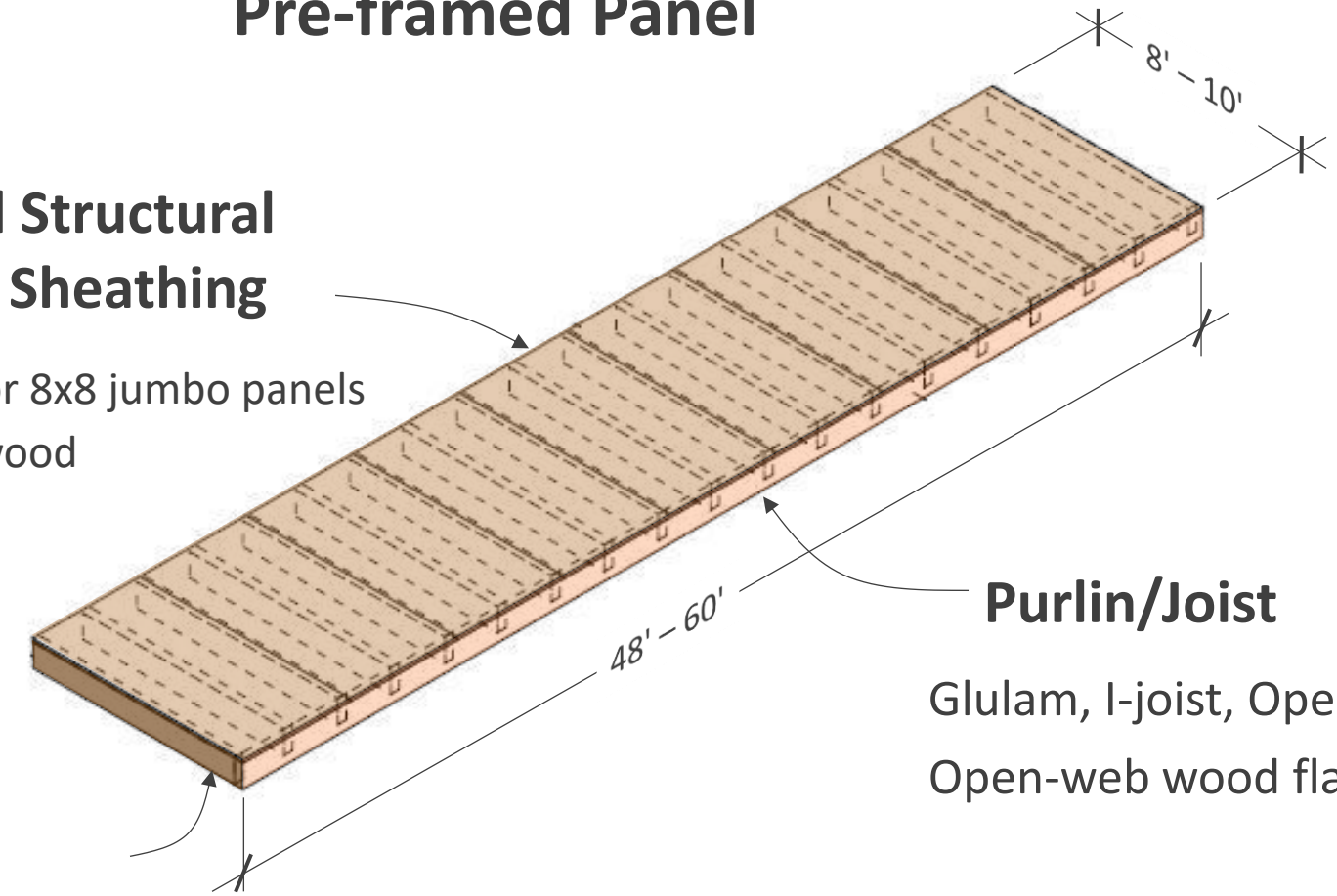
- Commonly used with tilt-up concrete or masonry walls
- Typically used in big, box-type structures
  - Warehouses/Distribution Centers
  - Commercial low-slope roofs

Photo: Redbuilt

Photo: Panelized Structures

Panelized System Elements

Pre-framed Panel



Wood Structural Panel Sheathing

- 4x8, 4x10, or 8x8 jumbo panels
- OSB or plywood

Purlin/Joist

Glulam, I-joist, Open-web truss

Open-web wood flange, steel joist

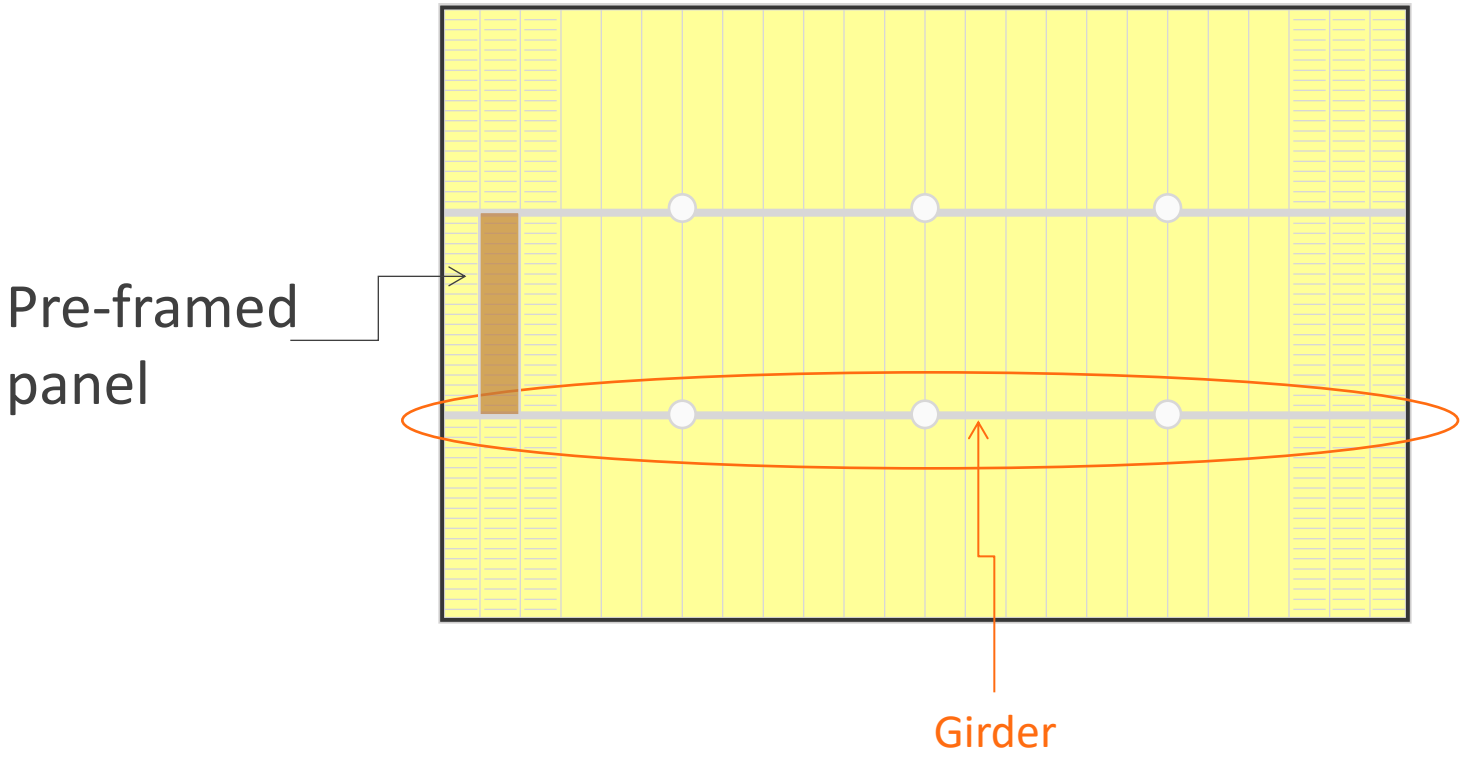
Subpurlin

Dimensional sawn lumber

Defining Panelized System Elements

Simple span or Cantilevered Glulams

Panels span between girder lines



How is a Panelized Roof Constructed?

1. Erect columns
2. Place girders
3. Install purlins/joists at columns

Photos: Panelized Structures

How is a Panelized Roof Constructed?

4. Assemble panels on ground
   - » Often in 8’ width
   - » Single purlin/joist
   - » Sub-purlins @ 24”oc
   - » Wood structural panel

Photos: Panelized Structures

How is a Panelized Roof Constructed

5. Place pre-framed panel

Photo: Panelized Structures

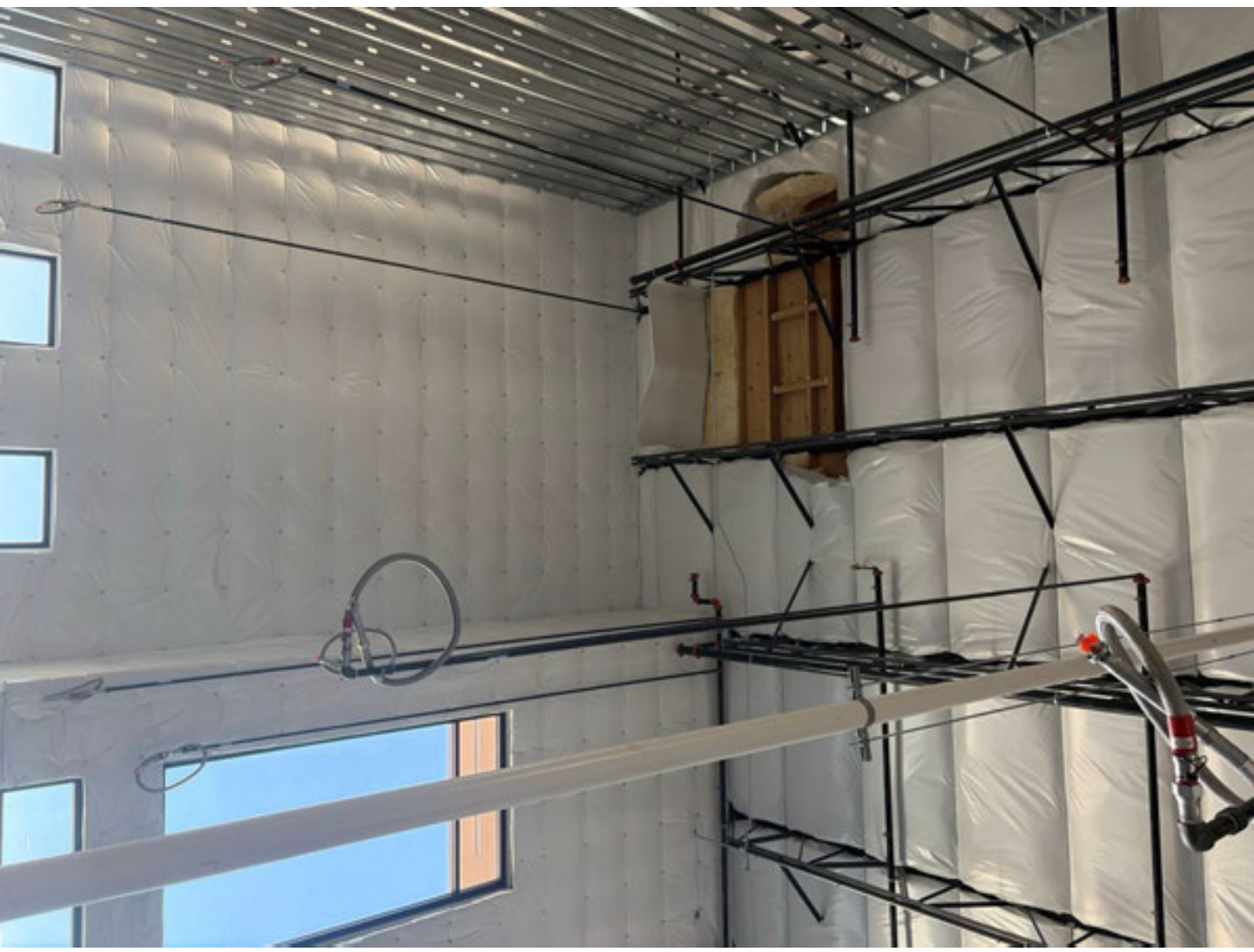
How is a Panelized Roof Constructed?

6. Secure pre-framed panel
   - » Purlin/joist to girder
   - » Sub-purlins to adjacent purlin
   - » Final panel nailing
7. Process repeated

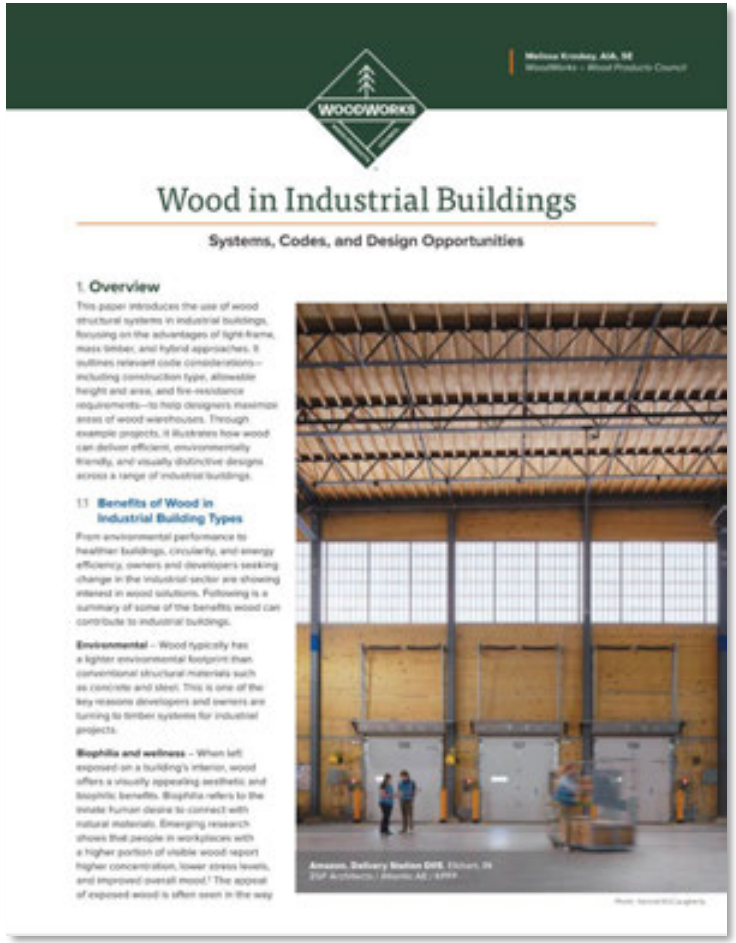
Photos: Panelized Structures

Photo: Redbuilt

Photo: The Structures Group



Resources



Wood in Industrial Buildings

Systems, Codes, and Design Opportunities

1. Overview

This paper introduces the use of wood structural systems in industrial buildings, focusing on the advantages of light-frame, mass timber, and hybrid approaches. It outlines relevant code considerations—including construction type, allowable height and area, and fire-resistance requirements—to help designers maximize areas of wood warehouses. Through example projects, it illustrates how wood can deliver efficient, environmentally friendly, and visually distinctive designs across a range of industrial buildings.

1.1 Benefits of Wood in Industrial Building Types

From environmental performance to healthier buildings, circularity, and energy efficiency, owners and developers seeking change in the industrial sector are showing interest in wood solutions. Following is a summary of some of the benefits wood can contribute to industrial buildings.

Environmental – Wood typically has a lighter environmental footprint than conventional structural materials such as concrete and steel. This is one of the key reasons developers and owners are turning to timber systems for industrial projects.

Biophilia and wellness – When left exposed on a building's interior, wood offers a visually appealing aesthetic and biophilic benefits. Biophilia refers to the innate human desire to connect with natural materials. Emerging research shows that people in workplaces with a higher portion of visible wood report higher concentration, lower stress levels, and improved overall mood.[7] The appeal of exposed wood is often seen in the way

Amazon, Delivery Station DXS. Elkhart, IN

[Wood in Industrial Buildings: Systems, Codes, and Design Opportunities]

Why Consider a Panelized Wood Roof System for Commercial Buildings

Roof panelizing is the process of assembling roof sections on the ground and lifting them into place. This approach offers a number of potential benefits, with users citing cost savings—mainly due to installation speed—and safety as the main drivers.

Panelized wood roofs are most common on industrial buildings in West Coast markets, where savings can range from $1.25 to $1.50 a square foot or approximately 15% compared to conventional steel joist-metal deck systems.[1] However, they can be engineered to resist loads in any location and the economies associated with efficient installation and cost-effective materials apply nationwide.

An accomplished roof erector with one crew can install more than 100,000 square feet of wood roof panels per week, while a hybrid roof can be installed in as little as half the time of a metal deck roof.[2]

This paper provides an overview of panelized wood roof systems, including project typologies that lend themselves to wood construction, code considerations, structural and enclosure design, and assembly and installation. For information on construction type and height and area considerations, see the WoodWorks paper, *Wood in Industrial Buildings: Systems, Codes, and Design Opportunities*.

[Paper: Why Consider a Panelized Wood Roof System for Commercial Buildings]

[Expert Tip: Panelized Wood Roofs: Enclosure Design for Long-Term Performance]

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