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Mass Timber Enclosure Overview

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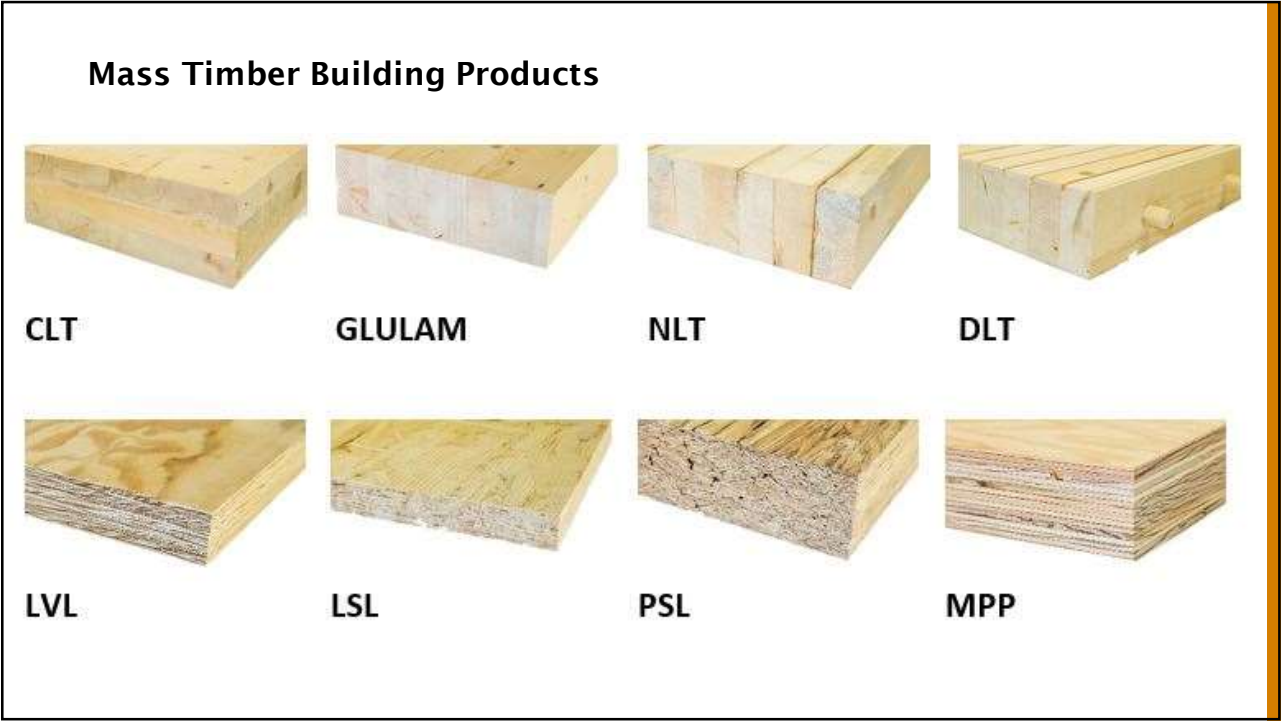
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OUTLINE

1. Mass timber materials + applications
2. Wood and moisture
3. Building enclosure design + mass timber
4. Lessons learned

Materials + Applications

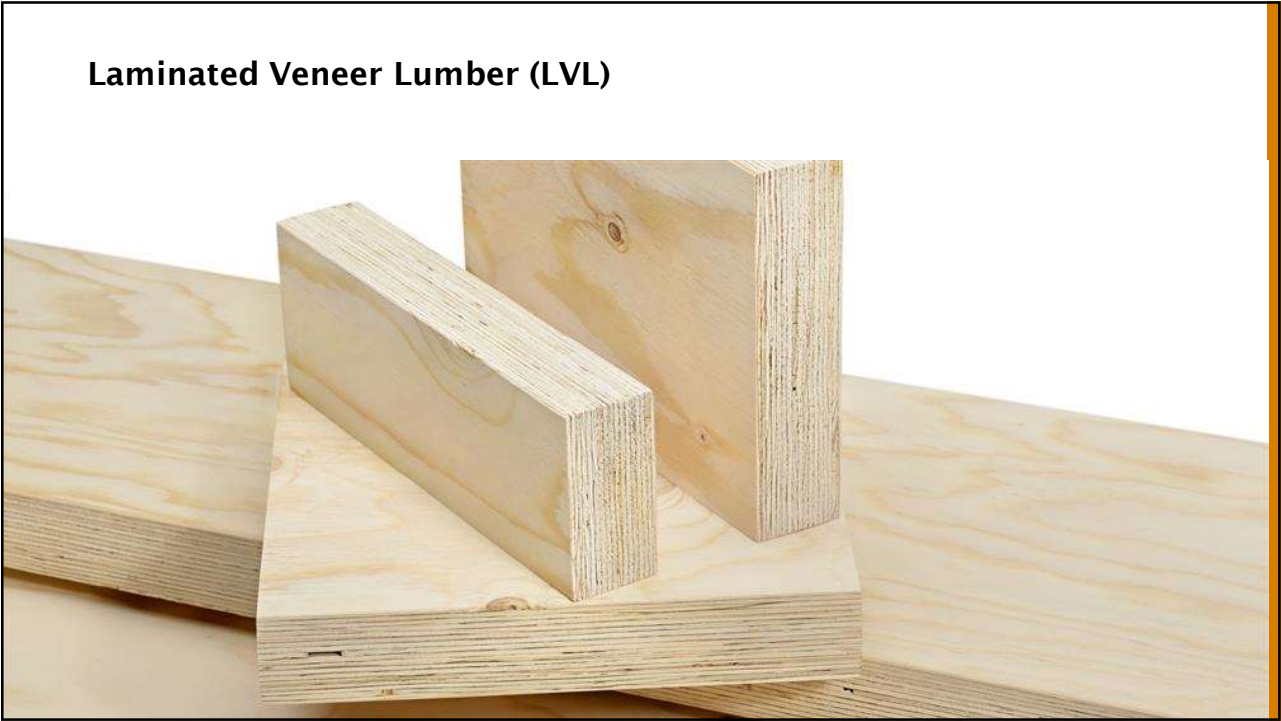


Nail Laminated Timber (NLT)

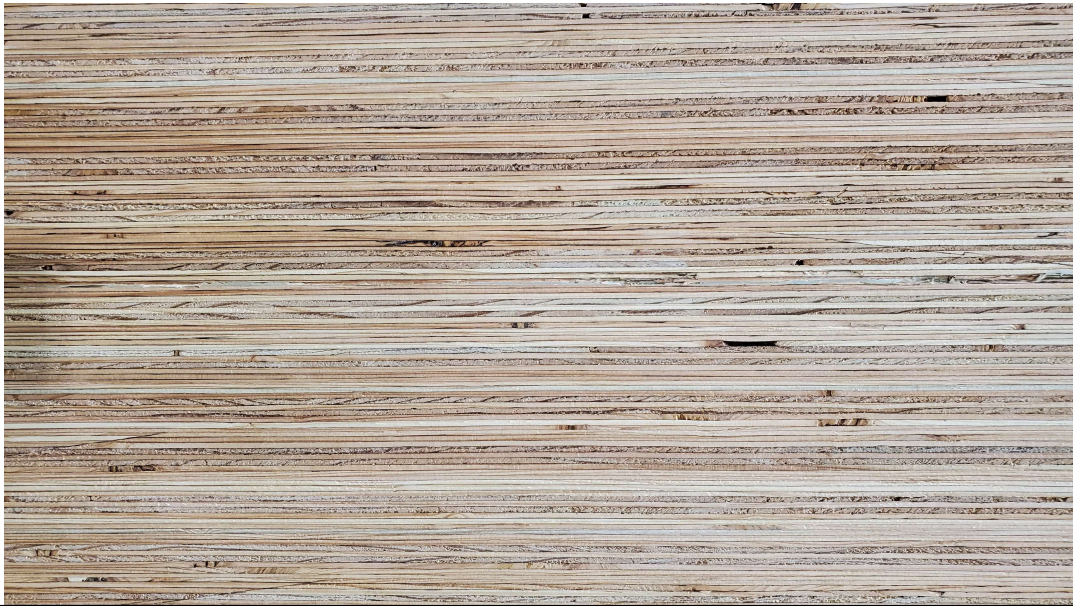


Dowel Laminated Timber (DLT)



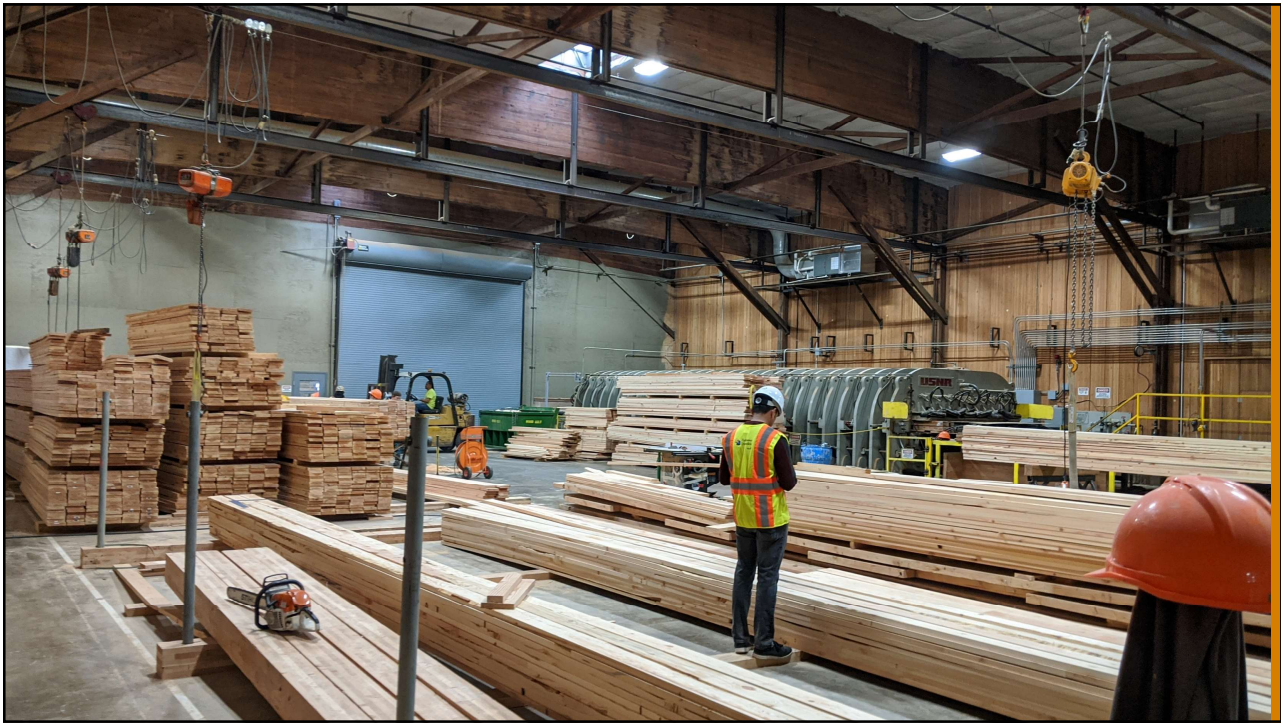


Mass Plywood Panel (MPP)

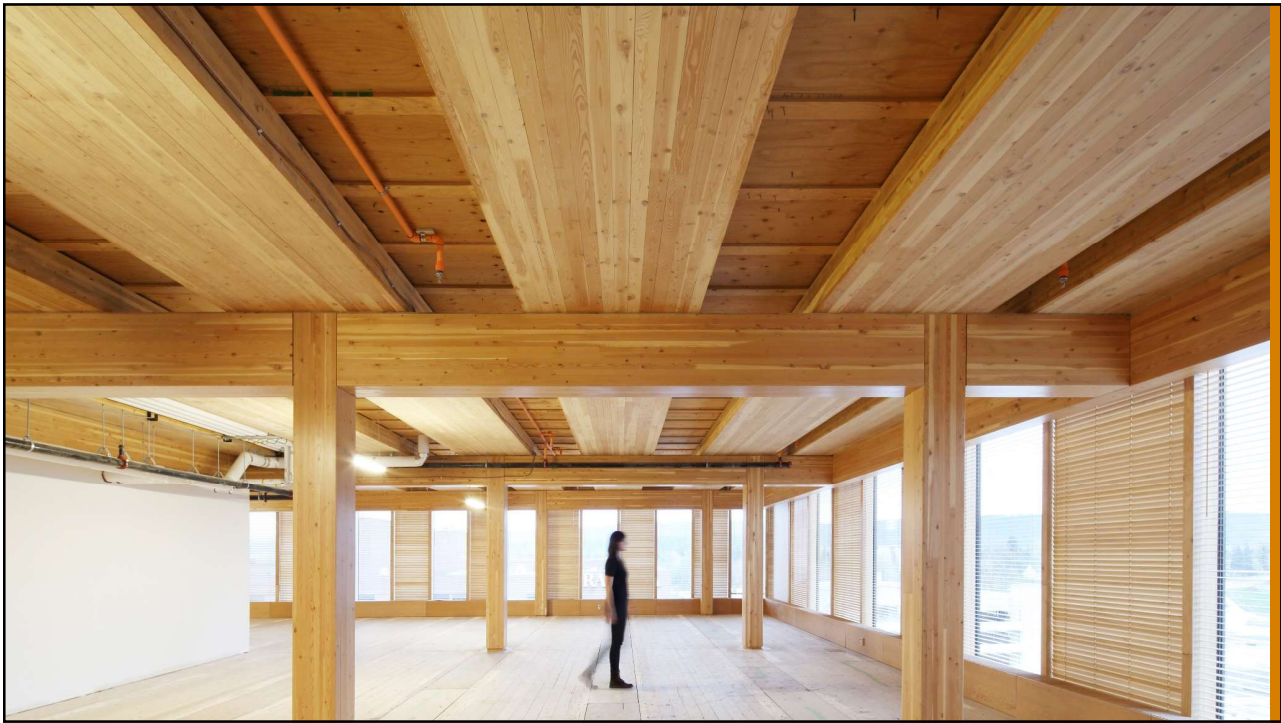
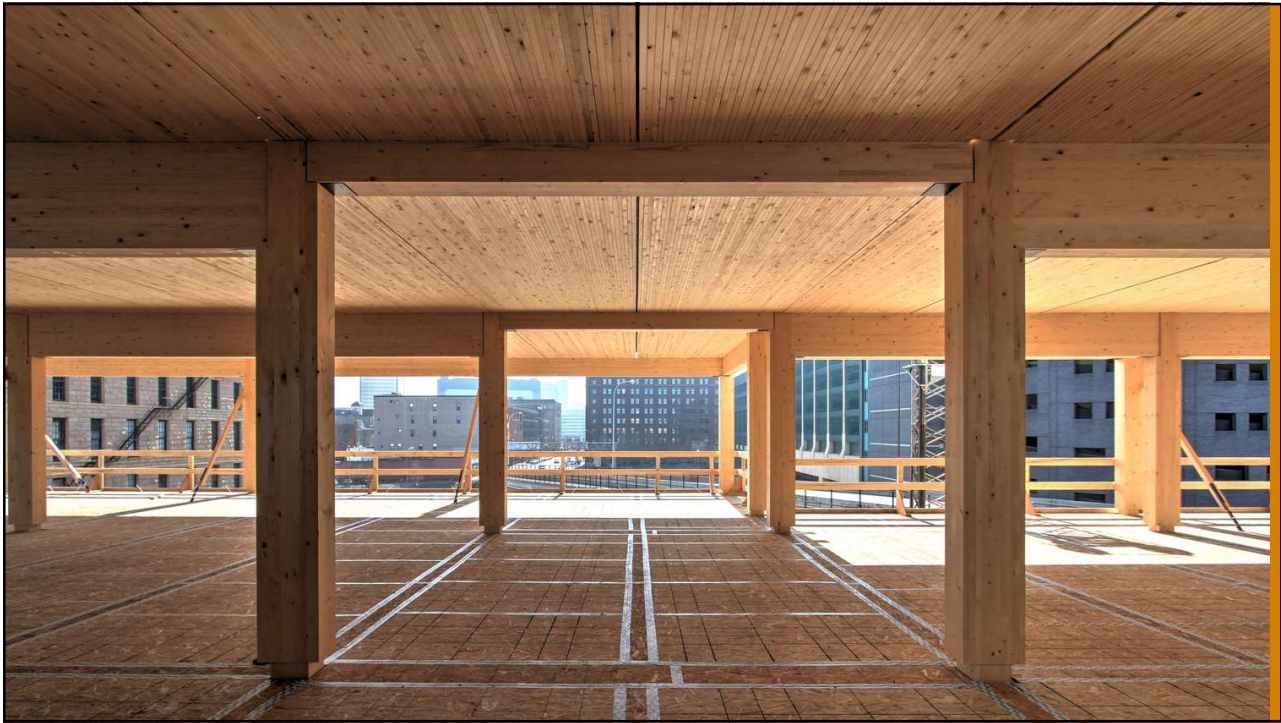


Cross Laminated Timber (CLT)

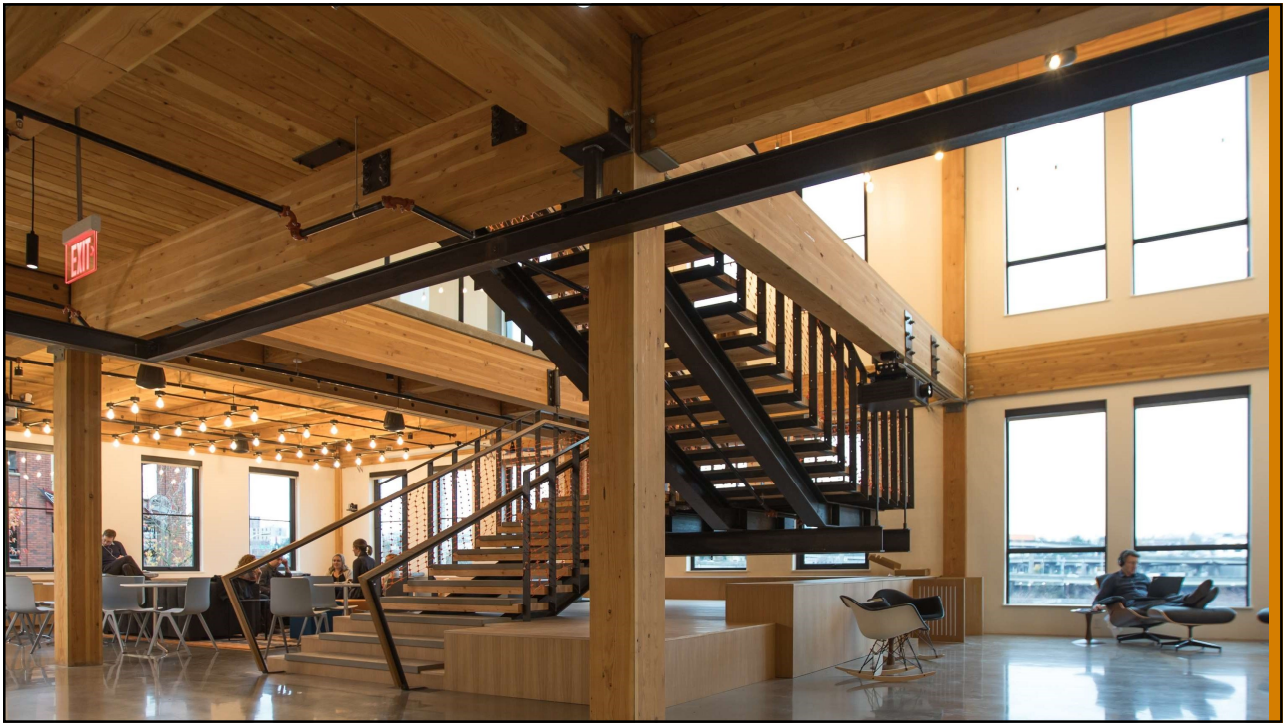






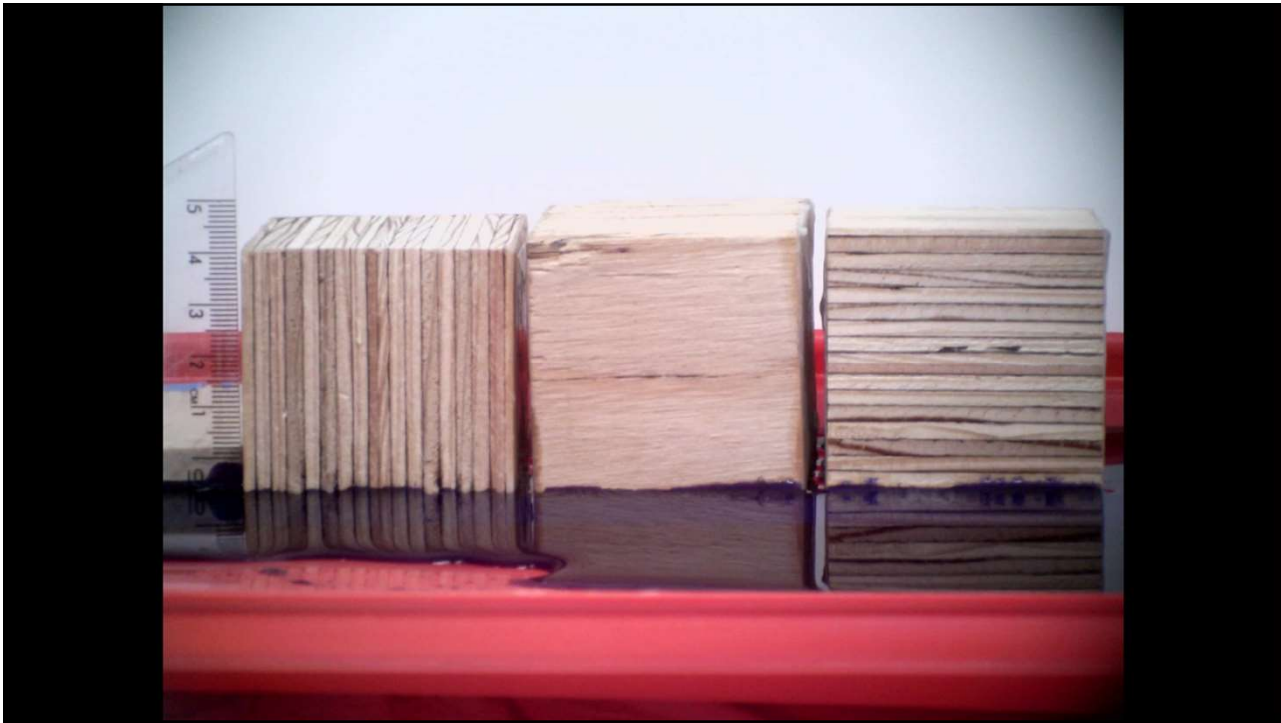




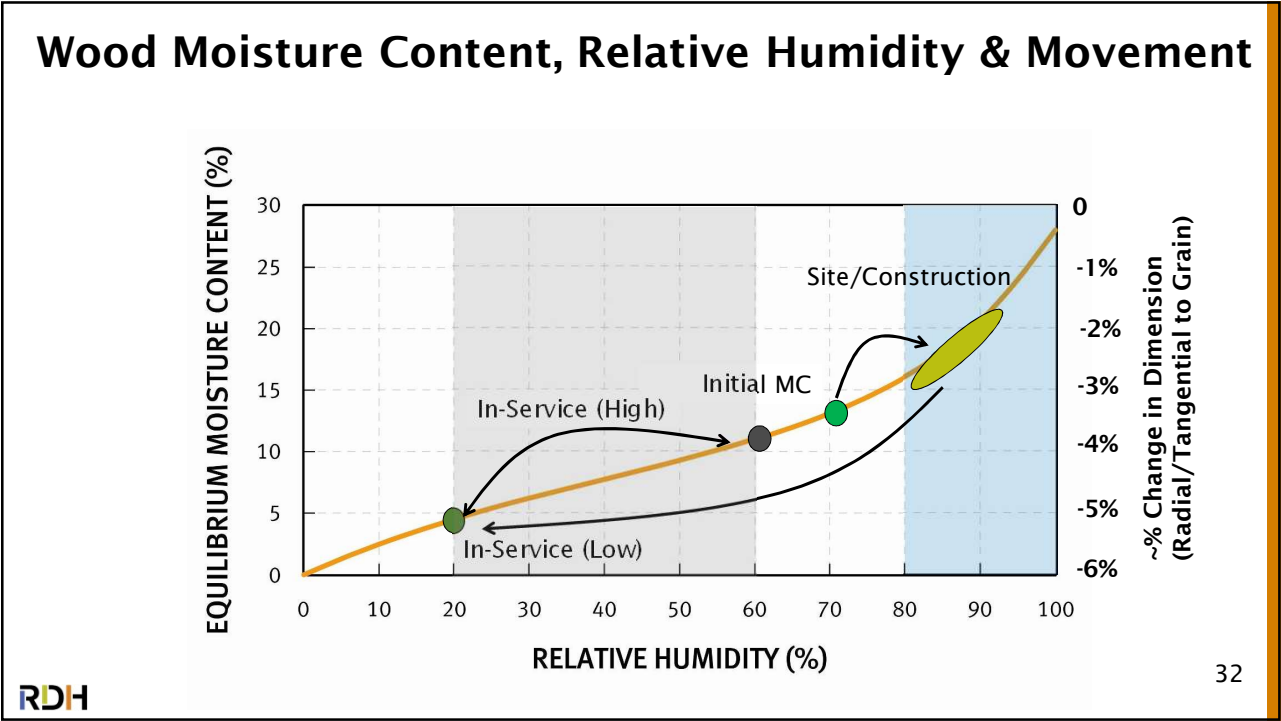
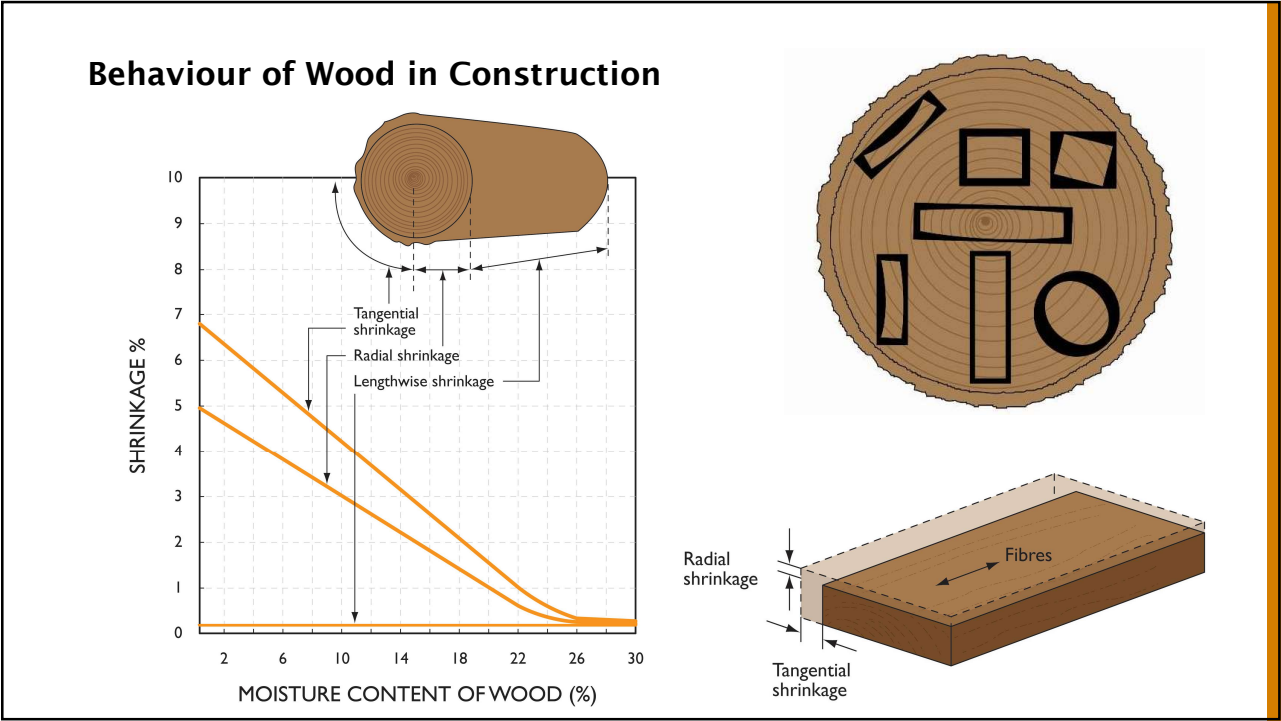










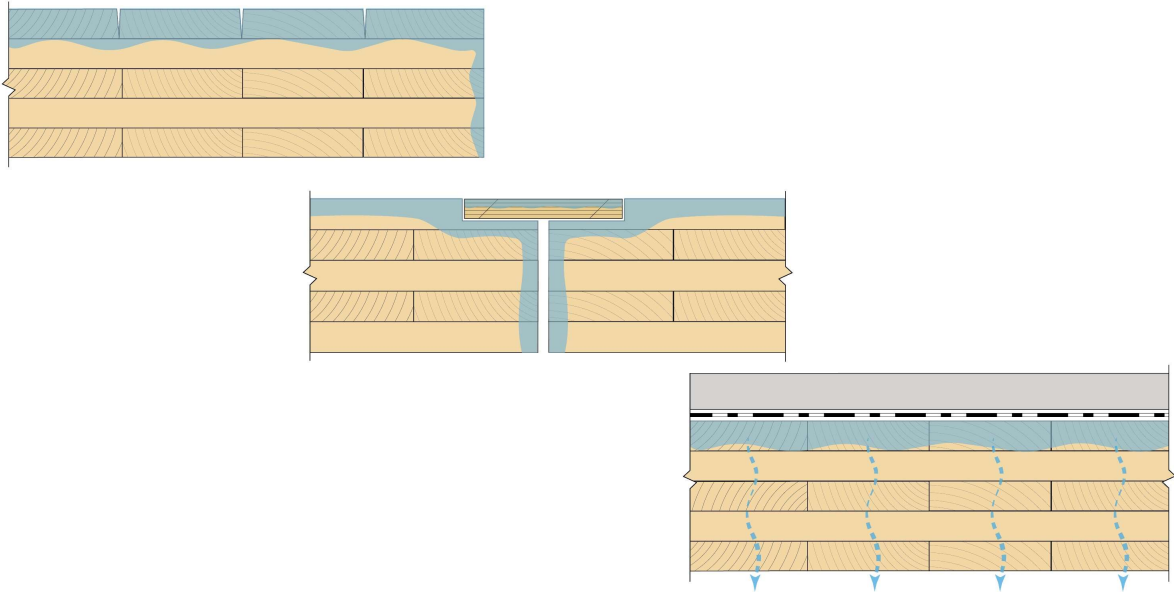


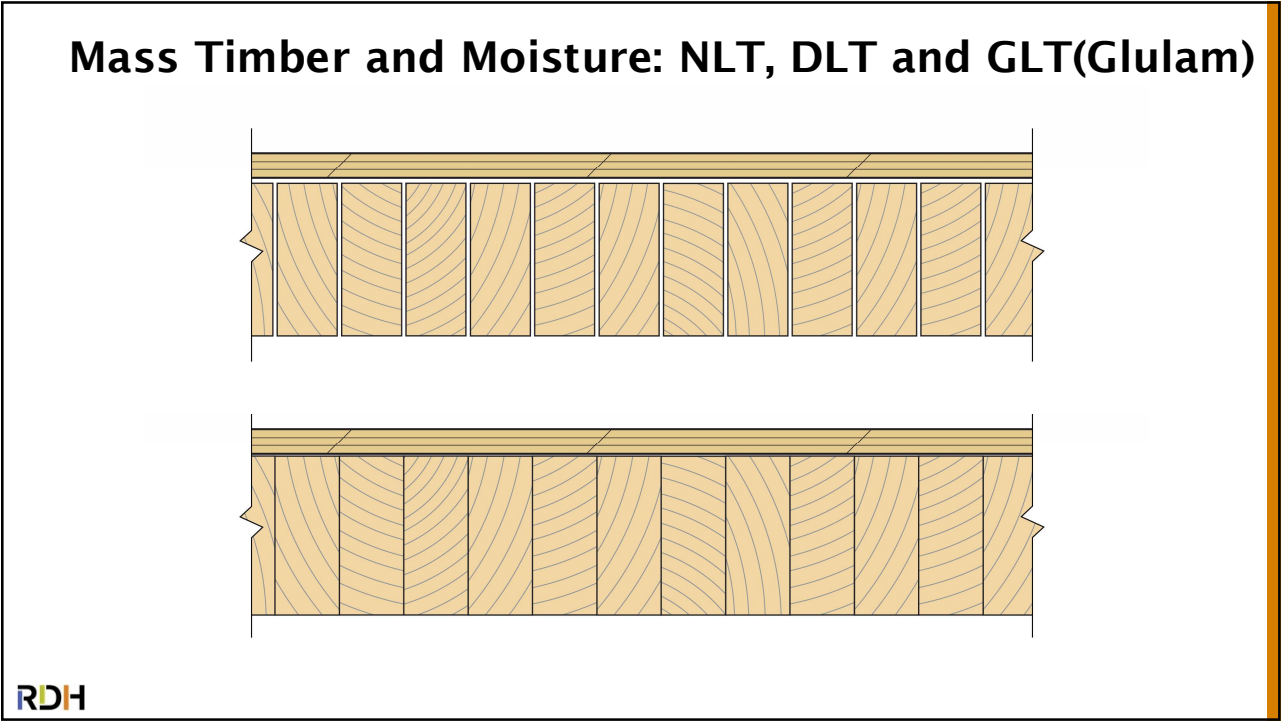
Mass Timber and Moisture: CLT



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Mass Timber and Moisture: CLT





Mass Timber and Moisture: LVL and MPP












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Mass Timber and Moisture: PSL & LSL



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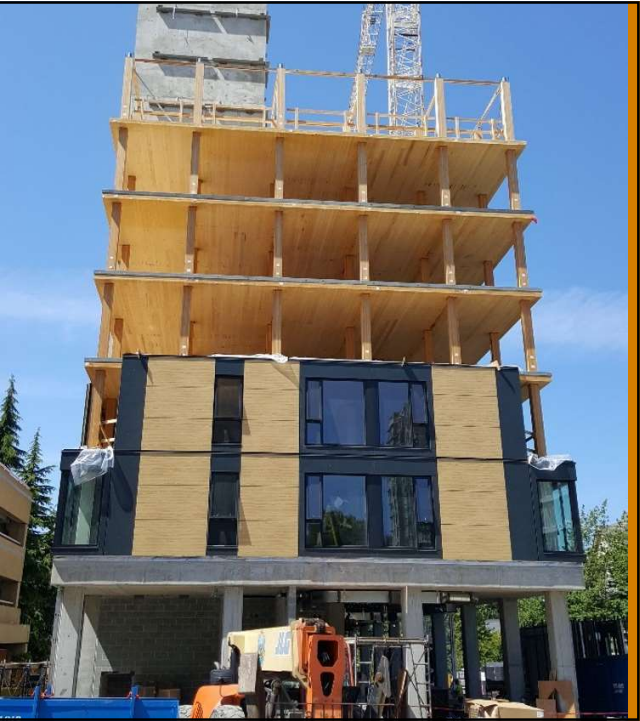


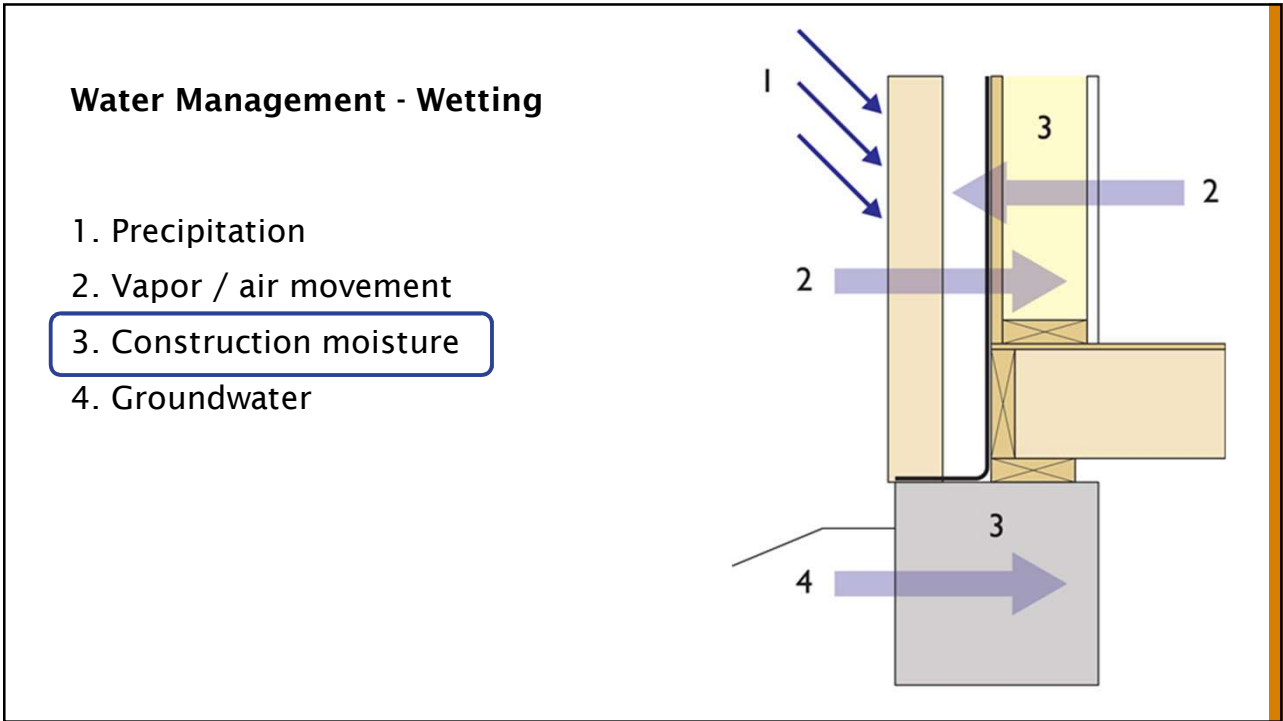
PROTECTION LEVEL	TMMS MEMBRANE / JOINT TREATMENT	BENEFITS	CHALLENGES / LIMITATIONS	RECOMMENDED CLIMATE INDEX / SEASON
 HIGH	Field Membrane: Fully adhered, vapor impermeable waterproof membrane on sheathing. Joint Treatment: Fully adhered or welded field membrane laps.	Factory applied field membrane prior to shipping minimizes errors and weather limitations of on-site application. Field membrane may serve as part of permanent nail membrane or flooring underlayment. Allows for immediate installation of joint treatment following panel installation if skilled workers are available. High durability of membrane laps when torched or welded (avoid self-adhered laps).	Requires pre-coordination with subcontractor installing TMMS. Can trap moisture within the NLT assembly and significantly reduce drying should water penetrate the membrane.	All Climate Indices / All Seasons
 MODERATE	Field Membrane: Precast, moisture-resistant bonded water-resistant coating on sheathing. Joint Treatment: Taped and/or sealed (e.g., flexible flashing membrane or tape).	Precast sheathing minimizes need for experienced membrane installers. Sheathing and TMMS field membrane are combined into a single fabrication step. Allows immediate installation of joint treatment following panel installation.	Sheathing attachment penetrates through TMMS field membrane, jeopardizes seal failure. May be susceptible to damage and/or adhesion failure due to trade activities. May have limited exposure time, ponding water may result in water absorption and slow drying.	Climate Index < 70 / All Seasons
 MODERATE	Field Membrane: Fully adhered, vapor permeable and moisture-resistant membrane on sheathing. Joint Treatment: Taped and/or sealed (e.g., flexible flashing membrane or tape).	Factory applied field membrane prior to shipping minimizes errors and weather limitations of on-site application. Allows for immediate installation of joint treatment following panel installation if field membrane is pre-applied to sheathing.	Requires pre-coordination with subcontractor installing TMMS. TMMS may be susceptible to damage and/or adhesion failure due to trade activities. May require skilled/experienced installers.	Climate Index < 70 / All Seasons
 MODERATE	Field Membrane: None. Exposed plywood or OSB sheathing. Joint Treatment: Taped and/or sealed (e.g., flexible flashing membrane or tape).	Allows for immediate installation of joint treatment following panel installation. Skilled/experienced workers not required for joint treatment installation. Additional applications of water sealer may further increase water resistivity of the sheathing. Cost effective compared to options with field membrane.	Some joint treatment products may not bond to damp or wet sheathing substrate. Joint treatment may be susceptible to damage and/or adhesion failure due to trade activities.	Climate Index < 35 / All Season Climate Index < 70 / Dry Seasons
 LOW	Field Membrane: None. Exposed plywood or OSB sheathing. Joint Treatment: None. Exposed sheathing joints.	Cost effective. May minimize schedule impacts.	System permits water migration between sheathing joints and into the NLT in wet weather conditions.	Climate Index < 35 / All Season
 LOW	Field Membrane: None. Exposed NLT connections. Joint Treatment: Not applicable.	Accommodates sheathing installation at a later date or following site installation. May minimize schedule impacts. Cost effective.	Option permits water migration between NLT in wet weather conditions.	Climate Index < 35 / All Season
 ISOLATED AREAS ONLY	Field Membrane: Loose laid sheet over sheathing. Joint Treatment: Taped and/or sealed (e.g., flexible flashing membrane or tape).	Serves as short-term temporary protection for isolated areas.	Low durability. Difficult to walk. Typically slippery and dangerous to walk on. Allows lateral moisture movement beneath membrane.	Isolated Conditions (evaluate for project specific appropriateness)
 ISOLATED AREAS ONLY	Field Membrane: Membrane under sheathing and over NLT connections. Joint Treatment: Varies.	Sheathing protects membrane from trade damage.		

guidance

Managing Movement

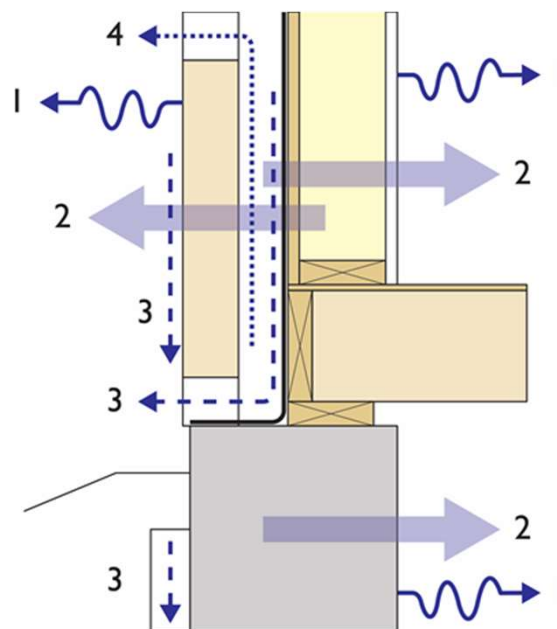
- Critical to consider vertical displacement differences between different vertical elements
 - Floors and columns
 - Core elements
 - Façade elements
- Minimize magnitude of differential movements that need to be accommodated
 - Keep wood dry, watch saturation of floor framing during construction
 - Remove floor framing from the vertical load path





Water Management - Drying

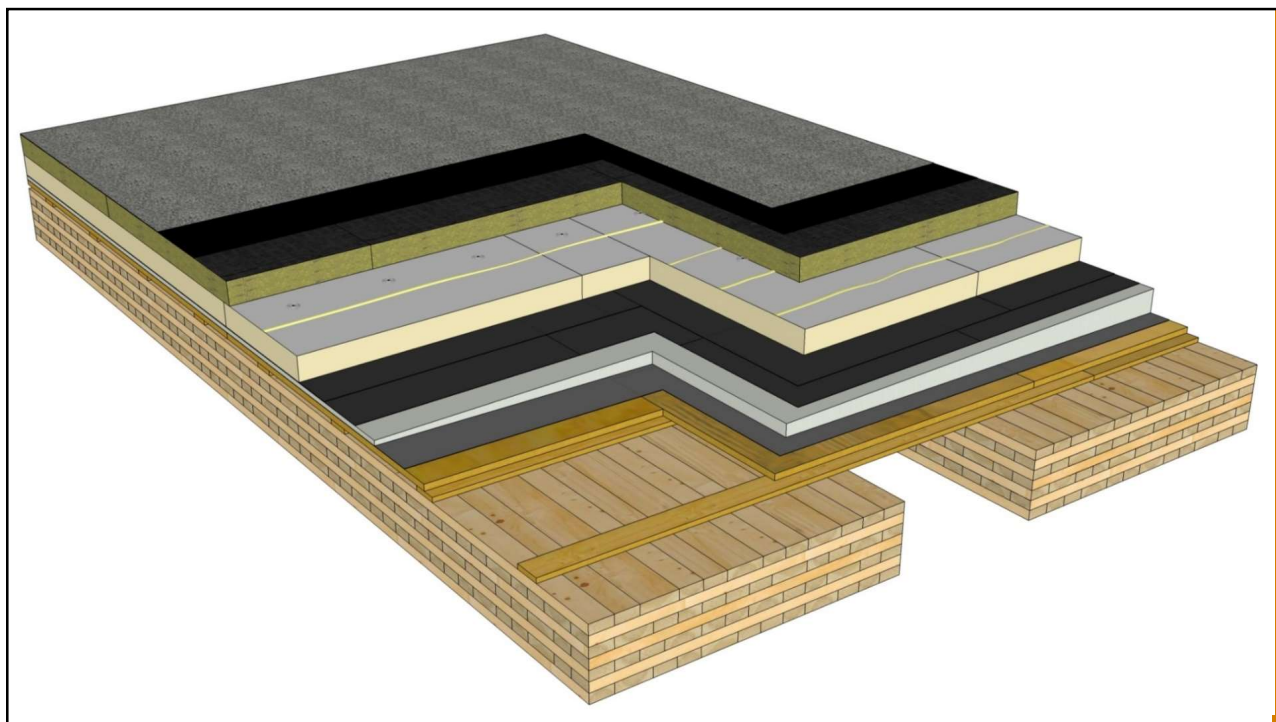
1. Evaporation
2. Vapor / air movement
3. Drainage
4. Ventilation drying



Vapor Open + Exterior Insulation

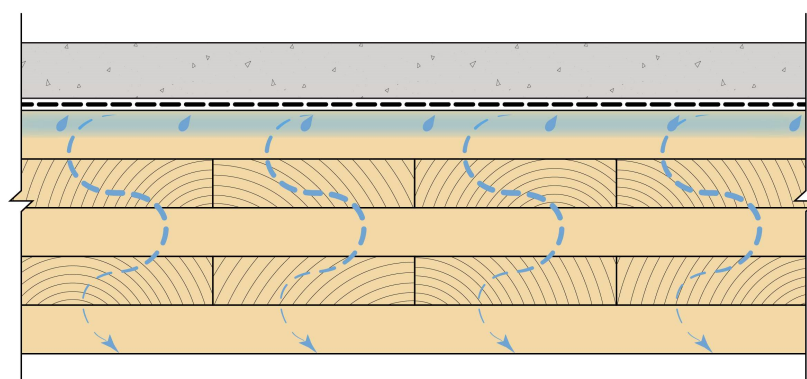






Roofs + Topping Slabs

- “Vapor open” approach doesn’t work at roofs
- Need to be even more diligent about managing construction wetting
- Composite concrete-wood decks particularly difficult
- Temporary membrane in factory?
- Structural anchorage



Discussion + Questions

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