Planning for Successful Mass Timber Moisture Management

AIA Seattle Mass Timber Committee Meeting

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Moisture Risks to Mass Timber Buildings

- **Exposure to moisture during construction**
  - Supply & delivery from factory to site
  - Handling on site
  - Construction sequence after installed

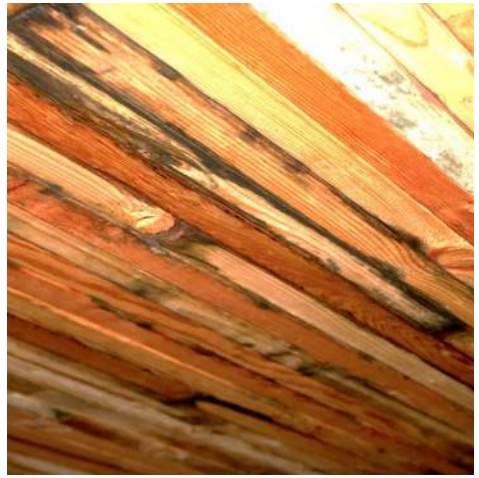
- **Exposure to moisture during operation**
  - Accidental large leaks (sprinklers/plumbing)
  - Persistent small leaks
  - Relative Humidity (too high or too low)

The 5 Risks to Mass Timber During Construction

Schedule Delays

Staining

Mold (Health)



Movement

Decay (Structure)

Higher to lower likelihood of occurrence as a result of mass timber getting wet during construction

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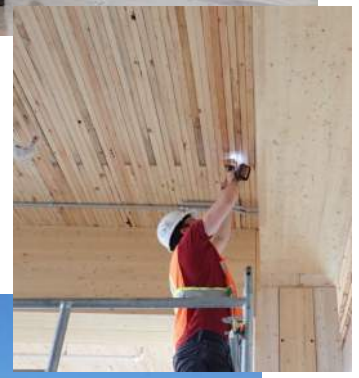
Many Different Solutions – How to Decide & Plan for Your Specific Project?










Solution: Planning for Moisture Management

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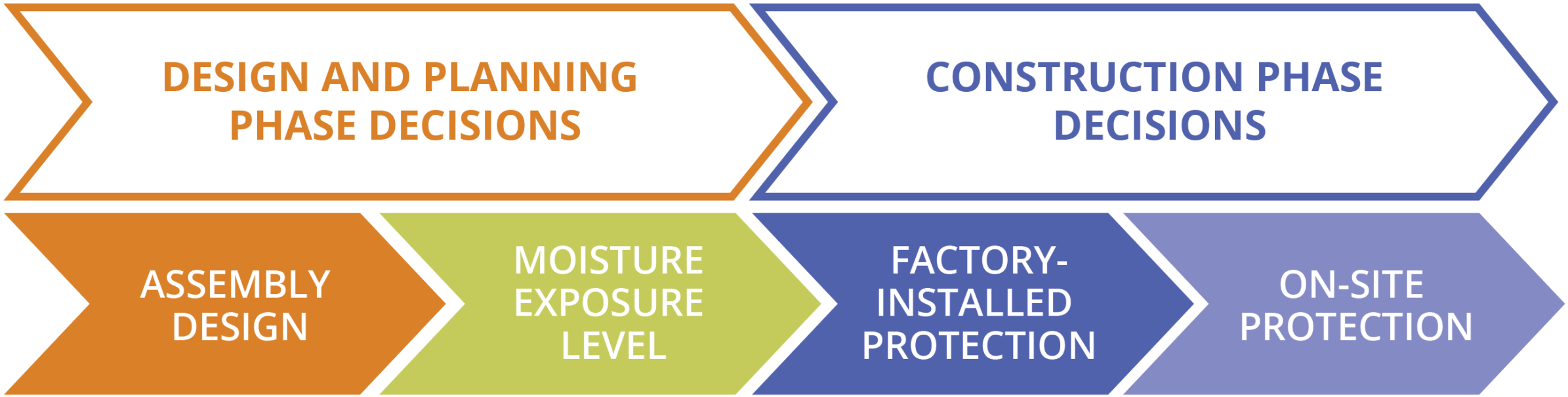
STEP 1 - COMPLETE A MOISTURE RISK ASSESSMENT FOR MASS TIMBER ASSEMBLIES

Step 1: Assembly Considerations and Risk Assessment



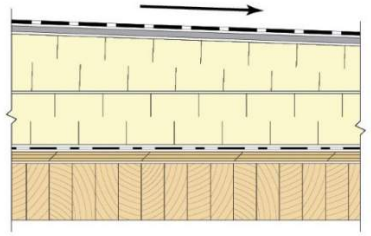
What mass timber do you have, in what assembly, when will it potentially get wet & for how long?

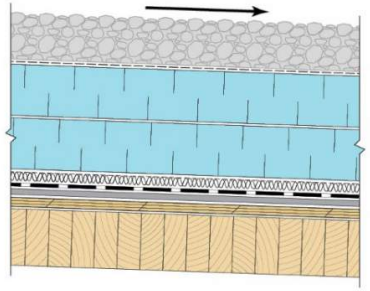
What are options for appropriate level of possible protection factory or site applied that works with the final assembly, schedule, risk tolerance and budget?

DESIGN AND PLANNING PHASE DECISIONS | CONSTRUCTION PHASE DECISIONS

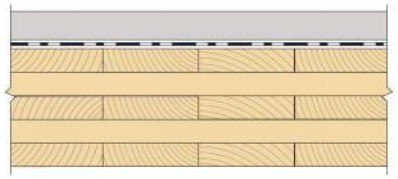
ASSEMBLY DESIGN | MOISTURE EXPOSURE LEVEL | FACTORY-INSTALLED PROTECTION | ON-SITE PROTECTION

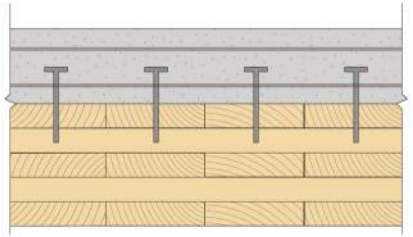
Roof & roof decks



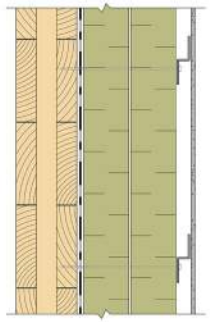


Floors, waterproof floors, composite floors



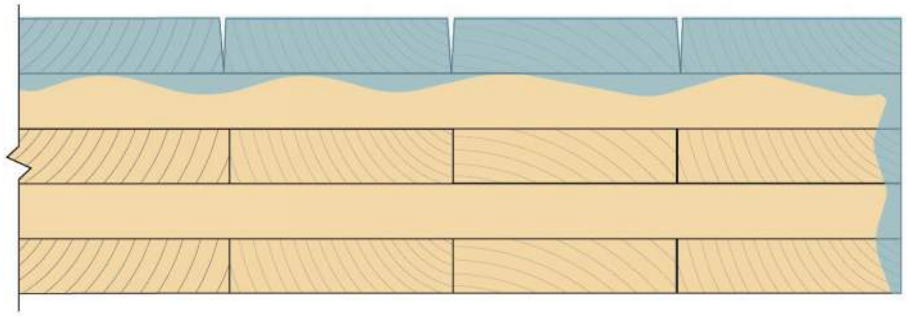


Walls

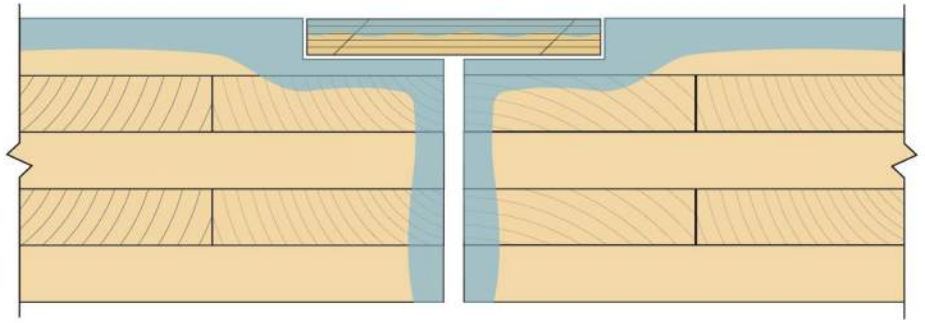


Assessment of Risk Changes through Construction

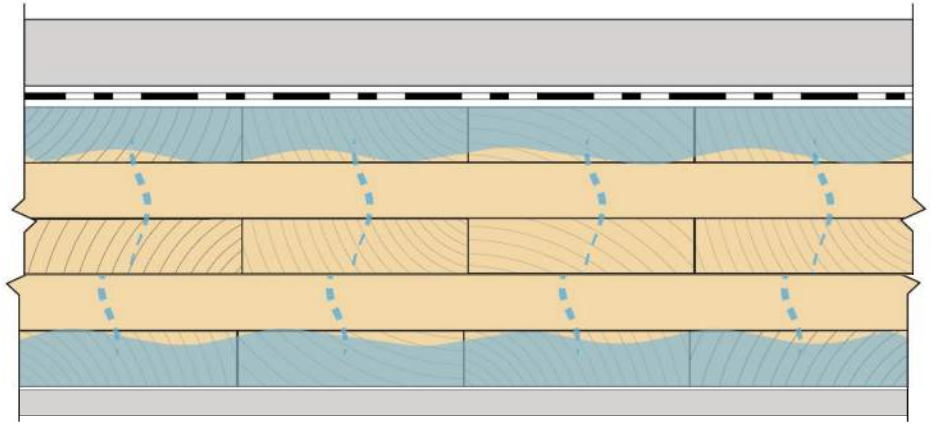
Mass timber components



Mass timber connections



Mass timber assemblies



Encapsulated Assemblies

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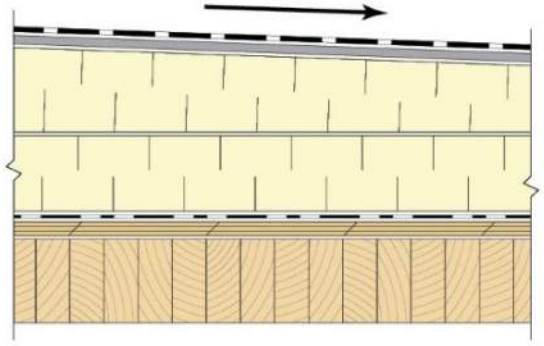
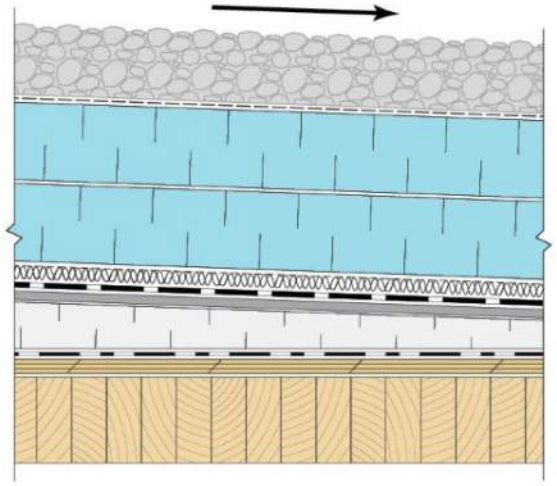
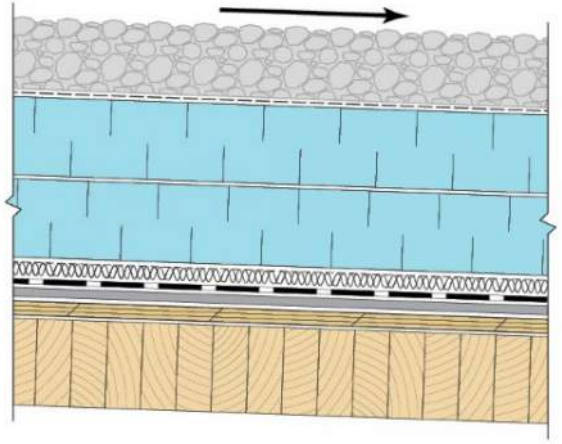
Timing & Placement of Temporary Protection – Roofs & Roof Decks



Conventional roof – permanent AB/VB direct to mass timber is ideal temporary moisture protection membrane





Inverted/protection membrane roof – temporary moisture protection often in supplement to final roofing membrane given slope and roofing membrane system requirements/sequencing

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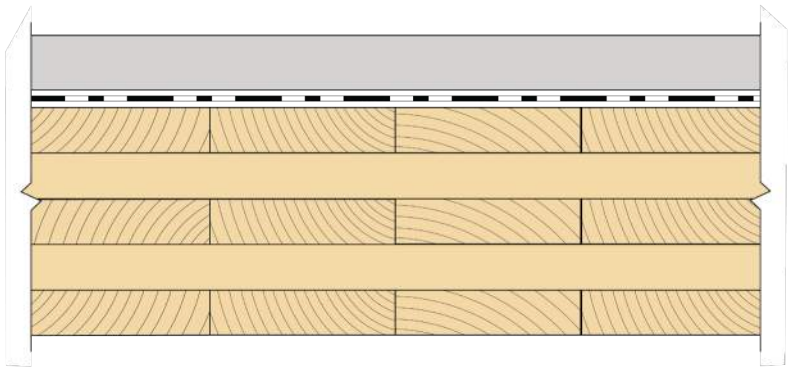
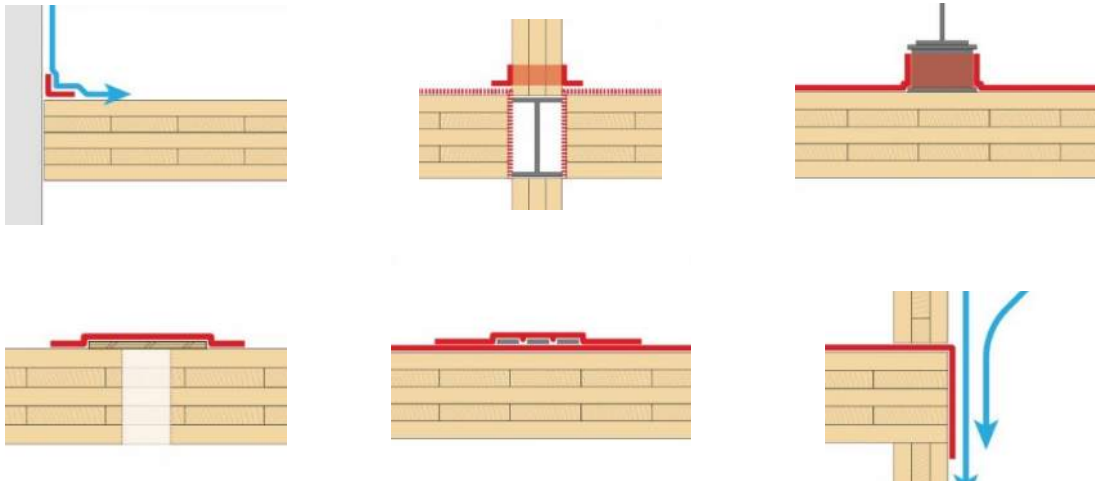
Timing & Placement of Temporary Protection – Floors





For a Floor, temporary protection membrane may be supplemental to assembly, or possibly part of acoustic assembly and separation from concrete topping

Consideration for partial (i.e. tape strips) vs full membrane coverage approaches should consider myriad of various joints & interfaces to be sealed and sequencing on-site

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DESIGN AND PLANNING PHASE DECISIONS | CONSTRUCTION PHASE DECISIONS

ASSEMBLY DESIGN | **MOISTURE EXPOSURE LEVEL** | FACTORY-INSTALLED PROTECTION | ON-SITE PROTECTION

- Construction Schedule
  - Length of exposure by element, floor by floor
  - Façade installation sequencing, synced or delayed
  - Roofing (temporary to final membrane protection)
- Anticipated Weather (Wetting & Drying Potential)
- Shipping, Storage & Installation Exposure Times
- Possible Water Management Strategies During Construction (hoarding, slope, drainage etc.)
- Encapsulation or Other Work Below
- Occupancy Phase Exposure & Protection Needs

Moisture Exposure Level

HIGH

High Exposure

- → No roof above with precipitation expected during exposure duration, *or*
- → Roof above but open perimeter with wind-driven precipitation expected during exposure duration.
- → Extended exposure timeline that increases the risk of wetting potential.

MODERATE

Moderate Exposure

- → Roof above, but open at perimeter with periodic precipitation and limited risk of wind-driven rain.

LOW

Low Exposure

- → Roof above with perimeter protected with tarps or hoarding, *or*
- → Exposed during dry/drought season when precipitation is unlikely or limited enough to allow full drying of the mass timber.

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DESIGN AND PLANNING PHASE DECISIONS

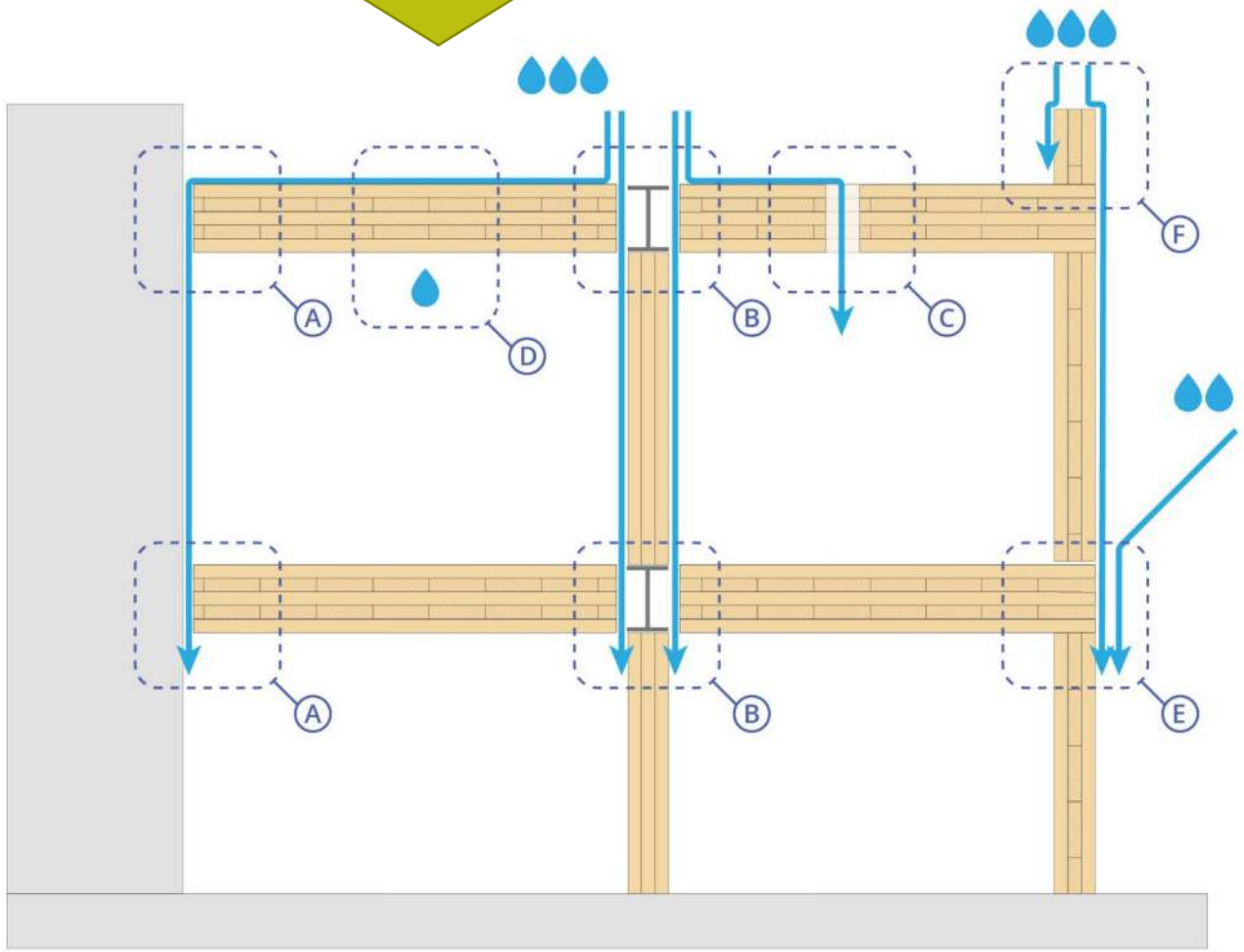
CONSTRUCTION PHASE DECISIONS

ASSEMBLY DESIGN

MOISTURE EXPOSURE LEVEL

FACTORY-INSTALLED PROTECTION

ON-SITE PROTECTION



Exposure level of mass timber elements will change as construction progresses

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DESIGN AND PLANNING PHASE DECISIONS

CONSTRUCTION PHASE DECISIONS

ASSEMBLY DESIGN

MOISTURE EXPOSURE LEVEL

FACTORY-INSTALLED PROTECTION

ON-SITE PROTECTION

- Various factory or site applied protection options
  - Do nothing
  - Coatings, Membranes, Tapes of various types, chemistries and water repellant properties
  - Temporary vs Permanent
- Schedule and sequencing of protection
- What happens on-site with different types of protection
  - Passive vs Active Measures

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Protection Robustness

LOW

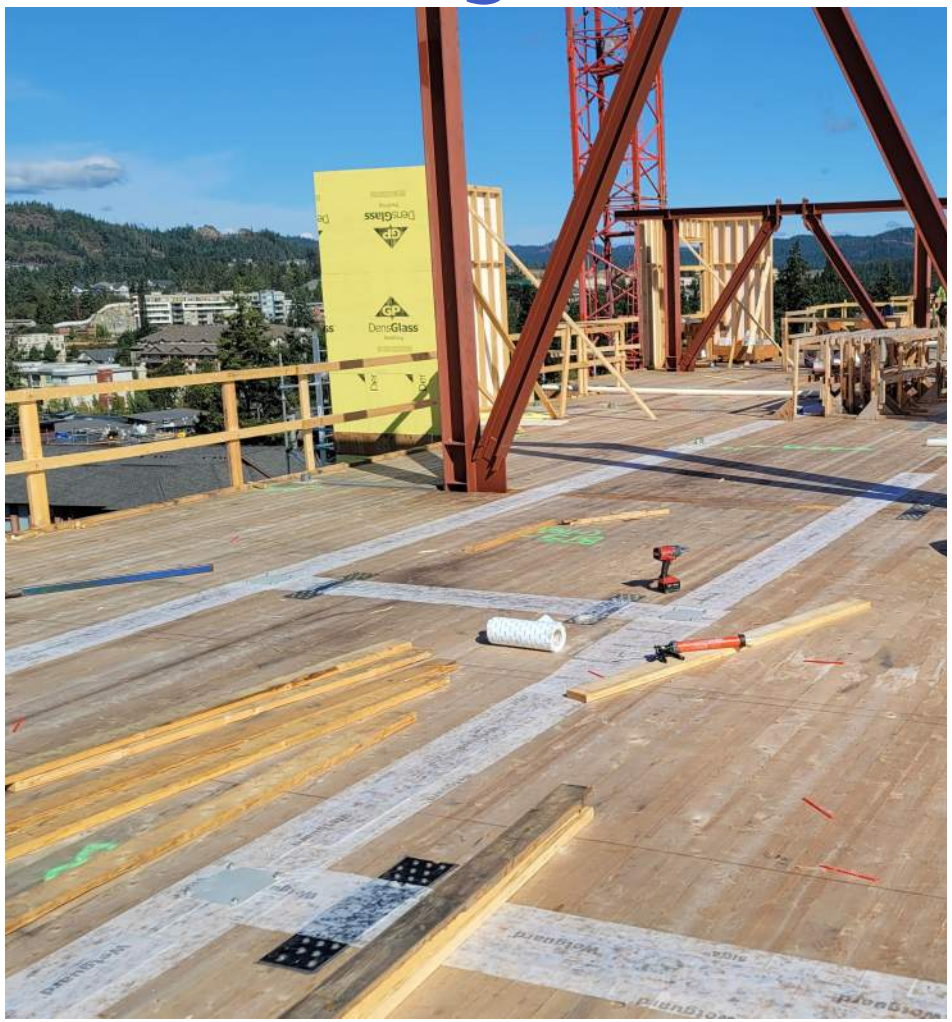
Low Protection Robustness (Water Resistant)

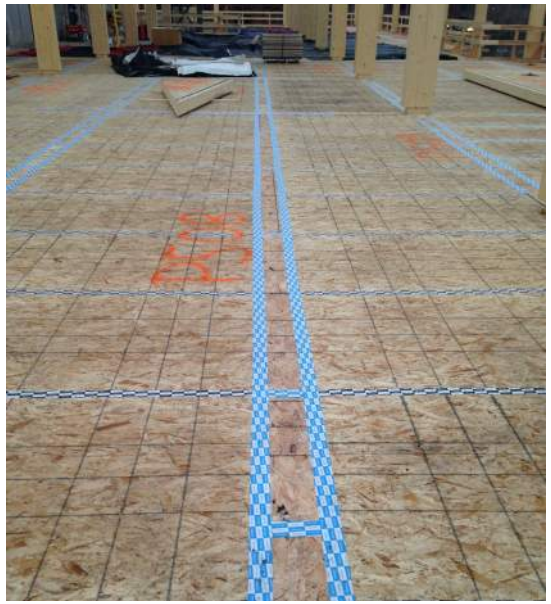
- → Coatings, loose-laid protection, or targeted protection.
- → Immediate action required in a wetting event.

Examples:

- → Tape/Sealant only at joints
- → Factory coatings/sealers
- → Loose laid membranes (any type)

Low Robustness – Water Resistant and/or Limited Coverage





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MODERATE

Moderate Protection Robustness (Water Shedding)

- → Water-shedding/vapor-permeable membrane.
- → Action required in a timely manner in a wetting event.

Examples:

- → Vapor impermeable SAM
- → Vapor permeable SAM
- → Coated sheathing with taped joints

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Moderate Robustness = Water Shedding w/ Varying Effectiveness @ Field/Joints & Useful Lifespan

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Protection Robustness

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- → Action required in a timely manner in a wetting event.

Examples:

- → Vapor impermeable SAM
- → Vapor permeable SAM
- → Coated sheathing with taped joints

HIGH

High Protection Robustness (Waterproof)

- → Waterproof membrane with heat-welded laps.
- → No immediate action required in a wetting event.

Examples:

- → Roofing/waterproofing membranes (SBS, EPDM, PVC, TPO, fluid applied) – waterproof laps/joints critical

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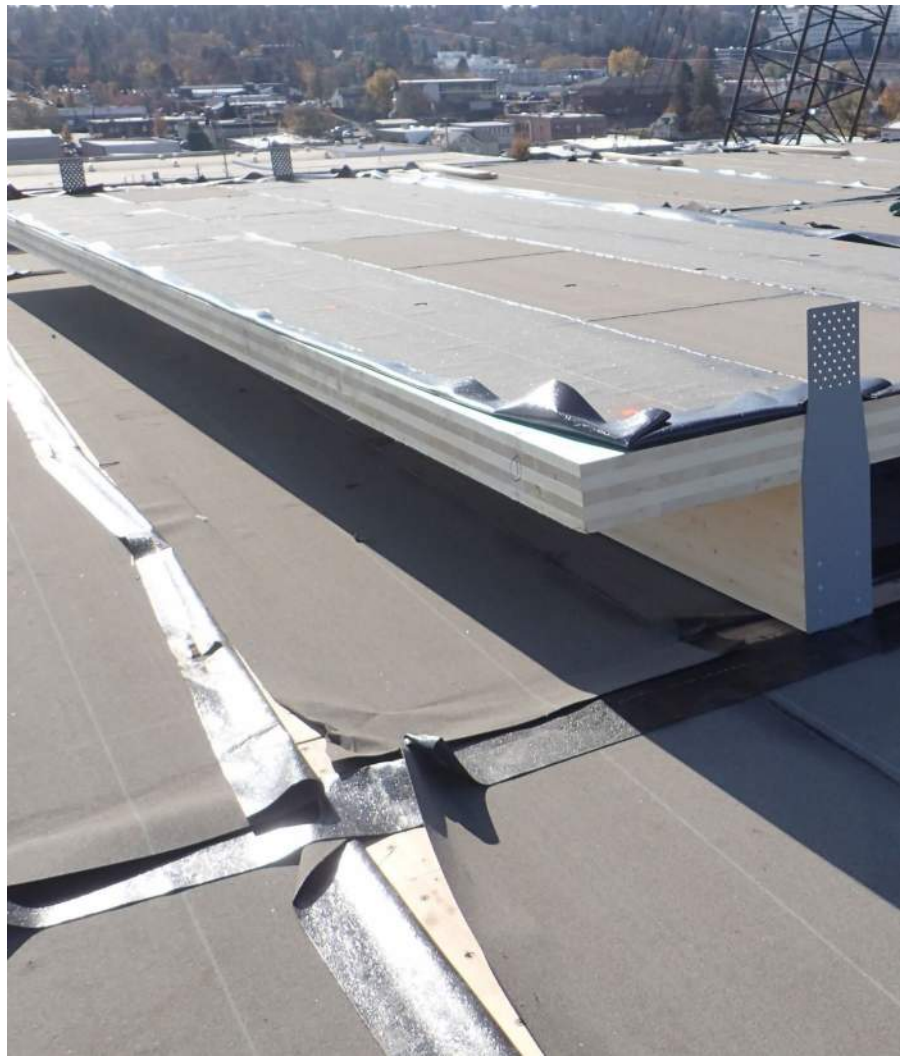
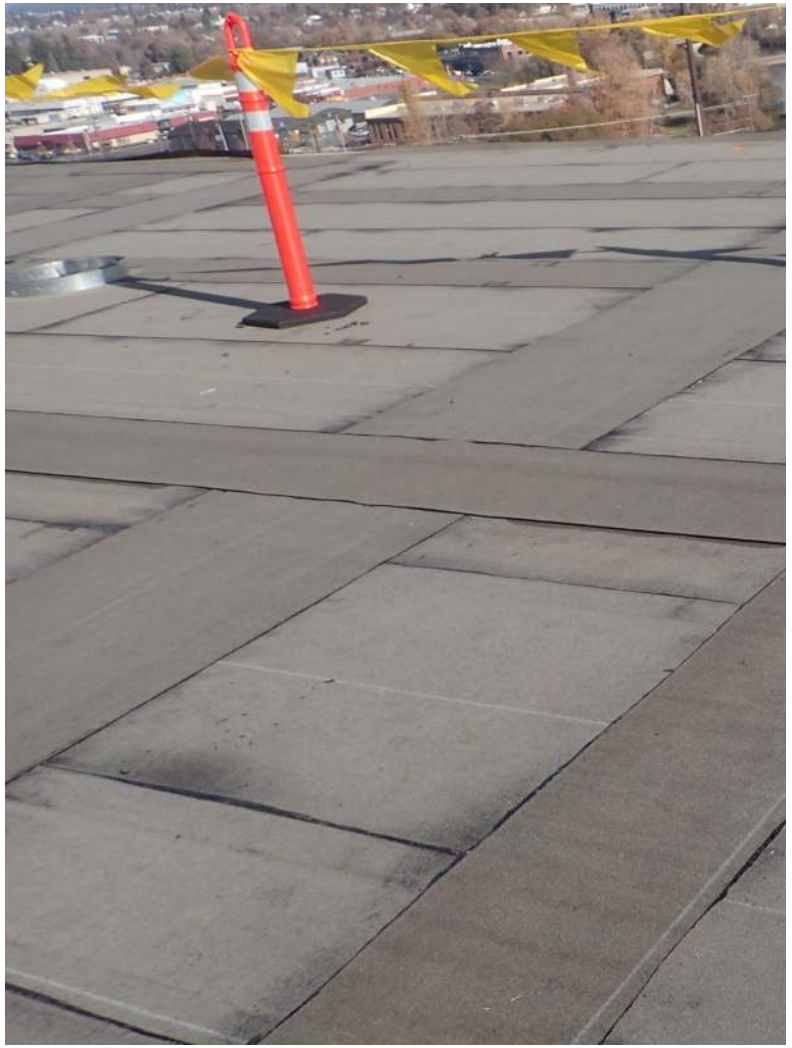
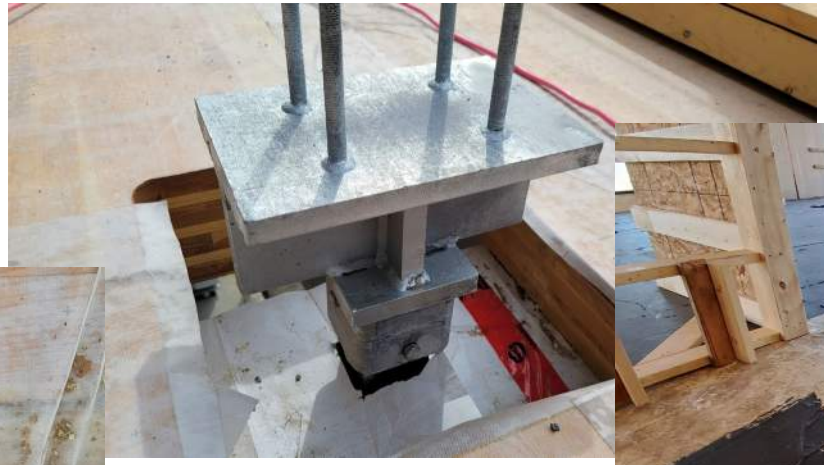
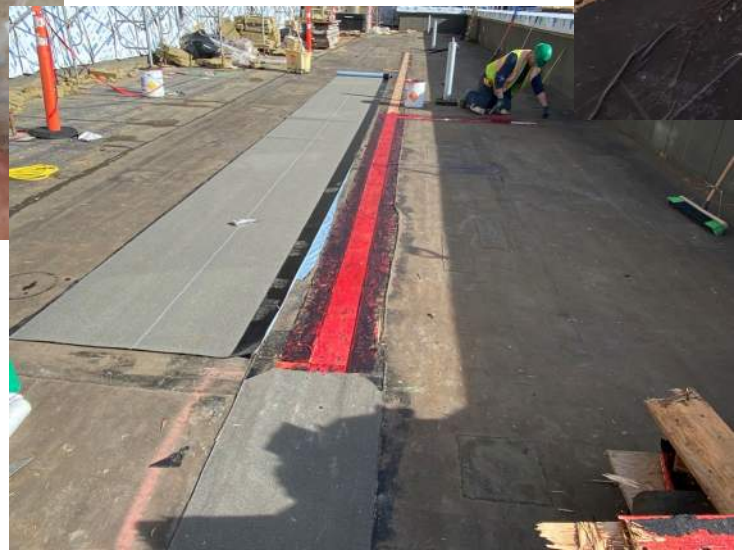
High Robustness = Waterproof to Standing Water – Reliable as a Temporary Roof

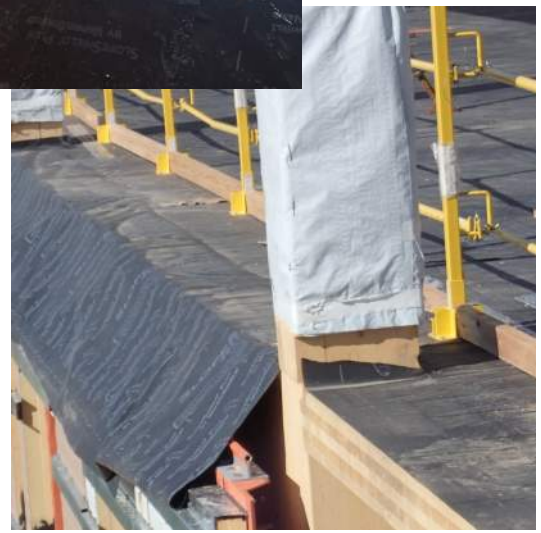




Robustness Impacted by Sequencing & Detailing and Length of Exposure







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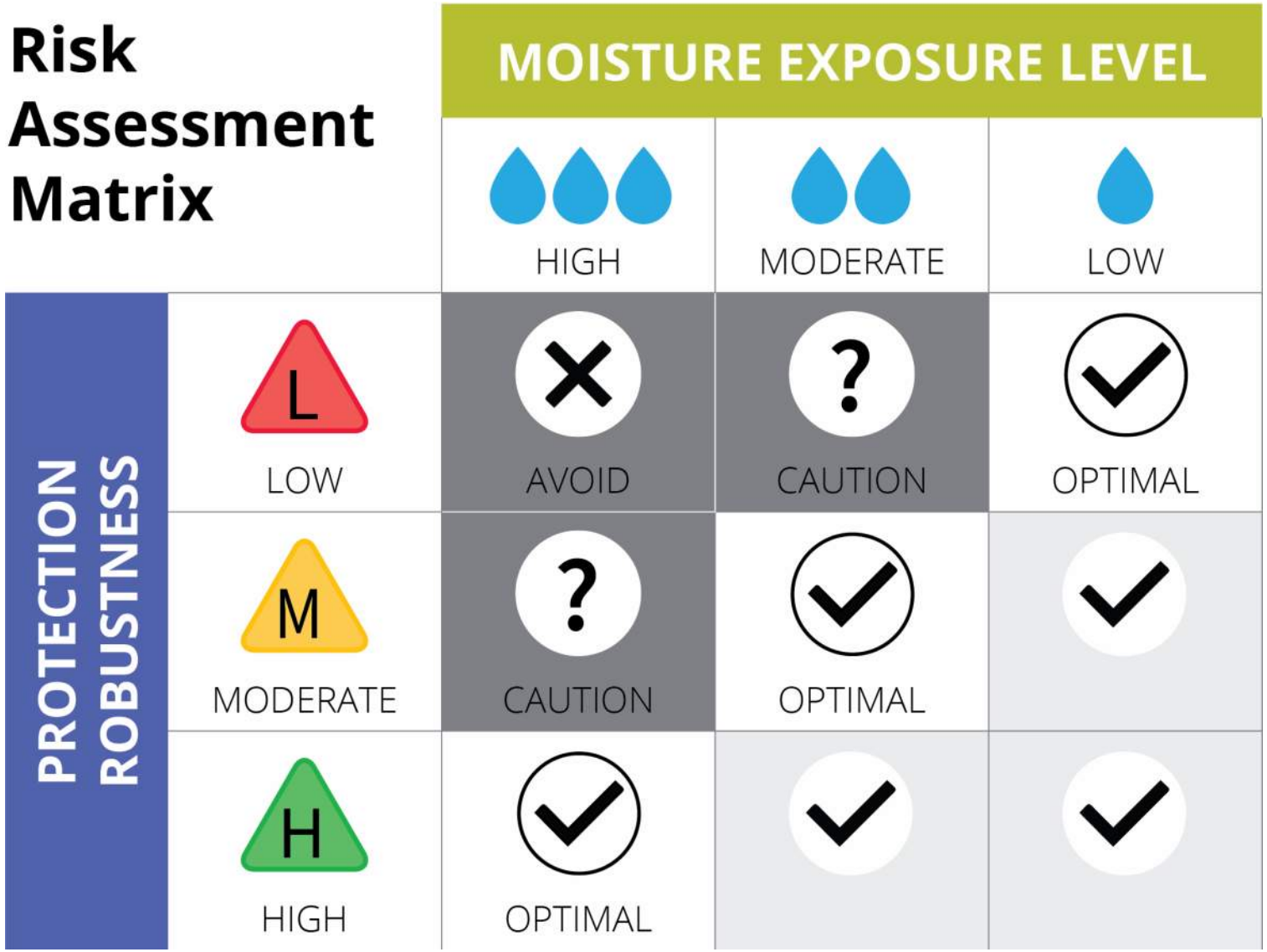
Moisture Exposure Level & Protection Robustness



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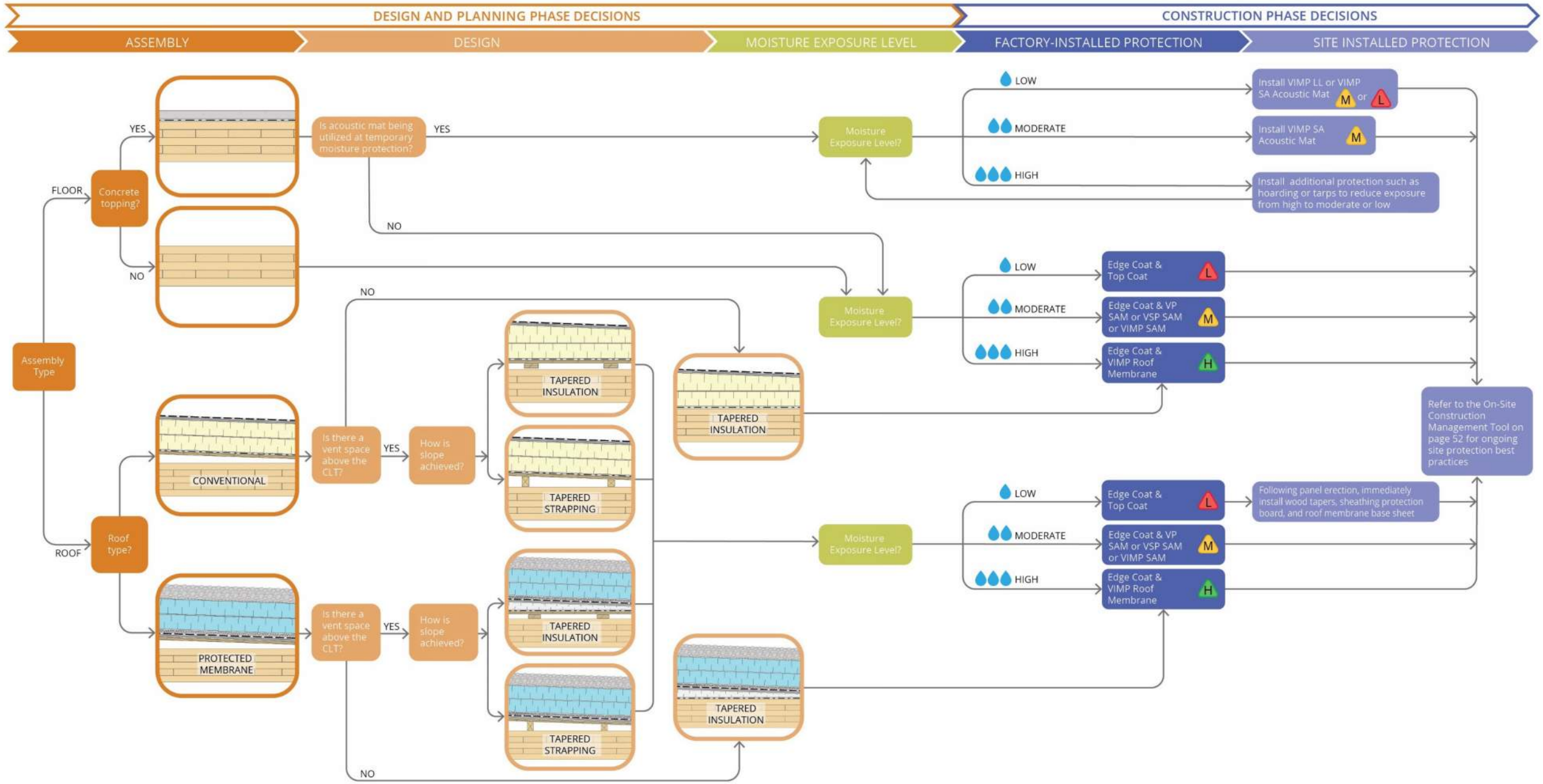
Process Helps Make Risk Informed Decisions



Experiences with Factory Application to Mass Timber

LOW

Water repellant coatings

- → Wax edge coatings – optional, but common
- → Top surface coatings – optional, some hesitation by suppliers

MODERATE

Self-adhered vapor permeable or impermeable water-shedding membranes

- → Optional - can be challenged with space/time in factory for application, use of low VOC primers

HIGH

Self-adhered vapor impermeable waterproof roofing membranes

- → Optional though less common - can be challenged by separation of labor between factory and roofer (warranties), hot-work & heat welding laps, use of low VOC primers

2

STEP 2 - DEVELOP A CONSTRUCTION PHASE MOISTURE MANAGEMENT PLAN

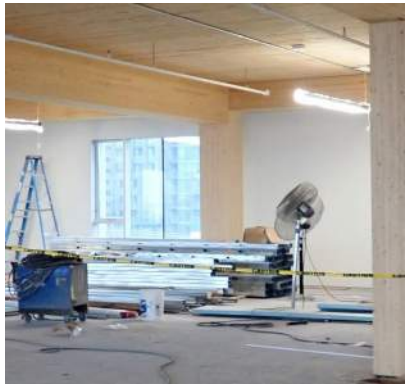
Step 2: Construction Phase Moisture Management Planning

Now that I have designed and detailed the assembly, performed a risk assessment of options and selected a desired protection strategy, what do I plan for on-site? Create checklists, plans and other documents for use in Step 3

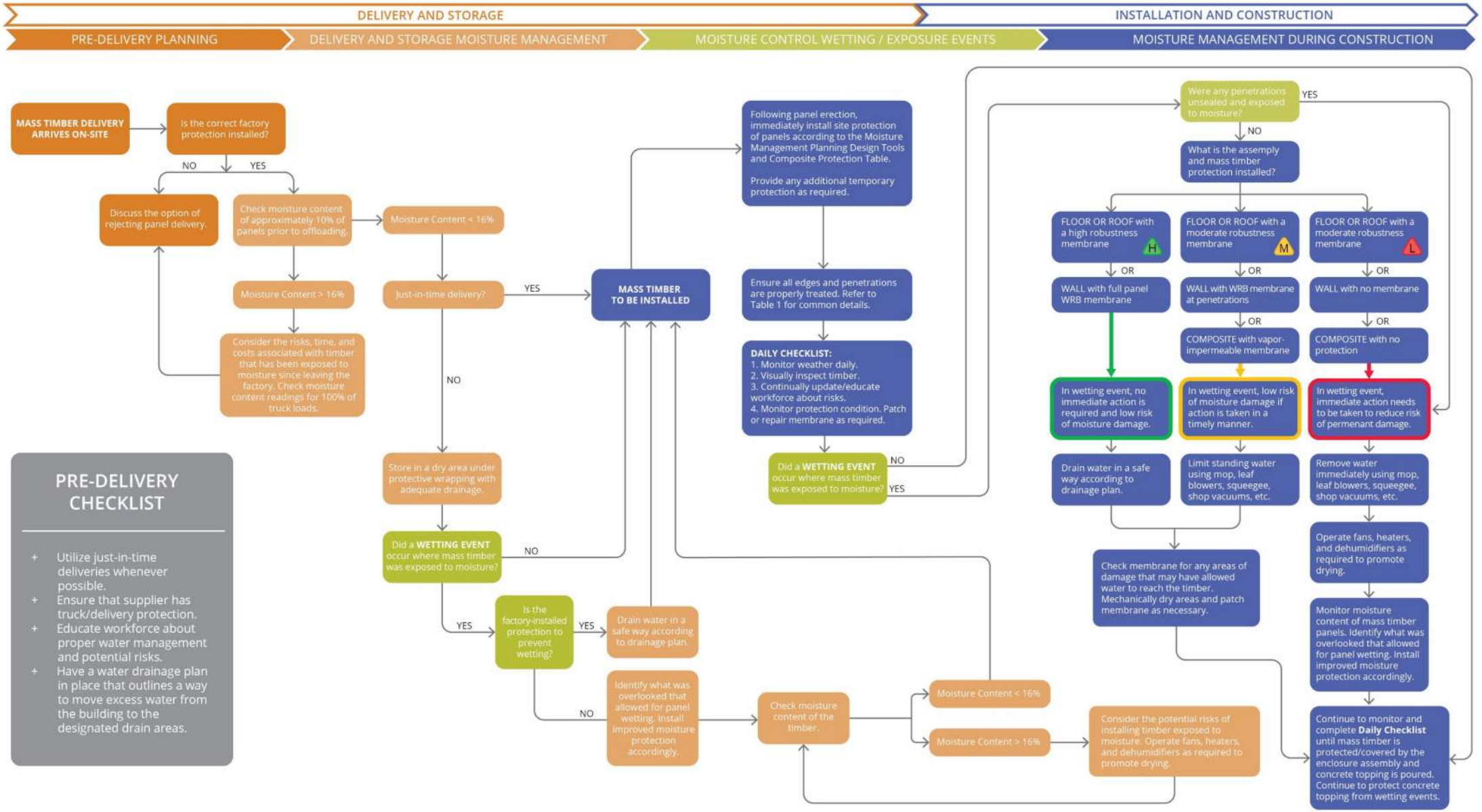
Active measures required onsite will depend on designed protection applied prior

Construction Phase Moisture Management Planning

- Schedule and Delivery Plans
- Moisture Protection Methods
- Water Removal Plans
- Checklists
- Moisture Exposure Response
- Contingencies
  - Tenting/Hoarding
  - Mechanical Drying
  - Stain Removal
  - Sanding/finishing
  - Fungal Remediation
- *Contracts & Scope of Various Parties*



Moisture Management Tools & Decision Making



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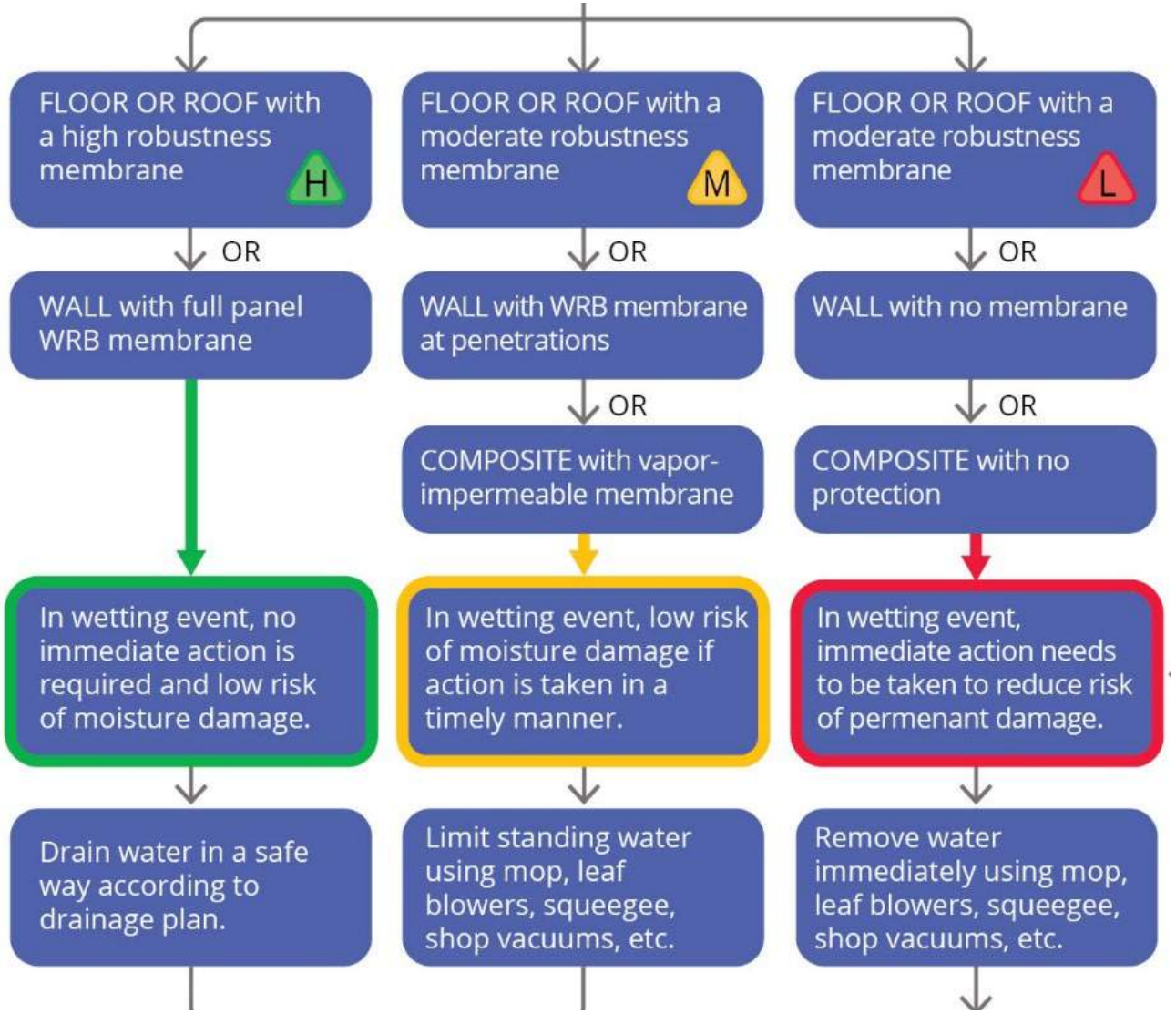
Robustness Level of Protection Guides Onsite Actions

L
LOW

M
MODERATE

H
HIGH



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STEP 3 - EXECUTE THE DESIGN AND MOISTURE MANAGEMENT PLAN

Step 3: Execute the Moisture Management Plan

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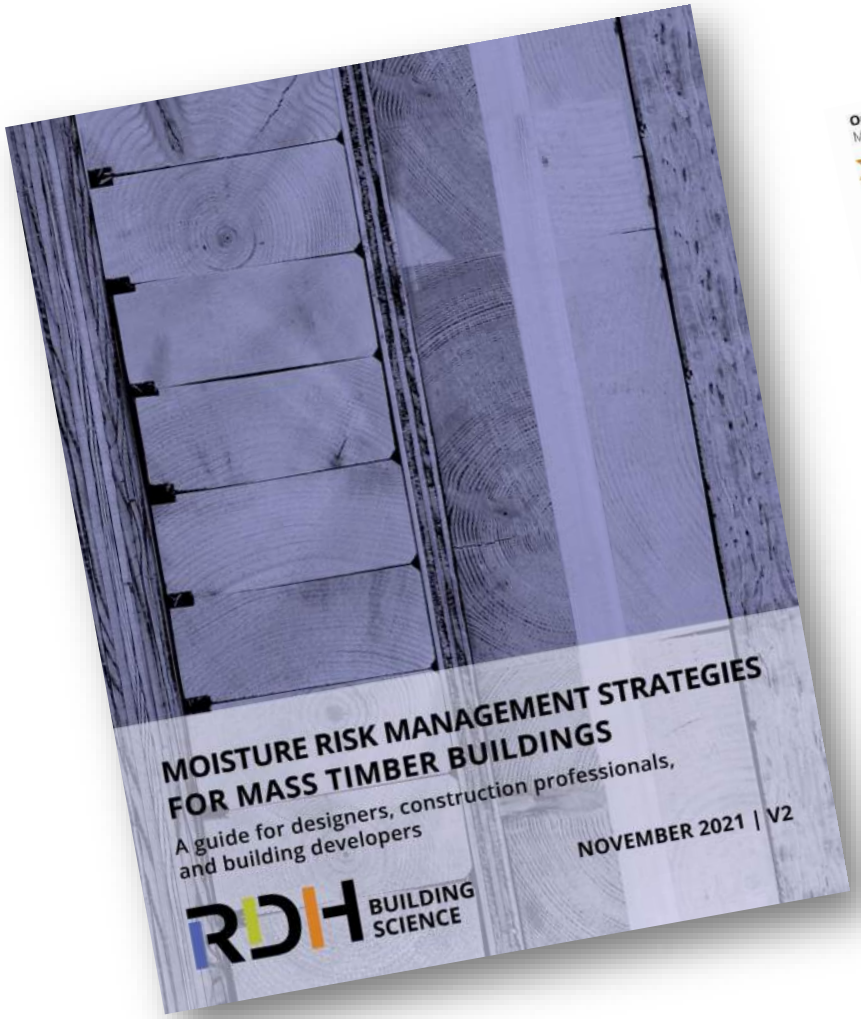
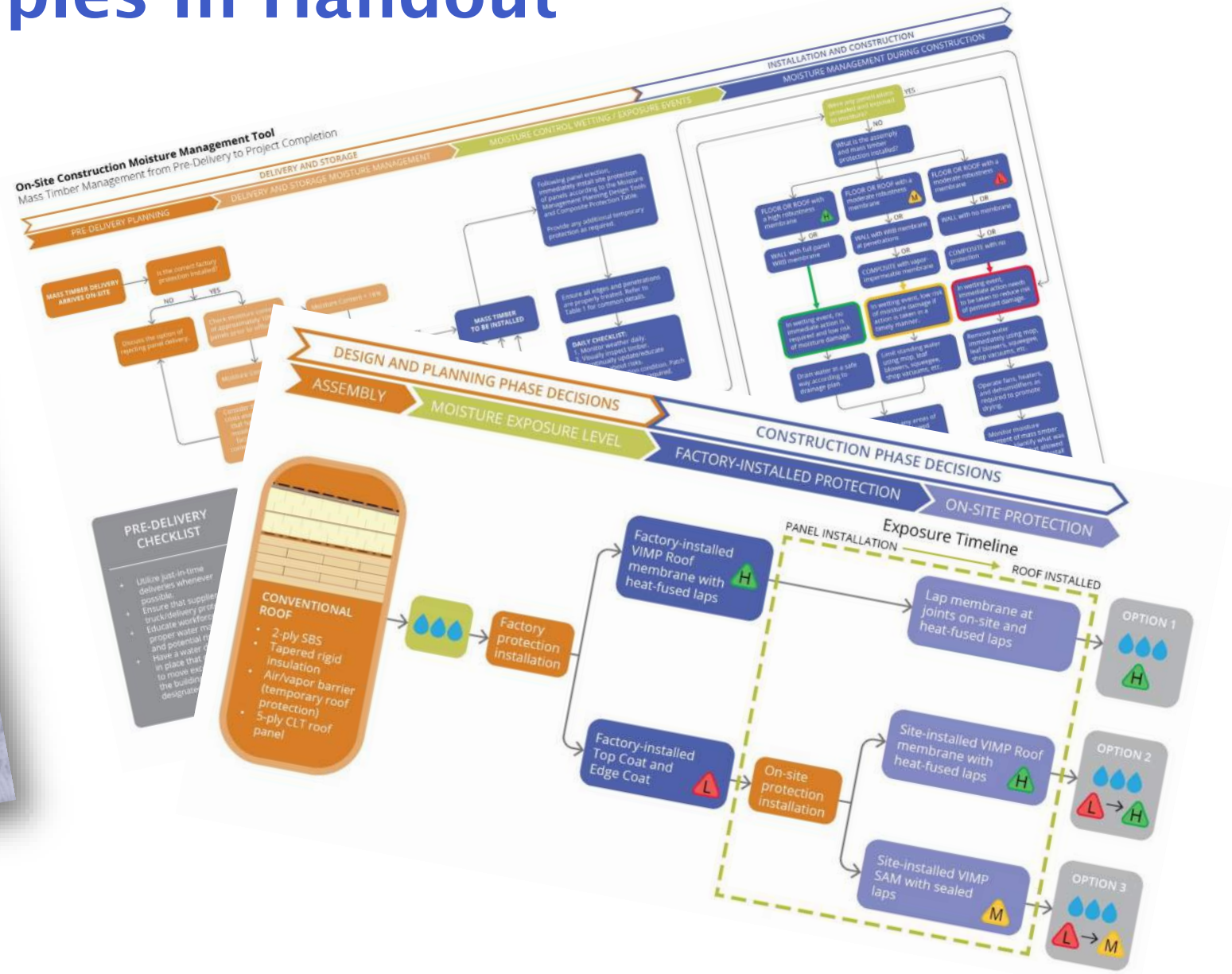
Plan Iterations & Mid Construction Updates are Okay!

Reference & Examples In Handout





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