APA Technical Topics
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Wood Moisture Content and the Importance of Drying in Wood Building Systems

The use of impermeable materials, such as some types of insulation and moisture barriers, needs careful consideration during design and construction of wood building systems. This Technical Topic provides guidance on how to avoid potential moisture problems which could lead to costly and potentially hazardous structural deterioration and possible health risks.

WOOD MOISTURE CONTENT

APA-trademarked engineered wood products are bonded with moisture-resistant adhesives and are suitable for limited moisture exposure during construction delays. "Limited" is key—construction should proceed with minimal interruptions, and wood products should be protected by roofing and/or weather-resistive barriers as soon as practicable.

Wood naturally contains some moisture within its cellular structure. The moisture content of wood products, both during construction and in-service, depends on variables including exposure to direct wetting, accumulated moisture, temperature, relative humidity, and the drying potential of the system in which the wood is contained.

Once a structure is complete, wood normally stabilizes to an in-service moisture content between 6 and 14 percent. At these low levels, moisture content has negligible impact on the strength, stiffness, or durability of wood products. However, accumulated moisture can lead to decay and mold growth if moisture content remains high (approximately 20 to 25 percent or higher) for a prolonged period.

Protecting against moisture damage depends on proper system design, installation and maintenance. Good design and construction practices protect against water leaks, control moisture-laden air infiltration and condensation potential, influence the rate at which air moves around and through building systems, and mitigate the effects of humidity and temperature differentials between the inside and outside of the structure. Improper design, construction or maintenance can result in moisture build-up in the structure and lead to problems with mold, mildew, decay or other moisture-related problems, such as dimensional stability issues. Over the life of the building, and even with proper design and construction of the exterior building envelope, it is possible for water or moisture-laden air to penetrate into the wood structural systems if materials like siding, windows, roofing or sealants (e.g., caulks and tapes) deteriorate. Other causes of moisture penetration into buildings include wind-driven rain, ice dams, degradation of flashing, and damage of wall and roof coverings due to wind storms or other natural events.

To mitigate moisture exposure, APA recommends covering wood structural panel sheathing as soon as possible after installation. After the building exterior envelope is complete, but before enclosing the wall cavity, roof cavity, or installing interior finishes, the roof and wall sheathing and lumber framing should be allowed to dry (to less than 18 percent) to minimize moisture absorption during construction. This is especially important when substances that inhibit drying have been applied to the sheathing or assembly.

UNVENTED ATTICS

Notwithstanding the acceptance of unvented attics by the International Building Code (IBC) and International Residential Code (IRC) in IBC 1203.3. and IRC R806.5, a general concern has emerged about possible detrimental effects resulting from the recently popularized practice of applying insulation directly to the underside of roof sheathing. Should incidental wetting occur within the roof system, the direct application of low vapor permeance insulation on the underside of the roof deck may limit the ability of wood structural panel sheathing to dry. **This could lead to structural panel performance issues such as buckling and other moisture-induced problems. When such insulation materials are used in combination with a vapor-impermeable layer on top of the roof sheathing, such as some adhered shingle underlayment materials, the risk of moisture damage due to reduced drying potential of the system will increase substantially.** This could lead to potential long-term accumulation of moisture in the roof system, resulting in costly and potentially hazardous structural deterioration and possible health risks.

For unvented attics to be successful, all of the following conditions must be met:

1. The design, detailing, and installation of the roof system must be complete, correct, and maintained properly.
2. Building and mechanical systems must be maintained in good condition such that the long-term moisture content of wood materials continues in a dry state for the service life of the structure.
3. In the event that moisture accumulation does occur, the roof system must have a means to dry.

The designer and builder should assure that these conditions can be met if using unvented attic assemblies.

WALL SYSTEMS

Moisture vapor movement through walls occurs naturally, so it is important to design wall systems that can manage moisture vapor. The ideal wall assembly will restrict moisture gain when the wall is dry, but will allow for drying of the wall when moisture is elevated. Use of wood structural panel wall sheathing facilitates wall cavity drying to the exterior of the building (see *Water Vapor Permeance of Wood Structural Panels and Wall Construction,* Form J450.) The use of vapor-impermeable exterior wall sheathing, such as some insulating sheathing products, may slow the wall drying process or even trap moisture in the wall cavity. If excessive moisture accumulates in the wall, it is possible that the rate of accumulation may exceed the ability of the wall assembly to dry. Therefore, it is vital to minimize leaks that allow water or water vapor into the wall cavity and to use materials that allow drying when elevated moisture conditions exist. As with roof assemblies, proper design, construction and maintenance of wall systems can prevent many sources of moisture intrusion. However, wall systems should allow for drying to the exterior as well as the interior of the building whenever possible, since it's likely that moisture will accumulate in a wall system at some point during the building's service life.

ADDITIONAL INFORMATION

For additional information and detailed recommendations on moisture control in engineered wood construction systems, refer to the following APA publications: (www.apawood.org/resource-library).

- *Condensation Causes and Control* Form X485
- *Controlling Decay in Wood Construction* Form R495
- *Water Vapor Permeance of Wood Structural Panels and Wall Construction* Form J450
- *Build Energy Efficient Walls* Form J440
- *Build A Better Home—Foundations* Form A520
- *Build A Better Home—Mold* Form A525
- *Build A Better Home—Walls* Form A530
- *Build A Better Home—Roofs* Form A535
- *Moisture Control in Low Slope Roofs* Form R525

Also refer to the following sections in the building code for requirements for unvented attics and unvented, enclosed rafter assemblies:

- Section R806.5 of the 2015 International Residential Code, and
- Section 1203.3 of the 2015 International Building Code.

We have field representatives in many major U.S. cities and in Canada who can help answer questions involving APA trademarked products. For additional assistance in specifying engineered wood products, contact us:

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