



WHY WOOD MOISTURE METERS ARE USED FOR MEASURING MOISTURE IN OTHER MATERIALS

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Wood has a long, long history as a building material. Next to stone, it's what we've been using to construct our homes and other structures since prehistoric times. That makes sense – wood is strong, adaptable, and abundant.

While construction methods have evolved, the same holds true for the material today.

Even in buildings made predominantly of steel, brick, or concrete, wood still has its place in almost any structure. Just like in the earliest dwellings, wood gives spaces definition or provides structural support.

A material that's reactive to ambient conditions in a way that others aren't, wood requires a bit more attention when it comes to moisture – you've never heard of a brick rotting. But that same reactivity makes wood a barometer of sorts for measuring moisture in other materials.

Whether you're completing a home inspection, checking a property after a flood damage incident, or installing new hardwood floors, **having a professional moisture meter that's calibrated for wood on hand goes a long way.**

With its readings, you're able to make a better determination of safety, longevity, and durability of wood and many other materials in homes and other structures.



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Wood & Moisture: Real-time Reactivity

One of the few building materials considered organic, wood was once living. And while a piece of lumber will never grow, it does retain some of the same properties it had when living.

Specifically, wood is hygroscopic, meaning it can absorb or release moisture. This phenomenon is ever-present as unsealed or untreated wood is always trying to be in equilibrium with its environment. That's why on a hot, humid day, you'll notice doors stick to their frames or even more hairline cracks in plaster walls because of wood swelling and taking in more moisture to equilibrate to ambient conditions.

For untreated or unprotected wood, prolonged exposure to excessive moisture presents a host of problems that compromise the integrity of a piece of wood or the soundness of a structure:



- **Microbial Growth:** Moisture in wood creates a conducive environment for fungi and bacteria, leading to microbial growth that can rot and weaken the wood.
- **Warping:** When wood absorbs moisture unevenly, it causes differential expansion or contraction, resulting in warping, where the wood distorts from its original shape.
- **Deterioration/Degradation:** Excessive moisture accelerates the breakdown of wood fibers over time, leading to deterioration or degradation that compromises the wood's structural integrity.
- **Splitting:** Fluctuations in moisture content can cause wood to dry unevenly, leading to splits along the grain as the wood contracts more in some areas than others.
- **Buckling:** Wood floors or panels may buckle, lifting away from their underlying surface, when they absorb moisture and expand without sufficient space to accommodate the enlargement.
- **Cracking:** As wood dries and loses moisture, it can develop cracks due to the stress of uneven shrinkage, especially in dryer conditions.

To our original question: ***Why is wood the basis for moisture meter calibration and measuring moisture in other materials?***

Like wood, other building materials – such as plaster, drywall, and even brick – also absorb and release moisture based on the ambient conditions of the space or contact with other materials. Using wood as the baseline for moisture measurements, the playing field between materials is equal, and it's easier to gauge actual moisture presence. Another way, by using wood as your standard for moisture measurement, you don't need to take and interpret different measurements for different materials and then attempt to compare them – that would take a lot of time and require having a few different devices on hand.

Moisture Meter Readings: WME/Wood Moisture Equivalent & EMC/Equilibrium Moisture Content

Before we go much further, it's worth spending a bit of time on two terms you'll come across when testing moisture in wood and other materials: [WME/Wood Moisture Equivalent](#) & [EMC/Equilibrium Moisture Content](#). It's nearly impossible to avoid both in wood moisture testing.

WME VS. EMC	
WME measures the percentage of moisture content that would be attained by wood in contact with, or in close proximity to, a moisture equilibrium across a host of materials. You'll use a traditional professional moisture meter to take WME readings.	EMC is the point at which a material stops absorbing or releasing moisture to reach a balance with the humidity in its immediate environment (See chart below). Taking EMC readings requires using a hygrometer.

Choosing the Right Meter

For home inspections, flood damage restoration, and flooring installation, [your choice of wood moisture meter](#) isn't any different than what you'd choose for most other moisture surveys.

You'd still need a professional moisture meter calibrated for wood.

And yes, there are some wood moisture meters made for more specific applications – you might come across lumber moisture meters with built-in [species correction](#) for more accuracy in specialty applications, such as woodworking. However, for general use in a moisture survey, the two standard moisture meter types every inspector should have in their toolboxes are more than sufficient: pin-type and pinless (non-invasive) moisture meters.



MOISTURE METER FOR WOOD & OTHER MATERIALS: METER SELECTION

Like testing other materials, you'll have two choices for your moisture meter for wood or other building materials: [pin-type meters](#) or [pinless meters](#). Let's look at both types.

Pin-type Meters

This meter type is the go-to for checking wood for moisture. It also works just as well for checking plaster, drywall, & even brick.

Why?

Their readings provide a quantitative measurement, meaning they tell you the moisture content (as a percentage) in the wood you're testing. With these readings, you'll have the best idea possible about whether the wood or other material being tested has excessive moisture or is within an acceptable range.

Pinless (Non-invasive) Meters

This meter type is less-frequently used for testing wood and other materials during inspections than its pinned counterpart.

That's because of the type of reading it takes.

Non-invasive moisture meters do not measure actual moisture content; rather, they measure moisture presence within its depth through conductance measurement. Another way, pinless meters tell you if there's moisture around, but not how much. For wood testing, this lack of specificity is helpful when trying to determine areas that require further investigation.




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WHAT'S THE BEST (WOOD) MOISTURE METER?

One that is not only accurate and reliable, but also lightens your load. Dual-function meters, such as our [SurveyMaster](#), can function as both a pin-type and pinless wood moisture meter.

Feature	Pin-type Moisture Meter	Pinless Moisture Meter
<i>Accuracy</i>	High accuracy & repeatability.	Less point-specific accuracy.
<i>Depth Measurement</i>	Can measure at various depths based on pin length & use accessories such as hammer electrodes and deep wall probes.	Limited to the meter range.
<i>Surface Damage</i>	Can leave small imprints on a surface and can be undesirable for finished surfaces.	Non-destructive; does not damage the wood surface.
<i>Measurement Speed</i>	Slower, as it requires touching its pins to the wood. Actual measuring only takes seconds	Quick scanning over large areas.
<i>Measurement Area</i>	Measures moisture only where pins make contact with the material surface.	Capable of assessing a larger area quickly.



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Application: How to Test Wood (& Other Materials) for Moisture During an Inspection

For our purposes here, let's use wood as the material we're testing and assume that you already know the areas or pieces of wood you're planning to take measurements on.

When it comes to how to use a wood moisture meter, the process is straightforward.

WITH A PIN-TYPE METER:

- 1. Make Contact With the Wood Surface:** We'll address a misconception first. When using a pin-type meter, **you do not need to press hard on the pins so they break the surface of the wood.** That's one of the worst things you can do – not only does it potentially bend the pins or break the meter, but it doesn't give you accurate results. Simply touch the pins to the surface of the wood. At worst, your pins should leave barely noticeable indents on the wooden surface. For deeper measurements, you should use accessories such as hammer electrodes.
- 2. Take Multiple Readings:** To get the most accurate picture of the wood's moisture content, take several readings from different spots on the material and average the results.
- 3. Record the Readings:** Note the moisture level displayed on the meter each time you take a reading.

Bonus (a sometimes) step: When testing hardwood floors or in flood damage restoration when it's pertinent, select the species of wood you're testing (more on this later).

WITH A PINLESS METER:

1. Place the meter on the surface of the area being tested
2. Allow a few seconds for a reading

Remember: Non-invasive meter readings do not give 100% confirmation of moisture. Rather, they help you hone in on areas that should be investigated further.



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A Word on Depth Measurements Using Electrodes

Remember what we said about not breaking the surface of wood with your meter's pins?

There are some scenarios where it's necessary to get moisture readings from inside a piece of wood. In those instances, you'll be using a different type of electrode – one that's longer and more durable to be driven into wood.

When are depth measurements necessary?

- **Building Survey:** During a building survey or home inspection, it might be necessary to verify elevated moisture levels detected using a non-invasive moisture meter. Utilizing insulated deep wall probes, it's possible to penetrate deeper into brick and plaster walls to confirm the presence of moisture. This allows for a more thorough diagnosis of any moisture-related issues identified during the inspection.
- **Flood Damage Restoration:** During the initial assessment of flood damage and throughout the drying procedure, it is crucial to conduct measurements at different depths within the building materials to confirm the presence of moisture and monitor the progress of drying. For instance, employing a hammer electrode to measure moisture at various depths in hardwood floors and subfloors can provide valuable insights to ensure thorough drying of the material. Additionally, utilizing hammer electrodes and deep wall probes can enable the measurement of moisture in sill plates.
- **Restoration Work:** In restoration (think: rehabbing an historic building), it's important to assess the integrity of wooden structures. Moisture levels deep inside the wood can indicate potential decay or the risk of structural failure.
- **Drying Process Monitoring:** When drying lumber, it's crucial to understand the moisture gradient (difference in moisture content between the surface and the core). This helps in determining whether the wood is drying evenly and at the right pace, reducing the risk of defects like warping or cracking.
- **Woodworking and Furniture Making:** In woodworking, ensuring that the wood has uniform moisture content throughout is essential for the stability and longevity of the final product. Measuring at different depths helps to ensure the wood won't warp or change shape after the piece is made.



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The logo for Protimeter, featuring a stylized orange wave or signal icon above the brand name 'PROTIMETER' in a large, bold, orange sans-serif font.

Resource: Equilibrium Moisture Content Chart

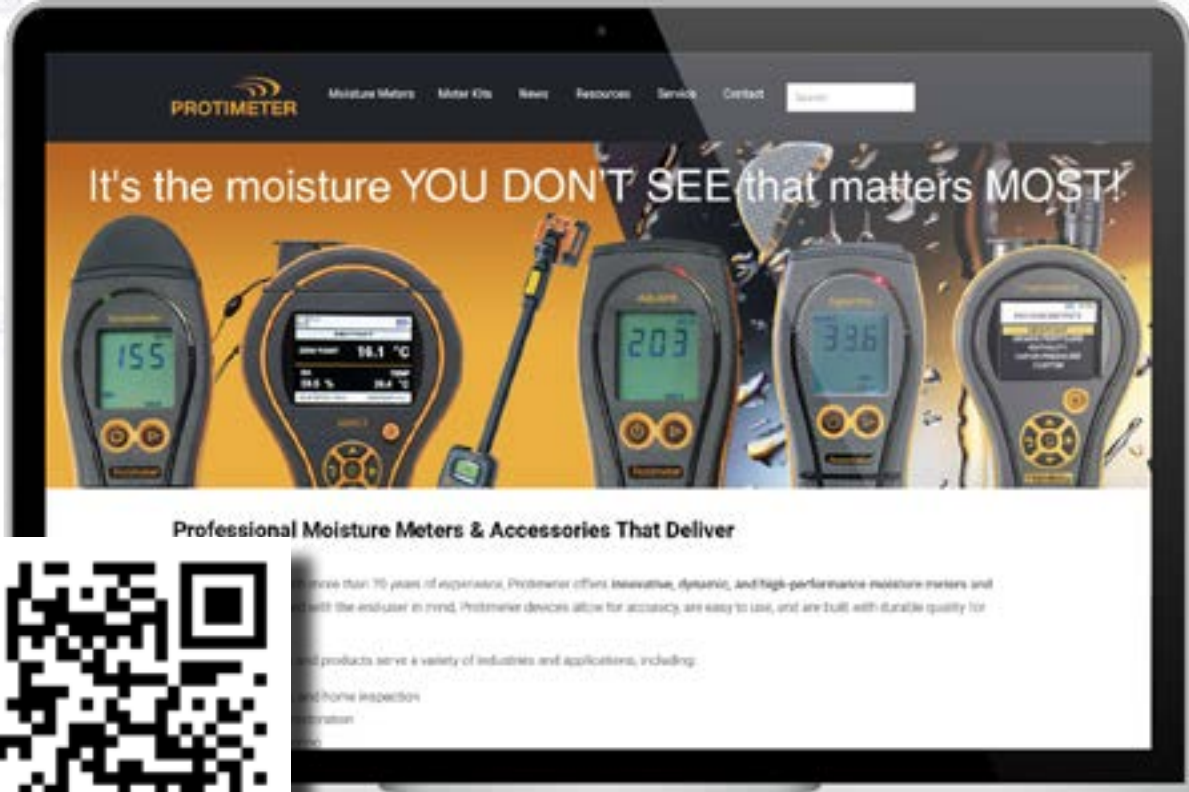
Regardless of potential moisture ingress problems, moisture content in materials will change throughout the seasons due to natural environmental changes in humidity and temperature.

EQUILIBRIUM MOISTURE CONTENT (EMC)

Dependence of equilibrium moisture content (EMC) of wood on relative humidity (RH) and temperature

Temperature		5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
°F	°C	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH	RH
30	-1.1	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3
50	10.0	1.4	2.6	3.6	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.2	12.3	13.4	14.8	16.4	18.4	20.9	24.3
70	21.1	1.3	2.5	3.5	4.5	5.4	6.2	6.9	7.7	8.5	9.2	10.1	11.0	12.0	13.1	14.4	16.0	17.9	20.5	23.9
90	32.2	1.2	2.3	3.4	4.3	5.1	5.9	6.7	7.4	8.1	8.9	9.7	10.5	11.5	12.6	13.9	15.4	17.3	19.8	23.3
110	43.3	1.1	2.2	3.2	4.0	4.9	5.6	6.3	7.0	7.7	8.4	9.2	10.0	11.0	12.0	13.2	14.7	16.6	19.1	22.4
130	54.4	1.0	2.0	2.9	3.7	4.5	5.2	5.9	6.6	7.2	7.9	8.7	9.4	10.3	11.3	12.5	14.0	15.8	18.2	21.5
150	65.6	0.1	1.8	2.6	3.4	4.1	4.8	5.5	6.1	6.7	7.4	8.1	8.8	9.7	10.6	11.8	13.1	14.9	17.2	20.4

For more information on the Protimeter range, visit our Protimeter website



www.protimeter.com