Moisture meters measure an electrical property of the wood which is affected by the amount of moisture present.

- Pin meters – Conductance (DC resistance)
- Pinless meters – Capacitive Admittance (Dielectric)
  - RF/Wave technology - capacitance
- Measure wood MC as a % of the oven-dry weight of the wood – ASTM D4442
- **Pin meter** – electrodes measure the current between two points of contact.
- **Pinless meter** – transmits electromagnetic wave energy to detect the influence of moisture as an estimate of MC.

**Why use a Moisture Meter when drying lumber?**

- Wood is hygroscopic
- Results are immediate
- Less labor
- Larger sample
- Wet spots
- Easy to use
Which meter?

Must consider:

- Factors that can potentially affect a meter reading
- Achieving the best accuracy possible
- Impact of client demands/practices

Factors That can Potentially Affect a Meter Estimate of MC

1. Species
2. Specific gravity (density)
3. Wood temperature
4. MC Range
5. MC Gradient
6. Presence of wet pockets
7. Surface moisture
8. Sample size (width and thickness)
9. Surface quality
<table>
<thead>
<tr>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pin Meter</strong></td>
</tr>
<tr>
<td>✓ Correction factor required</td>
</tr>
<tr>
<td>✓ Regional differences can be an issue</td>
</tr>
<tr>
<td>✓ Source differences</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pin Meter</strong></td>
</tr>
<tr>
<td>✓ No correction required</td>
</tr>
<tr>
<td>✓ Species corrections most likely incorporate effect of SG as well as chemical differences between species</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
## Wood Temp

**Pin Meter**
- Meter readings affected by wood temperature and must be considered under conditions other than testing at normal indoor ambient conditions.

**Pinless Meter**
- Meter readings are affected but not to the same extent as DC-resistance.
- Still need to correct if testing at extremes of temperature.

## MC Range

**Pin Meter**
- Accurate results within 6 to 25% range (below FSP)
- Readings outside this range are a relative indication of MC

**Pinless Meter**
- Useful results below FSP
- Readings down to 5%
- More stable at low MC than DC-resistance
### MC Gradient

<table>
<thead>
<tr>
<th>Pin Meter</th>
<th>Pinless Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Meter can be used to test for presence of a MC gradient.</td>
<td>✓ Meter cannot detect presence of a gradient but is affected by it.</td>
</tr>
<tr>
<td>✓ Affects estimate of MC obtained.</td>
<td>✓ Produces an estimate of the average to a certain depth</td>
</tr>
<tr>
<td>✓ Need to be aware and drive pins to appropriate depth</td>
<td>✓ Depth of penetration varies by meter make and model</td>
</tr>
<tr>
<td>✓ Good estimate of average possible (i.e. pin at 1/5&lt;sup&gt;th&lt;/sup&gt; depth)</td>
<td></td>
</tr>
</tbody>
</table>

### Wet Pockets

<table>
<thead>
<tr>
<th>Pin Meter</th>
<th>Pinless Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Hitting a wet pocket will cause over-estimate</td>
<td>✓ Easy to scan over surface of board to find wet pockets</td>
</tr>
<tr>
<td>✓ Need to probe a lot to find wet pockets</td>
<td>✓ Reading is not as heavily influenced when you find one (averaging effect)</td>
</tr>
<tr>
<td></td>
<td>✓ Larger wet pockets will have more pronounced effect than very small ones</td>
</tr>
</tbody>
</table>
### Surface Moisture

<table>
<thead>
<tr>
<th>Pin Meter</th>
<th>Pinless Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Will not affect reading if insulated pins are used and in good condition</td>
<td>✓ Has an influence on MC estimates obtained</td>
</tr>
<tr>
<td>✓ Can still detect for presence of wet surface by touching pins</td>
<td>✓ May cause to over-estimate average MC</td>
</tr>
</tbody>
</table>

### Size – Width – Thickness

<table>
<thead>
<tr>
<th>Pin Meter</th>
<th>Pinless Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Meter readings not affected by sample size</td>
<td>✓ Board width / sensor plate</td>
</tr>
<tr>
<td>✓ Meter reading is very specific to wood between tips of pins</td>
<td>✓ Meters have depth of penetration limit</td>
</tr>
<tr>
<td>✓ Thickness compensated for by pinning depth</td>
<td>✓ Thin material - be conscious of material behind sample</td>
</tr>
<tr>
<td></td>
<td>✓ Thick material (over 2-inches) - may not penetrate to core</td>
</tr>
</tbody>
</table>
## Surface Quality

<table>
<thead>
<tr>
<th>Pin Meter</th>
<th>Pinless Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Not affected</td>
<td>✓ Rough surfaces reduce the contact between sensor and wood and tend to reduce the reading</td>
</tr>
</tbody>
</table>

## Other Factors

- ✓ Electrode - 2 or 4 pins/insulated vs. non-insulated
- ✓ Grain direction
- ✓ Static electricity – low RH
- ✓ Frozen lumber
- ✓ Treated lumber
- ✓ Meters do not always agree – corrections, pins’ penetration, standards
Other Factors

The user

✓ Be aware of, compensate for, or avoid the factors that affect your readings

✓ Basic care – calibration, batteries, pins

Proscan

✓ Primary and secondary markets
✓ Digital readout (5%-30%)
✓ Internal adjustment for SG
✓ Penetration – 3/4in+
✓ Alarm to alert for high readings
✓ Analog version available
J-2000

- Internal species and temperature corrections
- Memory – total no. of readings, average, highest
- 5/16” penetration – non-insulated pins
- Use with 26-ES (insulated pins) in drying application

26-ES Hammer Electrode

Insulated pins – use on stock up to 5-6in thick
Management Tool

- Collect many readings and statistics on groups, not individual samples
- Generate reports for QC and client requirements
- Use with the basic elements of wood-moisture relationship in mind

Calibration Check Tool

- Moisture Content Standard
- Used to verify that your meter is in calibration
- Two contact points at resistance values of 12% and 22% to test your meter against
Recap

Use Moisture Meters with confidence......

✓ Follow manufacturer’s procedures
✓ Know the meter’s capabilities
✓ Apply your knowledge and experience
✓ Fast and accurate
✓ Proven and essential tools

THANK YOU!
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