

PRIOR TO INSTALLATION & MOISTURE MANAGEMENT

The MOST IMPORTANT VARIABLE YOU NEED TO CONTROL & UNDERSTAND IS MOISTURE. All wood in houses naturally has water in it and this can not and should not be avoided.

Houses usually experience less variation in humidity than outside. This is inherently obvious. We control inside temperatures with windows and doors, air-conditioning, heating and the roof keeps the rain off.

If too dry (<35% relative humidity 'RH'¹) wood becomes brittle and if too wet (>65% RH) wood will be attacked by fungus and metal corrodes excessively. High humidity also promotes dust mite growth.² There is no such thing as dry rot in wood that is really dry. The INTERIOR RH range in a room must be from 40% to 60%.

The relationship between the RH and temperature and wood moisture content is shown in the table.³

When wood changes moisture content it changes size in the across the grain direction. Longitudinal movement is typically <1% of the across grain movement and is usually ignored. Australian Hardwoods tend to change dimension more than pine and the softer hardwoods used in the Northern Hemisphere: AND the harder the wood the more difficult it is to stop it moving.

¹ Relative Humidity [RH] from air temperature [dry bulb] temperature of thermometer wrapped in a wet cloth [wet bulb]

Psychrometric Table.

Relative Humidity %	Dry Bulb Temperature °C Celcius								
	15	18	20	22	25	27	30	33	
Difference Between Dry Bulb and Wet Bulb Temperatures oC	1	90%	91%	91%	92%	92%	92%	93%	93%
	2	80%	82%	83%	84%	85%	85%	86%	87%
	3	71%	73%	75%	76%	77%	78%	79%	80%
	4	62%	65%	67%	68%	70%	71%	73%	74%
	5	53%	57%	59%	61%	64%	65%	67%	69%
	6	44%	49%	52%	54%	57%	59%	61%	63%
	7	36%	42%	45%	47%	51%	53%	55%	58%
	8	28%	34%	38%	41%	45%	47%	50%	53%
	9	21%	27%	31%	34%	39%	41%	45%	48%
	10	13%	20%	25%	28%	33%	36%	40%	43%

For details go to

<http://archive.amol.org.au/recollections/3/pdf/humidity.pdf>

² "Relative Humidity" Joseph Lstiburek, Ph.D. P.Eng
http://www.buildingscienceconsulting.com/resources/moisture/relative_humidity_0402.pdf

³ "Equilibrium Moisture Content of Wood in Outdoor Locations in the United States and Worldwide" U.S. Forest Products Laboratory. <http://owic.oregonstate.edu/pubs/emc.pdf>
h=RH as a fraction; T=temperature Celcius

$$EMC = \frac{1,800}{W} \left(\frac{Kh}{1-Kh} + \frac{K_1Kh + 2K_1K_2K^2h^2}{1 + K_1Kh + K_1K_2K^2h^2} \right)$$

$$W = 349 + 1.297T + 0.0135T^2$$

$$K = 0.805 + 0.0007367T - 0.000002737T^2$$

$$K_1 = 6.27 - 0.009387T - 0.0003037T^2$$

$$K_2 = 1.91 + 0.04077T - 0.0002937T^2$$

This effect was used by the Ancient Egyptians to split granite⁴ and is not able to be resisted by our houses. Therefore the movement must be allowed for in the design. This is done by installing expansion joints and maintaining RH control in the room.

If the substrate that is supporting the floor or walls surrounding to floor has moisture in it, the moisture must be removed or completely prevented from entering into the prefinished floor. Moisture moves as water vapour so ventilation is essential.

The 1st step to control moisture in a room is to control the temperature for a period before installation that is long enough to 'dry' surfaces that have too much moisture.

- Prior to installation, cooling/heating system must be in operation, and room temperature must have been maintained at 22°C ±3°C for at least one week until the supporting structure no longer changes moisture content. In locations where air-conditioning is not available the RH MUST BE CONTROLLED to between 45% and 50% by heating until moisture content is stable.

- To avoid any moisture-related damage, subfloors must be dry and under-floor-areas well ventilated. Wooden subfloor moisture must not exceed 12% and differential between flooring and subfloor must be less than 4%. If moisture is too high, postpone installation, find moisture source and correct it if needed, raise heat and increase ventilation until the required conditions are met.

- DO NOT INSTALL ON CONCRETE that is over 3% moisture content without a perfect water and water vapour seal.

- Subfloor must be structurally sound without movement or squeaks.

Moisture Content (EMC)	Relative Humidity %							
	30	40	50	60	70	80	90	
Temperature	15°C	6.0	7.1	8.1	9.4	11.2	13.7	17.5
	20°C	6.0	7.1	8.1	9.4	11.2	13.7	17.6
	25°C	6.0	7.2	8.2	9.4	11.3	13.8	17.7
	30°C	6.0	7.2	8.2	9.5	11.3	13.8	17.8
	35°C	6.0	7.2	8.2	9.5	11.3	13.8	17.8

⁴ "Advanced Machining in Ancient Egypt" Christopher P. Dunn

<http://www.theglobaleducationproject.org/egypt/articles/cdu-mn-1.php>