



**Andrew Rynhart on knowing your ERH from your ARH**

# Fluctuating temperatures can blur readings

**Equilibrium Relative Humidity (ERH) readings can be misleading when taken in an environment with fluctuating temperature.**

THIS is possibly a contentious statement to make, especially in an industry where ERH readings are taken as a benchmark for testing the moisture content of subfloors, so I want to choose my words carefully.

Before writing more on the subject I would like to make a quick observation about the difference between Ambient Relative Humidity (ARH) and Equilibrium Relative Humidity (ERH). These two completely different tests often appear to be confused.

■ **ERH** testing is actually an indirect way of measuring the moisture content of concrete or other floor slabs and screeds. The test is carried out by measuring the relative humidity of the air within a sealed environment directly in contact with the slab, which is allowed sufficient time to come to an equilibrium relative humidity with the slab.

These readings are either taken within a hood sealed to the surface, as in the British Standard test method, or from within a sleeve inserted into the screed, as in the ASTM test method.

■ **ARH** on the other hand, is a direct measurement of the relative humidity in the air within the environment the floor covering is to be installed into. This simple test is extremely important for anyone installing wood or engineered floors as it allows the installer to judge whether the environment is stable for installation.

In conjunction with a moisture content test of the timber it becomes more useful as it allows the installer to judge if additional expansion gaps are required between the boards or not.

It is the ARH not the ERH which directly determines what moisture content the timber will equalise to and this is often confused. For an example a wood floor installer would be happy to find a building with an ARH of 50% and an ERH of 70%, by referencing a chart giving the moisture content of wood at various temperatures and relative humidity readings, they will see

## Moisture content of wood at various temperatures and relative humidity readings

Temp (degC)	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	26.9
-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	26.9
4.5	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	26.9
10	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	26.9
15.5	1.3	2.5	3.6	4.6	5.4	6.2	7.0	7.8	8.6	9.4	10.2	11.1	12.1	13.3	14.6	16.2	18.2	20.7	24.1	26.8
21	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	26.6
26.5	1.3	2.4	3.5	4.4	5.3	6.1	6.8	7.6	8.3	9.1	9.9	10.8	11.7	12.9	14.2	15.7	17.7	20.2	23.6	26.3
32	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	26.0
38	1.2	2.3	3.3	4.2	5.0	5.8	6.5	7.2	7.9	8.7	9.5	10.3	11.2	12.3	13.6	15.1	17.0	19.5	22.9	25.6
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	98

Chart from Wood Handbook; Wood as an engineering material (Agriculture Handbook 72), Forest Products Laboratory, US Dept of Agriculture.

that when the ARH is 50%, at room temperature, they can expect the timber to stabilize at about 9% moisture content. If they were to look up the ERH readings of 70% they may expect the timber to go to 13% which will not happen in the conditions described above.

So back to the main point I am trying to make that Equilibrium Relative Humidity (ERH) readings can be misleading when taken in an environment with fluctuating temperature.

**The following common situations are examples of this:**

A conservatory where the temperature tends to drop at night and can reach quite high levels during the day, new buildings without heating or open to the elements or even older buildings where the occupants do not keep all the rooms heated. In all these examples it is very difficult to get the stable temperature necessary for consistently meaningful ERH tests to be carried out.

The maximum amount of moisture which can be present in air depends on its temperature, as the air temperature fluctuates so does its ability to carry moisture.

Relative humidity is the amount of moisture present in the air measured as a percentage of the maximum amount that can be present; this in effect means that when the temperature drops so does the maximum amount of moisture which can be present and the net effect is that the relative humidity increases. The dew point is the temperature at which the amount of moisture is greater than the amount which can be present in air and the result is condensation.

When taking ERH readings, a period of up to 72 hours is allowed for the moisture within the

subfloor to come to equilibrium with the humidity within the air space, this takes place by a constant mixing between the air and concrete. If the temperature changes before equilibrium is reached, it can be like beginning the test again and in many cases an ERH is never reached.

A simple experiment can be carried out to demonstrate this. Take two samples of concrete with exactly the same moisture content, keep one at a constant temperature and the other in an unheated environment like a conservatory. By comparing the readings from the second sample throughout the day it is easy to get a clear picture of the differences in readings depending on what time the test are done.

In the early morning and late evening when the temperature is low the readings tend to be higher and in the middle of the day, when

most tests would be carried out, the readings tend to be lower. Now compare the results with the first sample with the constant temperature.

I am in no way suggesting that this type of test should not be carried out as directed in the British Standards but consideration should be given to the ambient temperature. By combining a humidity test with a test which directly measures moisture content such as the Tramex CME or the Calcium Carbide test it is possible to eliminate most problems associated with moisture in subfloors. **CFJ**

■ **Email: [andrew@tramex.ie](mailto:andrew@tramex.ie)**  
**Andrew Rynhart is the technical director at Tramex**

**Further information on T: 0870 735 2870**

## Advice on handling rolls of flooring

FLOORLAYERS are being advised to take care when handling rolls or packages of material.

The warning follows the publication of accident figures showing that 40% of minor injuries resulting in three or more days of absence were caused by handling, lifting or carrying. Injuries result in musculoskeletal disorders such as back pain, joint injuries and repetitive strain.

**KEY FACTS:**

Any work involving lifting and putting down, carrying, or pushing and pulling is manual handling.

**Injury risk is increased by:**

- Repetitive activity or working for long periods without a break;
- Heavy loads or those that are awkward to lift;
- Bending or twisting of the body whilst lifting; and

■ Poor or uncomfortable working positions.

**Manage the risk by:**

- Reducing the size/weight of the load;
- Using mechanical aids such as pallet trucks where possible;
- Modifying the task to reduce the risks associated with poor posture, bad environments etc; &
- Giving employees training

As with any workplace risk, manual handling should be subject to a risk assessment. HSE's Manual Handling Assessment Chart (MAC) tool can help:

■ **[www.hse.gov.uk/msd/mac](http://www.hse.gov.uk/msd/mac)**

Do keep records of manual handling risk assessments.

The above advice is given by Norwich Union, soon to be A viva, as part of its new Simply Safety campaign.