

Moisture content & machining tolerances

Good joinery practice

The moisture content of timber changes constantly with variations in ambient temperature and relative humidity. As moisture content changes, the cells in the timber swell or shrink to accommodate the changing moisture levels, producing a dimensional change in the timber section.

The degree of dimensional change varies with species and grade, but as a broad rule of thumb, in typical UK and Irish conditions, timber dimensions will vary by about 1% for every 3% change in timber moisture content.

Over a year, the equilibrium moisture content of exterior joinery can vary from under 15% in dry summer conditions to over 20% in the wetter winter months. Since moisture contents as low as 10% are often found in workshops without humidity control, dimensional changes as large as 3% - 4% are quite possible when the joinery is delivered and fitted on site.

As an example, typical temperature and humidity data for Southern England is shown in the adjacent table. The variations will be more extreme in colder northern areas and in the wetter western regions.

This flexing of timber over the seasons often causes premature failure in traditional solvent based coatings, particularly as they embrittle with ageing. It has been a significant factor in the switch to more flexible waterbased protective coatings.

Under normal circumstances, exterior joinery is designed to accommodate this natural movement of timber, and ideally the timber is stored and machined in factories with controlled humidity. Typically, timber moisture content around 14% is recommended for controlled production environments.

Where the joinery producer does not have humidity control, care has to be taken with items produced in the winter, when the relative humidity on site is likely to be high and wider tolerances may be required to prevent 'sticking' problems arising. Dimensional changes are most significant on larger section sizes. Door stiles, double or French doors and bi-fold systems produced from dry timber are particularly problematic, as the swelling effect is multiplied.

We recommend speaking with your timber supplier to request the moisture content specification.

The example below shows the effect of moisture content on a typical exterior panel door:

- Moisture content of timber in joinery shop: 10%
- Moisture content of joinery on site: 22%
- Expected dimension change: 4%
- Stile width in joinery shop: 120mm
- Dimension change (width) due to moisture: 4.8mm
- Total width change (two stiles): 9.6mm

Modern factory installed hinge systems allow about 10mm of adjustment. This should be sufficient for most situations if the frames are accurately machined and they have sufficient tolerance.

Sticking timber doors and windows can be an irritating and costly source of snagging items. However with appropriate design tolerances, manufacturing process controls and ideally moisture control during production, the problems can be avoided.

Average temperature, humidity & moisture levels

Month	Average temperature °c	Average relative humidity %	Equilibrium moisture content %
January	4.9	90	20
February	6.6	88	19
March	8.0	84	19
April	8.3	85	18
May	13.0	77	17
June	15.7	77	16
July	15.8	76	15
August	17.4	77	14
September	15.2	84	17
October	11.0	88	18
November	7.3	90	19

Data taken for High Wycombe area