

SHRINKAGE AND SWELLING OF WOOD IN USE.

By

M. A. Sattar,
Senior Research Officer.

We are quite familiar with tightening of doors, windows and drawers during rainy season. In the winter, the same doors, windows and drawers become loosened. Sometimes, unsightly cracks make their appearance even on the costly furniture. There is every reason that we feel disgusted and disappointed with this undesirable behaviour of wood which we purchase in exchange of our hard-earned money and we expect that the furniture made out of it would behave well. We make carpenters responsible for these too. But, in fact, we should blame neither carpenters nor wood. This is due to shrinkage and swelling which are inherent properties of wood. The following discussion explains, briefly, the cause of shrinkage and swelling and also suggests the remedial measures for their minimization.

Cause of shrinkage and swelling:

Wood is a hygroscopic material. So, when even the well seasoned wood is exposed to air, its moisture content adjusts itself until it is in balance with the equilibrium moisture content of the surrounding atmosphere. The equilibrium moisture content depends entirely on the relative humidity of the atmosphere. Consequently, a change in the relative humidity will

bring about a change in the moisture content of wood which shrinks as it gives off moisture and swells as it takes up moisture. It is interesting to note that shrinkage and swelling occurs only when the moisture content of wood is below 30% which is known as fibre saturation point.

In East Pakistan, the variation of relative humidity during different seasons of the year is significantly high. For example, the normal equilibrium moisture content at the Forest Research Institute campus reaches the value of 18.5% during the rainy season while in the winter it goes down to 11.5%. This change of 7% moisture content is sufficient to create serious defects in many of the woods which are susceptible to dimensional changes. Because, as a rule, a change in moisture content of 3% brings a change in dimension of 1% in width direction. Thus a table top of 30 inches width in changing from moisture content of 18% (in June/July) to 12% (in January/February) would undergo a shrinkage of 2% which is equivalent to 0.6 inch. Similarly a drawer or a window of 30" width would experience a swelling of 0.6 inch if it is manufactured in the winter and used in the rainy season. This 0.6 inch shrinkage or swelling is, as you know, sufficient to cause the table top to split and develop unsightly cracks or to cause the drawer and window stick and bind.

The rate of shrinkage or swelling is not same for all woods. Some woods respond to shrinkage or swelling easily; but others are stable. In practice, for this reason, we encounter much trouble with furniture made out of some of the woods.

For example, champa which is used in preference to other species for its eye-catching superb grain and colour, is vulnerable to dimensional changes. Doors and windows of chapalish do not give satisfactory performance too as chapalish does fall in the group of high co-efficient of shrinkage and swelling. But the manufactured from teak does not behave differently in different seasons of the year.

How to minimize the effects of shrinkage and swelling of wood in service:

As it is stated earlier that the property of shrinkage or swelling is inherent to wood, the dimensional changes cannot be avoided with cent percent success. But, its harmful effects can be minimized if the following points are taken into consideration in the selection and preparation of wood products:

1. Wood should be seasoned uniformly and to a moisture content which must be equal to the average equilibrium moisture content of the atmosphere where to be used. In East Pakistan, the average EMC is 15%, so wood should be seasoned to 15% moisture content.

2. Since wood shrinks or swells more (about two times) along the growth ring, i.e., tangentially than across, i.e., radially, quarter-sawn lumber shrinks or swells less in width but more in thickness than plain-sawn lumber. So, quarter-sawn lumber should be preferably used as change in thickness is not usually noticeable and does not cause any inconvenience.

3. If a minimum change in dimension is highly desirable, wood which shrinks or swells least should be selected.

4. Plywood panels drastically reduce the shrinkage or swelling in the lateral directions. So, for wide plain surfaces, such as table tops, counter tops and panels, plywood may be profitably used.

5. Protective coatings, such as paint, shellac, lacquer, varnish or impregnation with linseed oil, paraffin, etc., minimize the rate of dimensional change of wood. It may be mentioned here that while coatings or finishes are used on the table top, for example, both the top and the bottom should be preferably coated. Otherwise, a difference in the rate of moisture loss or gain between two surfaces may cause warping.

6. Lastly, wood products should not be, as far as possible, exposed directly to sun-shine or rain in order to avoid rapid drying and wetting.

Conclusion:

Shrinkage and swelling of wood in East Pakistan are so high that their effects need not be over emphasized. Systematic studies which are being made at the Forest Research Institute, Chittagong will, therefore, help the wood users in the proper and efficient utilization of wood with minimum degrades caused due to dimensional fluctuation of wood.
