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IS 287 (1993): Permissible Moisture Content For Timber Used For Different Purposes - Recommendations [CED 9: Timber and Timber Stores]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

विभिन्न प्रयोजनों के लिए प्रयुक्त इमारती लकड़ी में
अनुमत नमी अंश — सिफारिशें
(तीसरा पुनरीक्षण)

Indian Standard

**PERMISSIBLE MOISTURE CONTENT FOR
TIMBER USED FOR DIFFERENT PURPOSES —
RECOMMENDATIONS**

(Third Revision)

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FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Timber Sectional Committee had been approved by the Civil Engineering Division Council.

This standard was first published in 1951. It was subsequently revised in 1960 to include a modified demarcation of climatic zones on the basis of meteorological data on relative humidity and then revised in 1973 to incorporate the latest data in regard to permissible moisture content for various purposes besides prescribing in greater detail the methods of testing moisture content.

In this third revision the table on 'Species Correction for Some Makes of Electric Resistance Type Moisture Meters for Common Commercial Timbers' has been omitted. The methods for determination of moisture content of timber is deleted and reference has been made to IS 11215 : 1991 'Methods for determination of moisture content of timber and timber products (first revision)'. Amendments No. 1 and 2 issued to second revision of this standard have also been incorporated.

The moisture content of a fully seasoned piece of wood depends mainly upon the atmospheric conditions prevailing in the locality in which it is seasoned, although the species of wood and cross-section of the piece also have an important bearing. The moisture content of seasoned wood changes from season to season depending chiefly upon the fluctuations in atmospheric humidity, though here again the nature of the species and the cross-sectional area of the piece as well as the surface treatment applied to it play an important part. For instance, a piece of teak is susceptible to lesser changes in moisture content than a piece of semul of the same size and exposed to the same atmospheric changes. Again, a piece of timber 100 mm × 100 mm in cross-section suffers lesser changes than a piece of the same timber 100 mm × 25 mm in the cross-section. The application of a paint or varnish to the surface of timber reduces changes in moisture content with changes in humidity of the surrounding air. Dipping or pressure treatment with oil or creosote-oil mixture also has a similar effect.

India is a vast country with a variety of climatic conditions. For the purpose of this standard, the country has been broadly divided into four zones, from the very hot and dry climate to the coastal climate of South India where it is almost always hot and moist (see 3 and Map of India). Seasonal changes in the moisture content of wood occur mostly in zones II and III, where a hot, dry summer is abruptly followed by a wet rainy season.

It may be mentioned that with the data available to the committee, it was not possible to demarcate the zones in a clear-cut manner. Observations were carried out by the then Forest Research Institute and Colleges, Dehradun, at 19 localities, out of which only 12 now fall within the boundaries of India. Based on this information, and on the published meteorological data, an attempt has been made to divide the country roughly into four moisture content zones. Even within a zone, climatic conditions vary at different localities due to physical features, such as altitude and vicinity of mountains acting as barrier to moist or dry winds. The information given in this standard has, therefore, to be applied in a very general manner, taking into consideration the existing local conditions.

Timber shrinks on drying, and the shrinkage in fabricated stores leads to unsightly gaps between planks and loosening of joints besides deformation, cracks, etc. The shrinkage along the grain is very small and negligible for practical purposes, except when the timber contains compression and tension wood and wood from around the branches. There is appreciable shrinkage across the grain. The timber used in the manufacture of timber stores should, therefore, be properly seasoned before use, though for some types of stores a little more tolerance in moisture content is permissible than for others in the interest of expediency and resultant economy. In a packing case, unlike a table top for instance, a gap of about 3 mm between adjacent planks, caused by shrinkage of wood subsequent to fabrication, is of no importance.

It is essential that timber used for the manufacture of wooden stores should have attained a moisture content as near as possible to the value that will be attained in equilibrium with the average atmospheric conditions in service. Full discussion of this subject is to be found in 'A survey of seasonal variation of the moisture content of Indian woods', Indian Forest Records, Utilization (New Series), Vol 2, No. 10. Strictly speaking, for different timber stores there is an optimum moisture content, depending upon the nature of use and the climatic conditions, at which timber should be seasoned and manufactured for best performance in service.

(Continued on third cover)

Indian Standard

PERMISSIBLE MOISTURE CONTENT FOR TIMBER USED FOR DIFFERENT PURPOSES — RECOMMENDATIONS

(Third Revision)

1 SCOPE

This standard covers the recommendations for permissible limits of moisture content based on optimum moisture contents indicated by experimental data* and the tolerances permissible in these limits, for different stores in each of the four climatic zones into which the country has been broadly divided for this purpose, with a view to ensuring unimpaired utility of the stores as a result of climatic changes.

2 REFERENCES

IS 11215 : 1991 'Methods for determination of moisture content of timber products (first revision)' is a necessary adjunct to this standard.

3 ZONES

The country has been broadly divided into the following four zones (*see also* Map) on the basis of information collected by the Forest Research Institute on the seasonal changes in the moisture content of timber at 12 localities in India, supplemented by published meteorological data on the humidity variations in the country:

- Zone I Average annual relative humidity less than 40 percent
- Zone II Average annual relative humidity 40-50 percent
- Zone III Average annual relative humidity above 50 and up to 67 percent
- Zone IV Average annual relative humidity more than 67 percent

NOTE — For any micro-climatic condition not covered by the meteorological data for standard stations in the country on which the map is based, the zonal condition for a locality may be decided on the basis of its monthly humidity data and in the light of the criterion about RH range already prescribed for different zones under 3.

4 LIMITS OF PERMISSIBLE MOISTURE CONTENT AS INDICATED BY EXPERIMENTAL DATA ON SEASONAL VARIATION OF MOISTURE CONTENT OF TIMBER

The permissible limits of moisture content of timber when determined in accordance with IS 11215 : 1991 based on optimum moisture contents indicated by experimental data for seasoned timber required for various wooden stores and uses in each of the four zones are given in Table 1. These limits have been derived

from the principle that timber for use for any particular store should be seasoned to a moisture content which is midway between the maximum and minimum equilibrium moisture content of the particular place.

NOTE — Any piece of wood will give off or take on moisture from the surrounding atmosphere until the moisture in wood has come to a balance with the existing atmospheric conditions. The moisture content at which timber neither gains nor loses moisture when subjected to a given constant condition of temperature and humidity is known as the equilibrium moisture content corresponding to that condition.

5 RECOMMENDED TOLERANCES IN PERMISSIBLE LIMITS OF MOISTURE CONTENT FOR VARIOUS END USES

Seasoned timber (whether air or kiln-dried) shall be deemed to conform to the moisture content requirements of this standard if the averaged moisture content of all the samples from a given lot is within ± 2 percent and the moisture content of individual samples is within ± 3 percent of the permissible moisture content for the particular end use and locality indicated under Table 1, except for the following end uses for which tolerances shall be as indicated below:

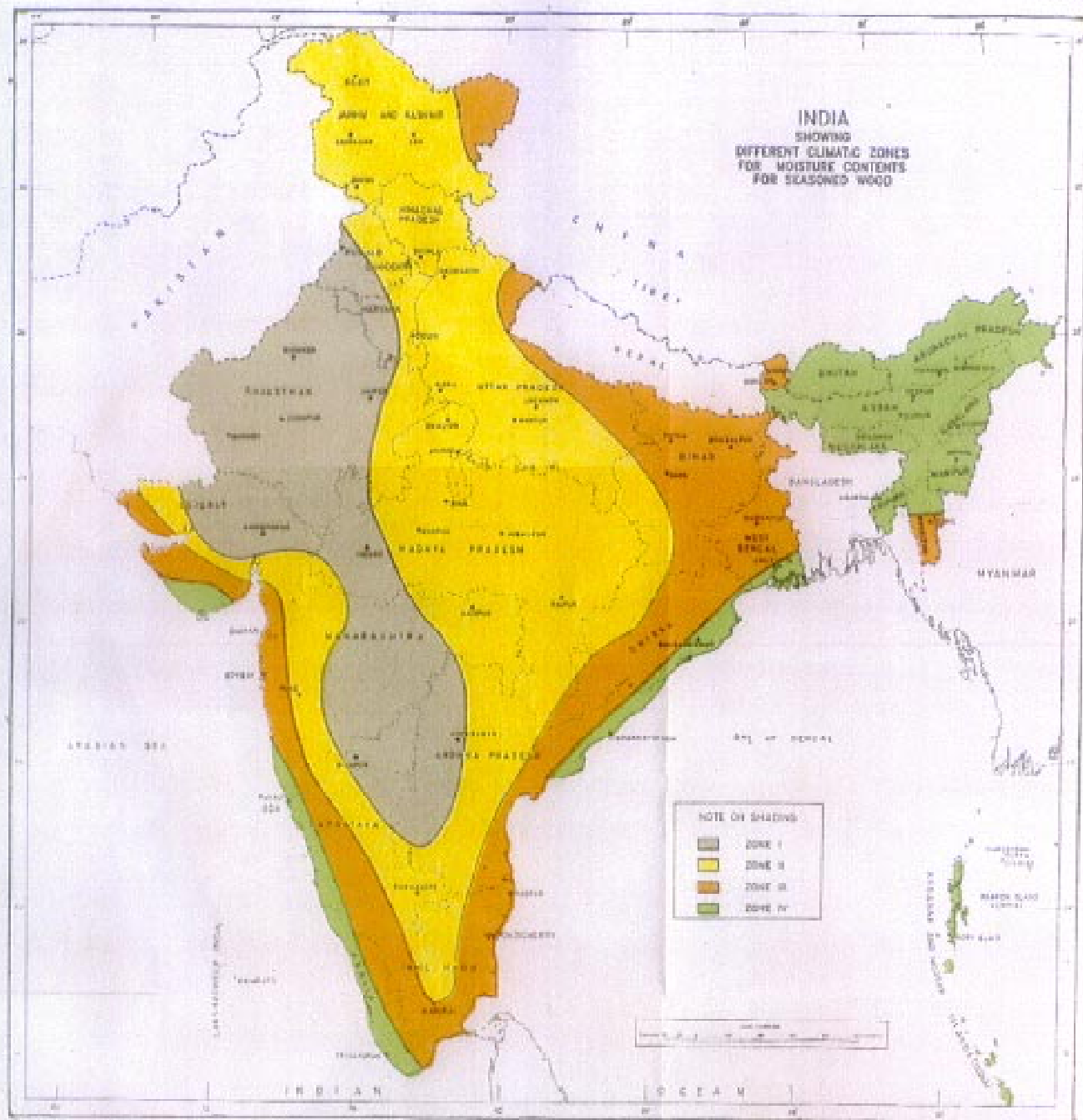
Use	Tolerances
Agricultural implements Beams and rafters Carts and vehicles (not motor-driven) Doors and windows: 50 mm and above in thickness	Average moisture content of all the samples from a lot shall be within ± 3 percent and moisture content of individual samples within ± 5 percent of the permissible moisture content for the particular end use and locality indicated under Table 1.
Aircraft Boot lasts Pattern making Rifle parts and gun stock Shuttles	Average moisture content of all the samples from a lot shall be within ± 2 percent and moisture content of individual samples within ± 3 percent of the permissible moisture content for the particular end use and locality indicated under Table 1.

NOTE — The tolerances as indicated under 5 are absolute values over the values indicated in Table 1.

*Indian Forest Records, Vol 2, No. 10.

Table 1 Permissible Moisture Content of Timber for Different Uses
(*Clauses 4 and 5*)

Sl No.	Use	Moisture Content, Percent, Max			
		Zone I	Zone II	Zone III	Zone IV
(1)	(2)	(3)	(4)	(5)	(6)
i)	Aircraft	10	12	14	15
ii)	Agricultural implements	12	14	16	16
iii)	Ammunition boxes	10	12	14	14
iv)	Artificial limbs	8	10	12	12
v)	Automobile bodies:				
	a) 50 mm and above in thickness	10	12	14	16
	b) Thinner than 50 mm	8	10	12	14
vi)	Beams and rafters	12	14	17	20
vii)	Boot lasts	10	12	14	16
viii)	Box shooks	12	14	16	18
ix)	Carts and vehicles (not motor driven)	10	12	14	16
x)	Cooperage	10	12	12	14
xi)	Doors and windows:				
	a) 50 mm and above in thickness	10	12	14	16
	b) Thinner than 50 mm	8	10	12	14
xii)	Electrical industry	10	12	14	15
xiii)	Flooring strips for general purposes	8	10	10	12
xiv)	Flooring strips for the tea gardens	12	12	14	16
xv)	Furniture and cabinet making	10	12	14	15
xvi)	Handles	12	12	14	15
xvii)	Pattern making	8	10	12	14
xviii)	Railway carriage building:				
	a) 50 mm and above in thickness	10	12	14	14
	b) Thinner than 50 mm	8	10	12	12
xix)	Rifle parts and gun stocks	8	10	12	12
xx)	Shuttles and bobbins	8	10	12	12
xxi)	Sports goods, umbrellas and walking sticks	10	12	14	16
xxii)	Ship and boat building:				
	Deck	10	12	12	14
	Frame	12	14	16	18
	Planking	12	14	14	16
xxiii)	Sleepers	20 percent in all zones, moisture content being determined within a depth of 20 mm from the surface and excluding 300 mm from each end			
xxiv)	Timber meant for further conversion, post and poles	20 percent in all zones, moisture content being determined within a depth of 12 mm from the surface and excluding 300 mm from each end			
xxv)	Toys, turnery, carving, clocks, brushes, picture frames, brooms, cigar boxes, pens, pencils, mathematical and musical instruments and household goods	8	10	12	12

**NOTES**

- 1 Based upon Survey of India map with the permission of the Surveyor General of India.
- 2 The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
- 3 The boundary of Mizoram shown on this map is as imagined from the North-South Area (Fleegerisation) Act, 1971, but has yet to be verified.

4 The administrative headquarters of Chandigarh, Haryana and Punjab are at Chandigarh.

5 Responsibility for the correctness of internal details shown on the map rests with the publisher.

(Continued from second cover)

In practice, however, it is neither economical nor essential to absolutely conform to the optimum moisture contents indicated by experimental data, except for the uses demanding extreme precision. The difficult availability of seasoned timber, long periods required for air seasoning or even kiln seasoning thick and refractory timber, inevitable changes in the moisture content of seasoned timber in storage or transit and expense otherwise involved in providing for conditioned storage facilities, inherent inaccuracy in methods of field testing of moisture content, etc, make this course quite impracticable. Suitable tolerances relative to these optimum moisture contents have therefore to be considered, depending upon the precision involved in different uses, to make the standards more feasible and adaptable for inspection purposes in field transactions of timber.

Positive tolerances have to be fixed mainly by a consideration of the dimensions of timber sections used, seasoning periods involved, inaccuracy of moisture determination methods and the extent to which the particular end use permits precision to be sacrificed. Negative tolerances should take account of the liability of timber to dry further in storage even after the optimum moisture content has been attained and the extent to which timber may deviate from this moisture level without adversely affecting precision. With the already acute scarcity of sufficiently seasoned timber it is considered rather farfetched to further restrict acceptability by specifying limits for negative tolerances also. Accordingly, negative tolerances have not been laid down for the majority of general uses for which only positive tolerances relative to the optimum moisture contents have been specified. Additional specification of negative tolerances has been considered essential only for the more exacting uses, such as rifle stock, foundry patterns, aircraft stock, aircraft construction, shoe lasts and shuttles, which require high precision of shape and size in service or in repetitive production of other finished goods.

Considerable assistance has been received from the Forest Research Institute, Dehradun in preparing this standard.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ' Rules for rounding off numerical values (revised) '. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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