इंटरनेट मानक

Disclosure to Promote the Right To Information

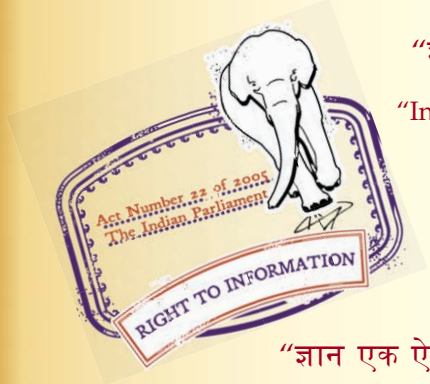
Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 2700 (1987): Code of practice for roofing with wooden shingles [CED 13: Building Construction Practices including Painting, Varnishing and Allied Finishing]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"



"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

IS : 2700 - 1987
(Reaffirmed 2000)

Indian Standard

CODE OF PRACTICE FOR ROOFING WITH WOODEN SHINGLES

(First Revision)

UDC 692·415·3 : 674·114 : 006·76

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4

January 1988

Indian Standard

CODE OF PRACTICE FOR ROOFING WITH WOODEN SHINGLES

(First Revision)

Building Construction Practices Sectional Committee, BDC 13

Chairman	*Representing*
SHRI SUSHIL KUMAR	National Buildings Construction Corporation Ltd, New Delhi
Members	
ADDITIONAL ARCHITECT	Research, Designs and Standards Organization (Ministry of Railways), Lucknow
JOINT DIRECTOR, ARCHITECTURE (*Alternate*)	
SHRI P. D. AGARWAL	Public Works Department, Government of Uttar Pradesh, Lucknow
SUPERINTENDING ENGINEER (*Alternate*)	
SHRI B. K. CHAKRABORTY	Housing and Urban Development Corporation Ltd, New Delhi
SHRI V. K. GROVER (*Alternate*)	
CHIEF ENGINEER (BUILDINGS)	Public Works Department, Government of Tamil Nadu, Madras
SUPERINTENDING ENGINEER (*Alternate*)	
CHIEF ENGINEER	Public Works Department, Government of Rajasthan, Jaipur
SUPERINTENDING ENGINEER (S & S) (*Alternate*)	
CHIEF ENGINEER (TRAINING)	Central Public Works Department, New Delhi
SUPERINTENDING ENGINEER (TRAINING) (*Alternate*)	
CHIEF ENGINEER	Public Works Department, Government of Arunachal Pradesh
DR M. P. DHIR	Central Road Research Institute (CSIR), New Delhi
SHRI S. S. GILL	Public Works Department, Government of Punjab, Chandigarh
SHRI A. V. GOPALKRISHNA	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
MAJ V. K. SURI (*Alternate*)	
SHRI M. KARTIKAYAN	Builder's Association of India, New Delhi

(*Continued on page* 2)

(*Continued from page* 1)

Members	*Representing*
SHRI R. L. KUMAR	Institution of Surveyors, New Delhi
SHRI V. C. PATWARDHAN (*Alternate*)	
SHRI R. C. MANGAL	Central Building Research Institute (CSIR), Roorkee
SHRI M. P. JAISINGH (*Alternate*)	
SHRI H. N. MISHRA	Forest Research Institute & Colleges, Dehra Dun
SHRI K. S. PRUTHI (*Alternate*)	
SHRI M. N. RAJARAMAN	Raman Brothers, Madras
SHRI A. S. VASAN (*Alternate*)	
SHRI S. G. RANADIVE	Indian Institute of Architects, Bombay
SHRI RUMMY SHROFF (*Alternate*)	
SHRI T. S. RATNAM	Bureau of Public Enterprises (Ministry of Finance), New Delhi
SHRI P. R. KALRA (*Alternate*)	
REPRESENTATIVE	Bhabha Atomic Research Centre, Bombay
REPRESENTATIVE	Hindustan Prefab Ltd, New Delhi
SHRI H. S. PASRICHA (*Alternate*)	
REPRESENTATIVE	National Industrial Development Corporation Ltd, New Delhi
SHRI G. B. JAHAGIRDAR (*Alternate*)	
SHRI P. K. SINGHA ROY	State Bank of India, Bombay
SHRI K. S. SRINIVASAN	National Buildings Organization, New Delhi
DEPUTY DIRECTOR (*Alternate*)	
SHRI K. BALBIR SINGH	Life Insurance Corporation of India, Bombay
SHRI M. V. BHIDE (*Alternate*)	
SHRI S. R. TAMBE	Public Works and Housing Department (PWD), Bombay
SHRI B. T. UNWALLA	The Institution of Engineers (India), Calcutta
SHRI G. RAMAN, Director (Civ Engg)	Director General, BIS (*Ex-officio Member*)

Secretary

SHRI A. K. SAINI
Deputy Director (Civ Engg), BIS

Timber Engineering Subcommittee, BDC 13 : 4

Convener	
SHRI H. N. MISHRA	Forest Research Institute and Colleges, Dehra Dun
Members	
SHRI K. S. PRUTHI (*Alternate* to Shri H. N. Mishra)	
SHRI A. N. BAJAJ	In personal capacity (*BC/5C, DDA Flats, Munirka, New Delhi*)
SHRI A. DATTA	Central Building Research Institute (CSIR) Roorkee
DR Y. SINGH (*Alternate*)	

(*Continued on page* 13)

Indian Standard

CODE OF PRACTICE FOR ROOFING WITH WOODEN SHINGLES

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 27 May 1987, after the draft finalized by Building Construction Practices Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Wooden shingles are short, thin, rectangular pieces of timber, usually tapering in thickness along the grain, used in the same way as tiles for covering roofs of buildings. Thickness of shingles ordinarily reduces from tail (butt) to head.

Wooden shingles are used for pitched roofs in some of the Himalayan regions of India, such as, Jammu and Kashmir, North Punjab, Himachal Pradesh and Assam, and Andaman and Nicobar Islands, where suitable species of timber for such shingles are available. Shingles are nailed to the battens and arranged generally in a number of courses overlapping each other so as to ensure leak-proof drainage. There are several precautions with regard to the manufacture of the shingles and details of workmanship in roof construction with them for obtaining satisfactory performance. This standard is intended to provide the necessary guidance in this type of work. The provisions of the standard are largely based on the data furnished by the Forest Research Institute and Colleges, Dehra Dun and also the constructional practices presently being adopted in this country.

0.3 This standard is intended chiefly to cover the technical provisions relating to roofing with wooden shingles, and it does not include all the necessary provisions of a contract.

0.4 This standard was published in 1964. The revision has been undertaken to incorporate the necessary modifications as a result of experience gained during the use of this standard. The modifications include additional design considerations and changes in the list of timber species suitable for shingles.

0.5 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the design aspects and techniques of laying and maintenance of wooden shingles for roof covering including their specifications.

2. TERMINOLOGY

2.0 For the purpose of this standard, definitions given in IS : 707-1976† and the following shall apply.

2.1 Breaking Joints — The method of staggering of shingles in order to avoid continuous vertical joints by providing end lap and side lap.

2.2 Butt End — The exposed end of a shingle.

2.3 Edge Distance — Dimensions taken from the centre of the extreme nail to the edge of the member (*see* Fig. 1).

2.4 Edge Grained Timber — Quarter or radial sawn timber.

2.5 Hip — A salient angle formed by the intersection of two inclined roof surface.

2.6 Lap — The distance by which one shingle overlaps an adjacent shingle, when measured course-over-course, will be termed as 'end lap'; and when measured edge-over-edge of the shingle, will be termed as 'side lap'.

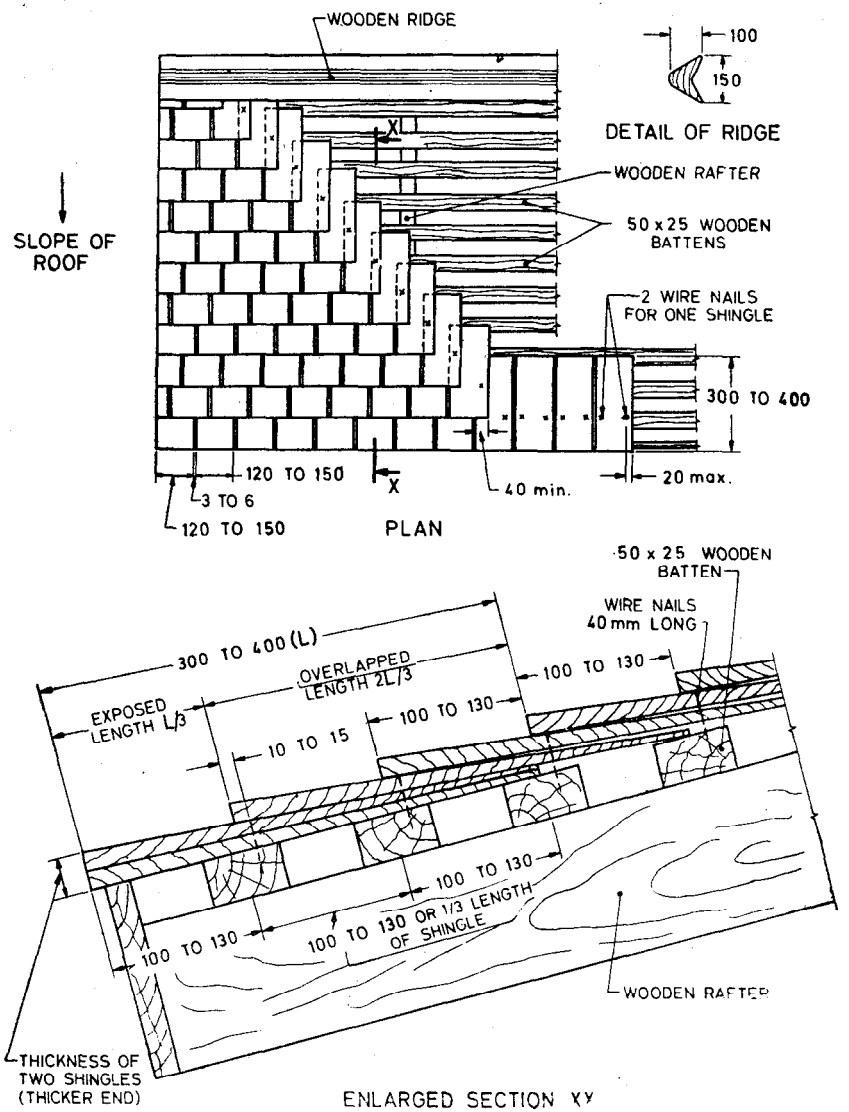
2.7 Purlin — Structural members spanning between pitched roof trusses or partition walls and transmitting the weight of the roof coverings to the trusses or partition walls. They are placed or framed into the truss in such a manner that one of the major axis of the purlin is parallel to the slope of the roof.

2.8 Rafters

2.8.1 *Common Rafters* — The structural members which form the principal framework for the slopes of the roof and support the reepers or boarding which carry the roof covering.

*Rules for rounding off numerical values (*revised*).

†Glossary of terms applicable to timber technology and utilization (*second revision*).



All dimensions in millimetres.

FIG. 1 TYPICAL DETAIL SHOWING ROOFING WITH WOODEN SHINGLES

2.8.2 *Hip Rafters* — The structural members of the roof at the intersection of the two roof surfaces forming a hip.

2.8.3 *Valley Rafters* — The structural members of the roof at the reentrant of the two roof surfaces forming a valley.

2.8.4 *Jack Rafters* — The rafters that are shorter than the common rafter running from a hip to the eaves or from a ridge to the valley, and cut against the hip and ridge.

2.9 Reeper or Batten — Horizontal timber members of small section on which shingles are to be supported.

2.10 Roofing Boards — A layer of wooden boards laid between the rafter and the shingled roof so as to provide a base and an undercover to the roofing to improve its functional performance.

2.11 Roofing Sheets — Any metallic sheet, preferably galvanized steel, corrugated or plain.

2.12 Sawn Timber — Timber that is obtained in required sections by sawing.

2.13 Shingle — Thin, flat, tapering rectangular piece of wood used as a roofing tile.

2.14 Shingle Exposure — The exposed length of the shingle as laid on the roof.

2.15 Split Wood — A wooden piece which is obtained by splitting a larger block along the grain.

2.16 Valley — The re-entrant angle formed by the intersection of two inclined roof surfaces.

3. NECESSARY INFORMATION

3.1 For efficient planning and execution of the work, the following information is necessary:

a) Surface area to be covered;
b) Type of supporting elements and restrictions, if any, to their arrangements;
c) Provision for slope and other requirements for drainage;
d) Provision for fixing ridge pieces;
e) Species and grading of timber used;
f) Moisture content of timber; and
g) Details of pre-treatment.

4. MATERIALS

4.1 Wooden Shingles — The wooden shingles shall conform to the requirement specified in Appendix A.

4.2 Nails — Nails shall conform to IS : 723-1972*. Preferably rust-resistant or hot-dipped galvanized nails shall be used. For use in fixing of wooden shingles, nails shall be of 2·00 or 2·24 mm shank diameter and length 40 mm depending upon the species. Subsidiary battens shall be fixed to main battens by 2·80 or 3·15 mm diameter, 60 mm long nails which, in turn, be suitably fixed to purlin/rafter, etc, as the case may be.

NOTE — Higher diameter nails may be used for dense species of wood.

4.3 Timber for Battens and Rafters — This shall conform to the requirements for structural timbers specified in IS : 3629-1986†. The timber shall be preservative treated in accordance with IS : 401-1982‡.

5. DESIGN CONSIDERATIONS

5.1 General — Wooden shingles may be supported on battens over purlins and rafters, over-roofing sheets, or overtimber roofing boards. In case of low pitched roofs, particularly in areas of high winds, it will be necessary to have an underlay of roofing sheets or timber roofing boards. In areas of heavy rainfall and in very damp climates, however, spaced roofing boards may preferably be used to permit quicker drying of the underside of the shingles.

The provision of an undercover for the roof will not only add insulation and water proofing but will also prevent debries and insects from falling in. The mass of wooden shingles along with subsidiary battens only shall generally range from 22 to 50 kg/m^2 for all design purposes, depending upon the timber species used.

5.1.1 *Weather Resistance* — One of the essential requirements of a shingle roof covering will be to drain away rain water and effectively prevent its ingress into the structure below. The overlapping of shingles as well as the lying technique shall ensure that the joints are leakproof. Such a roof shall also have an effective roof drainage system which will quickly drain off the rain water. A proper layout of roof gutters and down pipes for the roof surface as a whole will thus be necessary.

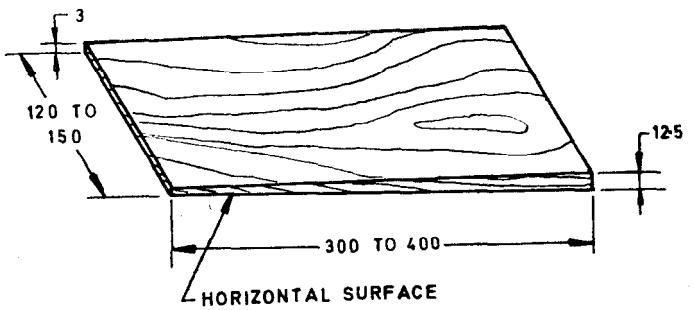
5.1.2 No gutter or rain water pipe shall discharge water from one roof to another, unless the discharge is from a small area such as 'dormer'. For detailed information relating to the disposal of rain water from roofs, reference shall be made to IS : 2527-1984§. If a valley gutter is

*Specification for steel countersunk head wire nails (*second revision*).
†Specification for structural timber in building (*first revision*).
‡Code of practice for preservation of timber (*third revision*).
§Code of practice for fixing rainwater gutters and downpipes for roof drainage (*first revision*).

formed by means of sheet metal, the sheet metal shall be taken at least a distance of 300 mm under the roof on either side of the gutter. Near a wall the sheet metal constituting valley gutter shall be taken at least 450 mm into the wall and set with cement mortar.

5.2 Pitch — Generally, the pitch of the common rafter or surface on which shingles are laid shall not be less than 35°. Where abnormal conditions may be expected, such as, in elevated sites or in areas of heavy rainfall, this minimum pitch may not ensure full protection to weather, and pitch shall therefore, be suitably increased.

5.3 Size and Shape of Shingles — Depending upon the spacing of the battens, wooden shingle sizes may be chosen from 300 to 400 mm for length and 120 to 150 mm for width. The minimum thickness of the shingle shall be as shown in Fig. 2.



All dimensions in millimetres.

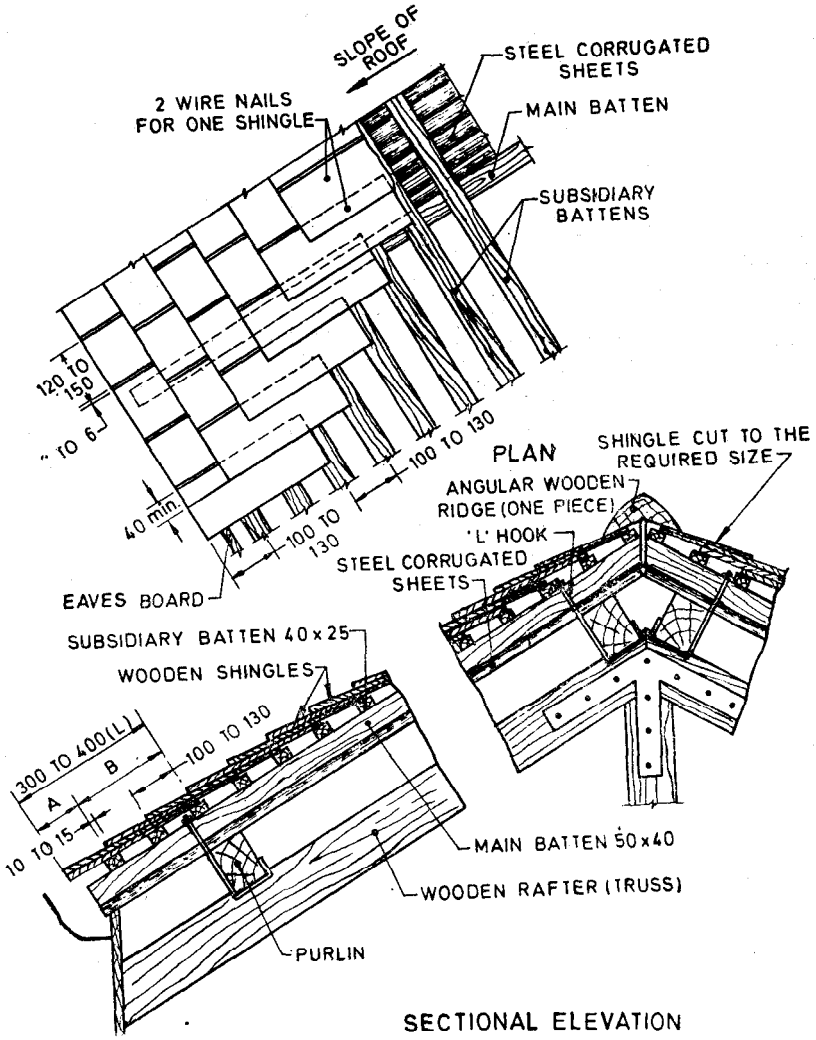
FIG. 2 TYPICAL WOODEN SHINGLE

5.3.1 To add to the attractiveness of the finished appearance, the butt end of the shingles may be cut or shaped to any geometric pattern.

5.4 Spacing of Battens — The spacing of battens, which support the shingles, shall be equal to about one-third of the length of the shingles, that is, from 100 to 130 mm (*see* Fig. 1 and 3).

5.4.1 If necessary, batten length shall be extended only by means of butt joints, which shall occur only over the rafter. The joints of two adjacent rows of battens shall not come over the same rafter.

5.5 Overlap for Shingles — The shingle covering shall be at least three courses deep at every section. The minimum overlap shall be one-third of the length of the shingle.



A — Overlapped Length 2L/3
B — Exposed Length L/3

All dimensions in millimetres.

NOTE — One piece ridge arrangement of shingles shall be followed for hip ridges also.

FIG. 3 TYPICAL DETAIL SHOWING ROOFING WITH WOODEN SHINGLES OVER GI CORRUGATED SHEETS

5.6 The spacing of rafters shall not normally exceed 600 mm, unless the battens are otherwise designed against sagging taking into consideration the species of timber used and the loads coming over them, in accordance with IS : 883-1970*.

The sizes of the battens, unless otherwise designed, shall normally be 50 × 25 mm.

When ceiling board is adopted, the planking shall not be less than 12 mm thick and shall preferably be tongued and grooved or ploughed and tongued, and it shall be nailed to the rafters first so as to form a continuous surface from ridge to eaves and the battens nailed over them. Alternatively, ceiling boards may be fixed direct to purlins. In this case the minimum size of the subsidiary battens shall not be less than 40 × 25 mm, fixed at suitable distances apart to suit the shingle size and spacing. The maximum spacing of rafters may not exceed 750 mm in any case.

5.7 Wooden shingles shall be given fire retardant treatment by pressure impregnation with chemicals. The following chemicals are generally used for treatment:

a) Ammonium mono-phosphate,

b) Ammonium di-phosphate,

c) Sodium arsenate, and

d) Sodium tetraborate.

6. LAYING OF SHINGLES

6.1 Each wooden shingle shall be fastened to the battens by two nails (*see* Fig. 1 and 3).

6.2 The distance of the nails from the butt end of the shingle being nailed shall be equal to the shingle exposure plus 10 to 15 mm.

6.3 The edge distance of the nails from the sides of the shingles shall be not more than 20 mm.

6.4 The nail shall be driven flush, but not so hard that may crush or split the wood.

6.5 Each course of wooden shingles shall be overlapped by another course such that only one-third of the length of the shingle in the lower course is left uncovered; the remaining two-third length shall be overlapped. Except for the bottom two courses, the wooden shingle shall be three course deep throughout the roof area.

*Code of practice for design of structural timber in building (*third revision*).

6.6 In each horizontal course, the shingles shall be laid 3 to 6 mm apart to allow for swelling, when wet.

6.7 Each horizontal course of wooden shingles shall break joints with two courses above and two courses below it.

6.8 The gaps between wooden shingles in each course shall be off set at least 40 mm centre-to-centre from the corresponding gaps between the shingles in the course above. The two courses of shingles at the eaves shall also be break-jointed.

6.9 The first shingle course laid in double should extend 50 to 60 mm beyond facia member, if adopted, to prevent the water from backing up underneath the shingles.

7. MAINTENANCE

7.1 Wooden shingle roofing shall be periodically painted (generally after every three years) by a suitable preservative (*see* IS : 401-1982*). Any decayed shingle and batten shall be replaced in time.

APPENDIX A

(*Clause* 4.1)

TIMBER FOR WOODEN SHINGLES

A-1. QUALITY REQUIRED

A-1.1 The wood should be durable, that is, heartwood of high decay resistance and low shrinkage. Dimensional stability, light weight, good insulating properties, adequates strength, even grain and ability to take stains, paint or preservative are desirable attributes. Shingles used in any one roof shall be of the same size. The following species of timbers may be used for wooden shingles depending upon the local availability:

Sl No.	Botanical Name	Trade Name
1.	*Abies pindrow*	Fir
2.	*Acrocarpus fraxinifolius*	Mundani
3.	*Adina cordifolia*	Haldu
4.	*Bombax ceiba*	Semul
5.	*B. insignea*	Didu
6.	*Castanopsis sp.*	Indian chestnut
7.	*Cedrus deodara*	Deodar

*Code of practice for preservation of timber (*third revision*).

Sl No.	Botanical Name	Trade Name
8.	*Chrysophyllum roxburghii*	Star apple
9.	*Cupressus torulosa*	Cypress
10.	*Hopea odorata*	Thingan
11.	*Lagerstroemia hypoleuca*	Pyinma
12.	*Palaquim ellipticm* (syn. *Dichopsis elliptica*)	Pali
13.	*Pinus roxburghii*	Chir
14.	*Pinus wallichiana*	Kail
15.	*Pterocarpus dalbergiodes*	Padauk
16.	*Quercus lamellosa*	Oak
17.	*Taxus baccata*	Yew
18.	*Tectona grandis*	Teak
19.	*Xylia dolabriformis* (*Xylia Xylocarpa*)	Irul

Shingles may be of sawn or split wood.

A-2. Timber for making wooden shingle shall be of Grade 2 in accordance with IS : 1331-1971*. This grade is also referred to as 'Standard' in some Indian Standards. Only heartwood and edge grained timber shall be used for the wooden shingles.

A-3. MOISTURE CONTENT

A-3.1 Normally, only timber seasoned to moisture content in accordance with IS : 287-1973† shall be used.

A-4. Wooden shingles shall be preservative-treated in accordance with IS : 401-1982‡.

*Specification for cut sizes of timber (*second revision*).

†Recommendations for maximum permissible moisture content for timber used for different purposes (*second revision*).

‡Code of practice for preservation of timber (*third revision*).

(*Continued from page* 2)

Members	*Representing*
SHRI V. N. DESHPANDE	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
SHRI S. K. GUPTA (*Alternate*)	
DEPUTY DIRECTOR STANDARDS (B & S)	Railway Board (Ministry of Railways), New Delhi
Assistant Director (B & S) (*Alternate*)	
DIRECTOR	Indian Plywood Industries Research Institute, Bangalore
SHRI H. N. JAGADEESH (*Alternate*)	
DR C. D. DWIVEDI	Research & Development Organization (Ministry of Defence), New Delhi
SHRI R. A. PANSE (*Alternate*)	
SHRI P. N. GADI	Institution of Surveyores, New Delhi
SHRI P. C. GANDHI	PVM Processed Timber (India) Pvt Ltd, Bombay
SHRI ANAND P. GANDHI (*Alternate*)	
SHRI J. SEN GUPTA	National Buildings Organization, New Delhi
SHRI A. K. LAL (*Alternate*)	
SHRI E. KURIEN MATHEW	Public Works Department, Government of Kerala, Trivandrum
REPRESENTATIVE	Hindustan Prefab Ltd, New Delhi
SHRI H. S. PASRICHA (*Alternate*)	
SENIOR DEPUTY CHIEF ENGINEER (BUILDINGS)	Public Works Department, Government of Tamil Nadu, Madras
EXECUTIVE ENGINEER (*Alternate*)	
SUPERINTENDING SURVEYOR OF WORKS (CZ)	Central Public Works Department (Architecture Wing) New Delhi
SURVEYOR OF WORKS (CZ) (*Alternate*)	
SUPERINTENDING ENGINEER (PLANNING)	Public Works Department, Government of Madhya Pradesh, Bhopal
SHRI J. K. VISARIA	Pest Control (India) Pvt Ltd, Bombay
SHRI T. R. RAO (*Alternate*)	

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 3 31 01 31, 3 31 13 75 Telegrams: Manaksanstha
(Common to all Offices)

Regional Offices:	*Telephone*
*Western : Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093	6 32 92 95
†Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	36 24 99
Northern : SCO 445-446, Sector 35C, CHANDIGARH 160036	2 18 43 3 16 41
Southern : C. I. T. Campus, MADRAS 600113	41 24 42 41 25 19 41 29 16

Branch Offices:

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001	2 63 48 2 63 49
Peenya Industrial Area 1st Stage. Bangalore-Tumkur Road, BANGALORE 560058	38 49 55 38 49 56
Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar, BHOPAL 462003	6 67 16
Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002	5 36 27
53/5, Ward No. 29, R.G. Barua Road, 5th Byelane GUWAHATI 781003	—
5-8-56C L. N. Gupta Marg (Nampally Station Road), HYDERABAD 500001	23 10 83
R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 34 71 6 98 32
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76 21 82 92
Patliputra Industrial Estate, PATNA 800013	6 23 05
Hantex Bldg (2nd Floor), Railway Station Road, TRIVANDRUM 695001	7 66 37

Inspection Offices (With Sale Point):

Pushpanjali, 205A West High Court Road, Bharampeth Extension, NAGPUR 440010	2 51 71
Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005	5 24 35

*Sales Office in Bombay is at Novelty Chambers, Grant Road, Bombay 400007 — 89 65 28

†Sales Office in Calcutta is at 5 Chowringhee Approach, P. O. Princap Street, Calcutta 700072 — 27 68 00

Printed at Printograph, New Delhi, India