IS 5119-1 (1968): Code of Practice for Laying and Fixing of Sloped Roof Covering, Part I: Slating [CED 13: Building Construction Practices including Painting, Varnishing and Allied Finishing]

BLANK PAGE

IS : 5119 (Part I) - 1968
(Reaffirmed 2000)

Indian Standard

CODE OF PRACTICE FOR LAYING AND FIXING OF SLOPED ROOF COVERING

PART I SLATING

(Second Reprint JUNE 1990)

UDC 69.024.153.2 : 69.001.3

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

Gr 4

July 1969

Indian Standard

CODE OF PRACTICE FOR LAYING AND FIXING OF SLOPED ROOF COVERING

PART I SLATING

Building Construction Practices Sectional Committee, BDC 13

Chairman	*Representing*
SHRI M. L. NANDA	Central Public Works Department
Members	
ADDITIONAL DIRECTOR STANDARDS (ARCHITECTURE), RDSO DEPUTY DIRECTOR STANDARDS (ARCHITECTURE), RDSO (*Alternate*)	Railway Board (Ministry of Railways)
SHRI B. D. AHUJA SHRI P. C. JAIN (*Alternate*)	National Buildings Organization (Ministry of Works, Housing and Supply)
SHRI B. V. APTE SHRI K. J. SAPRA (*Alternate*)	Builder's Association of India, Bombay
CHIEF ARCHITECT	Central Public Works Department (Architectural Wing)
CHIEF ENGINEER	National Buildings Construction Corporation Ltd, New Delhi
CHIEF ENGINEER (B & R) EXECUTIVE ENGINEER (*Alternate*)	Public Works Department, Government of Rajasthan
SHRI B. K. CHOKSI	In personal capacity (*Shrikunj, Near Prakash Housing Society, Athwa Lines, Surat 1*)
SHRI J. DATT SHRI Y. K. MEHTA (*Alternate*)	The Concrete Association of India, Bombay
SHRI V. S. DEVDHAR	Institute of Surveyors, New Delhi
PROF DINESH MOHAN	Central Building Research Institute (CSIR), Roorkee
DIRECTOR	Engineering Research Department, Government of Andhra Pradesh
SHRI C. M. GOVEAS	Atomic Energy Commission, Bombay
SHRI HARISH CHANDRA	Central Public Works Department
SHRI S. B. JOSHI SHRI R. N. JOSHI (*Alternate*)	S. B. Joshi & Co Ltd, Bombay
SHRI V. S. KAMAT	The Hindustan Construction Co Ltd, Bombay
SHRI KEWAL KRISHAN	Public Works Department, Government of Punjab
SHRI N. J. MASANI	Forest Research Institute and Colleges, Dehra Dun
SHRI T. R. MEHANDRU	Institution of Engineers (India), Calcutta
COL O. P. NARULA SHRI K. P. GHOSH (*Alternate*)	Engineer-in-Chief's Branch, Army Headquarters

(*Continued on page* 2)

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

(*Continued from page* 1)

Members	*Representing*
SHRI A. P. PARACER	Central Public Works Department
SHRI D. J. PATEL	Hindustan Housing Factory Ltd, New Delhi
SENIOR ARCHITECT (BI), CENTRAL PUBLIC WORKS DEPARTMENT	Indian Institute of Architect, Bombay
SHRI J. D. SHASTRI	Directorate General of Health Services, New Delhi
SHRI T. N. SUBBARAO	Gammon India Ltd, Bombay
SHRI P. M. APTE (*Alternate*)	
SUPERINTENDING ENGINEER, DESIGN AND MARINE WORKS CIRCLE	Public Works Department, Government of Madras
EXECUTIVE ENGINEER, BUILDING CENTRE DIVISION (*Alternate*)	
SHRI R. NAGARAJAN, Director (Civ Engg)	Director General, ISI (*Ex-officio Member*)

Secretary

SHRI C. K. BEBARTA
Assistant Director (Civ Engg), ISI

Covering, Veneering and Glazing Subcommittee, BDC 13:10

Convener	
SHRI A. P. PARACER	Central Public Works Department
Members	
SURVEYOR OF WORKS, CALCUTTA CENTRAL CIRCLE II (*Alternate* to Shri A. P. Paracer)	
SHRI K. C. BANERJEE	Institution of Engineers (India), Calcutta
DR BHAN BHUSHAN	Central Glass and Ceramic Research Institute (CSIR), Calcutta
SHRI M. BHATTACHARYA	Martin Burn Ltd, Calcutta
CHIEF ENGINEER	Public Works Department, Government of Assam
SHRI T. A. E. D'SA	The Concrete Association of India, Bombay
SHRI V. N. PAI (*Alternate*)	
EXECUTIVE ENGINEER (DESIGN DIVISION No. II)	Public Works Department, Government of West Bengal
SHRI P. GUHA	Calcutta Municipal Corporation
SHRI N. J. MASANI	Forest Research Institute and Colleges, Dehra Dun
SHRI M. V. PRADHAN	Ballardie Thampson and Mathews, Calcutta
REPRESENTATIVE	Balmer Lawrie and Co Ltd, Calcutta

Indian Standard

CODE OF PRACTICE FOR LAYING AND FIXING OF SLOPED ROOF COVERING

PART I SLATING

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 31 December 1968, after the draft finalized by the Building Construction Practices Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Rectangular slates of uniform thickness are widely used for roofing work in this country. The specific advantage of these roofs is the ease of maintenance, since any broken slate may be easily replaced without much disturbance to the roofing as a whole. Depending upon the protection needed from the roof, generally two ways of slating are adopted, they are single slating and double slating. This standard describes the method of laying and fixing of the slates and other constructional details of such roofing.

0.3 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.4 This code represents a standard of good practice and therefore takes the form of recommendations.

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 (Part I) lays down requirements regarding the methods of laying and fixing of slates for roofing purposes.

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

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Course — Slates laid in the same plane so that all the heads and all the tails are in alignment respectively, are said to form a course (*see* Fig. 1B).

2.2 Eaves — The lower portion of inclined roof projecting beyond the outer face of the wall (*see* Fig. 1A).

2.3 Gable — The triangular upper part of a wall at the end of a ridge roof (*see* Fig. 1A).

2.4 Gauge — The distance apart the nails which have to be inserted on battens or reepers. This is required to determine the positions of the battens to receive the nails by which slates are secured (*see* Fig. 1B).

2.5 Gutter — The trough fixed under eaves of roof or between the sloping roofs for carrying off water.

2.6 Hip — The salient (external) angle formed by the intersection of two inclined roof surfaces (*see* Fig. 1A).

2.7 Lap — The distance by which one slate overlaps an adjacent slate. When measured from course over course, this is termed as 'head lap', and when measured edge over edge, this is termed as 'side lap' (*see* Fig. 1B).

2.8 Margin — The part of each course of slates exposed to view (*see* Fig. 1B).

2.9 Pitch — The slope of roof is called pitch and is expressed as the ratio between the rise and horizontal span of the roof. It is also expressed in terms of angle of inclination.

2.10 Pitched Roof — A roof the pitch of which is greater than 10° to horizontal.

2.11 Rafters — (*see* Fig. 1C).

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

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

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

2.11.4 *Valley Rafter* — The structural members of the roof at the intersection of the two roof surfaces forming a valley.

2.12 Reepers or Battens — Horizontal timber member of small sections on which slates are supported.

2.13 Ridge — The horizontal intersection of two rising roof surfaces inclined in opposite direction.

2.14 Ridge Piece — The timber members underneath the ridge, to which the ends of common rafters are jointed (*see* Fig. 1C).

2.15 Valley — The re-entrant (internal) angle formed by the intersection of two inclined roof surfaces (*see* Fig. 1A).

2.16 Verge — The edge of a roof surface finished at a gable (*see* Fig. 1A).

3. NECESSARY INFORMATION

3.1 For efficient design and construction of the work, detailed information with regard to the following is necessary:

a) Surface area to be covered;

b) Type o. supporting elements and restrictions, if any, to their arrangements;

c) Treatment of junctions with walls;

d) Provision for slope and other requirements for drainage; and

e) Provision for fixing slates.

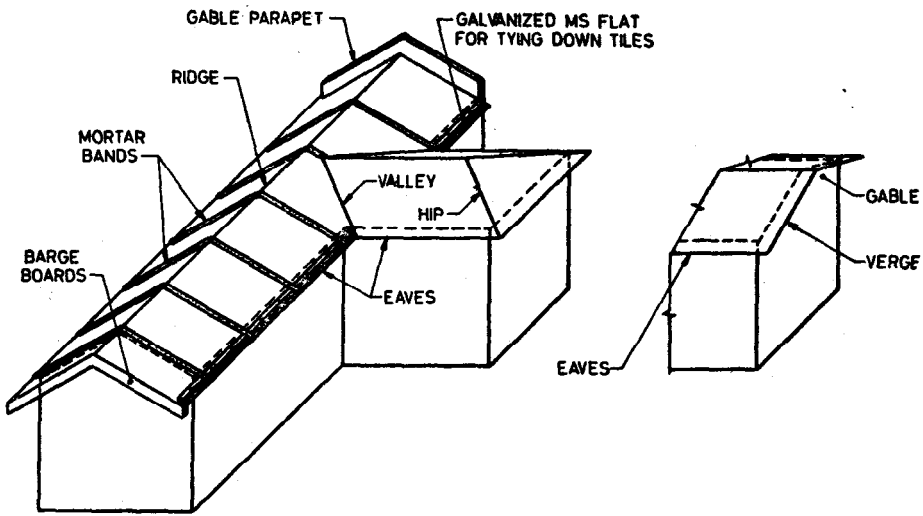
3.1.1 All information shall be made available to those who are responsible for laying the roof. Necessary drawings and instructions for preparatory work shall be given.

3.2 Arrangement shall be made for proper exchange of information between those engaged in laying and all others whose work may be affected.

4. MATERIAL

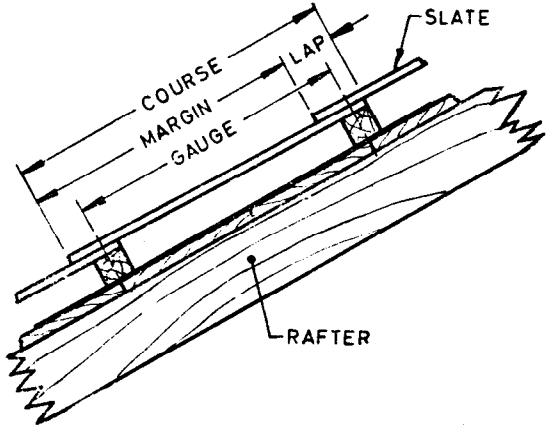
4.1 Slate — Slates shall be of uniform thickness and rectangular shape. Generally slates of sizes, 60 × 30 cm, 50 × 25 cm and 40 × 20 cm and of thickness varying from 5 to 10 mm, shall be used for roofing. Slates shall be so selected that the thickness of any one lot of 20 slates, selected from an individual consignment and closely packed one above the other shall not exceed that of any other lot of 20 of the same size taken from the same consignment, by more than 25 percent.

4.1.1 The slates shall be of uniform size, colour and texture, free from white patches and be hard and brittle but not tough. When struck it shall give ringing sound and shall not break when it is let fall flat on hard ground from a height of 1·25 metres.

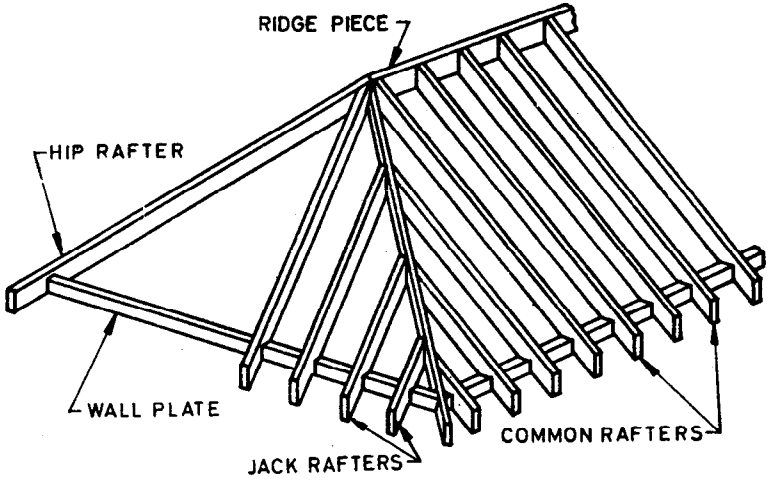


IA

FIG. 1 NOMENCLATURE OF A PITCHED ROOF



1B



1C

FIG. 1 NOMENCLATURE OF A PITCHED ROOF

4.1.2 The slates shall be of reasonably straight cleavage. The grains shall be longitudinal and not transverse.

4.1.3 The surface of the slates shall be such as to permit proper laying of the slates.

4.1.4 The slates shall be impervious to moisture. The percentage absorption by weight of the slate after it is kept immersed in water for a period of six hours shall not be more than 2 percent of its weight before immersion. When the slate is kept dipped on edge in water for six hours, the water level shall not rise to more than 12 mm and the immersed edge shall not show signs of swelling, splitting, or flaking.

4.2 Timber Plankings, Reepers and Rafters — The timber for plankings, reepers and rafters shall conform to the requirements for structural timber specified in IS:3629-1966*. The timber shall be treated wherever possible with wood preservative in accordance with IS:401-1961†.

4.3 Nails and Screws for Fixing Reepers — Nails used for fixing reepers or rafters shall be plain head nails of size 2·50 mm or 2·25 mm conforming to IS:723-1961‡. The nails shall be galvanized. The length of the nails shall be such that a minimum penetration of 2 cm shall be obtained into the rafters when they are driven through. If the nails are of copper, they shall conform to IS:725-1961§. Screws may also be used in place of nails. Screws used shall conform to IS:451-1961‖.

5. DESIGN CONSIDERATION

5.1 As far as possible, hipped roof shall be adopted. The slope of the roof may vary from 22° to 30°. It is also advisable to adopt slates of size 60 × 30 cm when the slope of the roof is 22°, size of 50 × 25 cm when the slope of 27°, and size of 40 × 20 cm when the slope is 30°.

5.2 Ridges and Hips — Galvanized steel sheet ridge and hip pieces shall be used and these shall be fixed with roofing screws, limpet and washers, which are preferably dipped in anticorrosive bituminous paint conforming to IS:158-1965¶. Corresponding holes in the slates below the hip or ridge pieces shall be made to receive the screws. These ridge or hip pieces shall have an overlap of 7·5 cm over the slates. The thickness of GS sheets shall preferably be 0·63 or 0·80 mm.

---

*Specification for structural timber in building.
†Code of practice for preservation of timber (*revised*).
‡Specification for mild steel wire nails (*revised*).
§Specification for copper wire nails (*revised*).
‖Specification for wood screws (*revised*).
¶Ready-mix paint, brushing, bituminous, black, lead-free, acid alkali, water and heat resisting for general purposes (*revised*).

5.3 Valleys — The valleys shall be formed by laying lead or galvanized steel sheet gutter on boarding fixed in the valley bottom. The gutter shall extend for 20 cm on each side of the valley line, the edges being turned over to form beaded edges and shall be fixed down by nails with corresponding suitable holes in the slates. The slates shall be cut to shape and shall be fixed with a lap of 7·5 cm over the gutter. The edges of the slates shall be made true and the face of the edges shall be chisel dressed. For the tools used for cutting of the slates, reference may be made to IS:1129-1959*.

6. LAYING OF SLATES

6.0 The slates shall be laid in any one of the following two ways.

6.1 Single Slating

6.1.1 Slates shall be laid on wooden reepers as indicated in Fig. 2 or as directed by the engineer-in-charge.

6.1.2 Timber planking of thickness 15 to 20 mm shall be laid on wooden rafters. The rafters shall be of designed sections spaced at 50 to 150 cm apart.

6.1.3 On the planking, bitumen felt conforming to IS:1322-1965† shall be laid according to the procedure laid down in IS:1346-1966‡ Bitumen felt shall overlap at horizontal joints by not less than 7·5 cm and the other joints by not less than 15 cm. At hips a strip not less than 60 cm wide shall be laid from top to bottom overlapping the felting of the roof. At valleys, a similar strip shall be lapped under the felting.

6.1.3.1 Polythene sheets may also be used in place of bitumen felts and laid as agreed between the supplier and the user.

6.1.4 On bitumen felts, wooden reepers shall be fixed, one under the head of each. A reeper shall be fixed in the middle of each slate (*see* Fig. 2). The spacing of the reepers thus depends upon the length of the slates. The size of the reeper depends upon its spacing, the superimposed load and the spacing of the rafters. In places subjected to snow-fall the superimposed load shall take into account the snow loads also. The top surface of the reepers shall conform to the underside of the slates resting over them. The reepers shall be nailed to the planking and bitumen felt layer. A reeper, whose thickness is more by half the thickness of the slates used than the thickness of other reeper, shall have to be used to support to middle of each slate to ensure that its top surface is in contact with the underside of the slate.

*Specification for dressing of natural building stones.
†Specification for bitumen felts for waterproofing and damp-proofing (*revised*).
‡Code of practice for waterproofing of roofs with bitumen felts (*first revision*).

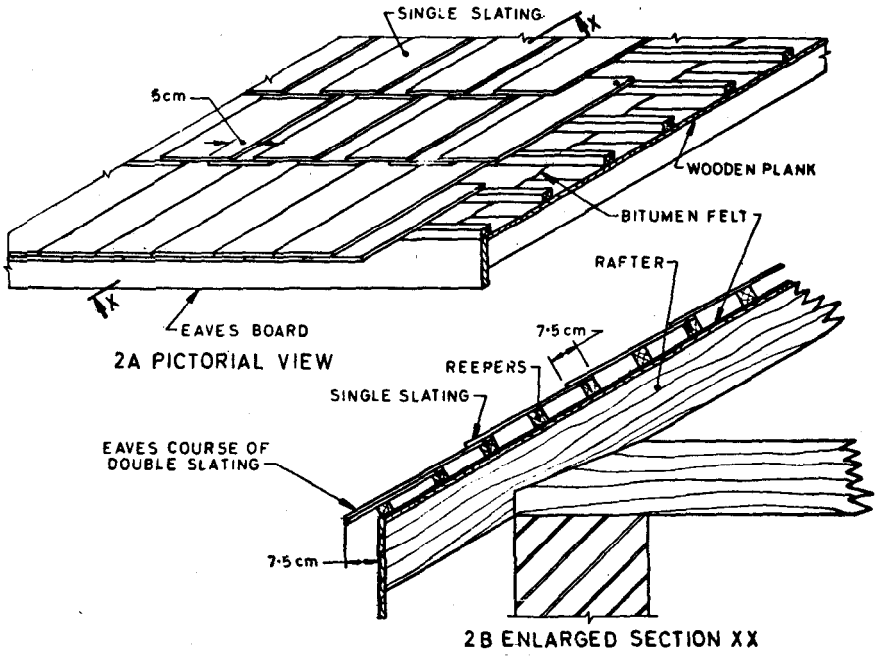


FIG. 2 DETAILS OF SINGLE SLATING

6.1.5 The bottom course of the slates near the eaves shall project 7·5 cm outside the planking and shall be of half the length plus 7·5 cm. This course shall be laid of double slates, the joint of the top layer shall be in the centre of bottom layer.

6.1.6 Over the bottom course other courses shall be laid. Each slate shall be laid with a minimum lap of 7·5 cm over the bottom layer and of 5 cm at the each side.

6.1.7 Slates shall be fixed to reepers with flat headed galvanized wire nails of 2·50 mm diameter, and length 3 to 4 cm. It is preferable to dip the nails in the anti-corrosive paint and to dry them before use. Nails made of copper or aluminium alloy and screws may also be used. It shall be ensured that the nail is driven into the reeper by at least 2 cm or two thirds of the depth of the reepers, whichever is less.

6.1.8 Nails shall be fixed on two holes, 3·75 cm from top edge and 5 cm from side edges, made from front to back side in each slate thus leaving a countersunk on the top surface of slates which serves to take the head of a nail. All slates shall be head-nailed with two nails each. Holes for the

nails shall be made preferably by drilling. The twist drills used for drilling slates shall conform to all applicable requirements as given in IS : 599-1960*. Care shall be taken while making the holes that there is no undue spalling. The heads of the nails shall not be driven firmly against the slates, but close enough to prevent any appreciable movement.

6.1.9 Rigde pieces of galvanized steel sheet shall be laid as shown in Fig. 3.

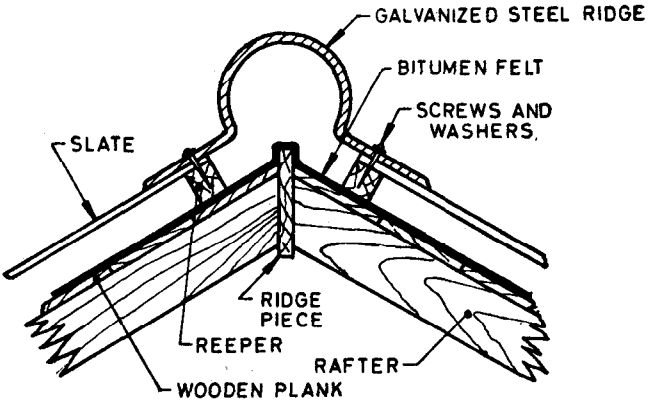


FIG. 3 DETAILS AT THE RIDGE OF SLATED ROOF

6.2 Double Slating

6.2.1 Slates shall be laid on reepers as indicated in Fig. 4 or as directed by the engineer-in-charge.

6.2.2 Timber planking shall be laid on rafters as described in **6.1.2.**

6.2.3 Bitumen felt may not be provided except in the case of important building, where the specifications as detailed out in **6.1.3** may be adopted. At the rainwater gutters the provision for bitumen felts shall be made. The bitumen felt shall extend to one slate length under bottom course.

6.2.3.1 Polythene sheets may also be used in place of bitumen felts and laid as agreed between the supplier and the user.

6.2.4 On the planking and bitumen felt, reepers shall be fixed one at the head of the slate and another at the middle of the slate as described in **6.1.4** and Fig. 4.

*Specification for twist drills (*revised*).

6.2.5 Over the bottom course, other courses shall be laid. Slates shall be laid with a minimum lap of 5 cm at each side and shall have an overlap of slightly more than half the slate length over the bottom layer, as shown in Fig. 4.

6.2.6 Slates shall be fixed on these battens using two nails as described in **6.1.8** and Fig. 4.

6.2.7 Ridge pieces shall be laid in the similar way as given in Fig. 3.

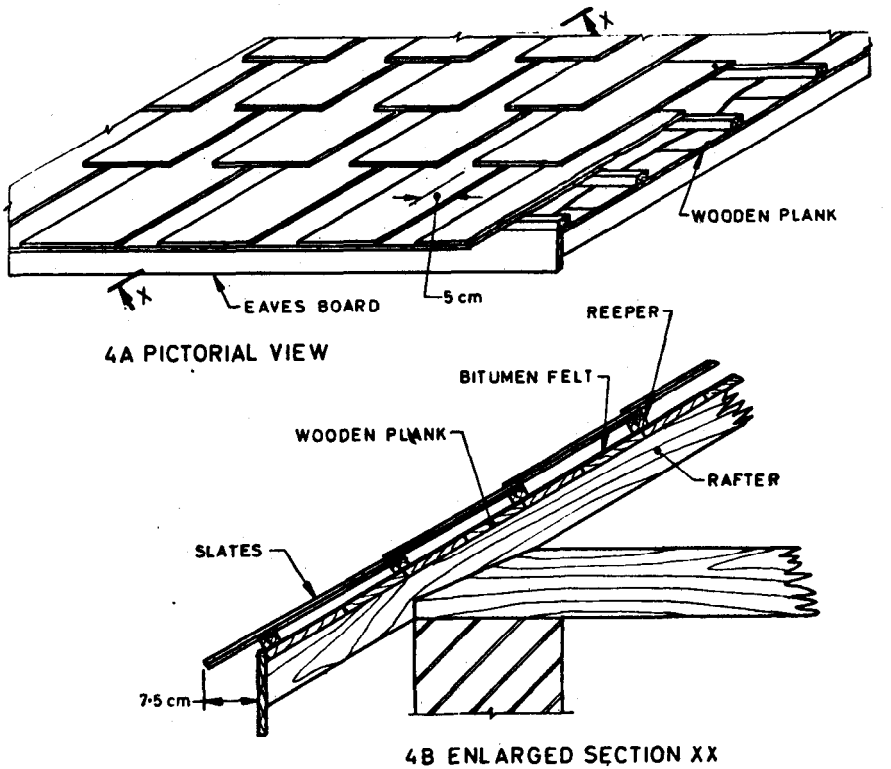


FIG. 4 DETAILS OF DOUBLE SLATING

7. FINISHING EDGES AROUND CHIMNEY STACKS

7.1 At the junction of the chimney stack with the slate roofing, proper precaution against leakage of water shall be taken by providing galvanized steel sheet and a double layer of bitumen felt.

8. TREATMENT OF JUNCTIONS WITH WALL

8.1 Junctions of the roof with walls shall preferably be treated for waterproofing. Wherever special features like roof gutters and flashings are not provided between the junctions of the roof and wall, the slates shall be let into the wall to a depth of not less than 5 cm and a drip moulding shall be provided at about 10 cm height above the roof surface, and the joints between the roof and the wall shall be grouted with a waterproofing mortar or such other materials. Fig. 5 shows the typical details of the junction of wall with roof, with single slating when the slates themselves are used for roof drainage.

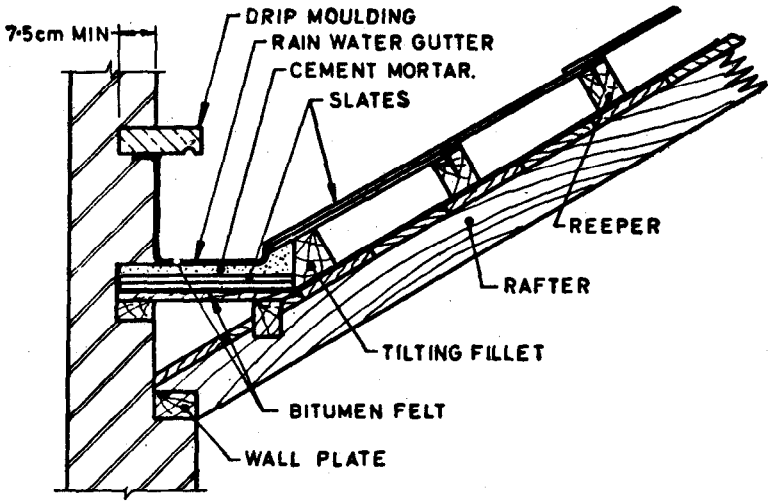


FIG. 5 DETAILS AT THE JUNCTION OF THE ROOF WITH WALL (WHERE SLATES THEMSELVES ARE USED FOR ROOF DRAINAGE)

9. MEASUREMENTS

9.1 The measurements shall be taken for the finished work. The laps between slates shall not be measured.

10. INSPECTION

10.1 Inspection shall be done to avoid unsatisfactory construction which may result one or more defects given in Table 1.

TABLE 1 DEFECTS DUE TO UNSATISFACTORY CONSTRUCTION

(*Clause* 10.1)

STAGE	PARTICULARS OF INSPECTION	TYPE OF FAILURE THAT MAY OCCUR IF (2) IS NOT SATISFACTORY
(1)	(2)	(3)
Laying of reeper	No joint between the reepers shall occur except over the joist. At eaves the tilting fillet shall be fixed to the correct height	Sagging or cracking
Laying of slates	Overlapping of slates shall be ensured	Unsightly fall of roof surface near the eaves

BUREAU OF INDIAN STANDARDS

Headquarters:

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

Telephones: 331 01 31, 331 13 75 Telegrams: Manaksanstha (Common to all Offices)

Regional Offices:	*Telephone*
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	331 01 31 331 13 75
*Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	36 24 99
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	2 18 43 3 16 41
Southern : C. I. T. Campus, MADRAS 600113	41 24 42 41 25 19 41 29 16
†Western : Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093	6 32 92 95

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	3 31 77
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
T.C. No. 14/1421, University P.O., Palayam TRIVANDRUM 695035	6 21 04 6 21 17

Inspection Offices (With Sale Point):

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

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

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

‡Sales Office in Bangalore is at Unity Building, Narasimharaja Square, Bangalore 560002 — 22 36 71

Reprography Unit, BIS, New Delhi, India