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मानक

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Mazdoor Kisan Shakti Sangathan

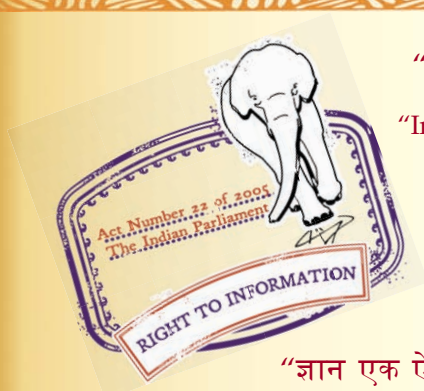
“The Right to Information, The Right to Live”

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“Step Out From the Old to the New”

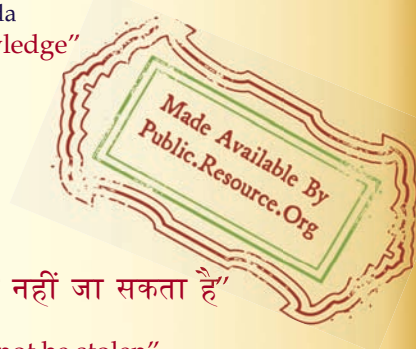
IS 2455 (1990): Method of sampling of model trees and logs and their conversion for timber testing [CED 9: Timber and Timber Stores]



“ज्ञान से एक नये भारत का निर्माण”

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“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक
इमारती लकड़ी के परीक्षण के लिये मॉडल पेड़ों और
लट्ठों तथा उनके रूपान्तरण के नमूने लेने की पद्धति
(दूसरा पुनरीक्षण)

Indian Standard

**METHOD OF SAMPLING OF MODEL TREES
AND LOGS AND THEIR CONVERSION
FOR TIMBER TESTING**

(Second Revision)

UDC 674'03 : 620'113

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

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FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards on 20 March 1990, after the draft finalized by the Timber Sectional Committee had been approved by the Civil Engineering Division Council.

Evaluation of basic properties of timber is an important base for establishing design functions for structural timber. For this purpose, small clear specimens and specimens in structural sizes are tested according to standard procedures laid down in IS 1708 : 1986 and IS 2408 : 1963. In order to obtain a good average figure, which is truly representative of the species, it is necessary to take samples from different trees and further from different logs.

This standard was first published in 1963 and contained information pertaining to sampling for logs only. It was first revised in 1974 thereby including sampling of model trees and logs and their conversion for timber testing. In this second revision requirements for sampling of trees and logs and their conversion for obtaining test specimens of 20 mm × 20 mm cross-section have been included in addition to 50 mm × 50 mm cross-section, as methods of testing of 20 mm × 20 mm specimens have now been prescribed in IS 1708 (Parts 1 to 18) : 1986 along with 50 mm × 50 mm specimen.

In the formulation of this standard, due weightage has been given to standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

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.

Indian Standard

METHOD OF SAMPLING OF MODEL TREES AND LOGS AND THEIR CONVERSION FOR TIMBER TESTING

(*Second Revision*)

1 SCOPE

1.1 This standard deals with the selection of model trees and logs in forest areas and their conversion for determination of physical and mechanical properties of wood.

2 REFERENCES

2.1 The Indian Standards listed below are necessary adjuncts to this standard.

<i>IS No.</i>	<i>Title</i>
401 : 1982	Code of practice for preservation of timber (<i>third revision</i>)
707 : 1976	Glossary of terms applicable to timber technology and utilization (<i>second revision</i>)
1708 (Parts 1 to 18) : 1986	Method of testing of small clear specimens of timber (<i>second revision</i>)
2408 : 1963	Method of static tests of timbers in structural sizes
4905 : 1968	Methods for random sampling

3 TERMINOLOGY

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

3.1.1 Blocks — A series of compartments within a reasonable geographical area convenient for location and mapping.

3.1.2 Compartment — The smallest unit of management in a forest, and mostly consists of one or two limited species only.

3.1.3 Standard Clear Specimens — Specimens with their size as per the corresponding test mentioned in IS 1708 (Parts 1 to 18) : 1986 having straight grains and free from any defects which may influence the strength characteristics.

3.1.4 Test Area — A particular compartment/block of forest area selected for getting the timber trees for testing.

3.1.5 Testing Authority — The organization which is responsible for testing timber and presenting its data in accordance with the standard procedures.

3.1.6 Underwood — Bushes and small trees growing under timber trees.

4 SELECTION OF TEST AREA

4.1 The test area shall be a forest block/compartment with most typical taxation characteristics for the species under study.

4.2 The test area shall contain at least 100 trees of each generation of the species to be examined. The girth at breast height shall be at least 450 mm (the minimum dia shall be at least 140 mm). The girth of tree shall be measured in mm.

4.3 The particulars of the taxation of the test area shall be filled in the standard form as illustrated in Annex A.

5 SELECTION OF MODEL TREES IN TEST AREA

5.1 In order to obtain the average data of species, material for the required species shall be taken from different test areas which are representatives of different growth conditions and site qualities available throughout the geographical range of the species. Selection, marking, etc., of different consignments from each test area shall be made in accordance with 5.2 to 5.6 and 6.

5.2 Trees shall be selected in the standing condition by one who is qualified to identify the species and understands the various implications involved in conversion and testing. Where necessary and convenient, the testing authority shall inspect the test area and the model trees before felling them.

5.3 Trees which appear to be healthy of average growth and dominant in each category and of the same age group shall be selected. In species of highly commercial importance, trees of merchantable size shall be considered. While making the selection, the excessively fast or slow grown trees, or trees with particularly clear or branchy or uncommonly straight or crooked boles shall be ignored so that the trees are representative of average dominant trees of the test area.

5.4 If the trees selected according to 5.3 are of widely varying girths, they shall be first divided into the following girth-groups and then different consignments from different girth-groups shall be taken separately for the purpose of testing:

<i>Group Number</i>	<i>Girth in mm</i>
G1	450-600
G2	600-800
G3	800-1 100
G4	1 100-1 500
G5	1 500-2 000
G6	2 000 and above.

5.5 Minimum 5 trees of the same girth group shall be selected randomly from a test area and shall constitute one consignment. Logs selected from different test areas shall constitute different consignment. For random selection, standard random tables or any practice recommended in IS 4905 : 1968 may be followed.

5.6 Immediately after selection of the trees, the testing authority shall be informed of the location so that further special instructions, if any, may be given.

6 MARKING AND FELLING OF MODEL TREES

6.1 The required details as illustrated in Annex B shall be carefully filled in before felling the trees.

6.2 Before felling, the breast height shall be marked with a white or black paint ring at 1.37 m from the ground level.

6.3 Before felling, the northern point and the tree number shall be clearly marked on each tree (if necessary by removal of a small portion of the bark) just below the ring to facilitate correct relative location of test specimens subsequently selected. Any other required distinguishing mark to indicate the category to which the tree belongs shall also be made. If numbers 6 and 9 are used for marking, a line should be drawn underneath the figures so that the characters may be distinguished.

6.4 The tree shall be felled nearest to the ground level and in no case above 400 mm from the ground. Immediately after felling, the stump height shall be measured for entering in the form given in Annex B.

6.5 A disc of thickness shall then be cut off from the top of the stump for despatching along with other material. This disc shall be used for counting the annual rings to ascertain the age of the tree. On the top side of the disc, the northern point and other distinguishing marks as given to the corresponding tree shall also be indicated.

6.6 When required for analysis, soil samples shall be collected immediately after felling, from each distinct horizon or if horizons are not distinct,

from 3 to 4 arbitrary depths, from a pit up to 2 m deep, excavated near the tree. The samples shall be packed in a suitable cloth bag, each sample weighing at least one kilogram. All bags shall be properly and adequately labelled to indicate the corresponding references of the tree and the disc as explained in 6.3 to 6.5 and sealed.

6.7 Leaves, flowers and fruits collected from the tree at the time of felling will help confirmation of the identification of the species. These should be sent when they are available and necessary.

7 CONVERSION OF TREES INTO LOGS AND DESPATCHING TO THE TESTING AUTHORITY

7.1 Immediately after felling, a 3 m or 2 m log from the butt end depending on the girth being 900 mm and above or less than 900 mm, shall be cut and stored on skids in a shady place. A prophylactic treatment as per IS 401 : 1967 shall be given to the log.

7.1.1 Only one log from the bottom portion of the tree shall be taken, for testing of small clear specimen for standard evaluation of physical and mechanical properties of wood. In case where more than one log of the required length is available and/or is necessary to be tested for any specific purposes, logs of the above-mentioned size shall be taken from different heights. Each such log shall be given separate number and its relative position in the tree in terms of height in metres shall be indicated.

7.2 The logs should be, as far as possible, free from visible defects and without branches (that is, from the trunk portion only). If however there are some visible defects, the same shall be filled in Annex B.

7.3 The logs shall not be debarked. The barks may be treated against borer infestation as and when convenient.

7.4 The marking of northern point and other distinguishing marks as given to the tree under the ring at breast height shall also be stamped or engraved on the smaller end of the logs, that is, the top end of the log.

7.5 The two ends of each log shall be coated with coal tar or varnish to prevent rapid drying and splitting; care should be taken to see that no marking is obliterated by these paints.

7.6 Rest of the details required in the form of Annex B shall then be completed.

7.7 Despatching the Consignment

7.7.1 The following shall constitute one consignment:

- a) Logs from 5 different trees (that is one log from each tree);

- b) 5 corresponding discs from the stumps;
- c) Corresponding soil samples with respect to each tree, when required for analysis; and
- d) Fruit, flower and leaf samples of these trees when required for identification of the species of timbers, if available and necessary.

7.7.2 If there is more than one consignment from a particular test area, separate consignment numbers shall be given to each, and separate set of proformae (Annexes A and B) shall be filled in for each consignment.

7.7.3 All the details in the proformae of the various consignments shall be rechecked, signed and dated by the despatcher.

7.7.4 While loading and unloading the logs during transport at different stages, care shall be taken that no bark is removed and no undue mechanical injury is caused to the logs.

7.7.5 Least possible time shall be taken between felling and despatch to the testing authority.

8 RECEIPT AND STORAGE OF LOGS BY TESTING AUTHORITY

8.1 On receipt of logs by testing authority, the identification number of the logs and all other details shall be checked and the proper record of the same kept.

8.2 The logs shall be stored for as short a duration as possible, in such a way that no deterioration takes place. A recommended practice is to keep the logs fully submerged in a clean water tank free from any silt, etc. The water of the tank shall preferably be changed every week.

9 MARKING AND CONVERSION OF LOGS INTO STICKS

9.1 Before cutting the log into sticks, the freshly cut smaller ends of the logs shall be photographed, when necessary, with the cardinal points indicated in the cross-section. A card shall also be attached on the logs to be photographed indicating the name of the species, project and consignment number of the testing authority, and tree or log number. A metre scale may be placed on the logs so as to indicate the scale of the photograph.

9.2 All logs shall be marked on small end (top end) into 62 mm × 62 mm or 32 mm × 32 mm squares as shown in Fig. 1 and sawn into nominal 60 mm × 60 mm or 30 mm × 30 mm scantlings parallel to pith-to-pith axis, depending on the girth. The letters *N, E, S, W* in Fig. 1 indicate the cardinal points and where these are not definitely known, letters *H, K, L, M* shall be used in place of *N, E, S, W* respectively. Sector portions shall also be marked as shown in Fig. 1 and converted for true radial and tangential shrinkage specimens and for other required tests

(such as nail and screw holding power, creep, fatigue, etc.). Each log shall be divided into bolts of 1.5 m or 1 m length depending on girth and each bolt shall be indicated by a letter of the alphabet in order, beginning with the one nearer the stump (Thus the 1.5 m or 1 m bolt above the stump shall be designated as 'a' bolt and next above it as 'b' bolt).

9.3 When sticks as marked in Fig. 1 are taken out, each test stick shall be marked with a complete identity to indicate project number under which testing scheme is undertaken, consignment number, tree number, the bolt designation and the stick number. For example, a stick marked 1—2—3 a—N 5 indicates the stick No. 5 of the north side of the bolt 'a' of tree No. 3 being tested under consignment No. 2 and project No. 1.

10 MATCHING OF MARKED STICKS FOR TESTS UNDER GREEN AND DRY CONDITIONS

10.1 To afford matching, the 1.5 m sticks of 60 mm × 60 mm cross-section of one bolt shall be interchanged as illustrated in 10.1.1 and 10.1.2 with 1.5 m sticks of 60 mm × 60 mm cross-section of the adjacent bolt of the same log to make two composite bolts, each being complete and being made of equal portions of the adjacent bolt. Similarly, 1 m sticks of 30 mm × 30 mm cross-section of one bolt shall be interchanged with 1 m sticks of 30 mm × 30 mm cross-section of the adjacent bolt of the same log to make composite bolt. All the sticks of one of these two composite bolts shall be tested in green condition and all the sticks of the other composite bolt shall be tested in dry condition as per 10.1.1 and 10.1.2 respectively.

10.1.1 Composite Bolt for Green Condition — All even numbered sticks from the upper bolt and the odd numbered sticks from the lower bolt shall constitute the composite bolt for testing in the green condition.

10.1.2 Composite Bolt for Dry Condition — All even numbered sticks from lower bolt and odd numbered sticks from upper bolt shall constitute the composite bolt for testing in the dry condition.

10.2 All the material from one composite bolt shall be tested under exactly similar conditions.

11 STORAGE OF STICKS TO BE TESTED

11.1 Dry Sticks

11.1.1 Material intended for air-dry tests shall be end coated with melted paraffin or any other substance suitable to retard checking and cracking. They shall be stored by stacking suitably so as to permit free circulation of air but protected from severe changes in atmospheric conditions and moisture from the ground.

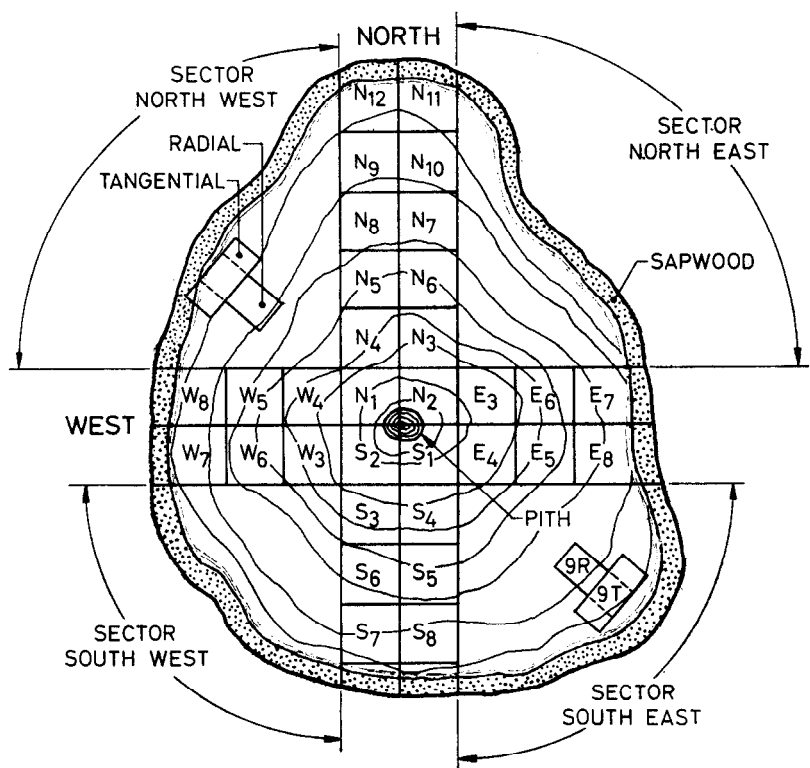


FIG. 1 SMALLER END OF LOG MARKED FOR CONVERSION

11.1.2 Twenty percent of the sticks to be tested in air-dry conditions shall be weighed to the nearest gram at the time of storage. Their weight shall be observed and recorded periodically to watch the progress of drying until they reach equilibrium condition. After the material has attained equilibrium, moisture disc of about 25 mm length and of full cross-section shall be taken from about 10 percent sticks to determine the actual moisture content by the oven dry method [see IS 1708 (Parts 1 to 18) : 1986]. This disc shall be cut not less than 200 mm from either end and in such a way as to prevent any appreciable loss in the material for testing. When the approximate moisture content of 12 percent is reached the sticks shall be placed in a conditioning chamber maintained at a temperature of $27 \pm 2^\circ\text{C}$ and 65 ± 5 percent relative humidity so as to reduce the moisture gradient within the material. Then the sticks shall be planned on four sides to 50 mm $\times$ 50 mm or 20 mm $\times$ 20 mm cross-section, as the case may be, and the specimens made out of these shall be tested within the least possible time to avoid major fluctuations in the moisture content.

11.1.3 When drying time is required to be reduced kiln drying may be adopted, provided the process adopted is mild enough for the species to avoid defects such as case hardening, honey-combing, collapse, etc. A record of operating conditions of the kilns shall be kept for the entire run. However, the specimens for determination of volumetric, radial and tangential shrinkage and fibre saturation point shall be air dried only, even if the other properties are evaluated in kiln dry condition.

11.1.4 When the dried (air-dried or kiln-dried) test specimens are required to be stored awaiting test, they shall be kept in a conditioning chamber mentioned in 11.1.2.

11.2 Green Sticks

11.2.1 The material intended for green tests shall be kept in a framed pit or container closely piled together and covered with damp saw dust of durable wood or any other material, so that the moisture always remains well above the fibre saturation point.

11.2.2 All material before testing shall be surfaced on four sides to 50 mm $\times$ 50 mm or 20 mm $\times$ 20 mm cross-section and the test specimens shall be cut in the specified size and shape as indicated in IS 1708 (Parts 1 to 18) : 1986. Least possible time should be taken in planning and cutting the test specimens from the green sticks. When green test specimens awaiting test are required to be stored, they shall also be kept in the framed pit mentioned in 11.2.1.

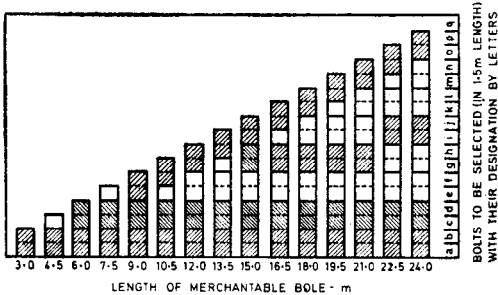


FIG. 2 DIAGRAM INDICATING NUMBER AND POSITION OF BOLTS TO BE COLLECTED FROM A TREE OF MERCHANTABLE BOLE

12 ORDER OF TESTS AND SELECTION OF SPECIMENS

12.1 The order of tests in all cases shall be such as to eliminate, as far as possible, the effects of changes in the conditions of specimens due to factors like storage and weather. The following order of test is recommended:

- a) Static bending,
- b) Impact bending,
- c) Izod/Charpy impact,
- d) Compression parallel to grain,
- e) Compression perpendicular to grain,
- f) Hardness,
- g) Shear parallel to grain,
- h) Cleavage parallel to grain,
- j) Tension parallel to grain,
- k) Tension perpendicular to grain,
- m) Torsion,
- n) Nail and screw withdrawal,
- p) Specific gravity and volumetric shrinkage, and
- q) Radial and tangential shrinkage.

12.2 Specimens for the tests mentioned in 12.1 shall be selected from the sticks in accordance with the schedule given in Annex C. In instances where sticks do not provide sufficient material, or mechanical tests other than those described in 12.1 are required, the test specimens may be taken either from uninjured portions of the static and impact bending specimens remaining after tests, or from the Sector pieces shown in Fig. 1. However, proper care shall be exercised in the selection of specimens giving due regard to the direction of the growth rings and visible defects.

12.3 Each test specimen shall be clearly marked by appropriate abbreviation and number to indicate the project number, consignment number the bolt designation and the stick number (*see 9.3*) and the name of the test.

12.4 All specimens shall be clear and straight grained, free from decay and other defects, where inevitable discretion should be used, so as to be certain that the presence of any defects shall not influence the failure or otherwise effect the strength of the specimen.

ANNEX A

(Clauses 4.3 and 7.7.2)

TAXATION OF THE TEST AREA

(To be filled at the time of collection and despatch of material)

- 1) a) Species.....
 b) Natural seedling, coppice of plantation.....
 c) Site quality.....
- 2) Name of State.....
- 3) Division and range.....
- 4) Approximate total number of trees of the particular species in the test area.
- 5) Sketch map of the area indicating the location of the selected trees by circled numbers 1, 2, 3, 4, etc, the numbers indicate the tree number of the particular consignment. Other forest and geographical features should also be indicated. Northern direction should be indicated by an arrow.
- 6) Climate :

<i>Mean Annual Temperature</i>			<i>Mean Annual Rainfall</i>			<i>Humidity</i>
<i>Max</i>	<i>Min</i>	<i>Mean</i>	<i>Total</i>	<i>Rain</i>	<i>Winter</i>	
...	...	...	...	...	...	
- 7) Approximate distance and direction of any nearby perennial/seasonal rivers or NALAS (give names)

- 8) Depth of ground-water table (well).....
- 9) Geological formation and rock.....

10) a) Altitude

b) Aspect.....

11) Slope :

Shape (convex or concave).....

Length.....

Gradient (percent or degree).....

12) Vegetation (species in order of fequency)

a) Forest type and general description.....

b) Over wood.....

c) Under wood.....

d) Groundc over.....

e) Regeneration of principal species.....

13) Soil mass : Depth.....

Root penetration (depth and mode of distribution).....

Fauna (earth worms, white ants, rodents, etc).....

14) Brief history of the site (management practices, fire, grazing, felling, etc).....

.....

In the following, check the appropriate class and cross out items which do not apply :

15)	a) Land form physiography	Hill top	Hill slope	Plateau or high terrace	Alluvial plain	Valley bottom	—
	b) Relief	Hilly excessive	Undulating normal	Flat upland subnormal	Flat low-land flat or concave	—	—
16)	a) Drainage external (surface)	Ponded Water logging	Very slow	Slow	Medium	Rapid	Excessive
	b) Internal	None	Very slow	Slow	Medium	Rapid	Excessive
17)	Erosion	Slight	Moderate	Severe	Gullied	—	—
18)	Deposition	None	Slight	Moderate	Excessive	—	—
19)	Soil type	Red	Lateritic	Black	Alluvial	Brown	Hill
		Desert	Saline	Marshy	—	forest	—
			Alkaline	—	—	—	—
20)	Parent material	Formed <i>in-situ</i>	Transported	Organic	—	—	—
21)	Surface	Loose friable	Slight crushing	Compact	—	—	—
22)	Moisture :	Wet	Moist	Moderately dry	Dry	Very dry	—
	a) Top soil						
	b) Sub-soil	Wet	Moist	Moderately dry	Dry	Very dry	—
23)	Plant litter	Light	Moderate	Heavy	—	—	—
24)	Organic matter	Little	Average	High	Excessive	—	—

Signature and designation
of collector with date... ..

Name and designation of despatcher.....

Signature and date
(After completely verifying details before despatch)

ANNEX B
[Clauses 6.1, 6.4, 7.2, 7.6 and 7.7.2]
INFORMATION REGARDING INDIVIDUAL TREES
(Normally only one log is required from each tree)

<i>Tree No.</i>				
1	2	3	4	5

- 1) Distinguishing marks :
 - a) On the small end
 - b) At breast height
 - c) On the disc cut from stump
- 2) Age of tree if known from records
- 3) Total length of the tree
- 4) Total length of the trunk
- 5) Girth at breast height over bark at 1.37 metres
- 6) Date of felling
- 7) Height of the stump
- 8) Date of converting into logs for storage
- 9) How are ends coated?
- 10) Girth of the logs, in mm, at
 - a) Large end
 - b) Small end
- 11) No. and date of R/R, or despatch voucher under which the material has been despatched. Also please give reference of covering letter, if any
- 12) Description of the visible defects

Signature of collector and date——

Name and designation of despatcher—
 Signature and date (after completely
 verifying details before despatch——

ANNEX C

[Clause 12.2]

SCHEDULE FOR ALLOTMENT OF MATERIAL FROM THE COMPOSITE BOLTS FOR DIFFERENT TESTS

Sl No.	Name of Test	Description
1	Static bending	One specimen from each pair of sticks. A pair consists of two adjacent sticks equidistant from the pith. For example N_1 of 'a' bolt and N_2 of 'b' bolt (in the composite bolt) forms a pair. Care shall be taken that if from $N_1 - N_2$ pair, static bending specimen is taken from N_1 then from $N_3 - N_4$ pair the static bending specimen shall be taken from N_4 stick.
2	Impact bending	Six specimens, one from near the pith, one from near the periphery and four from the intermediate zone.
3	Izod/Charpy impact	One specimen from uninjured portion of each of the tested static bending and impact bending specimen.
4	Compression parallel to grain	One specimen from each stick.
5	Compression perpendicular to grain	One specimen from each of 50 percent of the sticks from which specimens for static bending are taken.
6	Hardness	One specimen from the other 50 percent of the sticks selected for static bending.
7	Shear parallel to grain	Six pairs of specimens. One from near the pith one from near the periphery and four from intermediate zone. One specimen of each pair shall be tested radial (surface of failure is radial) and other tangential (surface of failure is tangential).
8	Cleavage parallel to grain	Six specimens chosen and divided as for shear.
9	Tension parallel to grain	Six specimens, one from near the pith, one from near the periphery and four from intermediate zone.
10	Tension perpendicular to grain	Six pairs of specimens. One from near the pith, one from near the periphery and four from intermediate zone. One of each pair of specimens from the same stick shall be tested in radial tension (surface of failure radial) and the other in tangential tension (surface of failure tangential).
11	Torsion	Six specimens chosen and divided as for shear.
12	Nail and Screw withdrawal	Eighteen specimens from the sector sticks of the log. Six for each condition.
13	Specific gravity & volumetric shrinkage	Six specimens, one from near the pith, one from near the periphery and four from the intermediate zone.
14	Radial and tangential shrinkage	Four pairs of specimens (each pair consisting of one true radial and another true tangential) from the sector portion of the log as shown in Fig. 1 and representing both the bolts and all the sectors.

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