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TIMBER CONIFEROUS & NONCONIFEROUS SUITABLE FOR THE PURPOSE OF ARMAMENT STORES COVERING

i) AMMUNITION
ii) WEAPONS
iii) SMALL ARMS
iv) EXPLOSIVES AND EXPLOSIVE COMPOSITIONS
v) INSTRUMENTS
vi) GENERAL ARMAMENT STORES

(DS Cat No. 5510 000 478 to 483)

सत्यमेव जयते

गुणता से विश्वास

CONTROLLERATE OF QUALITY ASSURANCE (MILITARY EXPLOSIVES)

AUNDH ROAD, PUNE - 411 020

DEPARTMENT OF DEFENCE PRODUCTION

MINISTRY OF DEFENCE

AMENDMENT RECORD

Amendment		Authority letter	Clauses Affected	Remarks
D.C. No.	DATE			

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0.0 FOREWORD

0.1 This specification has been prepared by the Controllerate of Quality Assurance (Military Explosives), Aundh Road, Pune - 411 020.

0.2 This specification shall be used for tender enquiry, procurement, manufacture and quality assurance of the item covered by this specification.

0.3 This specification is the revision of IND/ME/883(f) (Prov) and supersedes the same.

0.4 The Quality Assurance Authority for this store is the Controller, Controllerate of Quality Assurance (Military Explosives), Aundh Road, Pune - 411 020. Enquiries regarding this specification relating to technical or any other contractual conditions shall be referred to Quality Assurance authority mentioned above/named in the tender or contract.

0.5 Copies of the specification can be obtained on payment from the Controller, Controllerate of Quality Assurance (Military Explosives), Aundh Road, Pune - 411 020.

1.0 SCOPE

1.1 This specification prescribes requirements, method of sampling and tests of timber and provides guidance to supplier/manufacturer and quality assurance agencies.

1.2 This specification is suitable for manufacture of boxes, chests and other packing cases for pocking etc. for (i) Ammunition (ii) Weapons (iii) Small arms (iv) Explosives and explosive compositions (v) Instruments (vi) Other general armament stores.

2.0 RELATED SPECIFICATIONS AND DOCUMENTS

2.1 The related documents mentioned at clause 2.2 are those applicable at the date of publication of this specification. It is contractor's/manufacturer's responsibility to confirm their current applicability and to obtain from the Authority Holding Sealed Particulars (i.e. CQA(ME) Aundh road, Pune-411 020) information concerning any change that may be necessary due to cancellation, replacement or supersession of any of these documents.

2.2 The following related specifications have been referred to in the preparation of this specification:-

i)	IS 138:1992, AMD-1, Reaffirmed – 2009	---	Ready mixed paint, marking for packages and petrol containers
ii)	IS 399 : 1963, AMD-1 Reaffirmed – 2010	---	Classification of commercial timbers and their zonal distribution
iii)	IS 401 : 2001 Reaffirmed – 2011	---	Code of practice for preservation of timber
iv)	IS 707 : 2011	---	Timber Technology and utilization of wood, Bamboo, and cane-Glossy of Terms
v)	IS 1078 : 1987 Reaffirmed – 2010	---	Copper Naphthanate
vi)	IS 1150 : 2000 Reaffirmed – 2010	---	Trade names and abbreviated symbol for timber species
vii)	IS 1708 : 1986 (Part 1 to 18)	---	Method of testing of small clear specimens of timber
viii)	IS 2753 (Part I) : 1991 Reaffirmed – 2010	---	Methods for Estimation of Preservatives in treated timber and treating solutions : Part 1 Determination of Copper, Arsenic, Chromium, Zinc, Boron, Creosote and fuel oil
ix)	IS 2753 (Part II) (Amdt. 1) : 1991 Reaffirmed – 2010	---	Determination of Copper (copper organic in preservative salt
x)	IS 3364:1976 (Part 1), AMD-1 Reaffirmed – 2009	---	Methods of measurement and evaluation of defects in timber : part-1 logs
xi)	IS 3364:1974(Part 2), AMD-1 Reaffirmed – 2009	---	Methods of measurement and evaluation of defects in timber : part 2 converted timber
xii)	IS 4970 : 1973 Reaffirmed – 2010	---	Key for identification of commercial timbers
xiii)	IS 5806 : 1970, AMD-2 Reaffirmed – 2010	---	Non-coniferous timber in converted form for ammn/explosives boxes
xiv)	IS 287 : 1993 Reaffirmed – 2008	---	Permissible moisture content for timber used for different purposes – Recommendations
xv)	JSS 8010 : 24 : 2014 (Revision No. 3)	---	Paint, RFU, Ammunition bituminous brushing, anticorrosive black
xvi)	JSS : 6810-62 : 2009 (Revision No. 3)	---	Rosin Gr. 1 Ammn and Rosin powdered Gr. II Ammunition
xvii)	IND/ME/616 (Prov)	---	Lamp black for explosives

2.3 Copies of this specification and other related specifications are obtainable on payment basis as follows:-

SPECIFICATION		SOURCE OF SUPPLY
(i) IND/ME/ Specification	:	C. Q. A. (ME), AUNDH ROAD, PUNE - 411 020.
(ii) JSS	:	The Director Directorate of Standardization Standardization Documents Centre Ministry of Defence Room no 05, 'J' Block Nirman Bhawan PO New Delhi – 110 011
(iii) IS Specification	:	Bureau of Indian Standards, Manak Bhawan 9, Bahadur Shah Zafar Marg, NEW DELHI – 110 002 or Their regional / Branch offices

3.0 MATERIAL

3.1 Timber is divided into two groups.

(i) Coniferous or nonporous or softwood

(ii) Non-coniferous or porous or hardwood

3.1.1 Coniferous (Non porous woods) :

Non-porous woods are produced by coniferous or needle leaved, trees such as Deodar, Chir, Spruce having Trecheds type of cells for conduction of sap as well as for mechanical strength and known as softwood.

3.1.2 **Non-coniferous (Porous woods) :**

Porous woods are produced by dicotyledonous or broad leaved trees like Teak, Sal, Mango and Semul are known as hardwood having pores (vessels) used as channels for conducting sap only. Other cells called fibre gives mechanical strength.

3.1.2.1 Timber species to be used in the manufacture of packages/cases/boxes/chests shall be those mentioned in Appendix 'A' to this specification and to the respective store drawings.

3.1.2.2 In addition to the approved species of timber quoted in Appendix 'A' to the specn manufacturer may be permitted to use any of the alternative species mentioned in the relevant para of Appendix 'A' to this specification and to the respective store drawing subject to the Prior approval of the QA Authority/QA Officer.

3.1.3 The quality of timber shall be in accordance with para 3.2 of this specification. The details of the permissible defects are enumerated in Appendix 'D'.

3.1.4 The seasoning of timber shall be carried out in accordance with Appendix 'C'.

3.1.5 Finish shall be as per para 3.2.

3.1.6 Timber from the alternative species for which concession has been granted should be separately stacked and should not be mixed up with those from approved species permitted vide Appendix 'A'.

3.1.7 Mixing of two different species in a lot/batch offered for inspection shall not be permitted.

3.1.7.1 Identification of timber species shall be done as per specification IS:4970-1990 and punched cards keys available from B.I.S., New Delhi-110 002.

3.1.7.2 For the purpose of definition of various terms reference shall be made to specification IS:707 (Latest Issue).

When timber is required for small arms, the following additional clauses will apply:

3.1.8 Half wroughts intended for small Arms and packages are to be cut to sizes as per instructions regarding grain directions specified, as per respective drawing from the butts of trees fell when the sap is down after exhaustion of sap by girdling.

3.1.8.1 Half wroughts shall not be accepted unless each piece contains 80% or more of heartwood. The remaining 20% sap concentrated at one place is considered not acceptable. The mass per 0.0283 Cu/metre at 12% moisture content shall not be less than 14.5 kg as per Appendix 'E' and growth rings shall not exceed 30 per 25 mm.

3.1.8.2 Preservative treatment to finished timber (After seasoning) shall be given in accordance with Para 2 of Appendix 'C' to the specification and shall conform to the test requirements 5.3.2.

3.1.8.3 Wherever possible the timber components (shooks) like planks, scantlings, battens used for making the box crates etc. should be treated with preservative before assembly and any cutting/boring done on the treated components are to be brushed liberally with same preservative composition.

3.2 FINISH

3.2.1 Timber to be used in the manufacture of packages shall be in accordance with this specification and also correct in size and dimensions as per particulars quoted in the contract / supply order.

3.2.2 Timber to be procured and used in the manufacture of packages shall be sawn straight and square trimmed at the ends. It shall be free from brashness, shekes, split across the grain wane, centre heart (pith) sap stain, warp, insect attack and any kind of decay (rot) spike/splay knots or any other defect which is likely to reduce its strength and durability.

3-2.3 When nominal sizes are ordered, length, width and thickness of planks and scantlings shall be measured on the basis of accepted sizes, plus tolerance shall not be added while calculating cubical contents.

4.0 SUPPLIER'S INSPECTION OF STORES/CONSIGNMENT

4.1 Manufacturers/contractors must satisfy themselves that stores are in accordance with the terms of the contract and fully conform to the required specification. by carrying out a thorough pre-inspection of each lot before actually tendering the same for inspection to the Quality Assurance Officer nominated under the terms of the contract. A declaration by the contractor that necessary pre-inspection has been carried out on the stores tendered will be submitted along with the challan. The declaration will also indicate the method followed in carrying out Pre-inspection showing the features checked/tested and will have test certificate attached to the challan/declaration.

4.2 If the Quality Assurance Officer finds that pre-inspection of the consignment as required above has not been carried out the consignment is liable for rejection.

5.0 QUALITY ASSURANCE

5.1 Inspection

5.1.1 The timber shall be subject to inspection by and to the final approval of the QA Officer / QA Authority.

5.1.2 Samples of the timber may be taken from any portion of a consignment/lot. The lot shall be of a convenient size consisting of only 'ONE SPECIE' of timber as specified in the contract.

5.1.3 The supplier/manufacturer must notify the QA Officer when he is in a position to supply the material (start work) and must inform him in writing of all sub orders placed in connection with the order, as soon as they are placed on sub contractors in order that arrangements may be made for inspecting the material as necessary.

5.1.4 The QA Officer shall have the right of access at all times to enter all sections of manufacturing plant or storage buildings which are concerned with the production and storage of timber at the works of the manufacture or his sub-manufacturers for inspection.

5.1.5 No timber shall be taken into use until the same have been approved by the QA Officer for the purpose intended. The QA Officer may at his discretion, require the bulk to be bonded or sealed until the results of tests are known, it is however, manufacturer's sole responsibility to ensure that the species of timber is as specified in the contract and conform strictly to the approved relevant store specifications.

5.1.6 The manufacturer/contractor will be required to supply free of cost, necessary quantity of timber for tests selected by the QA Officer.

5.1.7 If on examination, 20% of samples of a lot be found not to conform to this specification, the whole consignment may be rejected.

5.1.8 In case of timber meant for small Arms packages, if 10% of any delivery examined in the lot deviate from this specification/drawing requirements, the whole delivery may be rejected without further examination.

5.1.9 The foregoing provisions shall apply equally to the prime contractors and sub-contractors, if any.

5.2 Sampling

5.2.1 The number of planks/scantlings to be selected at random for drawing representative samples of the store from each consignment/lot shall be as per Table I. However, more number of samples can be drawn at the discretion of the QA Officer.

Table I

No. of planks in the lot	No. of planks to be sampled
Upto 100	4
101 to 150	5
151 to 300	6
301 to 500	7
501 to 1000	10
1001 to 2000	12
2001 to 3500	15
3501 to 5000	17
5001 to 10000	21
10001 & above	22

5.2.2 Samples shall be essentially from the same batch/lot of manufacture, they shall be conforming to this specification indicating the type of preservative and species used. They shall be of the size and dimension 300mm length and full width and full thickness.

5-3 TESTING

5.3.1 Samples shall be tested/examined as per clause 3 above and to the following test requirements:-

5.3.2 TEST REQUIREMENTS

SR. NO.	CHARACTERISTICS	PASSING STANDARD	TEST METHOD
1.	Identification of Timber	Shall conform to the approved species as in Appendix 'A'	IS 4970
2.	Visual examination	The permissible defects in timber shall be to the extent specified in Appendix 'D'	Appendix 'D'
3.	Dimensions (a) Width in mm (b) Thickness in mm	As ordered. Tolerance + 5mm - 2mm As ordered. Tolerance + 3mm - 0mm	See Note 1

4	Moisture percent max. (a) For Ammn. Explosives, Instruments & General Armament stores Zone I Zone II Zone III Zone IV (b) For small Arms Zone I Zone II Zone III Zone IV	 10 12 14 14 8 10 12 12	 See Note 2 & Appendix 'B'
	Ultimate transverse Strength in kg. min	958.3 kg for a specimen of 5cm x 5cm cross section and 75cm in length with a span length of 70 cm OR 153 kg for a specimen of 2cm x 2cm cross section and 30cm length with a span length of 28 cm OR 645.5 kg for a specimen of 3.8 cm x 3.8 cm cross section with a span length of 45.5 cm	See Note 3 IS 1708 Part 5

6.	Preservative content	Absorption Min, kg/m3	Penetration Min, mm	
	Copper chrome arsenic compn.	* 4.0	** 4.0	* Appendix 'C' of 2753 Pt I and Pt II
	Acid cupric chromate compn.	4.0	4.0	** Appendix 'D' of Clause 8.5 of IS 401
	Copper chrome boric compn.	6.5	4.0	
	Copper Naphthanate as copper	0.5	4.0	See Note 4 & 5

Note l :- Measurement of length, width & thickness and computationof volume shall be made as follows. The measurement shall be made in mid line of the surface on which it is measured.

(a) Length : Length shall be measured in metres. The fractions of a metre shall be taken in multiples of 0.01m and to the nearest lower 0.05m.

(b) Width : Width shall be measured in centimetres to the nearest lower one centimetre.

(c) Thickness : Thickness shall be measured in centimetres to the nearest lower one half centimetre i.e. 0.05cm.

(d) Volume : Volume shall be computed in cubic metres correct to three places of decimal on the basis of accepted sizes.

Note 2 :- For zones reference is made to the specification IS:287-1993. Permissible moisture content for Timber used for different purposes recommendations (third revision). The tolerance of moisture content of the timber shall be in accordance with clauses 3 and 4 of specification given in Table 1.

Note 3 :- Ultimate Transverse Strength (UTS) is required to be carried out when the timber is used for the manufacture of Small Arms furniture.

Note 4 : The estimation of preservative should be done according to IS 2753 Part I & II (after converting 'g' percent to 'kg/m^3' taking a sample of known mass and volume).

Note 5 : The method to be used for determination of depth of penetration of copper naphthanate preservative shall be as per Appendix 'D' of IS 401 (Latest Issue). This method is suitable for the said purpose, as indicator diphenyl carbazide reacts with copper to give (characteristic/positive indication) purple colour which is the basis of determination.

5.3.3 QUALITY OF REAGENTS

Unless otherwise specified pure chemicals and distilled water shall be employed in tests. 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

5.4 CRITERIA FOR CONFORMITY

5.4.1 The lot/consignment shall be declared as conforming to the specification if the samples drawn as per the sampling procedure satisfy Clause 3 above and the test requirements given in Clause 5.3.2.

6.0 PACKAGING

6.1 STORAGE BEFORE DESPATCH

6.1.1 Immediately after inspection and application of the end coating, the planks, scantling shall be properly stacked under cover in convenient lots pending despatch.

6.2 DELIVERY

6.2.1 The planks, scantlings shall be tendered for inspection duly stacked in air seasoning sheds using 50mm x 25mm crossers of uniform thickness. Each stack should contain planks / scantling of one size only. The planks/scantling shall be in good condition and free from mud, paint or any other coating material except for end coating which might conceal defects.

6.2.2 The planks/scantlings tendered for inspection in any one lot shall be of one cross section and of 'ONE SPECIE ONLY'.

6.2.3 The planks/scantlings (below 100mm x 100mm cross sectional area), after inspection shall be suitably tied using strong twine or galvanised wire to form bundles of 5 or 10 pieces as directed by the QA Officer in order to facilitate accounting & easy handling during transit and storage. Scantlings l00 mm x l00 mm & over in cross sectional area shall be delivered loose.

6.2.4 **Any** queries regarding the species of timber specified in the drawing of the package/store may be referred to the respective AHSP as shown below –

	STORE FOR	AHSP / QA AUTHORITY
(i)	Ammunition stores	Controllerate of Quality Assurance (Ammn.) Khadki Pune 411 003
(ii)	Weapons	Controllerate of Quality Assurance (Weapons) Jabalpur 482 005
(iii)	Small Arms	Controllerate of Quality Assurance (Small Arms) Ichapur West Bengal 743 144
(iv)	Explosives/Explosive compositions	Controllerate of Quality Assurance (Military Explosives) Aundh Road, Pune 411 020
(v)	Instruments	Controllerate of Quality Assurance (Instruments) Dehradun 248 008

7.0 MARKING

7.1 Paint used for marking, if required, shall be paint ready mixed marking, brushing golden yellow conforming to specification IS:138-1992 (third revision).

7.2 Any other paint shall have the prior approval of QA Officer/QA Authority.

7.3 Branding and stamping shall be indelibly and legibly marked to the satisfaction of the QA Officer.

7.4 END COATING

7.4.1 Immediately after inspection, the ends of each piece of timber upto a distance of 25 mm more than the length of the longest split shall be adequately coated by the supplier with any of the following materials :-

(a) Bituminous black anti-corrosive paint to specification JSS 8010-24.

(b) Rosin to specification JSS:6810-62 and lamp black to specification IND/ME/616. Composition 10:1. This shall be applied after melting and thorough mixing.

8.0 WARRANTY

8.1 The stores supplied against the contract shall be deemed to have been warranted against defective material and performance by the manufacturer/supplier for a period of 12 months from the date of receipt of the material at the consignee's end and if during this period any of the stores supplied is found defective the same shall be replaced by the supplier / contractor / manufacturer free of charge at the consignee's premises.

9.0 SAFETY OF OPERATIONS

9.1 Nothing in this specification shall relieve the manufacturer/supplier/user of his responsibility for the safety of operation in manufacture, storage, transport or use of the store.

10.0 DEFENCE STORES CATALOGUE NUMBER

10.1 The Defence Stores Catalogue Number allotted to this store are

(1)	Ammunition	-	5510 000 478
(2)	Weapons	-	5510 000 479
(3)	Small Arms	-	5510 000 480
(4)	Explosives & Explosive compositions	-	5510 000 481
(5)	Instruments	-	5510 000 482
(6)	General Armament Stores	-	5510 000 483

11.0 SUGGESTIONS FOR IMPROVEMENT

11.1 Any suggestion for improvement in this document shall be forwarded to the Controller, CQA(ME), Aundh Road, Pune - 411 020.

Date : 24.05.2016

(Mrs. MGP DHANRAJ)
CONTROLLER
CQA(ME), Aundh Road
Pune - 411 020

12.0 APPENDICES

APPENDIX 'A'

SPECIES OF TIMBER CONIFEROUS/NON-CONIFEROUS SUITABLE FOR THE PURPOSE OF THIS SPECIFICATION

A.1 Unless otherwise specially stated to the contrary in the contract/order/drawing only the following species of timber shall be used by the manufacturer, for manufacture of the packages and packing pieces. Quotations will clearly indicate which specie of timber are intended to be used by the manufacturer. Identification of timber shall be carried out as per specification IS:4970-1973, (first revision). Available regional names for timber are indicated in brackets. However reference for the same shall be made to specification IS:399-1963 (revised) (amdt. 1). for classification of commercial timbers and their zonal distribution.

A.2 Timber non-coniferous for manufacture of packages/packing pieces for Ammunition, Explosives and Explosive compositions and Instruments

Common Nomenclature	Botanical Nomenclature
1. Mango (Aam) -	Mangifera indica
2. Mundani (Mandana)	Acrocarpus fraxinefolius
3. Aini (Parhphanas)	Artocarpus hirsutus
4. Champ (champa) -	Michelia champaca
5. Hollock (Panisaj)	Terminalia myriocarpa
6. Chaplash (Chapalish) -	Artrocarpus chapalash
7. Kathal (Kanthal)	Arocarpus heterophyllus
8. Chickrassy (Bogapoma)-	Chukrasia velutina
'9. Jaman (Jamun)	Syzygium sipp cumini tubulasis
10. Kokko (Siris)	Albizia lebbeak
11. Kanju (Papri)	Holoptelea integrifolia

A.2.1 Alternative timber species which may be permitted on concession at the discretion of QA Officer, subject to satisfactory test results of end store

Common Nomenclature	Botanical Nomenclature
1. Haldu (Karam)	Adina cordifolia
2. Jutili	Altingia excelsa
3. Deodar (Diar)	Cedrus deodara
4. Gurjan (Garjan)	Dilerocarpus spp Grandiflorus
5. Kaim (Phaldu Kalam) -	Mitragyna parvifolia
6. Sandan (Tinnas Pannan)-	Ougeinia dalbergioides
7. Hethipaila (Kanak Champa)	Pterospermum acerifolium
8. Keora	Sonnertia apetala
9. Padari Wood (Paral)	Stereospermum chelonoides
10. Safed (White) Siris (Korai)	Albizia procera
11. Bahera Bhar	Terminalia bellirien

A.3 In addition to the species, quoted for Ammunition packages the following are specified for Armament packages, i .e. for Boxes/chests etc.

1.	Chir (Chil)	Pinus roxburghii
2.	Deodar (Diar)	Cedrus deodara
3.	Figs (Gular)	Ficusspp bengalensis
4.	Blue Pine (Kail)	Pinus wallichiana
5.	Sal (Sakhu)	Shorea robusta
6.	Lendi	Lagerstroemia parviflora
7.	Gumber	Parviflora
8.	Kanchan	Bauhinia
9.	Sueh	
10.	Kanju	Holoptelea integrifolia picea smithiana
11.	Gamari "	Gmelina arborea
12.	Sundari	Heritiera spp
13.	Kusum	Schleichera oleosa
14.	Oak	Quercus spp
15.	Ash	Franiumel excelsior fraxinus

A.3.1 Following species of coniferous timber are suitable for manufacture of chests, boxes, furniture, board, planks, scantlings and similar purposes.

1.	Blue Pine (Kail)	-	Pinus wallichiana
2.	Chir (Chil)	-	Pinus roxburghii sargent (Syn P.Longifolia roxb)
3.	Cypress	-	Cupressus torulosa
4	Deodar (Diar)	-	Cedrus deodara
5.	Fir (Partal)	-	Abies pindrow
6.	Khasia	-	Pinus khasya
7.	Spruce (Rai)	-	Picea smithiana

A.3.2 Timber species required for manufacture of Small Arms -

Kashmir Walnut, Kashmir Maple, Birdeherry, Assam Bola

Morus leavigata saditya (bola) and Assam Amoora spp Amar

A.3.3 Bengal Maple may be used as a temporary measure.

APPENDIX 'B'

B.1 DETERMINATION OF MOISTURE CONTENT

An adequate number but not less than three depending on type of the store or representative section of wood of suitable size shall be taken at random and each one accurately weighed (M_1) as soon as it is cut. This shall then be dried in an oven at a temperature of 100 to 105 degrees Celsius till the dry mass of each is constant (M_0). Care should be taken to prevent changes in moisture content between cutting of the section and weighing before drying or between removed from the oven and subsequent weighing.

$$\text{Percent Moisture (on dry mass)} = \frac{M1 - M0}{M0} \times 100$$

B.2 In case where samples cannot be obtained in the manner described above samples shall be taken by the use of an anger or bit, boring to the entire depth (thickness of the planks) and boring from each piece collected separately and packed in a proper receptacle to guard against moisture loss before they are weighed. Location of the bore shall be in the centre of the width of plank at a point not less than 305 mm from either end excluding the longest end split . The boring from each receptacle shall be dried separately in an oven in the manner described above till a constant dry mass is attained. When the thickness of the material is above 38 mm, boring to a depth of one half of the piece may be permissible.

B.3 An electric instrument moisture meter based on resistance of dielectric measurement and calibrated for moisture content for specific species of timber may also be used for routine determination. But the method at (B.l) above shall be regarded as final in all cases of dispute.

B.4 When testing the moisture content of planks by the method in (B.l) above the test piece should be taken in the centre of the width of the plank & at a position not less than 305 mm from either end of the plank excluding the length of the longest crack, if any.

APPENDIX 'C

SEASONING

C.l All species quoted in Appendix 'A' shall be well kiln seasoned except teak padauk which may be air seasoned (Rifle stocks as half wroughts are to be seasoned at Rifle Factory).

C.2 PRESERVATION

All shooks / timber components made from the species quoted at Appendix 'A' except teak, Padauk, sisoo. Aini, Chaplasin and katha (kanthal) shall be impregnated with an approved timber preservative by pressure process.

In the event, however. if any of the above named species contains sapwood, it shall also be treated with an approved preservative by Pressure Treatment.

a) Where a water soluble preservative is used the timber shall first kiln seasoned to a moisture content not exceeding 18% before treatment.

b) Where an organic preservative solution in an organic solvent is used, the timber shall first be kiln seasoned to a moisture content, not exceeding 12% before treatment.

c) In all cases where a water soluble preservative is used the timber scantlings/ timber components shall be dried out to a moisture content not more than 12% before they are used in the assembly of packages.

d) Where organic solvents are used with preservatives the volatile matter must be allowed to evaporate before scantlings/timber components are assembled into packages.

C.3 Pressure – Treatment

The timber after seasoning as stated in para C-2 above shall be pressure treated with any one of the following preservatives :

a. Copper-Chrome-Arsenic Composition

Copper Sulphate ($CuSO_4.5H_2O$)	---	3 parts
Arsenic Pentoxide ($AS_2O_5.2H_2O$)	---	1 part
Sodium Dichromate ($Na_2Cr_2O_7.2H_2O$) or Potassium Dichromate ($K_2Cr_2O_7$)	---	4 Parts

6% (by mass) solution in water of the above composition is taken for pressure treatment.

b. Acid-Cupric-Chromate-Composition

Chromic Acid (Cr_2O_3) (Equivalent to 2.5 parts of Sodium Dichromate)	-	1.68 Parts
Copper Sulphate ($CuSO_4.5H_2O$)	-	50 Parts
Sodium Dichromate ($Na_2Cr_2O_7.2H_2O$)	-	47.5 Parts

6% (by mass) solution in water of the above composition is taken for pressure treatment.

c. Copper-Chrome-Boric Composition

Boric Acid (H_3BO_3)	-	1.5 Parts
Copper Sulphate ($CuSO_4.5H_20$)	-	3 Parts
Sodium Di-Chromate ($Na_2Cr_20_7.2H_20$) or Potassium Dichromate ($K_2Cr_20_7$	-	4 Parts

6% (by mass) solution in water of above composition is taken for Pressure Treatment.

d. Copper Naphthanate - 5% (by mass) solution of copper naphthanate in white spirit or kerosene oil superior is taken for pressure treatment.

NOTE 1 : The use of any other suitable preservative may also be permitted with the prior approval in writing by the CQA(ME) Pune or the respective Quality Assurance Authority for the end store.

NOTE 2 : Application of Copper Naphthanate by brushing or by dipping is not permitted.

C.4 PRESERVATIVE CONTENT - Absorption and depth of penetration of preservative.

The treated timber shall contain the following quantities of preservative and depth of penetration when tested in accordance with specification IS:401:1982 for code of practice for preservation of timber as indicated below :

PRESERVATIVE	ABSORPTION Min kg/m^3	DEPTH OF PENETRATION Min mm
a) Copper-Chrome Arsenic Composition	4.0	4
b) Acid-Cupric Chromate Composition	4.0	4
c) Copper-Chrome Boric Composition	6.5	4
d) Copper-Naphthanate (as copper)	0.5	4

C.4.1 The estimation of preservatives shall be done according to IS:2753 (Part I and Part II), after converting 'g' percent to 'kg/m^3' taking a sample of known mass and Volume.

OR

An Alternate Method for the Determination of Copper and Chromium in the Preservatives

The test pieces should be taken from the centre of width of the plank and at a position not less than 305 mm from either end of the plank excluding the length of the largest crack if any.

Take samples from three different places and measure the volume accurately. Cut it into chips and ignite in a nickel crucible until carbonaceous matter is completely removed. Muffle furnace may be used. Cool the crucible and cover the ash with 4 to 5 g of Sodium Peroxide and fuze the mass until it is clear. Cool the crucible and place it in a beaker. Add water and boil. Filter the solution through a. Whatman filter paper No. 41 and wash the crucible and beaker with hot water and filter. The residue is used for estimation of Copper and filterate is used for estimation of Chromium.

a) Estimation of $Na_2Cr_20_7.2H_20$: Acidify the filtrate with

Conc. H_2S0_4. Add known volume of N/10 Ferrous Ammonium Sulphate until a clear green colour is obtained. Now titrate excess of Ferrous Ammonium Sulphate with N/10 $KMnO_4$. Take a blank reading.

$$Na_2Cr_20_7.2H_20 \text{ Kg/m3} = \frac{\text{Difference x Normality x f x 0.0497 x 1000}}{\text{Volume in cm}^3}$$

Where f - Factor of $KMnO_4$ Solution.

b. Estimation of $CuSO_4.5H_20$

Treat the residue in the filter paper with hot 1:1 HCl. Boil nickel crucible in hot 1:1 HCl to remove adhering copper and add to the filtrate. Evaporate the solution to about 5 ml. Add about 100 ml distilled water. Make it ammoniacal. Boil for a few minutes to precipitate iron (Fe). Filter through a No. 41 Whatman filter paper. Wash with Ammonium Hydroxide.

Take the filtrate in an Iodine flask. Acidify with Acetic Acid. Add 2 to 3 g KI.

Keep it in the dark for 10 minutes. Titrate the liberated Iodine with N/20 Sodium Thiosulphate.

$$CuSO_4.5H_20 \ (Kg/m^3) = \frac{\text{Reading x Normality x f x 0.248 x 1000}}{\text{Volume in cm}^3}$$

Where f = Factor of N/20 Sodium Thiosulphate solution.

C.4.2 The method used for determination of depth of penetration of Copper Naphthanate shall be as per Appendix "D" of IS:401. The method is suitable for the purpose since Diphenyl Carbazide reacts with Copper to give the characteristic purple colour precipitate which is the basis of determination.

C.5 If the samples tested from the lot withdrawn from pressure impregnation chamber fail to indicate the minimum stipulated absorption and depth of penetration as per para C.4 above, the lot represented by the samples shall be rejected and returned for re-impregnation, with the same preservative which was originally used. In no case, inadequately treated timber will be taken into use for fabrication of the boxes/crates.

C.6 Timber for small arms packages do not require preservative pressure treatment as per paragraphs C-3 and C-4 but will be treated as given in respective drawings.

APPENDIX 'D'

PERMISSIBLE DEFECTS

1 Plugging of defects is not permissible. Permissible defects shall be considered collectively and not individually.

D.2 For definition of various terms refer IS:707-1976 (second revision) (amdt. 1) reaffirmed 1990.

D.3 The defects shall be evaluated and measured as per IS:3364 (PART II) -1976.

D.4 The permissible defect in timber shall be to the extent specified in Table 1 below.

Table I Permissible Defect

Sr. No.	Defects	Timber for Armament stores Amn. Explosives & Explosive Composition, Instruments & Small Arms	Chests & Boxes for Weapons	For plank & Scantling and General Armament Stores
1	2	3	4	5
1	Cross grain	1 in 10 mm	1 in 12 mm for coniferous timber and non-coniferous timber	1 in 12 mm
2	End Split	Addition of longest end split at each end shall not exceed 20 mm per metre length of the piece. If splits in a piece exceed this limit the excess shall be excluded from the length of the piece.	shall not exceed 6 mm per 300 mm length of the piece.	shall not exceed 6 ll length of the piece
3	Live Knots	a) 15 ll Max (provided they are not so numerous or so located as to affect unduly the strength or usefulness of the piece) b) More than 15 mm acceptable to the extent of one knot per 750 mm length of the piece to the following extent : i) For timber upto 150 mm wide permissible to the Max. of ¼ of the width. ii) For timber over 150 mm wide Max. 40 mm permissible.	20 mn Max. (Provided they are not so numerous or so located as to affect unduly the strength or usefulness of the piece) Over 20 mm upto 65 mm permissible, to the extent of one knot per 610 mm length of the piece.	13 mm Max (provided they are not so numerous or so located as to affect unduly the strength or the usefulness of the piece). Over 13 mm & upto 50 mm permissible to the extent of one piece and a maximum of 5 knots in a length of 3050 mm. ....
4	Dead Knots (Diameter)	a) Max. 5mm permissible (Provided they are not numerous or so located as to affect unduly the strength or usefulness of the piece)	a) Max.6mm (Provided they are not so numerous or so located as to affect unduly the strength or use-fullness of the piece)	a) Max. 6mm (Provided they are not so numerous or so located as to affect unduly the strength or usefulness of the piece)

Sr. No.	Defects	Timber for Armament stores Ammn. Explosives & Explosive Composition, Instruments & Small Arms	Chests & Boxes for Weapons	For plank & Scantling and General Armament Stores
1	2	3	4	5
		b) Over 5 mm upto 15 mm for piece of 75mm and over in width to the extent of one such knot per 1200 mm length provided these are located at least 25 mm away from edges.	b) over 6 mm upto 25mm to the extent of one such knot per 915 mm length of the piece & a maximum of 3 knots in a length of 2750 mm.	b) over 6mm upto 25 mm to the extent of one such knot per 915 mm length of the piece & a Maximum of 3 knots in a length of 2750 mm
5	Live & Dead Knots Combined (Diameter)	Live knots on one face & dead knots on the other face are permitted as given below provided the depth of the affected surface does not exceed 5 mm and there is not more than one such knot for every 1200 mm length of the piece and is Min. 25 mm away from edges. a) For planks width upto 250 mm, 25 mm or ¼ of the width Max. b) For planks width above 150 mm, 40 mm Max.	Live knot on one face & dead knot on the other face permitted provided the depth does not exceed 6 mm below the affected surface Max. dia shall not exceed 50mm & there shall not be more than one such knot per 1200 mm length of the piece. ------ --------	live knot on one face & dead knot on the other face permissible provided the depth does not exceed 3 mm below the affected surface Max dia of such knot shall not exceed 40 mm and there shall not more than one such knot per 1200 mm length of the piece. --------- ------
	Surface cracks (on any face excluding the ends)	a) Max. 2 mm deep in the face and Maxl. 25 mm in length per 300 mm length of the piece. b) Max. 3 mmI deep in the edge and Max. 25 mm in length per 300 mm length of the piece	a) Max 1.5 mm deep on any face of timber piece upto 50 mm thickness. b) Max. 3 mm deep for timber piece over 50 MM & upto 100 mmI thickness.	a) Max 1.5 mm deep on any face of timber piece upto 50 mm thickness. b) max 3 mm deep for timber piece over 50 mm & upto 100 mm thickness.

Sr. No.	Defects	Timber for Armament stores Ann. Explosives & Explosive Composition, Instruments & Small Arms	Chests & Boxes for Weapons	For plank & Scantling and General Armament Stores
1	2	3	4	5
		c) Max. 3 mm in ends and the length of the cracks is 15 mm Max. par 300 mm length of the piece.	c) Max. 6 mm deep for timber over 100 mm thickness.	c) Max. 6 mm deep for timber over 100 mm thickness.
7	Sap stain	Not permissible.	Shall be permissible unless otherwise stated in the order.	Shall be permissible unless otherwise stated in the order.
8	Sap Hood	Shall be permissible	Shall be permissible	shall be permissible.
9	Spring	Not permissible.	Not permissible.	Shall be permissible upto a maximum of 1 mm per 300 mm length of the piece.
10	Twist	Not permissible	Not permissible	Upto 4 mm Max. per 300 mm length of the piece.
11	Bow	Not Permissible	Shall be permissible upto Max. 2 mm per 300 mm length of the piece.	2 mm Max. permissible per 300 mm length of the piece.
12	Centre-Heart (Pith)	Not permissible	Shall not be permissible	Permissible only in piece over 232 mm in cross sectional area provided it is sound and well boxed.
13	Cup	Not permissible.	6 mm Max per 300 mm width of the piece	6 mm Max per 300 mm width of the piece.

APPENDIX 'E'

METHOD TO DETERMINE THE MASS PER 0.0283 CU/METRE AT 12% MOISTURE CONTENT

The moisture content will be determined as follows :-

Sample pieces will be taken at random from each consignment and a disc of about 25 mm thick will be cut crossaways from each sample at a distance of about 75 mm from the end weighed accurately on a chemical balance.

The cut discs will then be placed in a dry oven maintained at 100-105 degree Celsius. After 48 hours drying the same will be placed in a desiccator to cool after which they will be re-weighed.

This will give the dry mass of each disc.

(The sample must be weighed as soon as it is removed from the desiccator, as in its dry state the sample absorbs moisture rapidly.)

The moisture content is given by the formula :

$$\text{Percent Moisture content on dry mass} = \frac{(M_1 - M_2) \times 100}{M_2}$$

Where

M_1 = Initial mass of disc.

M_2 = Dry mass of disc

The mass per 0.0283 cubic/metre of any sample at 12 % moisture is calculated by the formula.

$$M_{12} = Mm \times \frac{112}{100 + M}$$

Where M_{12} = mass per 0.0283 cubic/metre at 12 % moisture.

Mm = mass per 0.0283 cubic/metre of sample as received.

M = percent moisture in sample.