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SPECIFICATION FOR

PLYWOOD PANELS FOR TEA CHESTS

SRI LANKA STANDARDS INSTITUTION

SPECIFICATION FOR PLYWOOD PANELS FOR TEA CHESTS

SLS 751:1986

Gr. 8

SRI LANKA STANDARDS INSTITUTION
53, Dharmapala Mawatha
Colombo 3,
Sri Lanka.

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SRI LANKA STANDARD
SPECIFICATION FOR PLYWOOD PANELS FOR TEA CHESTS

FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 86-07-18 after the draft, finalized by the Drafting Committee on Packaging of Tea, has been approved by the Civil Engineering Divisional Committee.

This specification is one of a series of Sri Lanka Standards on Plywood Tea Chests. The other standards in this series are;

SLS	.....	Timber battens for plywood tea chests
SLS	109	Metal fittings for plywood tea chests
SLS	378	Plywood tea chests

This standard together with SLS ..... supersedes CS 108 : 1971 Ceylon Standard Specification for Components for Plywood Tea Chests (Metric Units).

In this standard, the methods of test for plywood panels specified in CS 108 : 1971 have been supplemented by introducing and alternate test for evaluating the water resistance. The quality requirements specified in CS 108 : 1971 have also been revised to overcome certain manufacturing difficulties whilst ensuring that such changes would not impair the quality of assembled tea chests.

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 CS 102. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

The valuable assistance derived from publications of the International Organization for Standardization, the British Standards Institution, the Indian Standards Institution and the Japanese Standards Association is gratefully acknowledged.

1 SCOPE

This specification covers the requirements of plywood panels used in the manufacture of plywood tea chests specified in SLS 378.

2 REFERENCES

This specification makes reference to the following standards :

CS 102 Presentation of numerical values

SLS 261 Plywood for general purposes

SLS 378 Plywood tea chests

SLS 428 Random sampling methods

3 DEFINITIONS

For the purpose of this standard the following definitions shall apply :

3.1 blister : Spot or area where veneers do not adhere together properly and bulge like a blister.

3.2 check : A seperation of fibres along the grain forming a crack or fissure that does not extend through the veneer from one surface to the other.

3.3 core : The inner layer or layers of plywood.

3.4 sloping grain : Deviation of the fibre alignment from a direction parallel to the long axis of the piece.

3.5 decay or rot : Disintegration of wood tissues caused by fungi and/or micro-organisms ('Dote' also means decay).

3.6 delamination : Separation of adjacent veneers through failure of the adhesive that is visible at the edges of the board.

3.7 discolouration : A change from the normal colour of the wood which does not impair the strength of the wood.

3.8 insect hole : A hole caused by insects or their larvae.

3.9 knot : A portion of a branch enclosed in the wood by the natural growth of the tree.

3.9.1 diameter of a knot : The maximum distance between two point farthest apart on the periphery of a round knot, on the face on which it becomes visible. In the case of spike or splay knot, the maximum width of the knot visible on the face on which it appears shall be taken as its diameter.

3.9.2 *dead knot* : A knot which is not held firmly in place.

3.9.3 live knot (sound knot) : A knot free from decay and other defects, firmly intergrown with surrounding wood.

3.9.4 *pin knot* : A knot not more than 6 mm in diameter.

3.9.5 *spike or splay knot* : A knot cut more or less parallel to its long axis so that the exposed section is elongated.

3.10 panel : Rectangular sheet of plywood constituting one of the six sides of a tea chest.

3.11 patch : A piece of sound veneer fitted in a sheet of veneer from which a defective part has been removed in such a manner that it is in contact with the surrounding veneer right round its perimeter.

3.12 ply : The individual layer of veneer in the plywood.

3.13 plywood : An assembly of plies bonded together with the direction of the grain in alternate plies usually at right angles. In general, the outer and inner plies are placed symmetrically on both sides of a central ply or a core.

3.14 rotary cutting : Production of veneer in a continuous sheet by feeding a log rotating on a lathe against a veneer knife parallel to the axis of the log.

3.15 **shook** : A bundle of 100 plywood panels of one particular size (tops, bottoms or sides) bound up sompletely for convenient transport.

3.16 slicing : Production of veneer by cutting a block of wood with a knife mounted approximately parallel to the longitudinal axis of the block.

3.17 split : A separation of fibres along the grain forming a crack or fissure in the veneer extending from one face to the other.

3.17.1 *closed split* : A split where the two adjacent edges of the broken veneers are in close contact with each other.

3.17.2 *open split* : A split where the adjacent edges of the broken veneers are not in close contact with each other.

3.18 veneer : A thin sheet of wood of uniform thickness obtained by slicing or rotory cutting.

3.19 warp : Distortion due to stresses causing departure from a plane of true form

3.20 incipient decay : Initial stage of decay, occasionally accompanied by a slight discolouration.

3.21 gap in core : A void in the core due to a split or edges of adjacent veneers in the same plane not being in contact.

3.22 overlap : A ridge like elevation noticeable on the surface of plywood due to the overlapping of the two adjacent pieces of core veneers.

3.23 open defect : A gap in the face or back plies occuring naturally or otherwise.

4 REQUIREMENTS

4.1 Materials

4.1.1 *Timber*

Timber used for manufacture of plywood panels shall be any of the species given in the Appendix A.

4.1.2 *Adhesive*

The adhesive used for bonding the veneers shall be such as to stand the test for water resistance specified in 7.1 and the glue adhesion test specified in 7.2 and shall also be such as not to impart any taint to tea.

4.2 Manufacture

4.2.1 *Veneers*

The veneers shall be either rotory cut or sliced. They shall be dried before bonding, preferably in a mechanical dryer to a moisture content not exceeding 12 per cent.

4.2.2 *Assembly*

The direction of grain of the veneers shall be at right angles in adjacent plies. A deviation in the direction of the grain not exceeding 10 degrees shall be permitted in adjacent plies. Face and back veneers may be of different species provided the construction is balanced and the two species have similar characteristics.

4.2.3 *Joints*

Where there are joints, the pieces joined shall have similar physical characteristics. Colour mismatch on one face shall be permitted. Not more than one tight joint shall be permitted in each ply, and neither piece shall be less than 100 mm wide except in the case of joints prepared mechanically and joined in a tapeless splicer, where up to five joints per ply shall be permissible. The veneers shall be securely joined together without overlap. End joints, that is joints across the grain shall not be permitted.

4.2.4 *Bond*

The adhesive shall be evenly spread to cover the entire surface. No unbonded area shall appear on separation of the veneers.

4.2.5 *Metal clips*

Any metal clips used for binding veneers during manufacture shall be removed.

4.2.6 *Moisture content*

After pressing the plywood, the finished plywood shall be re-conditioned to a moisture content not exceeding 15 per cent.

NOTE - As this is a specific application of plywood panels, the above requirements are considered sufficient although they may not be in full conformity with SLS 261 : 1974.

4.3 Dimensions

The lengths and widths of panels for different sizes of tea chests shall be as given in Table 1 subject to a tolerance of ± ½ mm.

The thickness of plywood panels shall not be less than 4 mm.

NOTE - The thickness of plywood panels for specific duties like containerized cargo will be reviewed when it becomes more widely acceptable.

4.4 Quality requirements

The quality requirements of plywood panels shall be as given in 4.4.1 to 4.4.11.

4.4.1 *Discolouration and stains*

Panels discoloured due to decay or fungus stains shall not be accepted.

4.4.2 *Knots*

4.4.2.1 Dead knots

Dead knots of diameter 6.0 mm or less shall be permitted, provided that such a dead knot is not within 40 mm of any edge of the panel. Dead knots larger than specified are acceptable if filled with a suitable material. Dead knots which are loose shall not be permitted.

4.4.2.2 Live knots

Live knots shall be permitted. No live knot over 12 mm in its widest dimension shall be within 40 mm of any edge of the plywood panel.

4.4.3 *Gap in core*

Gap in core shall not be wider than 5 mm, nor exceed a depth of 50 mm. Not more than two gaps per panel shall be permitted.

4.4.4 *Short core*

A short core at the edge of the panel not exceeding 5 mm depth may be permitted provided it does not exceed beyond 1/3 of the panel.

4.4.5 *Open splits*

Open splits on the face of a panel may be permitted if the split does not exceed 5 mm in width nor extend beyond ½ of the panel. An open split parallel to an edge shall not be closer than 40 mm.

A maximum number of two open splits may be permitted provided the splits which are on opposite faces are spaced not less than 40 mm from each other.

An open split shall be filled with resin based fillers.

4.4.6 *Insect holes*

Insect holes larger than 2 mm diameter shall not be permitted.

4.4.7 *Patches*

Defective portions in a veneer may be cut out and the portions so removed securely patched with sound pieces of matching veneer in the same grain direction. Not more than four patches per panel shall be permitted, and no patch shall exceed 50 mm in its maximum dimensions, except in the case of patches of width 12 mm and less where a maximum length of 100 mm may be permitted. The patches shall not be concentrated over a small area and shall be on one face of the panel only. Where the patching is done by mechanical means, a maximum dimension of 100 mm is permitted.

4.4.8 *Other defects*

Other defects such as delamination of plies, overlap of core or excessive warpage shall not be permitted.

4.4.9 *Water resistance of bond*

4.4.9.1 When tested in accordance with the procedure given in 7.1.2 none of the specimens shall delaminate more than 50 mm on any one side and shall offer a fair resistance to forcible separation of veneers by hand.

4.4.9.2 If tested in accordance with the alternate procedure given in 7.1.3 the average shear strength shall not be less than 540 N subject to a minimum individual of 440 N.

4.4.10 *Glue adhesion*

The shear strength of plywood shall not be less than 1.03 MN/m^2.

The method of test for shear strength shall be as specified in 7.2 and the criteria for conformity shall be in accordance with B.5.2.3.

4.4.11 *Moisture content*

The moisture content of plywood shall not exceed 15 per cent.

The method of test for moisture content shall be as specified in 7.3 and the criteria for conformity shall be in accordance with B.5.2.2.

4.4.12 *Finish*

The panels shall be of uniform thickness and finished smooth. Sanding shall be done where so required by the purchaser. The edges of the panels shall be trimmed square to within 3 mm per metre and free from excessive edge tears.

5 PACKING

The plywood panels shall be delivered in a clean and dry condition in shooks or otherwise as agreed with the purchaser.

6 MARKING

The panels shall be legibly and indelibly marked or stamped with the manufacturer's name or recognized trade mark. Each shook or package shall be

marked, with the month and year of manufacture.

The plywood panels may also be marked with the certification mark (illustrated on page 6) on permission being granted for such marking by the Sri Lanka Standards Institution.

7 METHODS OF TEST

7.1 Water resistance test

7.1.1 *Test pieces*

From each plywood panel of the sub sample 2 selected in accordance with the sampling procedure (see clause 8), two test pieces of size 150 mm x 150 mm shall be cut from sound portions.

7.1.2 *Procedure*

The test pieces shall be soaked in water at room temperature for 7 days. The pieces shall not touch the bottom and sides of the vessel in which they are kept. The water shall be changed every day. All the pieces shall be examined at the end of 7 days. A thin feeler gauge may be used for finding the extent of opening at the edges.

The extent of delamination shall comply with the requirements specified in **4.4.9.1.**

7.1.3 *Alternate procedure*

7.1.3.1 The test pieces shall be soaked in water at 27 ± 3 °C for 24 H. The pieces shall not touch the bottom and sides of the vessel in which they are kept. All the pieces shall be examined for delamination at the end of soaking period. The samples shall not show any delamination at the edges.

7.1.3.2 From each of the specimens examined under **7.1.3.1** three strips of 25 mm in width shall be cut and tested for glue shear strength as specified in the Appendix A of SLS 261 : 1974. The shear strength values obtained shall comply with the requirements specified in **4.4.9.2**

7.2 Glue adhesion test (dry state)

The plywood panels shall be tested for glue adhesion as specified in the Appendix A of SLS 261 : 1974.

7.3 Moisture content

The plywood panels shall be tested for moisture content as specified in the Appendix D of SLS 261 : 1974.

8 SAMPLING

The method of drawing representative samples of plywood panels and the criteria for acceptance shall be as given in Appendix B.

TABLE 1 - Dimensions of plywood panels

Location of panel	Chest size 600 x 400 x 400 mm	Chest size 600 x 500 x 400 mm
		2 panels 590 x 495 mm
Side	4 panels 590 x 395 mm	2 panels 590 x 395 mm
Top and bottom	2 panels 400 x 400 mm	2 panels 500 x 400 mm

NOTE - The use of the Sri Lanka Standards Institution Certification Mark (SLS Mark) is governed by the provisions of the Sri Lanka Standards Institution Act, and the regulations framed thereunder. The SLS mark on products covered by a Sri Lanka Standard is an assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by the Institution and operated by the producer. SLS marked products are also continuously checked by the Institution for conformity to that standard as further safeguard. Details of conditions under which a permit for the use of the Certification Mark may be granted to manufacturers or processors may be obtained from the Sri Lanka Standards Institution.

APPENDIX A

SPECIES OF TIMBER SUITABLE FOR THE MANUFACTURE OF PLYWOOD PANELS FOR TEA CHESTS

Local Name	Botanical Name
Andunwenna	Ilex zeylanica
Aridda	Campnosperma zeylanica
Beraliya	Doona cordifolia
Bomi	Litsea glutinosa
Diyapara	Wormia triquetra
Diyataliya	Mastixia tetrandra

Local Name	Botanical Name
Dorana	Dipterocarpus glandulosus
Etamba	Mangefera zeylanica
Godakirilla	Holoptelea integrifolia
Hal	Vateria copallifera
Hampalanda	Terminalia parvifolia
Havarinuga	Alstonia macrophylla
Hik	Lannea coromandelica
Hora	Dipterocarpus zeylanicus
Hulanidda	Shorea stipularis
Kankumbalketiya	Pygeum zeylanicum
Karavu	Prosorus indica
Katuboda	Cullenia zeylanica
Katuimbul	Salmalia malabarica
Kekuna	Canarium zeylanicum
Kokatiya	Garcinia terpnophylla
Kokun	Kokoona zeylanica
Kolon	Adina cordifolia
Malaboda	Myristica dactyloides
Mal veralu	Elaeocarpus glandulifer
Naimbul	Pometia eximia
Netavu	Xylopia parvifolia
Ovilla	Polyathia longifolia
Pelen	Kurrimia zeylanica
Rubber	Hevea brasiliensis
Talan	Litsea gardneri
Telambu	Sterculia foetida
Thiniya	Doona congestiflora
Toona	Cedrela toona
Ululu	Machilus macarantha
Velang	Pterospermum canescens
Wal beli (Beli patta)	Hibicus tiliaceus
Wal biling	Ailanthus triphysa
Wal Bulu	Terminialia belerica
Wal divul	Hydnocarpus octandra
Wal gonna	Ficus callosa
Wal waraka	Casearia zeylanica
Walukeena	Calophyllum bracteatum

APPENDIX B

SAMPLING

B.1 LOT

In a consignment all the panels of same type, size and manufactured under relatively similar conditions shall be grouped together to constitute a lot.

B.1.1 If the manufacturing conditions are not known consignments from different sources of supply shall be grouped into separate lots.

B.2 DEFECTIVE PANEL

A panel that does not conform to any one or more visual and dimensional requirements shall be considered as a defective panel.

B.3 SCALE OF SAMPLING

B.3.1 Each lot shall be inspected and tested separately for ascertaining conformity of the lot to the requirements of this specification.

B.3.2 The number of panels to be selected from the lot shall depend upon the size of the lot and shall be in accordance with Table 2.

B.3.3 The panels shall be selected at random. In order to ensure randomness of selection random number tables as given in SLS 428 shall be used.

TABLE 2 - Scale of sampling

Number of panels in the lot (1)	Stage of sample (2)	Sample size (3)	Cumulative sample size (4)	Acceptance number (5)	Rejection number (6)	Sub sample size (7)
Upto 1000	1st stage	13	13	0	3	3
	2nd stage	13	26	3	4	
1001 to 3000	1st stage	20	20	1	4	4
	2nd stage	20	40	4	5	
3001 to 10000	1st stage	32	32	2	5	5
	2nd stage	32	64	6	7	
10001 to 35000	1st stage	50	50	3	7	
	2nd stage	50	100	8	9	5
35001 and above	1st stage	80	80	5	9	
	2nd stage	80	160	12	13	7

B.4 NUMBER OF TESTS

B.4.1 The panels selected as in the first stage shall be examined for the visual and dimensional requirements (clauses 4.1.1, 4.3, 4.4 other than 4.4.4, 4.4.9, 4.4.10 and 4.4.11). If the number of defectives in the first stage, lies between acceptance number (column 5 of Table 2) and the rejection number (column 6 of Table 2) a second stage sample of size given in column 3 of Table 2 shall be drawn and examined for the visual and dimensional requirements.

B.4.2 If the lot has been found satisfactory with respect of visual and dimensional requirements, two sub samples, each having size as given in column 7 of Table 2 shall be selected at random.

Each panel of the sub samples shall be tested in accordance with Table 3.

TABLE 3 - Number of tests

Sub sample	requirements	
1	Assembly	(4.2.2)
	Joints	(4.2.3)
	Short core	(4.4.4)
	Bond	(4.2.4)
2	Water resistance	(4.4.9)
	Glue adhesion	(4.4.10)
	Moisture content	(4.4.11)

B.5 CONFORMITY TO STANDARD

The lot shall be considered as conforming to the requirements of this specification if the conditions given in B.5.1 and B.5.2 are satisfied.

B.5.1 Visual and dimensional requirements for panels

The number of defectives in the first stage sample is less than or equal to the corresponding first stage acceptance number given in Column 5 of Table 2,

OR

The number of defectives in the first stage and second stage samples (cumulative sample) is less than or equal to the corresponding second stage acceptance number given in column 5 of Table 2.

B.5.2 Other requirements

B.5.2.1 Each panel tested for assembly joints, short core, bond and water resistance satisfies the relevant requirements.

B.5.2.2 The value of the expression ($\bar{x}$ + 0.5R) (see Note 1) calculated using test results of moisture content is less than or equal to the corresponding limit in this specification.

B.5.2.3 The value of the expression ($\bar{\bar{x}}$ - 0.5$\bar{R}$) (see Note 2) calculated using test results of shear strength of glue adhesion is greater than or equal to the corresponding limit in this specification.

NOTES

1. *If one test result is obtained from each panel tested, the mean and range will be as follows :*

$$\bar{x} = \frac{\text{Sum of the test results}}{\text{Number of test results}}$$

R = *Difference between maximum and minimum values of the test results.*

2. *If more than one test result is obtained from each panel tested, the mean and range for each panel shall be calculated first. Then* $\bar{\bar{x}}$ *and* $\bar{R}$ *shall be calculated as follows :*

$$\bar{\bar{x}} = \frac{\text{Sum of average values}}{\text{Number of panels tested}}$$

$$\bar{R} = \frac{\text{Sum of range values}}{\text{Number of panels tested}}$$

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SRI LANKA STANDARDS INSTITUTION

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The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

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