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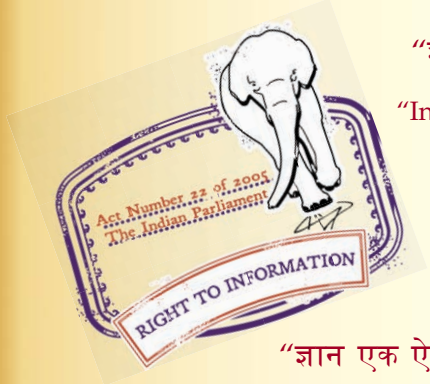
IS 652 (1960): Wooden Separators for Lead-Acid Storage Batteries [CED 20: Wood and other Lignocellulosic products]



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"Knowledge is such a treasure which cannot be stolen"

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IS : 652 - 1960
(Reaffirmed 2005)

Indian Standard

SPECIFICATION FOR WOODEN SEPARATORS FOR LEAD-ACID STORAGE BATTERIES

(Revised)

First Reprint JULY 1985

UDC 621·355·2·035·824 : 674-415

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Indian Standard

SPECIFICATION FOR WOODEN SEPARATORS FOR LEAD-ACID STORAGE BATTERIES

(Revised)

0. FOREWORD

0.1 This revised Indian Standard was adopted by the Indian Standards Institution on 5 January 1960, after the draft finalized by the Wood Products Sectional Committee had been approved by the Building Division Council.

0.2 The Indian Standard Specification for Wooden Separators for Lead-Acid Storage Batteries for Motor Vehicles IS : 652-1955 was first published in 1955. Current developments in battery design for higher performance, more power and less room capacity demand review of the existing specification for separators. Though timber separators have their limitations in regard to shaping and machining, it was felt that there was still room for improvement regarding width of ribs and dimensional tolerances. Flexibility has been introduced in the manufacture by omitting the thickness of webs and number of ribs per separator. Recent investigations indicated that though wooden battery separators always contained some traces of iron, it was found that within limits it had no harmful effect on the performance of the battery as a whole. As a result in this revision certain maximum limit of iron content is permitted in separators. At the time of revision, it was felt that the requirements of wooden separators for batteries other than motor vehicles would not be different and, therefore, the title and scope of this standard were modified accordingly. These modifications are introduced in this standard with a view to lining up the separator manufacture with that of the battery manufacture as a whole.

0.3 The species of timber specified in this standard have been recommended by the Forest Research Institute, Dehra Dun. The Institute has been carrying out experiments to discover further species which could be used for the purpose. It is hoped that when further research results become available, additions to the list of species specified in the standard shall be made.

0.4 The practice in the manufacture of separators is either to slice or saw the timber; the quality of the separator is not appreciably affected by the difference in practice. It may, however, be pointed out that sawing involves a considerable waste of timber.

0.5 Some battery manufacturers do their own grooving and finishing and, therefore, prefer the supply of veneers instead of ready-made separators. This standard does not specify the veneers separately but the specifications governing the quality and other requirements of the separators can be made the basis to check the quality of the veneers. Certain battery manufacturers prefer to treat the separators themselves and this standard may, therefore, be used for the purchase of untreated separators as well.

0.5.1 Note may be taken of the fact that insufficient treatment of separators may result in high electrical resistance in the battery and incomplete elimination of deleterious substances whereas overtreatment may result in the loss of mechanical strength of the separators.

0.6 Taking into consideration the views of producers, consumers and technologists, the Sectional Committee responsible for the preparation of this standard felt that it should be related to the manufacturing and trade practices followed in the country in this field. Furthermore, due weightage had to be given to the need for international co-ordination among standards prevailing in different countries of the world. These considerations led the Sectional Committee to derive assistance from the following publications:

No. C-305-1952 SPECIFICATION FOR WOODEN SEPARATORS FOR LEAD-ACID ACCUMULATORS. Standards Association of Australia.

REHMAN, M. A. AND JAI KISHEN. Indian Woods for Battery Separators. *Indian Forest Bulletin* No. 147 (1950).

VINAL, J. W. Storage Batteries. London. Chapman & Hall Ltd.

0.7 This specification requires reference to the following Indian Standards:

IS : 266-1950 SPECIFICATION FOR SULPHURIC ACID

IS : 707-1958 GLOSSARY OF TERMS APPLICABLE TO TIMBER, PLYWOOD AND JOINERY

IS : 1070-1957 SPECIFICATION FOR DISTILLED WATER

0.7.1 Wherever a reference to any Indian Standard mentioned in **0.7** or otherwise appears in this specification, it shall be taken as a reference to the latest version of the standard.

0.8 Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system.

0.9 This standard is intended chiefly to cover the technical provisions relating to wooden separators for lead-acid storage batteries, and it does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This standard covers the requirements for wooden battery separators used in lead-acid storage batteries.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply and for definitions other than those given below, reference may be made to IS : 707-1958.

2.1 Check — A fine crack.

2.2 Decay or Rot — Disintegration of wood tissues caused by fungus or other micro-organism. (The words 'Dote' and 'Rot' also mean decay).

2.3 Knot — A branch base embedded in the tree or timber.

2.3.1 *Dead Knot* — A knot which is not held firmly in place.

2.3.2 *Live Knot* (*Sound Knot*) — A knot free from decay and other defects, firmly intergrown with the surrounding wood.

2.4 Pin-Hole — A hole not more than 1·6 mm in diameter usually dark stained and not containing bore dust or frass.

2.5 Resin-Pocket (Pitch-Pocket) — Accumulation of resin between growth rings of coniferous wood as seen on the cross-section.

2.6 Resin-Streak (Pitch-Streak) — An opening along the grain following the growth rings and containing resins.

2.7 Rib — The raised portion of a separator.

2.8 Sapstain — A form of stain in the sapwood producing discolouration.

2.9 Split — A crack extending from one face to another face.

2.10 Web — The grooved portion of a separator.

3. MATERIAL

3.1 Timber used for the manufacture of separators shall be from amongst the species given in Table I.

TABLE I SPECIES OF TIMBER FOR MANUFACTURE OF SEPARATORS

BOTANICAL NAME	TRADE NAME	ABBREVIATION
Abies pindrow Spach	**fir**	FIR
Cedrus deodara Loudon	**deodar**	DEO
* *Chamæoyparis lawsoniana*	**Port Orford cedar**	POC
Cupressus torulosa Don	**cypress**	CYP
Michelia champaca Linn.	**champ**	CHM
Picea smithiana Boiss	**spruce**	SPR
* *Pseudotsuga taxifolia*	**Oregon pine or Douglas fir**	DFR

* Imported timber.

3.2 Veneers used in the manufacture of separators shall be of straight grain and uniform quality and shall be smoothly finished. They shall be free from checks, decay or rot, knots resin pockets and splits, except sound knots of maximum diameter of 2 mm to the extent of one per separator.

3.2.1 Small resin streaks not exceeding 12 mm in length and not going through the thickness of the separator which is not removed on treatment may be permitted.

3.2.2 The veneers shall be of natural colour. Slight variations in colour shall be permissible, provided the separators are free from resin, sapstain or other extraneous matter.

4. MANUFACTURE AND TREATMENT

4.1 Separators shall be grooved and dressed to comply with requirements sepcified in **5** (*see also* Fig. 1).

4.2 Separators shall be suitably treated.

NOTE — There are different methods of treatment in vogue; one method found suitable by investigations conducted in the Forest Research Institute, Dehra Dun is given below:

Separators shall be boiled in 2 percent solution of caustic soda for 3 to 5 hours. Fresh solution shall be used for each batch. They shall then be washed in cold water

until the water remains free from discolouration. They shall subsequently be immersed in cold, 10 percent (by weight) sulphuric acid (sp-gr 1·069) for 1 to 2 days, and then washed in cold running water for 5 to 6 hours. Alternatively, the separators shall be treated with 1 percent (by weight) sulphuric acid (sp-gr 1·006 at 21°C) maintained at about 93°C for one hour and then washed in water.

4.3 Treated separators shall be dipped in or sprayed with one percent aqueous emulsion of rosha grass oil and thymol in the proportion of 2 : 1 (by volume) or any other suitable anti-fungus treatment during storage and transit.

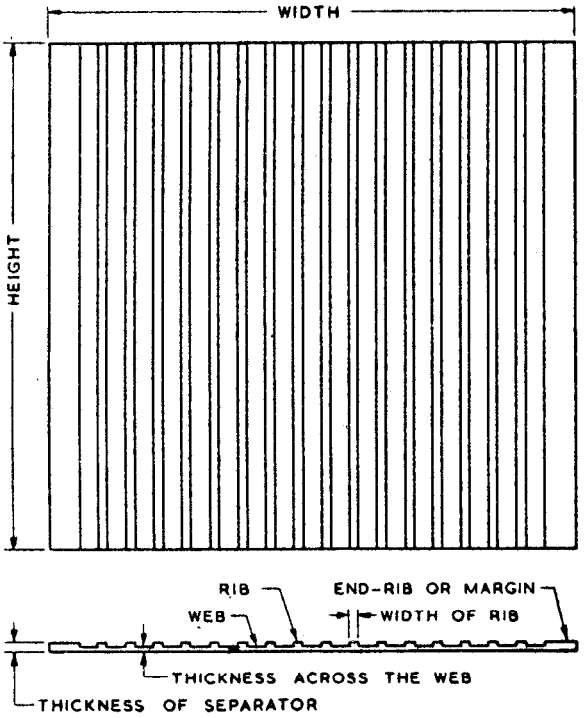

FIG. 1 WOODEN SEPARATOR

4.4 Separators shall then be stored moist in a cool place until required for use.

5. DIMENSIONS AND TOLERANCES

5.1 The width, height and thickness of separators shall be sepcified by the purchaser. Unless otherwise specified, these dimensions shall apply to the finished and treated separators in their green condition (that is, with more than 25 percent moisture content). Where dry or untreated separators are supplied, the dimensions of ribs, end-ribs and webs shall be subject to agreement between the purchaser and the vendor.

5.2 The width of ribs shall be not less than 1·5 mm.

5.3 The width of the end-ribs or margins of separator shall be not less than 6·5 mm and not greater than 10·0 mm.

5.4 The combined area of the ribs and margins shall be not less than 25 percent nor more than 40 percent of the face area of the separators.

5.5 The following tolerances shall be permissible:

	mm
Width	+0·75 −0·00
Height	+0·00 −0·75
Thickness, total	±0·05
Thickness, web	±0·05

5.5.1 To ensure squareness of the separators, the diagonals shall not differ by more than 1·5 mm.

6. ELECTRICAL RESISTANCE

6.1 Unless specified otherwise by the purchaser, the electrical resistance of the separator, as measured by the method given in Appendix A, or any other method shall be as follows:

THICKNESS OF SEPARATOR	ELECTRICAL RESISTANCE *Max* ohm/cm²
Not exceeding 1·88 mm (for motor vehicles)	0·2
Not exceeding 3·2 mm (for train lighting)	0·4

6.1.1 In case of dispute, values as determined by the method given in Appendix A shall be binding.

7. MANGANESE CONTENT

7.1 The manganese content in the separators, as determined by the method given in Appendix B, shall not exceed 1·5 mg per 100 g of oven-dry separator.

8. IRON CONTENT

8.1 The iron content in the separators, as determined by the method given in Appendix C, shall not exceed 0·06 g of iron per 100 g of oven-dry weight of the separator.

9. VISUAL INSPECTION

9.1 To check compliance with the requirements specified in **3.2**, **3.2.1** and **3.2.2**, each separator shall be held by the margin and examined against light. A slight flexure shall be given to find out the presence of splits.

10. PACKING AND MARKING

10.1 Separators shall be packed in batches of 100 in suitable air-tight containers to prevent them from drying during transit and storage.

10.2 Each separator package shall be legibly and indelibly marked with the following information:

a) Manufacturer's name or trade mark,

b) Species of timber from which the separator is manufactured (*see* **3.1** for abbreviations), and

c) Month and year of manufacture.

10.2.1 Each separator package may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, 1952 and the Rules and Regulations made thereunder. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(*Clause* 6.1)

MEASUREMENT OF ELECTRICAL RESISTANCE OF SEPARATORS

A-1. GENERAL

A-1.1 The resistance of a specially constructed cell is measured with the separator interposed across the path of the current under otherwise comparable conditions. In the first instance the ordinary separator is used and the internal resistance of the cell determined; then a separator with a hole coinciding with the hole in the baffle is used and internal resistance of the cell again determined. The difference between the two measurements is the effective resistance of the separator.

A-1.2 A cell suitable for this test is illustrated in Fig. 2. It contains two baffles which have round holes of 9 cm diameter. When the separator is inserted between the baffles, the current flow is restricted to a separator area of about 65 cm^2, and hence the test gives the resistance over this area. The plates used in the cell are negative formed but uncharged, and need to be renewed every few months.

A-2. PROCEDURE

A-2.1 Conditioning of Separator — Keep the separators with and without the holes in dilute sulphuric acid of sp-gr 1·280, prepared by suitably diluting concentrated battery grade sulphuric acid (conforming to IS : 266-1950), for 14 days before their resistance is measured.

A-2.2 Fill the cell to a level above the top of the baffle holes with sulphuric acid of sp-gr 1·280 prepared as described under **A-2.1**, and maintain at a temperature of 27°±2°C as the resistance of separators varies considerably with temperature.

A-2.3 Measure the resistance of the cell with the separators with and without the hole, using an alternating-current bridge such as that shown in Fig. 3, one arm being shunted with a variable condenser to obtain a reactive balance. The amplifier should contain a filter or other device to eliminate the effect of harmonics generated by the non-linear characteristics of the cell.

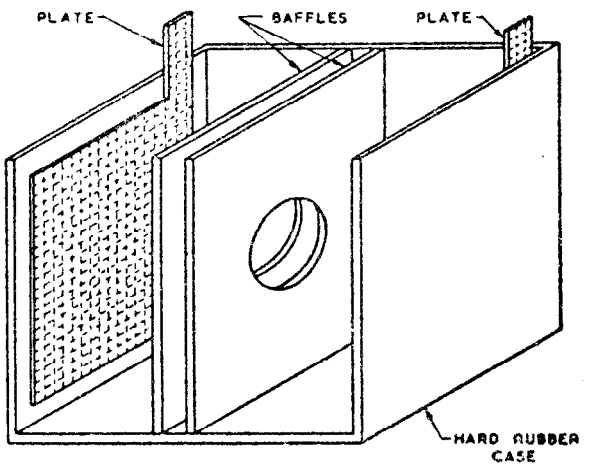

FIG. 2 CELL WITH NEAR SIDE REMOVED

A-2.4 Report the difference in resistances with and without the hole in separator, as ohms per square centimetre of the face area of the separator.

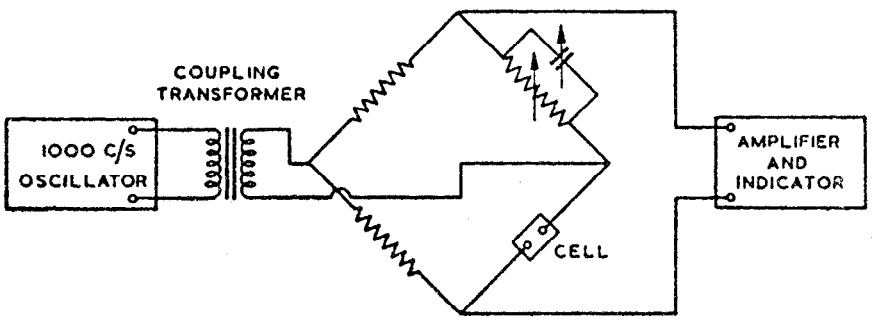

FIG. 3 CIRCUIT DIAGRAM OF TYPICAL AC BRIDGE FOR MEASURING CELL RESISTANCE

APPENDIX B

(*Clause* 7.1)

DETERMINATION OF MANGANESE CONTENT OF WOODEN SEPARATORS

B-1. GENERAL

B-1.1 Two methods have been prescribed. Method I, which is more accurate, shall be used in case of dispute. Method II is a control method for use by a manufacturer not having access to the apparatus required for Method I.

B-2. REAGENTS

B-2.0 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1957) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the experimental results.

B-2.1 The following reagents are required.

B-2.1.1 *Concentrated Sulphuric Acid* — sp-gr 1·84 (conforming to IS : 266-1950).

B-2.1.2 *Orthophosphoric Acid* — approximately 85 percent.

B-2.1.3 *Potassium Periodate* — solid.

B-2.1.4 *Standard Manganese Sulphate Solution* — Dissolve 0·030 8 g of manganese sulphate monohydrate in about 200 ml of water. Add about 20 ml of concentrated sulphuric acid followed by 5 ml of orthophosphoric acid. Add 3·0 g of potassium periodate, boil the solution for 2 minutes, and, after cooling, dilute to one litre. Take 10 ml of this solution and again dilute to 100 ml. One millilitre of the final solution contains 0·001 mg of manganese (Mn). The solution shall be stored in a cool dark place.

B-2.1.5 *Standard Potassium Permanganate Solution* — Dissolve 0·014 0 g of potassium permanganate in one litre of water to which one millilitre of concentrated sulphuric acid has been added. Keep the solution in a cool place in glass-stoppered bottles.

B-3. PROCEDURES

B-3.1 Method I — Select at least eight separators at random and break them into small chips. After thorough mixing, take a sample of about 10 to 12 g and place it in a tared weighing bottle. Oven-dry the sample for 16 hours at 105°±2°C, weigh accurately and transfer to a platinum or silica dish. Ignite the material in a muffle furnace at a dull red heat for approximately one hour. If necessary, stir the ash with a piece of platinum wire to ensure complete combustion. Cool the ash in a desiccator, moisten with water, add 2 to 3 ml of concentrated sulphuric acid followed by 0·5 ml of concentrated orthophosphoric acid. Next, add 10 ml of water and heat the dish and its contents on a boiling water-bath until all the material is dissolved. If there is any insoluble residue or turbidity, filter the solution. Transfer the solution to a 100-ml beaker, using sufficient water to provide approximately 50 ml of solution. Add 0·3 g of potassium periodate, boil the solution for two minutes and, after cooling, make it up to 50 to 100 ml, depending on the colour obtained, and compare in a colorimeter with the standard manganese sulphate solution. Conduct control determinations on the reagents and apply corrections, if necessary. Express the amount of manganese present as milligrams of manganese per 100 g of oven-dry wood.

B-3.2 Method II — Select eight separators from a batch at random and take four of these for the first test. Divide each separator into four equal quarters and take one quarter from each separator. Break the four selected quarters into small chips and place them into a 75-mm diameter porcelain basin. The basin should be checked before use to ensure that the porcelain is not cracked or crazed, as that may lead to erroneous results. Partly cover the basin with a piece of asbestos sheet and place the basin on a small Bunsen flame away from draughts. When most of the wood has been destroyed, increase the flame to complete the combustion. If necessary, stir the partly carbonized sample with a piece of platinum wire to ensure complete combustion.

Allow the basin to cool, and moisten the ash carefully with a few drops of water. Add a few drops of concentrated orthophosphoric acid followed by 4·5 ml of concentrated sulphuric acid from a measuring cylinder. Heat the basin and contents for a few minutes to dissolve the ash. After cooling, add 4·5 ml of water followed by a small quantity of potassium periodate (enough to cover the tip of a small pocket knife). Simmer gently for 3 to 4 minutes, allow to cool, and pour through a glass funnel into a 25-ml graduated flask. Rinse the basin carefully with water, and transfer the rinsings to the graduated flask. Make up the solution in the flask to the graduation mark by the addition of water, mix the contents thoroughly and then transfer to a test tube (measuring approximately 150 mm in length and having 19 mm internal diameter) for comparison with the same volume of the standard potassium permanganate solution in the same type of test tube. Compare the pink liquids by looking down through the liquids on a sheet of white paper.

B-3.2.1 If the colour of the test sample is darker than the standard solution, there is too much manganese present. If the colour is the same, or lighter, the sample is satisfactory in regard to manganese.

B-3.2.2 Repeat the above procedure on a further set of four separators. If the second result also shows that the manganese content of the separators is satisfactory, it may be taken that the manganese content is within the limit required.

APPENDIX C

(*Clause* 8.1)

TEST FOR IRON IN WOODEN SEPARATORS

C-1. REAGENTS

C-1.0 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1957) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the experimental results.

C-1.1 The following reagents are required:

a) *Sulphuric Acid* — sp-gr 1·200.

b) *Potassium Permanganate Solution* — approximately one percent.

c) *Ammonium Thiocyanate Solution* — approximately 10 percent.

d) *Standard Iron Solution* — Dissolve 1·404 4 g of ferrous ammonium sulphate in 100 ml of water. Add 25 ml of sulphuric acid of 1·200 sp-gr followed drop by drop by one percent solution of potassium permanganate to a slight excess. Transfer the solution to a 2-litre flask and dilute to the mark. This solution contains 0·10 mg of iron per ml of the solution.

C-2. PROCEDURE

C-2.1 Break, tear, or shred the separator into suitable small strips and put into a clean 250-ml glass-stoppered wide-mouthed bottle. Add 250 ml of sulphuric acid and allow to stand for 18 hours at room temperature. Transfer the acid to a 500-ml graduated flask. Rinse the bottle and the separators several times with distilled water and pour rinsings into the flask. Make up the solution in the flask up to 500 ml with distilled water and mix thoroughly. Pipette an aliquot of the above (usually 25 to 30 ml) into a beaker, heat to near boiling and add potassium permanganate solution, drop by drop, until the slight pink colour does not disappear after 3 or 4 minutes. When the permanent colour is secured, transfer the solution to a 100-ml Nessler tube and cool under the tap. When cool, add 5 ml of ammonium thiocyanate solution and dilute to the mark.

C-2.1.1 Carry out a blank test with the standard iron solution following the same procedure as under **C-2.1**, using the same quantities of reagents without the separator sample. Compare the colour developed in the two Nessler tubes.

C-2.1.2 The iron in the separator shall be taken to be within the permissible limit if the intensity of the colour produced in the test with the separator is not deeper than that produced in the blank test containing the permissible quantity of iron as added from the standard solution [*see* **C-1.1** (d)].