



भारत सरकार
GOVERNMENT OF INDIA
रक्षा मंत्रालय
MINISTRY OF DEFENCE

संयुक्त सेवा विनिर्देश
JOINT SERVICES SPECIFICATION

ON

CELLULOID SHEET, TRANSPARENT
(DCAN 1375-000 200)

मानकीकरण निदेशालय
रक्षा उत्पादन विभाग
रक्षा मंत्रालय
'एच'-ब्लॉक, निर्माण भवन डाकघर
नई दिल्ली-११००११

DIRECTORATE OF STANDARDISATION
DEPARTMENT OF DEFENCE PRODUCTION
MINISTRY OF DEFENCE
'H' BLOCK, NIRMAN BHAVAN POST OFFICE
NEW DELHI-110 011

LIST OF MEMBERS ASSOCIATED WITH FORMULATION OF THIS STANDARD

1. This Joint Services Specification has been approved by Shri RS Gauba, Sc 'G', Associate Director, PO-II, DRDO, Chairman, Armament Standardisation Sub-committee by circulation.
2. The representatives of following organisations have been present/consulted in approving the document:

S. No.	Organisations
1.	Programme Office-II, DRDO Orgn, New Delhi
2.	ADGWE/GS (WE-2/3), New Delhi
3.	Dte of Arty (GS/Artillery-5), New Delhi
4.	Dte Gen of Naval Armt, Naval HQ, New Delhi
5.	Dte of Armt & Safety Eqpt, Air HQ, New Delhi
6.	DGEME, Army HQ, New Delhi
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13.	HEMRL, DRDO, Pune
14.	ARDE/DRDO Orgn, Pune
15.	Ammunition Factory, Pune
16.	Secretary ASSC

RECORD OF AMENDMENTS

Amendment		Amendment pertains to S. No./Para No./ Column No.	Authority	Amended by	Signature & Date
No.	Date			Name & Appointment (In Block Letters)	

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0. FOREWORD

0.1 This Joint Services Specification has been prepared by Armament Standardisation Sub Committee on the authority of the Standardisation Committee, Ministry of Defence.

0.2 This specification has been approved by the Ministry of Defence and is mandatory for use by the Defence Services.

0.3 This JSS 1375-03 : 2016 (Fourth Revision):

- a) was prepared in the year 1988.
- b) was revised in the year 1998, 2004 & 2011 and supersedes the same.

0.4 This specification would be used for Manufacture, Supply and Quality Assurance of Celluloid sheet, Transparent.

0.5 Quality Assurance Authority for the item covered in this specification is the Controller, Controllerate of Quality Assurance (Military Explosives), Aundh Road, Pune-411 020. Enquiries regarding technical parameters shall be addressed to the Quality Assurance Authority, while other enquiries shall be referred to:

The Director,
Directorate of Standardisation,
Ministry of Defence,
'H' Block, Nirman Bhawan PO,
New Delhi-110 011.

0.6 Non registered users can obtain the following on payment:

a) Copies of IS from:

Bureau of Indian Standards,
Manak Bhawan,
9, Bahadur Shah Zafar Marg,
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their regional/Branch offices.

b) Copies of JSSs/JSGs from:

The Director,
Directorate of Standardisation,
Standardisation Documents Centre,
Ministry of Defence,
Room No. 05, 'J' Block,
Nirman Bhawan PO,
New Delhi-110 011.

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0.7 Indian Standard (IS) specifications are available free of cost for registered users on:

Directorate of Standardisation Website:

www.ddpdos.gov.in

For registration visit our website.

0.8 This specification holds good only for the supply order for which it is issued.

0.9 Directorate of Standardisation Website - All the approved JSSs/JSGs are available on the Directorate of Standardisation Website ***www.ddpdos.gov.in***. Defence Organisations desirous of accessing a copy of this document are requested to approach the Directorate of Standardisation for obtaining user id/password to access the website.

1. SCOPE

This specification is meant to govern Manufacture, Supply and Quality Assurance of Celluloid sheet, Transparent suitable for use in Ammunition stores.

2. RELATED SPECIFICATIONS/DOCUMENTS

2.1 Reference is made in this specification to:

<i>S. No.</i>	<i>Specification/ Document No.</i>	<i>Nomenclature</i>
a)	IS 138 : 1992 (Third Revision) AMD 1 Reaffirmed 2014	Ready Mixed Paint, Marking, for Packages and Petrol Containers-Specification
b)	IS 1060 (Part 1) : 1966 (Revised) AMD 5 Reaffirmed 2014	Methods of Sampling and Test for Paper and Allied Products : Part 1
c)	IS 1448 (Part 25) : 1976 (First Revision) Reaffirmed 2013	Methods of Test for Petroleum and its Products Part 25 Determination of Kinematic and Dynamic Viscosity
d)	IS 2500 (Part 1) : 2000 (Third Revision) AMD 2 Reaffirmed 2016	Sampling Procedures for Inspection by Attributes Part 1 Sampling Schemes Indexed by Acceptance Quality Limit (AQL) for lot-by-Lot Inspection
e)	JSS 6810-125 : 2014 (Third Revision)	Carbamite
f)	JSS 8135-14 : 2016 (Third Revision)	Paper Manifold and Paper Tissue
g)	IND/ME/458	Camphor
h)	Drawing No. CI/M/27	Stopper tube

2.2 Copies of IND/ME Specifications and Drawing No. CI/M/27 are obtainable on payment from:

The Controller,
Controllerate of Quality Assurance (Military Explosives),
Aundh Road,
Pune-411 020.

3. MATERIAL

3.1 The Celluloid sheet, Transparent consists of a colloid of Nitrocellulose and Camphor. The Nitrocellulose shall meet the requirements as per the end use given below.

3.1.1 For use in making Celluloid components like sleeves, primer tubes etc.-Nitro Celluloid type-I having Nitrogen content 11.2% *Min* and 11.6% *Max* and Viscosity $3.0 \pm 0.2 \times 10^{-6} \text{ m}^2/\text{s}$ as determined by method described at APPX 'A'.

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3.1.2 For use in making Celluloid containers (Horse Shoe Type)-Nitro Celluloid type-II having Nitrogen content 10.2% *Min* and 11.0% *Max*.

3.2 It must contain no other ingredients except small quantities of approved stabilising and/or gelatinising agents and no impurities which are not in nature and amount normal to Celluloid, made from such ingredients.

3.3 The material must be in the form of flat, rectangular, transparent sheets, practically colourless and with polished surfaces. It must be practically free from visible foreign matter and from holes, hard spots and lumps. The edges must be clean, straight and square cut.

3.4 Each sheet of a consignment must be of uniform thickness. The sheets supplied must be of such quality that they will not appreciably shrink or warp under ordinary storage conditions. A consignment may be retained for one month before inspection is completed.

4. MANUFACTURE

4.1 Celluloid sheet, Transparent shall be manufactured by a process which will produce the product conforming to this specification.

4.2 Ingredients

The ingredients shall conform to the respective specification (amended to date) as given below:

<i>S. No.</i>	<i>Ingredients</i>	<i>Specification</i>
a)	Nitrocellulose	(See Clause 3)
b)	Camphor	IND/ME/458
c)	Carbamite	JSS 6810-125

4.3 Composition

The composition of the material, free from volatile matter, must be as follows:

<i>S. No.</i>	<i>Ingredients</i>	<i>Percent</i>
a)	Nitrocellulose	75 ±3
b)	Camphor	25 ±3
c)	Carbamite	2.0 ±0.2 part per100 parts of Celluloid Composition

5. TENDER SAMPLE

The manufacturer/supplier/contractor shall submit two tender samples each of 250 g in mass in sheets of 30 cm x 30 cm essentially from the same batch/lot of manufacture, free of all charges and conforming to this specification, to the Quality Assurance Authority/Quality Assurance Officer, as stated in the contract.

6. PRE-INSPECTION OF STORES/CONSIGNMENT

6.1 Manufacturers/Contractors must satisfy themselves that the 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 a necessary pre-inspection has been carried out on the stores tendered will be submitted alongwith the challan. The declaration will also indicate the method followed in carrying out pre-inspection showing the features checked/tested and will have the test certificate attached to the challan/declaration.

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

7. QUALITY ASSURANCE

7.1 Inspection

Celluloid sheet, Transparent and the packages in which it is packed shall be subject to inspection by and to the approval of the Quality Assurance Officer/Quality Assurance Authority.

7.2 Sampling

7.2.1 Normally 500 to 1000 sheets of Celluloid sheet, Transparent are offered for inspection per lot. The sampling procedure shall be in accordance with Table I Inspection Level II of IS 2500 (Part 1). 20 representative samples amount to minimum of 250 g shall be drawn from each lot.

7.2.2 Samples of the material and of the packages may be taken from any portion of the lot/consignment.

7.3 Criteria for Conformity

If on examination, any sample is found not to conform to this specification, the whole lot/consignment may be rejected.

7.4 Test Requirements

7.4.1 Samples taken from any portion of the lot/consignment of material shall conform to Clauses 3 and 4.2 and in addition, shall conform to the test requirements shown in the following tables:

7.4.2 Chemical

<i>S. No.</i>	<i>Characteristic</i>	<i>Passing Standard</i>	<i>Test Method</i>
a)	Volatile Matter, percent by mass	1.6 Max	APPX 'B'
b)	Surface acidity	Shall pass the test	APPX 'C'

Chemical (Concluded)

<i>S. No.</i>	<i>Characteristic</i>	<i>Passing Standard</i>	<i>Test Method</i>
c)	Nitrogen content calculated on dry material free from mineral matter, percent by mass		APPX 'D'
	1) For use in the making celluloid components like, Sleeves, Primer tubes etc.	11.2 <i>Min</i> 11.6 <i>Max</i>	
	2) For use in making celluloid containers (Horse Shoe type)	10.2 <i>Min</i> 11.0 <i>Max</i>	
d)	Mineral matter, percent by mass	0.5 <i>Max</i>	APPX 'E'
e)	Sulphur compounds calculated as H ₂ SO ₄ , percent by mass	0.15 <i>Max</i>	APPX 'F'
f)	Shelf life	One year	-

7.4.3 Physical

<i>S. No.</i>	<i>Thickness in mm</i>	<i>Bursting Strength</i>		<i>Test Method refer to IS1060 (Part 1)</i>
		<i>Kilo pascal</i>	<i>(kg/cm²)</i>	
a)	0.13 ±0.02	416.8 to 833.6	4.25 to 8.50	12.4
b)	0.25 ±0.03	833.6 to 1961	8.50 to 20.0	12.4
c)	0.75 ±0.02	-	-	-

7.4.4 Stability Test

<i>S. No.</i>	<i>Characteristic</i>	<i>Passing Standard</i>	<i>Test Method</i>
a)	Small vessel test at 100°C	Shall pass six periods	APPX 'G'
b)	Puffing point	170°C <i>Min</i>	APPX 'H'
c)	Puffing time at 160°C ±1°C	60 minutes <i>Min</i>	APPX 'J'

8. WARRANTY

The store supplied against this specification shall be deemed to bear warranty for 12 months from the date of receipt of store at consignee's end and against defective design/material/workmanship/performance. If during this period any of the stores supplied is found defective, the same shall be rectified/replaced by the contractor, free of charge, at the user's premises within a period of three months from date of intimation of defect.

9. PACKAGING

9.1 The Celluloid sheets must be interleaved with tissue paper conforming to JSS 8135-14 and wrapped in suitable numbers in clean stout paper. Each parcel is to be tightly packed in stout, well-fitting wooden case in such a manner as to ensure that the sheets remain flat and undamaged.

9.2 Any other form of packages shall have the prior approval of the Quality Assurance Officer/Quality Assurance Authority.

9.3 The presence of foreign matter or impurities in any of the packages shall render the whole lot/consignment liable to rejection.

10. MARKING

10.1 All packages containing the material shall indelibly and legibly be marked with the following details:

- a) Package should be marked 'INFLAMMABLE' in red colour.
 - b) Nomenclature and specification No. of the material.
 - c) Name and address of the consignee.
 - d) * A/T or SO No. and date.
 - e) * Consignment No.
 - f) Lot No. and date of manufacture.
 - g) * Gross and net mass.
 - h) Consecutive No. of packages and total number of packages in the consignment.
 - j) * Date of supply.
 - k) Manufacturer's name and initial or his recognised trademark.
- * Not applicable when the store is manufactured in Ordnance Factories.

10.2 In addition to the above, the Quality Assurance Officer may suggest some more markings/identifications suitable at the time of inspection.

10.3 The paint used for marking should conform to IS 138 (latest issue) and to the satisfaction of the Quality Assurance Officer/Quality Assurance Authority.

11. SAFETY OF OPERATIONS

11.1 Nothing in this specification shall relieve the manufacturer/contractor/user of his responsibility for the safety of his operation during manufacture, storage and transit or use of the store.

11.2 Safety Certificate No.SC/Prop/63/21 is applicable and can be obtained on application from the Controller, Controllerate of Quality Assurance (Military Explosives), Aundh Road, Pune-411 020.

12. DEFENCE CATALOGUE NUMBER

The Defence Catalogue Number allotted to this store is 1375-000 200.

13. SUGGESTIONS FOR IMPROVEMENT

Any suggestion for improvement in this document may be forwarded to:

The Director,
Directorate of Standardisation,
Ministry of Defence,
'H' Block, Nirman Bhawan PO,
New Delhi-110 011.

DETERMINATION OF VISCOSITY

Prepare solvent mixture with the following composition:

Ethyl alcohol (Rectified spirit) = 25 parts by mass

Ethyl Acetate = 20 parts by mass

Toluene = 55 parts by mass

Dissolve 1.0 g prepared material in 99.0 g of solvent mixture. When solution is complete, determine the viscosity of the solution as laid down for liquids in IS 1448 (Part 25). Express the results in SI Units.

VOLATILE MATTER

5 g of coarsely ground material (M_1) is exposed for 48 hours under a bell-jar in vacuum over concentrated Sulphuric acid. Take the weight (M_2). The loss in mass is considered to be content of volatile matter in the sample.

$$\text{Volatile Matter Content, percent by mass} = \frac{(M_1 - M_2)}{M_1} \times 100$$

SURFACE ACIDITY TEST

C-1. 2 g of fresh and finely ground matter are added to a mixture of 10 ml of distilled water and 0.5 ml of 0.2 percent Alcoholic solution of Dimethyl Amino-Azo-Benzene in a test tube of 1.5 cm diameter which is closed by a cork covered with tin foil. The mixture is immediately and thoroughly shaken and allowed to stand for 3 hours with intermittent shaking. The colour of the contents of the tube is then compared with that of the standard colour tube, the comparison being made immediately after both tubes have been agitated. The colour of the sample must not be darker than that of standard.

C-2. The standard colour is prepared as follows:

5 ml of the above 0.2 percent Alcoholic solution of Dimethyl Amino-Azo-Benzene indicator solution, 6.1 ml of N/10 Hydrochloric acid and 3.9 ml of a solution containing 21 g of Citric acid crystals (Monohydrate) and 200 ml of normal Sodium hydroxide solution per litre are placed in a similarly stoppered tube. 0.1 g of a pure white, Whatman filter paper is added and the tube shaken vigorously until the paper is completely disintegrated.

NITROGEN CONTENT OF EXTRACTED NITROCELLULOSE

The material is extracted in a soxhlet apparatus with Chloroform for 20 hours. The extracted Nitrocellulose is placed in a closed vessel through which steam is passed for 2 hours. It is then dried in vacuum over concentrated Sulphuric acid and the Nitrogen content is determined by means of Nitrometer.

APPX 'E'
(Clause 7.4.2)

DETERMINATION OF MINERAL MATTER

E-1. Prepare the material as described in APPX 'A' and weigh 5.0 g into a tared crucible. Cover the material in the crucible with molten Paraffin wax or low molecular mass Polythene and determine the mass of Hydrocarbon added to the nearest 0.5 g. Heat the mixture gently until it ignites and allow it to burn without further external heating. Finally burn off all carbonaceous matter, allow the residue to cool and wet it thoroughly with 2 ml of 5 per cent Ammonium carbonate solution. Evaporate to dryness on a water bath and heat the residue to constant mass in an oven at 105°C to 110°C. Repeat the process of carbonation and drying until the residue is constant in mass.

E.2. Carry out a blank determination under identical conditions using an equal amount of the Hydrocarbon ashing aid, to find the mass of residue from the ashing aid and the Ammonium carbonate solution. Calculate the mineral matter from the expression.

E-3. Calculation

$$\text{Mineral matter, percent by mass} = \frac{(M_1 - M_2)}{M} \times 100$$

where,

M = Mass in g of the sample taken;

M_1 = Mass in g of the residue from the sample; and

M_2 = Mass in g of the residue from the blank.

DETERMINATION OF SULPHUR COMPOUNDS

F-1. Weigh accurately about 0.5 g of the sample and transfer into a 500 ml tall pyrex beaker. Add 15 ml of concentrated Nitric acid and the material is completely wetted with the same. Add gradually 1 g to 2 g Potassium chlorate and warm very gently until all Potassium chlorate is dissolved. Place the beaker on a sand bath.

F-2. Start heating gradually with a bunsen burner. The addition of 1 g of Potassium chlorate at an interval of every 10 minutes is continued till all the material is oxidised i.e. clear solution is obtained. The quantity of Nitric acid is replenished in order that the contents of the beaker do not become completely dry.

F-3. A similar quantity of Nitric acid and Potassium chlorate is taken in another beaker to serve as a blank for ingredients used. The contents after complete oxidation are evaporated to near dryness. Add 20 ml of concentrated Hydrochloric acid and evaporate to dryness. The process of addition of concentrated Hydrochloric acid is repeated twice and evaporated to dryness to remove the last traces of Nitric acid completely.

F-4. Add 50 ml of dilute Hydrochloric acid (1:2), warm a little and then filter the solution into a beaker and make up the volume of the filtrate to about 500 ml and take to boiling. To the boiling solution, add slowly 10 ml of 10 percent Barium chloride solution with stirring and digest on sand bath for 30 minutes. Allow to stand overnight and the contents of the beaker with precipitate are then filtered through No. 42 Whatman filter paper. Wash the precipitate with hot water till all chlorides are removed. Test the filtrate for freedom from chlorides by adding a few drops of Nitric acid followed by dilute Silver nitrate solution. When the filtrate is free from chlorides, dry the precipitate in water oven and then ignite in a crucible in muffle furnace and weigh after cooling. Carry out a blank using same quantity of the reagents and under identical conditions. Deduct the quantity of the precipitate in the blank. The excess obtained is the quantity representing Sulphate content of the sample to be calculated as Sulphuric acid.

F-5. Calculation

$$\begin{array}{l} \text{Sulphur Compounds calculated} \\ \text{as H}_2\text{SO}_4, \text{ percent by mass} \end{array} = \frac{\text{Mass in g of BaSO}_4 \times 0.4202 \times 100}{M}$$

where,

$$M = \text{Mass of sample taken.}$$

SMALL VESSEL TEST AT 100°C

G-1. Extract 2 g of grained celluloid of the Heat Test size (all passes through 2.0 mm and all retained on 1.0 mm sieve) are placed in a glass apparatus (Drawing No. CI/M/27) which has been previously weighed and heated in a bath maintained at 100°C. The vessel is taken out of the bath at the end of each period of 24 hours, allowed to cool and weighed. The percent loss in mass of the material is noted. The test is carried out in duplicate.

G-2. The material is considered to have broken down if the loss in mass during the first period after complete loss of volatile matter exceeds 0.5% or if the loss in mass during any subsequent period exceeds 1% of the original mass of the material.

DETERMINATION OF PUFFING POINT

0.2 g of grained Celluloid of the heat test size (all passes through 2.0 mm and all retained on 1.0 mm sieve) is placed in a loosely stoppered test tube (15 cm x 1.3 cm) and immersed in an oil bath heated to 100°C. The temperature of the bath is raised by 5°C per minute with constant stirring. The temperature at which the Celluloid puffs off, is taken as the puffing point. Adherence to the rate of temperature rise is important and the test is carried out in duplicate.

DETERMINATION OF PUFFING TIME

0.2 g of grained round Celluloid of the heat test size (all passes through 2.0 mm and all retained on 1.0 mm sieve) is placed in a loosely stoppered test tube (15 cm x 1.3 cm) and immersed in an oil bath at $160^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The time elapsing between the immersion of the tube and the puffing off of the Celluloid is noted. The test is carried out in duplicate and is not continued beyond 60 minutes.