JSS 9330-03 : 2019
(Fourth Revision)

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भारत सरकार
GOVERNMENT OF INDIA
रक्षा मंत्रालय
MINISTRY OF DEFENCE

संयुक्त सेवा विनिर्देश
JOINT SERVICES SPECIFICATION

ON

POLYETHYLENE LOW DENSITY, LINEAR LOW DENSITY AND HIGH DENSITY

	DS Cat Part No.	NSN
Polyethylene Low Density Type 1	**9330-000 115**	**9330720200190**
Polyethylene Low Density Type 2	**9330-000 131**	**9330720200201**
Polyethylene Linear Low Density	**9330-000 130**	**9330720200200**
Polyethylene High Density Type 1	**9330-000 117**	**9330720200191**
Polyethylene High Density Type 2	**9330-000 119**	**9330720200193**

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

DIRECTORATE OF STANDARDISATION
DEPARTMENT OF DEFENCE PRODUCTION
MINISTRY OF DEFENCE
'H' BLOCK, NIRMAN BHAWAN POST OFFICE
NEW DELHI-110011

LIST OF MEMBERS ASSOCIATED WITH REVISION OF THIS STANDARD

1. This Fourth Revision of the Joint Services Specification 9330-03 has been approved by RS Gauba, Sc 'G' Member Secretary, ARMREB; Chairman, Armament Standardisation Sub-Committee by circulation.

2. The following members were consulted in approving the document:

S. No.	Name & Designation	Organisation
1.	Shri RS Gauba, Sc 'G'	ARMREB/DRDO, New Delhi
2.	Col JBS Sidhu, Director,WE-2/3	ADGWE/GS (WE-2/3), New Delhi
3.	Rep (Dte Arty-5)	Dte of Arty (GS/Artillary-5), New Delhi
4.	Sh Prashant Shekhar Singh, AD (DGONA)	Dte Gen of Naval Armt, Naval HQ, New Delhi
5.	Gp Capt RR Pant, DASE'B'	Dte of Armt & Safety Eqpt, Air HQ, New Delhi
6.	Rep (DGEME)	DGEME, Army HQ, New Delhi
7.	Cdr Virendra, S Kanwal, JD/API	DGNAI, Naval HQ, New Delhi
8.	Shri Daljeet Singh, DD	DGAQA, JD (Armt) Gp, New Delhi
9.	Shri L Srinivasn, Asst Controller	CQA (ME), Pune
10.	PRS Balaji, PScO, Dy Controller	CQA (Amn), Pune
11.	Lt Col B J Naidu, Dy Controller	CQA (SA), Ichapur, West Bengal
12.	Shri K Yadav, PScO, Dy Controller	CQA (W), Jabalpur
13.	Dr. RB Pawar, Sc'G'	HEMRL, DRDO, Pune
14.	Shri RD Misal, Sc'G'	ARDE/DRDO Orgn, Pune
15.	Dr. Vinay Prakash, GM	Ammunition Factory, Pune
16.	Rep DG(ACE), Pune	DG (ACE), Pune
17.	Lt Col Saurabh Modi	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 the 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 9330-03 : 2019 (Fourth Revision):

a) was prepared in the year 1997.

b) was revised in the year 2002, 2007, and 2014.

c) is revision of 9330-03 : 2014 (Third Revision) and supersedes the same.

0.4 This specification would be used for Manufacture, Supply and Quality Assurance of Polyethylene, Low Density, Linear Low Density, and High Density.

0.5 Quality Assurance Authority for the item covered in this specification is The Controller, Controllerate of Quality Assurance (Military Explosives), Aundh Road, Pune-411020. (email id cqamear-dgqa@nic.in). 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-110011.
Secretary ASSC, e-mail id-assc.defstand@gov.in

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,
New Delhi-110002,
or
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-110011.

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.

0.10 Copies of ASTM Standards can obtain on payment from:

American Society for Testing and Materials,
1916-Race Street,
Philadelphia PA 19103-1887 USA

or

Their Official Distributors in India viz:

Book Supply Bureau,
D-44, South Extn-1,
New Delhi-110049

1. SCOPE

This specification is meant to govern, manufacture, supply and Quality Assurance of the following grades of polyethylene.

a) Low density polyethylene type 1 for use in the manufacture of sheets, lay flat tubing, bags used for packing ammunition, ammunition components, ammunition chemical and Explosives and wax special No. 8.

b) Low density polyethylene type 2 for use in the manufacture of carriers, containers and other moulded components.

c) Linear low density polyethylene for use in the manufacture of carriers, containers and other moulded components.

d) High density polyethylene type 1 for use in packing of ammunition components and in the manufacture of washers, sleeves etc used in ammunition.

e) High density polyethylene type 2 for use in the manufacture of carrier, containers and barmines.

2. RELATED SPECIFICATIONS/DOCUMENTS

Reference are made in this specification to:

Table 1

S. No.	Specifications/ Documents No.	Nomenclature
a)	IS 138 : 2018 (Fourth Revision)	Ready Mixed Paint, Marking, for Packages and Petrol Containers-Specification
b)	IS 1060 (Part 1) : 1966 (Revised) Amd 6 Reaffirmed 2016	Methods of Sampling and Test for Paper and Allied Products Part 1
c)	IS 1060 (Part 2) : 1960 Reaffirmed 2014	Methods of Sampling and Test for Paper and Allied Products Part 2
d)	IS 13360 (Part 5/Sec 1) : 2018 (First Revision)	Plastics-Methods of Testing Part 5 Mechanical Properties Section 1 Determination of Tensile Properties-General Requirements
e)	IS 13360 (Part 5/Sec 2) : 2017 (First Revision)	Plastics-Methods of Testing Part 5 Mechanical Properties Section 2 Determination of Tensile Properties-Test Conditions for Moulding and Extrusion Plastics

Table 1 (Concluded)

S. No.	Specifications/ Documents No.	Nomenclature
f)	IS 13360 (Part 5/Sec 4) : 2013	Plastics-Methods of Testing Part 5 Mechanical Properties Section 4 Determination of Izod Impact Strength
g)	IS 13360 (Part 5/Sec 5) : 2017 First Revision	Plastics-Methods of Testing Part 5 Mechanical Properties Section 5 Determination of Charpy Impact Properties Non-instruments Impact Strength 7
h)	ASTM-D 256	Test Method for Impact Resistance of Plastics and Electrical Insulating Materials
j)	ASTM-D 638	Test Method for Tensile Properties of Plastics
k)	ASTM-D 648	Test Method for Deflection Temperature of Plastics Under Flexural Load
m)	ASTM-D 1238	Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer

3. MATERIAL

Polyethylene Low density, Linear low density and High density shall essentially consist of polymer of Ethylene and shall be free from pigment and plasticizers like Polyisobutylene.

4. MANUFACTURE

Polyethylene Low density, Linear low density and High density shall be manufactured by a process which will produce the product conforming to this specification.

5. TENDER SAMPLE

The manufacturer/supplier/contractor shall submit a tender sample of 1 kg of moulding powder essentially from the same batch/lot of manufacture along with test specimen for the tests mentioned in clause **7.4** 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 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

7.1.1 Polyethylene Low density, Linear low density and High density and the packages in which it is packed shall be subject to inspection by and to the final approval of the Quality Assurance Officer/Quality Assurance Authority.

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

7.2 Sampling

The representative sample of 500 g shall be taken from each package selected for sampling from the batch/lot. The number of packages to be selected to draw the samples from the lot are as under:

Table 2

Lot Size	No. of Containers to be Selected
Up to 3	Each Container
4 to 15	3
16 to 50	4
51 to 100	5
101to 300	7
301to 500	10
501 & above	15

7.3 Criteria for Conformity

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

7.4 Test Requirements

Samples taken from any portion of the batch/lot/consignment of material shall conform to clause **3** and in addition shall conform to the test requirements shown in the following tables:

a) Chemical Requirements

Table 3

S. No.	Characteristics	Passing Standard			Test Method
		Low Density	Linear Low Density	High Density	
a)	Ash % by mass	0.05 *Max*	0.5 *Max*	0.05 *Max*	IS 1060 (Part 1) Method 11
b)	pH of water extract	5 *Min* 8 *Max*	5 *Min* 8 *Max*	5 *Min* 8 *Max*	IS 1060 (Part 1) Method 10

Table 3 (Concluded)

S. No.	Characteristics	Passing Standard			Test Method
		Low Density	Linear Low Density	High Density	
c)	Water soluble matter % by mass	0.2 *Max*	0.2 *Max*	0.2 *Max*	Appx 'A'
d)	Water soluble chlorides calculated as Sodium Chloride % by mass	0.05 *Max*	0.05 *Max*	0.05 *Max*	IS 1060 (Part 2) Method 17
e)	Water soluble sulphates, calculated as anhydrous Sodium sulphate % by mass	0.1 *Max*	0.1 *Max*	0.1 *Max*	IS 1060 (Part 2) Method 18
f)	Solubility in Toluene at 80°C ±1°C	Soluble	Partially Soluble	Insoluble	Appx 'B'
g)	Extractable matter in Toluene at 25°C ±1°C % by mass	6.0 *Max*	6.0 *Max*	---	Appx 'C'
h)	Solubility in Ethyl acetate, Acetone at 25°C ±1°C	Insoluble	Insoluble	Insoluble	Appx 'D'
j)	Effect of organic solvents	Resistant below 60°C	Resistant below 60°C	Resistant below 80°C	Appx 'E'

b) Physical Requirements

Table 4

S. No.	Characteristics	Passing Standard					Test Method
		Low Density Type		Linear Low Density	High Density Type		
		1	2		1	2	
a)	Melt flow index	--	2% ±20%	2% ±20%	--	8% ±20%	ASTM-D 1238
b)	Density g/ml	0.910 *Min* 0.925 *Max*	0.918 *Min* 0.922 *Max*	0.916 *Min* 0.920 *Max*	0.941 *Min* 0.965 *Max*	0.955 *Min* 0.959 *Max*	BS 2782 Part 6 Method No. 620 A
c)	Tensile Strength at break in MPa	7 *Min*	12 *Min*	20 *Min*	21 *Min*	23 *Min*	BS 2782 Part 3 Method 320 A
d)	Elongation % at break	90 *Min*	560 *Min*	500 *Min*	15 *Min*	10 *Min*	

Table 4 (Concluded)

S. No.	Characteristics	Passing Standard					Test Method
		Low Density Type		Linear Low Density	High Density Type		
		1	2		1	2	
e)	Impact strength (Notched) in mJ/mm2	--	--	--	--	2.7 *Min*	ASTM-D 256 Method A
*f)	Melting temperature, ^oC	98 *Min* 115 *Max*	98 *Min* 115 *Max*	122 *Min* 124 *Max*	128 *Min* 133 *Max*	128 *Min* 133 *Max*	--
*g)	Tensile modulus in MPa	98 *Min*	98 *Min*	350 *Min*	530 *Min*	530 *Min*	ASTM-D 638
*h)	Heat deflection temperature at 4.6 kg/cm^2 load, °C	60 *Min*	60 *Min*	68 *Min*	83 *Min*	83 *Min*	ASTM-D 648

NOTES

1. The tests mentioned at S. No. (f), (g) & (h) are for information only. The limits for the same will be finalized after generation of date.

2. The width of specimen for yield stress and elongation should be 6 mm and rate of traverse of the machine while testing should be 50 mm/minute.

8. WARRANTY

The stores supplied against the contract shall be deemed to be warranted against the defective material and performance by the contractor for a period of 12 months from the date of receipt of the stores at the consignee's end and shall retain the properties described above. If during this period any of the stores supplied is found defective, the same shall be replaced by the manufacturer/supplier/contractor free of charges at the consignee's premises.

9. PACKAGING

The packaging shall be in accordance with the terms of the contract or as agreed to between the purchaser and contractor.

10. MARKING

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

a) Nomenclature and Specification Number

b) Name and Address of the Consignee

c) A/T or SO Number and Date

d) Consignment Number

e) Lot/Batch Number and Date of Manufacture

f) Gross and Net Mass

g) Consecutive Number of Package and Total Number of Packages in the Consignment

h) Date of Supply

j) Contractor's Initials or Recognized Trademark

10.2 In addition to the above the Quality Assurance Officer/Quality Assurance Authority may suggest some more marking/identification considered suitable at the time of inspection.

10.3 The paint used for marking should conform to IS 138.

11. SAFETY OF OPERATIONS

Nothing in this specification shall relieve the manufacture/supplier/contractor of his responsibility for the safety of operations in the manufacture, storage, transit use of this store.

12. DEFFENCE STORES CATALOGUE NUMBERS/NATO STOCK NUMBER

12.1 Defence Stores Catalogue Numbers/Nato Stock Numbers allotted to the stores are as under:

Table 5

S. No.	Nomenclature	DS Cat Part No.	NSN
a)	Polyethylene Low Density Type 1	9330-000 115	9330720200190
b)	Polyethylene Low Density Type 2	9330-000 131	9330720200201
c)	Polyethylene Linear Low Density	9330-000 130	9330720200200
d)	Polyethylene High Density Type 1	9330-000 117	9330720200191
e)	Polyethylene High Density Type 2	9330-000 119	9330720200193

12.2 Applicability of the Amendment:

a) Applicable to existing service stores and stores under manufacture.

b) Specification can be amended locally.

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-110011

APPX 'A'
(*Clause* 7.4)

PREPARATION OF AQUEOUS EXTRACT AND ESTIMATION OF WATER SOLUBLE MATTER, CHLORIDES AND SULPHATES

A-1. Cover 10 g of sample, cut to small pieces passing through 200 micrometer IS sieve, with 100 ml of boiling distilled water. Allow to stand in a stoppered conical flask for an hour with occasional shaking. Filter through No. 1 Whatman filter paper. Evaporate 25 ml of the above solution in a previously cleaned, dried and weighed glass evaporating dish (M_1). On sand bath, keep the dish at 100°C for 30 minutes. Cool in desiccators and weigh (M_2).

$$\text{Water soluble matter \%} = \frac{(M_2 - M_1) \times 100 \times 100}{\text{Mass of the sample taken} \times 25}$$

A-2. Using the remaining extract, estimate chlorides and sulphates as per method 17 and method 18 of IS 1060 (Part 2) respectively.

APPX 'B'
(*Clause* 7.4)

SOLUBILITY IN TOLUENE AT 80°C ±1°C

Samples shall be tested at 80°C ±1°C with Toluene. Three samples of the material 1.5 g each shall be accurately weighed. These are transferred to three Erlenmeyer flasks of 125 ml capacity. To each sample shall then be closed with ground glass stoppers or with rubber stoppers wrapped with aluminum foil to eliminate any effect of Toluene on the rubber. The mixture shall be stored for 16 hours at 80°C ±1°C. The solubility of polyethylene in toluene at 80°C ±1°C shall be observed at this temperature. The polyethylene shall be classed as soluble in Toluene at 80°C if a clear, homogenous solution with no undissolved residue is obtained.

APPX 'C'
(*Clause* 7.4)

EXTRACTABLE MATTER IN TOLUENE AT 25°C ±1°C

C-1. Polyethylene toluene mixture form Appx 'B' shall be allowed to cool to 25°C ±1°C. It is advisable not to accelerate the cooling operation. The solution shall be filtered through a sintered glass crucible (G3) which has been previously treated in order to remove any Toluene soluble material and to bring it to constant mass by heating at 50°C ±1°C (M_2). The solution shall then be transferred to the tared crucible and suction applied to hasten the filteration followed by rinsing of flask with Toluene three times using 15 ml of Toluene each time. After the transfer and rinsing are complete, the final traces of Toluene are completely removed by applying suction.

C-2. The crucible shall then be heated in an oven at 50°C ±1°C to constant mass (M_3). During the period when crucible and/or residue is not being heated or weighed, it shall be kept in desiccators with anhydrous Calcium chloride as desiccant.

C-3. The per cent extractable matter in Toluene shall be calculated by the following formula:

$$\% \text{ insoluble matter} = \frac{(M_3 - M_2) \times 100}{M_1}$$

Where,

M_1 = The mass of the sample taken for test for Solubility at 80°C ±1°C in Toluene at Appx 'B'.

C-4. If the value is less than 6.0%, the material shall be considered insoluble at 25°C in Toluene and also to have complied with the requirement for extractable matter.

APPX 'D'
(*Clause* 7.4)

SOLUBILITY AT 25°C ±1°C IN ETHYL ACETATE, ACETONE

1.5 g of sample is stored with Acetone and Ethyl acetate separately at 25°C ±1°C for 20 hours with approximately 60 ml of reagent. The solubility shall then be observed by evaporating the solvent or visually.

APPX 'E'
(*Clause* 7.4)

EFFECTS OF ORGANIC SOLVENTS

Immerse a piece of the sample (weighed quantity if in powder form) in an organic solvent (normally Toluene or Ethyl acetate or Amylacetate and in special cases if required Methanol, carbon tetra chloride or dioxine) and maintain at the required temperature (60°C for grades A & B, low, density and linear low density polyethylene) and (80°C for grade C, High density polyethylene) for 1 hour. Take out the sample and examine it visually. The sample shall not become soft or deformed or no appreciable portion of it shall dissolve in the solvent.