Technical Specification for Antistatic Polypropylene Copolymer Cartons for Packaging of Small Arms Ammunition

1. **Scope:** This specification is meant to govern Manufacture, Supply and Quality Assurance of carton boxes made from antistatic polypropylene copolymer used for packaging of small arms ammunition made from cartridge brass and gilding metal.

2. **Material:**Polypropylene impact copolymer (REPOL grade C120MN) in the ratio 98 % Polypropylene & 2% Antistatic grains intended for Injection Moulding process to match the specified requirements and shall be free from pigment and plasticizers like Polyisobutylene. PP cartons shall conforms the antistatic properties and shall be free from any colour additives.
This antistatic polypropylene material is designed for manufacturing carton boxes used in packaging ammunition to prevent electrostatic discharge (ESD) and ensure the safety and integrity of the ammunition.

3. **Tender Sample:**

a) The manufacturer / supplier / contractor herby referred as supplier, shall submit test certificate from NABL accredited laboratory for the test requirements of raw material given in Table 6(b).
b) The supplier of antistatic polypropylene copolymer (APPCP) carton boxes must submit advance sample of polymer granules and only after satisfactory test results in below criteria, clearance will be given to production of APPCP boxes.
c) The supplier shall submit a tender sample of 5 kg of Polypropylene grain & 1 kg antistatic grain essentially from the same batch / lot of manufacture along with test specimens as per IS 10951:2002 for the tests mentioned in clause 6(b) free of all charges and conforming to this specification. Also Samples of the material and of the packages may be taken from any portion of the batch / lot / consignment.
d) The supplier shall submit a tender sample of 20 Nos. of Antistatic Polypropylene Cartons from the same batch / lot of manufacture for the tests mentioned in clause 6(a) free of all charges and conforming to this specification. Also Samples of the material and of the packages may be taken from any portion of the batch / lot / consignment.

4. **Documentation:** Supplier must submit following documents along with sample submission:

i Purchase invoice of polypropylene grains showing batch/lot number
ii Test report conforming to below criteria from NABL accredited laboratories
iii Material consumption report

5. **Criteria for Conformity:**If on examination, any sample is found not to conform to this specification, the whole batch/lot/consignment of raw material will be sentenced rejected and supplier will not be granted permission to manufacture APPCP Boxes from these batches/lots/consignments.

6. **Test Requirements (Raw Material):** Samples taken from any portion of the batch/lot/consignment of material shall conform to clause 2 and in addition shall conform to the test requirements shown in the following tables:

GO/PKG DO/PKG OIC/PKG

6(a)Requirements of Chemical Test for Raw Material(98 % Polypropylene & 2% Antistatic grains):

Sl.No.	Characteristic	Passing Standard	Test Method
(a)	pH of water extract	Min. 5 Max. 8	IS 1060 (Part l) Method 10
(b)	Water soluble matter, % by mass	Max. 0.2	Appendix 'A'
(c)	Water soluble chlorides, calculated as Sodium Chloride, % by mass	Max. 0.05	IS 1060 (Part 2) Method 17
(d)	Water soluble sulphates, calculated as anhydrous Sodium sulphate, % by mass	Max. 0.1	IS 1060 (Part 2) Method 18
(e)	Solubility in Xylene at 140°C± 1°C	Soluble	Appendix 'B'
(f)	Extractable matter in Toluene at 25°C ± 1°C, % by mass	Max. 6.0	Appendix 'C'
(g)	Solubility in Acetone at 25 °C ± 1°C	Insoluble	Appendix 'D'
(h)	Ash content, % by mass	Max. 0.5 %	ASTM - D5630 Method-A
(j)	Moisture content at 103°C to 105°C for 2 h, % by mass	Max.5.0 %	IS 1060 (Part 1) Method 9

6(b)Requirements of Physical Test for Raw Material (98 % Polypropylene & 2% Antistatic grains):

Sl. No.	Characteristic	Unit	Passing Standard	Test Method
(a)	Melt flow index@230°C/2.16 Kg	g / 10 min	12 ± 20 %	ASTM - D1238
(b)	Density	g/cc	Min. 0.85	ASTM- D792
(c)	Tensilestressat yield, (50mm/min)	MPa	Min. 22	ASTM - D638
(d)	Elongationat yield, (50mm/min)	%	Min. 6	ASTM - D638
(e)	NotchedIzod Impact Strength (23°C)	J/m	Min. 110	ASTM - D256
(f)	Flexural Modulus (l% Secant)	MPa	Min.800	ASTM - D 790A
(g)	Heat Deflection Temperature (455 KPa)	°C	Min. 85	ASTM - D 648
(h)	Brittleness Temp. of Plastic	--	To pass the test	ASTM – D746
(i)	Surface resistivity	Ohm / Sq	10^9 to 10^{12}	ASTM - D257

GO/PKG DO/PKG OIC/PKG

7. **Test Requirements (Final Carton- Finished Product):**

Samples of finished product selected randomly from the Lot/consignment will be subjected to following tests:

Sl. No.	Test	Sample Size	Passing Standard	Test Method
(a)	6P Low temperature Testing: Subject packages to 4 cycles of a. –40°C± 5 °C for 12 hours b. 25°C± 10 °C for 12 hours	20 Cartons	No visible crack should be observed.	JSG-0102, Joint Services Guide on Environmental Testing of Armament Stores Ammunition
(b)	High Temperature Test at 52°C± 5 °C for 48 hours	20 Cartons	No visible crack should be observed.	-
(c)	Surface resistivity	Ohm / Sq	10^9 to 10^{12}	ASTM - D257

8. **Warranty:**The stores supplied against the contract shall be deemed to be warranted against defective material and performance by the supplier for a period of 12 months from the date of receipt of the store at the consignee's end and if during this period any of the stores found deviating specifications, GM/OFV is empowered to re-test the material and reject the consignment. In such cases, 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:**

a All packages containing the material shall be indelibly and legibly marked with the following details:-
b Nomenclature and Specification Number
c Name and Address of the Consignee
d S.O. Number and Date
e Consignment Number
f Lot / Batch Number and Date of Manufacture
g Gross and Net Mass
h Consecutive Number of Package and Total Number of Packages in the Consignment
i Date of Supply
j Contractor's Initials or Recognized Trademark

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

10. **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.

GO/PKG DO/PKG OIC/PKG

APPENDIX 'A'

A. Preparation of Aqueous Extract and Estimation of Water Soluble Matter: Chlorides and Sulphates

1. Take 10 g of sample, cut to small pieces passing through 200 micrometre IS sieve, with 100 ml of boiling distilled water. Allow to stand in stoppered conical flask for an hour with occasional shaking. Filter through No. 1Whatman filter paper. Evaporate 25 ml of the above solution in a previously cleaned dried and weighed glass evaporating dish (M1). On sand bath, dry the residue in the dish at 100 +/- 2°C for 30 minutes. Cool in desiccators and weigh (M2).

$$\text{Water soluble matter \%} = \frac{(M2 - M1) \text{ X } 100 \text{ X } 100}{\textit{Mass of the sample taken X } 25}$$

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

APPENDIX 'B'

B. Solubility in Xylene at 140°C ± 1°C

Samples shall be tested at 140°C ± 1°C with 60 ml of Xylene. Three samples of the material 1.5 g each shall be accurately weighed. These are transferred to three Erlenmeyer flasks of 125 ml capacity. Each Flask shall then be closed with ground glass stoppers or with rubber stoppers wrapped with Aluminium foil to eliminate any effect of Xylene on the rubber. The mixture shall be stored for 16 hours at 140°C ± 1°C. The solubility of Antistatic Polypropylene granules in Xylene at 140°C ± 1°C shall be observed at this temperature. The Antistatic Polypropylene granules shall be treated as soluble in Xylene at 140°C if a clear, homogenous solution with no undissolved residue is obtained.

GO/PKG DO/PKG OIC/PKG

APPENDIX 'C'

C. Extractable matter in Toluene at 25°C ± 1°C, % by mass

1. 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. Add 60 ml of Toluene to the flask 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.
2. Above Polypropylene -Toluene mixture 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 (G-3) 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(M2). The solution shall then be transferred to the tared crucible and suction applied to hasten the filtration 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.
3. The crucible shall then be heated in an oven at 50 °C ± 1°Cto constant mass (M3). 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.
4. The percent extractable matter in Toluene shall be calculated by the following formula:-

$$Percent\ insoluble\ matter = \frac{(M3 - M2)\ X\ 100}{M1}$$

Where M1= Mass in gm. of Sample taken for the test.

5. 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.

APPENDIX 'D'

D. SOLUBILITY AT 25 °C ± 1°C IN ACETONE

1. 1.5 g of sample in a weighing bottle or suitable glass apparatus with lid and add approximately 60 ml of Acetone to it. Maintain it at 25 °C ± 1°C for 20 hours. Filter the liquid through No. 1 Whatman filter paper. Evaporate the solvent over a water bath and check for the presence of any residue. Absence of any residue indicate that the sample is insoluble.

GO/PKG DO/PKG OIC/PKG