भारतीय मानक
Indian Standard

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विस्फोटक में उपयोग हेतू अमोनियम नाइट्रेट की पैकिंग के लिए उच्च घनत्व पोलीइथाइलीन (एचडीपीई)/ पोलीप्रोपाइलीन की बुनी हुई बोरियाँ — विशिष्टि

High Density Polyethylene (HDPE)/Polypropylene (PP) Woven Sacks for Packing of Solid Ammonium Nitrate for Explosives — Specification

ICS 13.300; 71.100.30

भारतीय मानक ब्यूरो
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Explosives and Pyrotechnics Sectional Committee, CHD 26

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Explosives and Pyrotechnics Sectional Committee had been approved by the Chemical Division Council.

Ammonium nitrate is extensively used both in commercial and military explosives. Under controlled condition, ammonium nitrate is used for the manufacture of nitrous oxide which is an important anesthetic gas. Ammonium nitrate prills/crystals produced from non-conventional sources such as ammonium nitrate liquor from phosphatic fertilizer industry or any such other sources should not be employed for the production of any anesthetics grade nitrous oxide gas. Small crystals of ammonium nitrate with a large surface to volume ratio, facilitate the manufacture of amatol.

Increased production and use of ammonium nitrate as an ingredient for manufacture of explosives, anesthetic gases, fertilizers, cold packs, etc, resulted in the introduction of this standard. Bibliography is given in Annex C.

Ammonium nitrate is not an explosive by itself. However, it is one of the ingredients used for manufacture of explosives. It is classified as an oxidizer (**5.1**) as per UN classification for Dangerous Goods. Other ingredients like fuel, etc, have to be added to make it an explosive. For such explosive mixtures to explode, initiators like detonators are required.

Licence for manufacture, conversion, stevedoring and bagging, import, export, transport, possession for sale or use of ammonium nitrate is issued by Petroleum & Explosives Safety Organization (PESO) under the *Ammonium Nitrate Rules*, 2012 covered under the *Explosives Act*, 1884.

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 IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HIGH DENSITY POLYETHYLENE (HDPE)/ POLYPROPYLENE (PP) WOVEN SACKS FOR PACKING OF SOLID AMMONIUM NITRATE FOR EXPLOSIVES — SPECIFICATION

1 SCOPE

This standard prescribes the requirements and methods of sampling and tests for two types of HDPE/PP woven sacks suitable for packing of solid ammonium nitrate for explosives.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TYPES

3.1 Type I

The fabric used in the manufacture of HDPE/PP woven sacks shall be woven from HDPE/PP tapes having width of 2.5 mm (tolerance of ± 10 percent) (*see* IS 6192 and IS 11197) and linear density of 111 tex (1 000 denier).

3.2 Type II

The fabric used in the manufacture of HDPE/PP woven sacks shall be woven from HDPE/PP tapes having width of 2.5 mm (tolerance of ± 10 percent) (*see* IS 6192 and IS 11197) and linear density of 99.9 tex (900 denier).

4 MANUFACTURE

4.1 Raw Material

The high density polyethylene (HDPE) or polypropylene (PP) used for manufacture of tape shall conform to the requirements specified in IS 10146 or IS 10910 respectively.

The raw material composition mix to be used for manufacturing of the HDPE/PP woven sacks shall be as agreed to between the buyer and the seller.

4.2 Fabric

The fabric used in the manufacture of HDPE/PP woven sacks shall be woven from HDPE/PP tapes having width of 2.5 mm (tolerance of ± 10 percent) (*see* IS 6192 and IS 11197) and linear density of 111 tex (1 000 denier) for type I and 99.9 tex (900 denier) for Type II sacks. The denier of HDPE/PP tape used in the manufacture of woven fabric / sacks shall be subject to the following tolerances:

a) ± 10 percent on individual value, and
b) ± 5 percent on average.

4.3 Sacks

The sacks shall be produced from material woven as a tube on a circular loom and cut to the required length.

4.3.1 The constructional particulars of fabric used for conversion into sacks shall be as given in Table 1.

4.4 Liner

Unlaminated sack shall be provided with a loose liner of LDPE /LLDPE HMHDPE. The width of the loose liner shall be minimum 20 mm more than the width of the sack. The thickness of the loose liner, when tested in accordance with Annex A of IS 2508, shall be 70 µm ± 10 percent in case of LDPE /LLDPE and shall be 40 µm ± 10 percent in case of HMHDPE / HDPE.

4.4.1 The liner shall be free from pin holes, patches, tears, blisters and any other visible defects. The plastic material used for the liner shall be virgin.

4.4.2 The bottom seam of the loose liner shall be at least 10 mm from the bottom edge.

4.5 Lamination

The fabric woven on circular loom before manufacture into sacks may be laminated by coating with LDPE/ LLDPE for HDPE sack and PP for PP sack of uniform thickness having mass of 23 g/m^2 ±10 percent with a minimum overlap / overhang of 5 mm.

4.5.1 The plastic material used for the lamination of the sacks shall be virgin.

4.6 Seam

The stitching of bottom seam shall be done with two rows

of chain stitches. The two rows of stitches shall be separated from each other by about 5 mm and the outer stitch shall be approximately 8 mm from the outer edge of the sack. The stitching shall be done with single or double fold over seam to a depth of 25 mm, so that the stitches pass through a minimum of four layers of the fabric. The number of stitches/dm shall be 12 ± 2.

4.6.1 The material used for stitching shall be HDPE/ PP tape or any other thread suitable for the purpose, compatible to the product being packed in the sack. The stitching shall be uniform without any loose thread or knot.

4.7 Mouth of the Sack

The mouth of the sack shall be completely open and the edges shall not fray.

4.8 Capacity

The sack shall have the nominal capacity of 25 to 50 kg.

5 REQUIREMENTS

5.1 The sacks shall conform to the requirements specified in Table 1.

5.2 Mass

The mass of the sack shall be as agreed to between the buyer and the seller or as declared by the manufacturer subject to the following tolerances:

		Tolerance
a)	On bale of 500 sacks (excluding packing material)	± 3 percent
b)	On an individual sack	± 6 percent
c)	LDPE/HMHDEP Liner	± 10 percent

Table 1 Requirements of HDPE/PP Woven Sacks for Packing of Solid Ammonium Nitrate
(*Clauses* 4.3.1 *and* 5.1)

Sl No.	Characteristics	Requirement for		Tolerance	Method of Test, Ref to
		Type I	Type II		
(1)	(2)	(3)	(4)	(5)	(6)
i)	Dimensions, mm				IS 1954
	a) Length	As agreed to between the buyer and the seller	As agreed to between the buyer and the seller	+ 20 mm – 10 mm	
	b) Width	As agreed to between the buyer and the seller	As agreed to between the buyer and the seller	+ 20 mm – 10 mm	
ii)	Ends per dm	40	40	±2	IS 1963
iii)	Picks per dm	40	40	±2	IS 1963
iv)	Mass of fabric, g/m^2	88	79	±6%	IS 1964
v)	Average breaking strength of fabric, *Min* [Raveled strip method, 200 mm × 50 mm[1)], N[2)] (kgf)]:				IS 1969 (Part 1)
	a) Length-wise	680 (69)	600 (61)	–	
	b) Width-wise	850 (87)	700 (71)	–	
vi)	Minimum breaking strength of bottom seam (Strip method), N[2)] (kgf), *Min*	310 (32)	310 (32)	–	IS 9030
vii)	Elongation at break of fabric (Raveled strip method), percent :				IS 1969 (Part 1)
	a) Length-wise	20	20	±5	
	b) Width-wise	20	20	±5	

[1)] Width after ravelling = 50 mm, Gauge length = 200 mm.
[2)] 1 N = 0.102 kgf (approx).

NOTES
1 The sacks having width of less than 600 mm shall satisfy the requirements for Type II sacks.
2 The suitable size (inside dimensions) of sacks of 50 kg capacity for low bulk density materials, such as Low density Ammonium Nitrate is 610 mm × 965 mm and for high bulk density material, such as High density Ammonium Nitrate is 610 mm × 930 mm. These dimensions provide for optimum free space of minimum of 20 percent of length when measured along the surface of the fabric from mouth-stitch line of the sacks, up to the surface level of contents.
3 Tolerance on length and width are subject to the condition that inside area of the sack shall remain equal to the inside area of specified dimensions.

5.2.1 The method of calculating the mass of the sacks is given in Annex B for guidance.

6 PRINTING, PACKING AND MARKING

6.1 Printing

The sacks shall be printed with the information as required by the buyer using suitable inks by flexography.

6.2 Packing

The sacks shall be packed to form a bale using a layer of HDPE/PP woven fabric and suitably secured. The bale shall contain 500 sacks and multiple thereof.

6.3 Marking

6.3.1 *Marking on Ammonium Nitrate Bag*

Each bag containing Ammonium nitrate shall be marked in conspicuous indelible characters, by means of stamping or painting with

a) The words "AMMONIUM NITRATE"
b) Purity in percentage;
c) The name, address and licence number of manufacturer or convertor or importer;
d) Identification number of the package or bar coding ;
e) The net weight of Ammonium Nitrate;
f) Gross weight of the package;
g) Date of bagging and batch number; and
h) Name, address, licence number and unique identification number of stevedoring agent, if any.

NOTE — Each sack shall be compulsorily marked with visible recycling logo as given below at a space on bottom of the bag compatible with the art work of the buyer for printing the sack and on the bale.

6.3.2 *The bales shall be marked with the following information:*

a) Name of the manufacturer,
b) Type and size of sacks,
c) Number of sacks,
d) Gross weight,
e) Net weight, and
f) Month and year of manufacture.

6.4 BIS Certification Marking

Each bale containing HDPE/PP sacks may also be marked with the Standard Mark.

6.4.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 2016 and Rules and Regulations made thereunder. The details of the Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

7 SAMPLING AND CRITERIA FOR CONFORMITY

7.1 Prior to test, the specimens shall be conditioned to moisture equilibrium from dry side in the standard atmosphere of 65 ± 2 percent relative humidity and 27 ± 2° C temperature as laid down in IS 6359.

7.2 In any consignment, all the sacks of the same construction shall be grouped together to constitute a lot.

7.3 The conformity of the lot to the requirements of the standard shall be determined on the basis of the test carried out on the samples selected from it.

7.4 The number of bales to be selected depends on the size of the lot and shall be in accordance with col 2 and 3 of Table 2. The number of sacks to be selected from the bales sampled shall be in accordance with col 4 of Table 2 for visual inspection, dimensions, ends, picks and mass requirements and shall be in accordance with col 5 of Table 2 for breaking load of fabric, seam and percent elongation at break requirements.

7.5 Criteria for Conformity

The lot shall be considered as conforming to the requirements of the standard if the following conditions are satisfied:

a) The number of defective sacks in case of visual inspections, ends, picks and dimensions is up to 10 percent the sample size after rounding off the fraction to next higher integer.
b) None of the sack or bale of 500 sacks weigh less than the respective lower specified limit after allowing tolerance of ± 6 percent on individual sack and ± 3 percent on a bale of 500 sacks (*see* **5.2**).
c) The average breaking load of fabric is not less than the value specified and none of the individual values is more than 10 percent below the specified value. The test for the laminated sack shall be carried out on centre portion of the sack as well as at lamination joint.
d) The seam strength of none of the sacks is less than the specified value.

Table 2 Sample Size and Criteria for Conformity

(*Clause* 7.4)

Sl No.	No. of Bales in the Lot	No. of Bales to be Sampled	Sample Size for Visual Inspection, Dimensions, Ends, Picks and Mass Requirements	Sample Size for Breaking Strength of Fabrics Breaking Strength of Seam and Elongation at Break Requirements
(1)	(2)	(3)	(4)	(5)
i)	Up to 25	3	13	8
ii)	26 to 50	5	20	8
iii)	51 to 100	8	32	13
iv)	100 and above	12	50	20

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
1954 : 1990	Determination of length and width of woven fabrics—Methods (*second revision*)	2508 : 2016	Polyethylene films and sheets — Specification (*third revision*)
1963 : 2004	Methods for determination of threads per unit length in woven fabrics (*second revision*)	6359 : 1971	Method for conditioning of textiles
1964 : 2010	Methods for determination of mass per unit length and mass per unit area of fabrics (*second revision*)	9030 : 1979	Method for determination of seam strength of jute fabrics including their laminates
1969 (Part 1) : 2009	Textiles — Tensile properties of fabrics — Determination of maximum force and elongation at maximum force : Part 1 Strip method (*third revision*)	10146 : 1982	Specification of polyethylene for its safe use in contact to foodstuffs, pharmaceuticals and drinking water
		10910 : 1984	Polypropylene and its copolymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water

ANNEX B

(*Clause* 5.2.1)

METHOD FOR CALCULATION OF MASS OF SACKS

B-1 Total mass of sack comprises of:

a) Mass of fabric,
b) Mass of stitching tape or thread, and
c) Mass of lamination.

B-1.1 Calculate the mass of sacks with the help of the following formulae as the case may be:

a) Mass of the fabric:

1) Mass of tubular fabric (single fold stitching)

$G_{1s} = (L+30 \text{ mm}) \times 2W \times M \times 10^{-6}$

2) Mass of tubular fabric (double fold stitching)

$G_{1d} = (L+55 \text{ mm}) \times 2W \times M \times 10^{-6}$

b) Mass of stitching tape or thread:

$G_2 = L_1 \times T \times 10^{-6}$

c) Mass of lamination:

1) Mass of lamination (single fold stitching)

$G_{3s} = (L+ 30 \text{ mm}) \times 2 (W + 5 \text{ mm}) \times M_1 \times 10^{-6}$

2) Mass of lamination (double fold stitching)

$G_{3d} = (L+ 55 \text{ mm}) \times 2 (W + 5 \text{ mm}) \times M_1 \times 10^{-6}$

where

G = mass of sack, in g;
G_{1s} = mass of fabric (single fold stitching), in g;
G_{1d} = mass of tubular fabric (double fold stitching), in g;
G_2 = mass of stitching tape or thread, in g;
G_{3s} = mass of lamination (single fold stitching), in g;
G_{3d} = mass of lamination (double fold stitching), in g;
L = length of sack, in mm;
L_1 = approximate length of stitching tape or thread, in mm;
W = width of sack, in mm;
T = liner density of stitching tape, in tex;
M = mass of fabric, in g/m^2; and
M_1 = mass of lamination, in g/m^2.

ANNEX C

(*Foreword*)

BIBLIOGRAPHY

IS No.	*Title*	*IS No.*	*Title*
6192 : 1994	Textiles—Monoaxially oriented high density polyethylene tapes—specification	11197 : 1985	Specification for monoaxially oriented polypropylene tapes

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

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