 Prepared By: <i>P K Mallik</i> P K Mallik Scientist 'D'	Specn No. ADRDE/SPECN/2000/54(d) Reviewed By: <i>S K Pal</i> S K Pal Scientist 'G', GD, TGTE	Revision no: 4 Dated: 20/5/19 Page 1 of 13
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Government of India
Ministry of Defence

Specification
For

Tape Nylon Various Undyed/Dyed, Heat Set/Simultaneous Resin
Treated & Heat Set

Approved by

[Signature]
20/5/19

Group Director

Technology Group (Textile Engineering)




Aerial Delivery Research and Development Establishment

Ministry of Defence

Post Box No. 51


Station Road

Agra Cantt - 282 001

	Specn No. ADRDE/SPECN/2000/54(d)		Revision no: 4 Dated:
Prepared By: <i>P K Mallik</i> P K Mallik Scientist 'D'	Reviewed By: <i>Gaurav Singh</i> Gaurav Singh Scientist 'E'	Issue: 02 Dated: 09/05/2019 S K Pal Scientist 'G', GD, TGTE	Page 2 of 13

RECORD OF AMENDMENTS


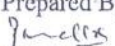
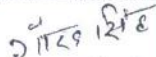
Amendment No.	Sub heading to which amendment pertains	Authority	Incorporated by Name & Rank in Block letters	Initials
1	<u>Appendix 'A', Column 9 & 10</u> For : Linear Density of twisted yarn (with a tolerance of -3 to +8%) Add: For Resin treated tape, tolerance in linear density of yarn shall be allowed up to +12%.	Director ADRDE	GD, TGTE	
2	<u>Appendix 'A' Column 13 & 14</u> For : Twist of yarn (with a tolerance of 15%) Warp : 0 to 10 Weft : 100 Read: Twist of yarn per meter, TPM, min Warp : 100 Weft : 100 Add Note - For Resin treated tape, manufacturer's certificate of compliance of twist shall be required.	Director ADRDE	GD, TGTE	

 Prepared By: <i>P K Mallik</i> P K Mallik Scientist 'D' <i>Gaurav Singh</i> Gaurav Singh Scientist 'E'	Specn No. ADRDE/SPECN/2000/54(d) Reviewed By: S K Pal Scientist 'G', GD, TGTE	Revision no: 4 Dated: Issue: 02 Dated: 09/05/2019 Page 3 of 13
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0. FOREWORD


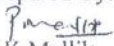
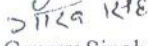
- 0.1 This specification has been prepared by a special committee, reviewed and approved by Group Director, Technology Group (Textile Engineering), ADRDE, Agra.
- 0.2 This specification would be used for manufacture inspection and procurement of tape nylon various undyed/dyed against Defence requirements.
- 0.3 In case of any discrepancy between this specification and any sample or pattern, this specification shall be taken as correct.
- 0.4 Enquiries regarding this specification in relation to any contractual conditions should be addressed to the Inspection Authority named in tender or contract. Other enquiries will be referred to the issuing authority, Director, ADRDE, Agra.
- 0.5 Whenever a reference to any other specification occurs in this specification, it shall be taken as a reference to the latest version of that specification.
- 0.6 Copies of this specification can be obtained from:
 - i. The Director,
A.D.R. & D.E.,
P.B. No. 51, Station Road,
Agra Cantt. - 282 001
 - ii. Concerned Inspectors and Inspection Authority.
- 0.7 IS specifications quoted in this specification may be obtained directly from B.I.S., Manak Bhawan, 9, Bahadur Shah Zafar Marg, New Delhi - 110 002 or its offices located in the country.

1. SCOPE

- 1.1 This specification covers the requirement of woven tape nylon various undyed/dyed used in the manufacture of parachutes and other miscellaneous Aerial Delivery Equipments.
- 1.2 Option for Heat setting/ Simultaneous resin treatment and heat setting for particular varieties of Tapes (variety no. 1 & 4) has also been covered. This specification has to be read in conjunction with Specification no. ADRDE/Specn/83.

2. RELATED SPECIFICATIONS

- 2.1 Reference is made in this specification to :
 - i. IS:2 Rules for rounding off numerical values
 - ii. IS:6359 Methods for conditioning of textiles
 - iii. IS:1954 Methods for determination of length and width of fabrics

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- iv. IS:7702 Method for determination of thickness of woven and knitted fabrics.
- v. IS:1963 Method for determination of threads per unit length in woven fabrics.
- vi. IS:4727 Method for determination of weight per metre (App 'A').
- vii. IS:1969 Methods for determination of breaking load and elongation at break of woven textile fabrics.
- viii. IS:3442 Determination of crimp and count of yarn removed from fabric.
- ix. IS:1670 Determination of breaking load, elongation at break and tenacity of yarns
- x. IS: 832 Method for determination of twist in yarn
- xi. IS:1390 Method for determination of pH value of aqueous extracts of Textiles (cold method).
- xii. IS:5762 Methods for Determination of Melting Point and Melting Range
- xiii. IS:7151 Specification for corrugated fibre board boxes for Para dropping of supplies.
- xiv. IS:9738 Polythene bags.
- xv. IS:4727 Method for determination of extractable material (Appendix 'E')
- xvi. IS:2454 Method for determination of colour fastness of textile materials to artificial light (xenon arc)
- xvii. IS:764 Method for determination of colour fastness of textile materials to washing

2.2 All specifications referred to in this specification for any tender or contract, shall mean the current edition on the date of such tender or contract.

3. REFERENCE STANDARD


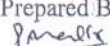
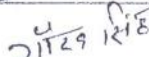
- 3.1 The standard of the tapes, held by ADRDE, Agra Cantt, shall constitute the reference standard as regards any particulars of properties not noted/defined in this specification.

4. MATERIAL

- 4.1 The basic material shall be nylon-66, bright, high tenacity (8.0 gpd min. for fine yarn and 8.5 gpd min. for coarse yarn), multi filament yarn suitably twisted as per Appendix 'A' to meet the requirements stipulated at clause 7. One spool of about 200 metre of the basic yarn material along with its test results should be supplied by the firm for testing/approval before starting the production of Advance sample (Ref. Clause 5.2)

5. MANUFACTURE

- 5.1 Nylon yarn used in the manufacture of the tape shall be of Du Pont or its equivalent standard manufactures' product that will ensure the compliance of the tape with the requirement of this standard.
- 5.2 The tapes shall be evenly woven under suitable tension. The edges of tapes shall be firm and regular. The tension given to the yarn during weaving shall be intimated along with the processing/manufacturing details. A piece of ten metre sample along with the test results shall be forwarded as an advance sample for approval.

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
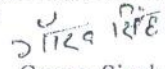
- 5.3 The tapes shall not be more than one year old from the date of manufacture to the date of delivery. A certificate to this effect shall be provided by the manufacturer/contractor at the time of delivery.

6. FINISH

- 6.1 The tapes shall have minimum weaving defects. The tape when laid on a flat even surface shall be in a straight line without application of any tension. For detail classification of defects, Appendix 'B' of this specification may be consulted.
- 6.2 For the tapes covered under variety no 1 & 4 of Appendix 'A', there is an option for 'heat setting' and 'Simultaneous resin treatment & heat setting' as per Para 6 and 7 respectively of ADRDE/SPECN/83.. The evaluation of heat setting shall be done in terms of Permanent set, boiling water shrinkage and drop angle as per Para 6.1 of Specification no. ADRDE/SPCN/83 and the evaluation of simultaneous resin treatment & heat setting shall be done in terms of Permanent set, boiling water shrinkage, drop angle and extractable material as per Para 7.4 of Specification no. ADRDE/SPCN/83.

7. REQUIREMENTS

- 7.1 The tapes shall conform to the particulars given in Appendix 'A', when tested in accordance with the methods mentioned in Related Specifications under clause 2.
- 7.2 For heat set/ simultaneous resin treated & heat set tapes, the tapes (variety no. 1 & 4 of Appendix 'A') shall also conform to the requirements of Para 6.1/7.4 of Specification no. ADRDE/SPCN/83.
- 7.3 pH Value : pH value of the finished tape shall be within the range or 5.5 to 8.5, when tested as per the relevant method.
- 7.4 Colour fastness to light: Colour fastness to light of the finished tape shall be 5 or better when tested as per IS: 2454.
- 7.5 Colour fastness to washing: No colour bleeding on white cotton/white wool when tested as per IS: 764.
- 7.6 Melting Point: The melting point of nylon yarn used in the manufacture of the tapes shall be $250 \pm 6^\circ\text{C}$.
- 7.6.1 The melting temperature of the nylon yarn shall be determined according to Appendix B of IS: 5762.
- 7.7 Sealed Sample: If, in order to illustrate or specify the un-measurable characteristics like general appearance, feel, etc of the tapes, sample has been agreed upon and sealed, the supply shall be in conformity with the sample in such respects.
- 7.7.1 The custody of the sealed sample shall be a matter of prior agreement between the buyer and the seller.

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8. MARKING

- 8.1 Each piece, prior to being offered for inspection, shall legibly be marked by the supplier with his name, initials or recognised trade mark, the year of manufacture, brief nomenclature, DS Cat. number of the store and length of the piece along with the number of flags contained in the piece.

9. QUALITY

- 9.1 On examination of sample taken from any portion of consignment, shall show that the tape conforms to the requirements of clause 7 above.

10. PRE-INSEPCION OF STORES/CONSIGNMNET

- 10.1 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 inspecting 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 along with 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.

- 10.2 If the Inspecting officer finds that pre-inspection of the consignment as required above has not been carried out, the consignment is liable for rejection.

11. SAMPLING


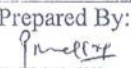
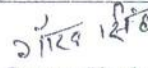
- 11.1 The manufacturer / supplier shall tender stores duly numbered and arranged in such a way that all the units are easily accessible to the Inspector.
- 11.2 The samples shall be drawn lot wise for carrying out tests specified in this specification. Unless otherwise agreed to between the buyer and the seller, the lot shall be defined under respective sampling plans as detailed below. The tape shall be in continuous length without joints of not less than 100 m or its multiple or as agreed between the buyer and the seller.

However, shorter cuts may be allowed in accordance with the following schedule or as agreed between the buyer and the seller:-

90 % of the total supply in length of 100 m
 10 % of the total supply in length of 50 m or above

11.3 Sampling Plan 'A'

- 11.3.1 Lot - The total length of the tape manufactured from same type of yarn purchased from the same supplier/ manufacturer and of same weave and finish, delivered to a buyer against one dispatch note shall constitute a lot.

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11.3.2 Each roll of the lot shall be measured for its length.

11.3.3 One sample of three metre length and of full width shall be drawn from each roll of the lot for carrying out the Breaking load and Extension at break

11.4 Sampling Plan 'B'

11.4.1 Lot - All the rolls of tape manufactured from same type of yarn purchased from the same supplier / manufacturer and of same weave and finish, delivered to a buyer against one dispatch note shall constitute a lot.

11.4.2 Five samples or 10 % of the lot, whichever is more, shall be drawn for the following tests. Each sample shall be of five-metre length and of full width:

- Width
- Thickness
- Mass

11.5 Sampling Plan 'C'

11.5.1 Lot - The quantity of tape manufactured from the same type of yarn purchased from the same supplier / manufacturer and of the same weave and finish, delivered to a buyer against one dispatch note shall constitute a lot.

11.5.2 Two samples or 2 % of the lot, whichever is more, should be drawn for the following tests; one sample of two metre length and of full width shall be drawn from each roll:

- Weave
- Total number of ends in full width
- No. of threads/dm (weft)
- Linear density of yarn
- pH value
- Type of basic material
- Twist of yarn
- Melting temperature of yarn


11.6 For heat set/ simultaneous resin treated & heat set tapes: A sample of 10 m length - both with and without any treatment is to be drawn from the rolls and tested as mentioned under Para 6.1/7.4 of Specification no. ADRDE/SPCN/83

12 CRITERIA FOR CONFORMITY

12.1 All the sample units drawn as per clause 11.2 above, shall be tested/examined to the relevant requirement / specification. The lot shall be considered to be in conformity if the requirements given in clause 7 are satisfied.

13 INSPECTION

13.1 If, on examination, 20 percent of those examined, are found not to conform to this specification in any respect, the whole consignment may be rejected.

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14. WARRANTY

- 14.1 The stores supplied, shall be deemed to bear a warranty of the contractor against defective material, poor workmanship and performance for a period of twelve months from the date of receipt of the stores at consignee's depot.
- 14.2 If, during the period, the stores supplied are found by the consignee to be defective, the same shall be replaced immediately with serviceable stores by the contractor at site, free of any charge or cost.

15. PACKAGING


- 15.1 Each roll / piece shall be wrapped with polythene bag as per IS: 9738 and secured by line cotton (0.32 cm) to form a unit pack. Suitable number of such unit packs shall then be wrapped with paper craft wrapping and placed in corrugated fibre-board box as per IS: 7151 of suitable size provided with line waterproof bag. The gross mass of the box shall not exceed 40 kg. The empty spaces if any shall be filled in with cushioning material to prevent any movement of the contents inside the corrugated fibre board box and the top lid of box shall be properly fixed with adhesive tape. The box packing shall be made secured by fastening with suitable tapes/corrls.
- 15.2 Packing material used, should be approved by Inspecting Officer. If ordered for delivery to a local inspection depot, the store shall be delivered in the same fashion as stated above in Cl no. 15.1. After inspection, the accepted supplies shall be packed by the inspection depot concerned as indicated in para. 15.1 above.
- 15.3 Before dispatch, each box of corrugated fibre board packing, shall be legibly and indelibly marked, showing following details:
- Nomenclature and D S Cat number.
 - Quantity packed in each corrugated fibre board box.
 - Serial no. of the corrugated fibre board box.
 - Month and year of packing.
 - Name and trade mark of the manufacturer.
 - Gross mass of each corrugated fibre board box in kg.
 - Name and address of the consignee.
 - Inspection Note number and date.

16. DEFENCE STORES CATALOGUE NUMBER

- 16.1 Not yet allotted.

17. SUGGESTION FOR IMPROVEMENT

- 17.1 Any suggestion for improvement of this document may be forwarded to the Director, ADRDE, Agra Cantt - 282 001.

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Vty. No.	Roll Length, min, or as agreed	Width, mm	Thickness, under 200g/cm ² pressure, max mm	Mass, max g/m	Breaking Load, min kgf	Extension at break %	Weave	Linear Density of twisted yarn (with a tolerance of -3 to +8 %)	
	m	mm	mm	g/m	kgf	%		Warp	Weft
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	100	21±1	0.75	11	600	27±5	Plain, 2-picks/shed	93X1	23X1
2	100	26±1	2.35	36.5	1850	27±5	Tubular Plain, 2-picks/shed	93X1	93X1
3	100	26±1	0.62	9.2	500	27±5	2/2 Pointed Twill, 2-picks/shed	93X1	23X1
4	100	26+1 -0	0.9	17	850	27±5	Plain, 2-picks/shed @	186X1	23X1, Two such yarns working as one #
5	100	25+1 -0	0.62	10	550	27±5	Plain, 2 ends working as one, 2-picks /shed	93X1	23X1

@ In this case, since weft (pick) consists of two parallel yarns of 23 tex x 1, there are practically four yarns of 23 tex x 1 in a shed.
Two yarns of 23 tex x 1 should work in parallel and should not be twisted together.

Note:

- In case of dyed tape, (+) 5% relaxation shall be allowed in mass and extension at break.
- For Resin treated tape, tolerance in linear density of yarn shall be allowed up to +12%.


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Total no. of ends in full width (with a tolerance of 1 %)	Picks per dm (with a tolerance of 1%)	Twist of yarn per meter, TPM, min	
		Warp	Weft
(11)	(12)	(13)	(14)
92	142*	100	100
318	92	100	100
75	245	100	100
70	136*	100	100
82	180	100	100

* The pick density of the untreated tape should be 136 while after resin treatment and heat setting, pick density lesser than that of untreated tape by 8% is acceptable.

Note: For Resin treated tape, manufacturer should issue certificate of compliance of specified twist in both warp & weft direction.

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APPENDIX 'B'

CLASSIFICATION OF DEFECTS

1. The following defects found in metre-by-metre examination are classified as major / minor.


a) Major defects detectable visually during inspection

Defects	Description	Major
Abrasion	Abrasion resulting in broken filaments, rupture of individual yarn and distortion in the orientation of threads	X
Broken and missing threads (ends/picks)	Two or more, regardless of length	X
Coarse or light filling bar	Extending for more than 13 mm in the length direction or more than 50 % of width resulting in visible differences in thickness	X
Floats skips	Single float or skip over 1 cm or more in length	X
	Contiguous float, the sequence of which measures 0.5 cm or more in length	X
	Any multiple float 5 mm square or more	X
Jerked-In filling	Any jerked-in filling occurring 4 times within 25 cm	X
Edge cut, torn or frayed	Complete separation of one or more yarns within 3 mm of the edge or at any adjoining point	X
Mispick or double pick	Two or more additional picks across full width	X
Slack end	Two or more for a minimum of 13 mm in length	X
Loose, Irregular and uneven Selvages	Clearly noticeable waviness along selvedge edge when no tension is on selvedge	X
Selvedge tight	Any clearly noticeable roll of edge or edges when tension is released.	X
Spot, stain	Single thread 40 cm or more in length	X
	Double threads 20 cm or more in length	X
	Over two threads 12 cm or more in length or clearly noticeable area more than 6 mm ² , whichever is greater	X
Slubs or strip back*	More than 5 over 1 cm in length	X
	Two to five over 2 cm in length	X
	One over 5 cm in length	X
Smash	Any smash	X
Wrong draw	Extending for more than 25 cm	X

* A strip back is defined as a broken filament (s) wrapped around the remaining yarns forming an enlarged area resembling a slub.

b) Minor defects detectable visually during inspection

The classification of the defects defined under clause a) above, may be considered minor, if it exists to a lesser degree than that given under the column 'Description'.

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2. Acceptance of rolls with defects

2.1 Each roll shall be visually examined for defects as described in a) and b) above. No roll shall contain more than 5 major defects per 100 m or 18 minor defects per 100 m. For this purpose, all the rolls shall be visually examined metre by metre and the defects classified in accordance with a) and b) of Appendix 'B'. The unit of product for examination, shall be one linear metre. For each unit of product, the defects shall be counted as follow:

- i) One major defect and one minor defect shall be counted as one major defect.
- ii) Three or more minor defects shall be counted as one major defect.
- iii) A continuous major defect shall be counted as one major defect for each unit of product or fraction there of in which it occurs.

2.2 Each major defect shall be flagged by a red string sewn in the selvedge. Each minor defect shall be flagged by a blue string sewn in the selvedge. Three or more minor defects occurring per linear metre shall be flagged by a red string sewn in the selvedge.

2.3 An allowance of 50 cm shall be claimed for each major defect flagged except for continuous defects, which shall be given an allowance of one metre for each metre in which it occurs. An allowance of 16 cm shall be claimed for each minor defect flagged.