




	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by, Director	Page 1 of 25

RAKSHA MANTRALAYA  
MINISTRY OF DEFENCE

PROVISIONAL SPECIFICATION  
FOR  
(NIV) TAPE WOVEN NYLON UNTREATED, U.V.R. TREATED BLACK &  
W.R. - U.V.R. TREATED BLACK




ISSUED BY  
DIRECTOR / NIDESHAK  
HAWAI VITRAN ANUSANDHAN AVAM VIKAS SANSTHAPAN  
RAKSHA MANTRALAYA

AERIAL DELIVERY RESEARCH AND DEVELOPMENT ESTT.  
MINISTRY OF DEFENCE  
POST BOX NO. 51  
STATION ROAD  
AGRA CANTT - 282 001

	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by:  Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma  TO 'A', TDTM	Recommended by  Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by,  Director	Page 2 of 25


RECORD OF AMENDMENTS

Amendment No.	Sub heading to which amendment pertains	Authority	Incorporated by Name & Rank in Block letters	Initials


	No. ADRDE/SPECN/70(b)	Issue: 05 Dated: 20/08/2013	Revision no: Dated:
Prepared by <sup>DATE</sup> Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma TO 'A', TDTM	Recommended by  Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by,  Director	Page 3 of 25

RECORD OF AMENDMENTS

Amendment No.	Sub heading to which amendment pertains	Authority	Incorporated by Name & Rank in Block letters	Initials

	No. ADRDE/SPECN/70(b)	Issue: 01 Dated: 20/08/2013	Revision no: Dated:
Prepared by: <i>D. Gaurav Singh</i> D. Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma TO 'A', TDTM	Recommended by Head, TDTM Vikas B. Thakare, Scientist 'F'	Approved by, <i>[Signature]</i> Director	Page 4 of 25

	<u>CONTENTS</u>	<u>PAGE No.</u>
0.	FOREWORD	5
1.	SCOPE	5
2.	RELATED SPECIFICATIONS	6
3.	MATERIAL	7
4.	MANUFACTURE	7
5.	SEQUENCE	7
6.	UNTREATED TAPE	8
7.	UVR TREATED TAPE	8
8.	WR - UVR TREATED TAPE	8
9.	RESISTANCE TO ACCELERATED AGEING	9
10.	STIFFNESS	9
11.	FINISH	9
12.	REQUIREMENTS	10
13.	MARKING	10
14.	QUALITY	10
15.	PRE INSPECTION OF STORES/CONSIGNMENT	10
16.	ROLL LENGTH	11
17.	SAMPLING	11
18.	CRITERIA FOR CONFORMITY	13
19.	INSPECTION	13
20.	WARRANTY	13
21.	PACKAGING	13
22.	DEFENCE STORES CATALOGUE NUMBER	14
23.	SUGGESTION FOR IMPROVEMENT	14
24.	APPENDIX 'A'	15
25.	APPENDIX 'B'	16
26.	APPENDIX 'C'	19
27.	APPENDIX 'D'	20
28.	APPENDIX 'E'	21
29.	APPENDIX 'F'	23
30.	APPENDIX 'G'	24
31.	APPENDIX 'H'	25

	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by, Director	Page 5 of 25

**TAPE WOVEN NYLON UNTREATED, U.V.R. TREATED BLACK &  
W.R. - U.V.R. TREATED BLACK**

0. **FOREWORD**
- 0.1 The specification supersedes the specification no. ADRDE/SPECN/70(a).
- 0.2 This specification has been prepared by a special committee at ADRDE and approved by the Director, ADRDE, Agra .
- 0.3 This specification would be used for manufacture, inspection and procurement of Tape Woven Nylon Untreated, U.V.R. Treated Black & W.R. - U.V.R. Treated Black against Defence requirements.
- 0.4 In case of any discrepancy between this specification and any sample or pattern, this specification shall be taken as correct.
- 0.5 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.
- 0.6 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.
- 0.7 Copies of this specification can be obtained on payment 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.
- 0.8 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 different parts of the country.
1. **SCOPE**
- 1.1 This specification covers the requirement of the following varieties of 26mm & 30 mm Nylon Tape:
- (i) Tape Nylon 26 mm Untreated (variety-1)
  - (ii) Tape Nylon 26 mm UVR (Ultra Violet Resistant) Treated, Black (variety-2)
  - (iii) Tape Nylon 26 mm WR (Water Repellent)- UVR Treated, Black (variety-3)
  - (iv) Tape Nylon 30 mm Untreated (variety-4)
  - (v) Tape Nylon 30 mm UVR Treated, black (variety-5)

	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: <i>DR. P. K. SINGH</i> Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by: <i>Vikas B Thakare</i> Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by: <i>[Signature]</i> Director	Page 6 of 25

(vi) Tape Nylon 30 mm WR- UVR Treated, black (variety-6)


used in the manufacture of Multi Element Net Assembly (MENA) of Aircraft Arrestor Barrier System (AABS) and can also be used in other Aerial Delivery Applications considering the suitability.

## 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
- 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 meter.  
(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: 832 Method for determination of twist in yarn
- x. IS:1390 Method for determination of pH value of aqueous extracts of Textiles (cold method).
- xi. IS:7151 Specification for corrugated fibre board boxes for para dropping of supplies.
- xii. IS:9738 Polythene bags.
- xiii. IS: 5762 Methods for the determination of Melting point and Melting Range.

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.

	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by: Head, TDTM Vikas B. Thakare, Scientist 'F'	Approved by: Director	Page 7 of 25

### 3. MATERIAL

- 3.1 The basic material shall be of bright, high tenacity (9.5 gpd and more), light and heat stabilized, multifilament nylon 66 yarn, suitably twisted as per Appendix 'A' to meet the requirements stipulated at clause 12. Manufacturer/ Supplier shall issue a certificate that the quality of yarn as mentioned above (clause 3.1) especially light and heat stabilized variety has been used to manufacture the stipulated variety of tape. One spool of about 200 metre of the basic yarn along with its test results should be provided by the firm for testing/approval from Inspection Officer/AHSP before starting the production of Advance sample.

### 4. MANUFACTURE

- 4.1 The Tape shall be evenly woven under suitable tension. The selvages of Tape 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 from Inspection Officer/AHSP.
- 4.2 The tape 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/supplier at the time of delivery.

### 5. SEQUENCE

- 5.1 Broad sequence of manufacture for the respective varieties of tape is given below:  
5.1.1 Sequence for variety no. 1 & 4:




- 5.1.2 Sequence for variety no. 2 & 5:



- 5.1.3 Sequence for variety no. 3 & 6:



	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by, Director	Page 8 of 25

## 6. UNTREATED TAPE

- 6.1 The sequence of manufacture of untreated tape should comply with that given under clause no. 5.1.1 of this specification.
- 6.2 The Tape Nylon, 26mm & 30 mm untreated (i.e. variety no. 1 & 4) should conform to the requirements as per clause no. 12 of this specification.

## 7. UVR TREATED TAPE

- 7.1 The sequence of manufacture of UVR treated tape should comply with that given under clause no. 5.1.2 of this specification.
- 7.2 The Tape Nylon, 26 mm. & 30 mm, UVR treated (i.e. variety no. 2 & 5) should conform to the requirements as per clause no. 12 of this specification.

### 7.3 UVR Treatment:


The resin used to treat the tape shall consist of polyvinyl butyral, plasticized with butyl sebacate applied by alcohol dispersion. The fine carbon black shall be added to the resin emulsion to produce uniform black colour. Any change either in the prescribed formulation or the process of application to provide specified U.V. resistance may be adopted with prior approval of the competent authority. Suggested procedure of UVR treatment with chemical composition is given in the Appendix-E of this specification.

- 7.4 **Extractable Material:** The tape after the resin treatment and curing when extracted by the method prescribed in Appendix-E of IS:4727 shall give 4-5 % extractable material on the dry weight of tape.

## 8. WR-UVR TREATED TAPE

- 8.1 The sequence of manufacture of WR- UVR treated tape should comply with that given under clause no. 5.1.3 of this specification.
- 8.2 The Tape Nylon, 26 mm. & 30 mm, WR-UVR treated (i.e. variety no. 3 & 6) should conform to the requirements as per clause no. 12 of this specification.
- 8.3 The WR-UVR treated tape should show:
- 8.3.1 maximum 15% water absorbency of the dry weight of Tape Nylon, 26mm, WR-UVR treated black and
- 8.3.2 maximum 18% water absorbency of the dry weight of Tape Nylon, 30mm, WR-UVR treated black when tested in accordance with the water repellency test method stipulated in Appendix- D of this specification.



	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by Director	Page 9 of 25

8.4 Suggested procedure of WR- UVR treatment is given in Appendix - F of this specification.

8.6 **Extractable Material**

The WR - UVR treated nylon tape when extracted by the method given in Appendix 'E' of IS:4727 shall give maximum 6.5% extractable material to the dry weight of tape.

9. **RESISTANCE TO ACCELERATED AGEING:**

a) The UVR treated tape & WR-UVR treated tape after carbon arc exposure, as per Appendix-C, Test method-1 of this specification, shall have not less than 95% of the original breaking strength of treated counterpart.

**OR**

b) The UVR treated tape & WR-UVR treated tape after UV-B light exposure, as per Appendix-C, Test method-2 of this specification, shall have not less than 93% of the original breaking strength of treated counterpart.

10. **STIFFNESS:**

The drop angle of the UVR treated tape & WR-UVR treated tape when tested as per method stipulated in Appendix- ~~6~~ <sup>5</sup> of this specification should not be greater than 35°.

11. **FINISH**

11.1 The tape shall be suitably heat set (if required) under already approved conditions of temperature, time & stretch. The supplier should primarily get approved the sequence of processes which is supposed to enable the manufacturer to achieve the specified properties.

11.2 The untreated, UVR treated & WR-UVR treated tape should be finished according to the clauses 6,7 & 8 respectively of this specification.

11.3 The tape 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 detailed classification of defects, Appendix 'B' of this specification may be consulted.

	No. ADRDE/SPECN/70(b)	Issue: 05 Dated: 20/08/2013	Revision no: Dated:
Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by, Director	Page 10 of 25

## 12. REQUIREMENTS

12.1 The untreated, UVR treated & WR-UVR tape shall conform to the particulars given in Appendix 'A', when tested in accordance with the methods mentioned in Related Specifications under clause 2.

12.2 pH Value : pH value of the finished tape shall be within the range or 5.5 to 8.5, for both treated and untreated, when tested as per the relevant method.

12.3 Melting Point: The melting point of Nylon 6,6 yarn used in the manufacture of the Tapes shall be 250-255°C,

12.3.1 The melting point of the nylon yarn shall be determined according to method stipulated in IS: 5762

12.4 Sealed Sample: If, in order to illustrate or specify the un measurable characteristics like general appearance, feel, etc of the tape, sample has been agreed upon and sealed, the supply shall be in conformity with the sample in such respects.

12.5 The custody of the sealed sample shall be a matter of prior agreement between the buyer and the seller.

## 13. MARKING


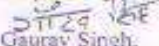


13.1 Each piece, prior to being offered for inspection, shall legibly be marked by the supplier with his name, initials or recognized trade mark, the year of manufacture, brief nomenclature, DS Cat. number of the store and length of the roll along with the number of flags contained in the roll.

## 14. QUALITY

14.1 On examination of sample taken from any portion of consignment, shall show that the tape conforms to the requirements of clause 12.

## 15. PRE-INSEPCION OF STORES/CONSIGNMENT

15.1 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.

	No. ADRDE/SPECN/79(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by:  Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma TO 'A', TDTM	Recommended by:  Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by:  Director	Page 11 of 25

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. A certificate should also be produced by the manufacturer that sequence of the manufacture has been followed as per clause no. 5. The manufacturer should also certify that during manufacture of the variety no. 3 & 6, the extractable WR content after curing has been checked and found to be with in the specified range i.e. 1-1.5 % of the dry weight of the tape.

- 15.2 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.

#### 16. ROLL LENGTH

- 16.1 Unless other wise specified the roll length of varieties of tape from 1 to 6 should be as follows:

- 16.1.1 Variety no.1: Each roll shall be of 156 mts in continuous length without any joint.

Roll of 85 mts. length (in one piece) of 5% of any particular supply (lot) can be accepted.

- 16.1.2 Variety no 2&3: Each roll shall be of 146 mts in continuous length without any joint.

Roll length of 80 mts (in one piece) of 5% of any particular supply (lot) can be accepted.

- 16.1.3 Variety no. 4: Each roll shall be of 111 mts in continuous length without any joint.





Roll of 62 mts. length (in one piece) of 5% of any particular supply (lot) can be accepted.

- 16.1.4 Variety no. 5&6: Each roll shall be of 101 mts in continuous length without any joint.

Roll of 57 mts. length (in one piece) of 5% of any particular supply (lot) can be accepted.

#### 17. SAMPLING

- 17.1 The manufacturer / supplier shall tender stores duly numbered and arranged in such a way that all the units are easily accessible to the Inspector.

	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by:  Gaufar Singh, Scientist 'D', TDTM Mahesh Kumar Verma TO 'A', TDTM	Recommended by:  Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by,  Director	Page 12 of 25

17.2 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.

#### 17.3 SAMPLING PLAN 'A'

17.3.1 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/treatment, delivered to a buyer against one dispatch note shall constitute a lot.

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

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

#### 17.4 SAMPLING PLAN 'B'

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

17.4.2 Five samples or 10 % of the lot, whichever is more, shall be drawn for the following tests. Each sample shall be of three metres length and of full width:


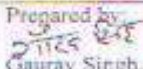


- a) Width
- b) Thickness
- c) Mass

#### 17.5 SAMPLING PLAN 'C'

17.5.1 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/treatment, delivered to a buyer against one dispatch note shall constitute a lot.

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

- a) Weave
- b) No. of threads/dm (warp & weft)
- c) Linear density of yarn
- d) pH value
- e) Type of basic material

	No. ADRDE/SPECN/70(b)	Issue: 05 Dated: 20/08/2013	Revision no: Dated:
Prepared by  Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by  Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by:  Director	Page 13 of 25

- f) Twist of yarn
- g) Melting point of yarn
- h) Extractable material (for variety no.2,3 & 5,6)
- i) Water repellency test (for variety no. 3 & 6)
- j) Stiffness (drop angle) (for variety no.2,3 & 5,6)

#### 17.6 SAMPLING PLAN 'D'

- 17.6.1 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/treatment, delivered to a buyer against one dispatch note shall constitute a lot.
- 17.6.2 In case of UVR & WR-UVR treated tape (variety no.2,3 & 5,6), three samples or 3% of the lot, whichever is more, should be drawn for the accelerated ageing test; one sample of three meters length and of full width shall be drawn from each roll.

#### 18. CRITERIA FOR CONFORMITY

- 18.1 All the sample units drawn as per clause 17 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 12 are satisfied.

#### 19. INSPECTION



- 19.1 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.

#### 20. WARRANTY

- 20.1 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.
- 20.2 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.

#### 21. PACKAGING

- 21.1 Each roll / piece shall be wrapped with suitable size of polythene bag as per IS: 9738 and secured by cotton thread/cord (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 water

	No. ADRDE/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: 12/5 Chaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by,  Director	Page 14 of 25

proof 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 tape/cord.

- 21.2 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 in clause no. 21.1. After inspection, the accepted supplies shall be packed by the inspection depot concerned as indicated in para 21.1.
- 21.3 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.

## 22. DEFENCE STORES CATALOGUE NUMBER

22.1 Not yet allotted.

## 23. SUGGESTION FOR IMPROVEMENT

23.1 Any suggestion for improvement of this document may be forwarded to the Director, ADRDE, P.B. no. 51, Agra Cantt - 282 001.



Prepared by  
 Dr. Gaurav Singh,  
 Scientist 'D'

M.K.V.  
 Mahesh Kumar Verma,  
 TO 'A', TDTM

Recommended by  
 Head, TDTM  
 Vikas B Thakare, Scientist 'F'

Issue: 03  
 Dated: 20/06/2013  
 Approved by  
 Director




Revision no:  
 Dated:  
 Page 15 of 25

APPENDIX-A

Technical Particulars of Tape Nylon 26 mm (Variety 1,2 &3) And Tape Nylon 30 mm (Variety 4,5 & 6)

S. No	Technical Particular	Variety no. 1	Variety no. 2	Variety no. 3	Variety no. 4	Variety no. 5	Variety no. 6	
1.	Width, mm	26 ± 1	26 ± 1	26 ± 1	30 ± 1	30 ± 1	30 ± 1	
2.	Thickness under a pressure of 200 g/cm <sup>2</sup> , mm, max	3.0	3.0	3.0	4.0	4.0	4.0	
3.	Weight, g/m, max	45	50	51	68	75	76	
4.	Breaking strength on full width X 20 cm between grips, kgf, min	2150	2040	2040	3300	3135	3135	
5.	Weave	Double Plain, two ends working as one, two picks/shed						
6.	Suggested Constructional Particulars							
	(I) No. of warp threads in full width	170	170	170	260	260	260	
	a) Ground (face & back)	20	20	20	34	34	34	
	b) Binders	160 (including both layers)	#	#	34 (including both layers)	\$	\$	
	(II) No. of weft threads per dn	1680 X 1	#	#	1680 X 1	\$	\$	
	(III) Denier of Yarn X Ply	840 X 1	#	#	840 X 1	\$	\$	
	a) Warp	840 X 1	#	#	840 X 1	\$	\$	
	b) Binder	100-10%	#	#	100-10%	\$	\$	
	(IV) Yarn twist/m	Spin Twist	Spin Twist	Spin Twist	Spin Twist	Spin Twist	Spin Twist	
	a) Warp	Intermingled yarn	Intermingled yarn	Intermingled yarn	Intermingled yarn	Intermingled yarn	Intermingled yarn	
	b) Binder	Spin Twist	Spin Twist	Spin Twist	Spin Twist	Spin Twist	Spin Twist	
	c) Weft	Intermingled yarn	Intermingled yarn	Intermingled yarn	Intermingled yarn	Intermingled yarn	Intermingled yarn	

# Due to UVR or WR - UVR treatment an increase of around 5 % in values of that given for variety no. 1 may take place.  
 \$ Due to UVR or WR - UVR treatment an increase of around 5 % in values of that given for variety no. 4 may take place.

	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/12/2013	Revision no: Dated:
Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by  Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by,  Director	Page 16 of 25

## APPENDIX 'B'


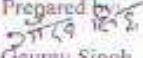
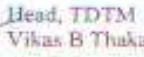

### CLASSIFICATION OF DEFECTS

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

**a) Major defects detectable visually during inspection**


<u>Defects</u>	<u>Description</u>	<u>Major</u>
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 or skips	Single float or skip over 1 cm or more in length	X
	Continuous 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



	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by  Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma TO 'A', TDTM	Recommended by  Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by,  Director	Page 17 of 25

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 selvage edge when no tension is on selvage	X
Selvage 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 <sup>2</sup> , 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.

	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by: Head, TDTM Vikas B. Thakare, Scientist 'F'	Approved by: Director	Page 18 of 25

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'.

**B-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 thereof in which it occurs.
- 2.3 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.
- 2.4 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.

	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by: Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by, Director	Page 19 of 25

### APPENDIX- C

#### METHOD FOR ACCELERATED AGEING OF TREATED TAPE

##### TEST METHOD-1: Carbon arc exposure

- C-1: **Test Specimen:** For the purpose of the test, all the treated tape rolls drawn as per clause no. 17.6.2 shall constitute the test specimen.
- C-2: **Equipment:** The equipment shall be the same as given in clause D-2 under appendix- D of IS: 4727.
- C-3: **Procedure:** Take 3 test specimens of treated tape from each roll selected for accelerated ageing. Place them 2.5 cm. apart side by side in the rack. Expose the specimen to carbon arc light source for a total of 100 hrs maintaining the exposure cycle stipulated under clause D-2.1.d of IS: 4727. Remove the test specimen at the end of the exposure period and condition them to standard atmospheric condition for 24 hrs. When the test specimens have been conditioned, test them for breaking strength by the relevant test method given under clause 2 (Related Specifications) of this specification.

##### TEST METHOD-2: UV-B light exposure

- C-1: **Test Specimen:** For the purpose of the test, all the treated tape rolls drawn as per clause no. 17.6.2 shall constitute the test specimen.
- C-2: **Equipment:** The equipment shall be as given in clause 6 of ASTM:G154-04.
- C-3: **Test conditions:**
1. Lamp: UVB-313 nm
  2. Typical Irradiance: 0.63 W/m<sup>2</sup>/nm at approximate 310nm wavelength
  3. Exposure Cycle: 8 hour UV at 60 (±3) °C Black panel Temperature and 4 hour Condensation Cycle at 50 (±3) °C Black Panel Temperature
  4. Exposure Time: 100 hours (8 complete Exposure cycle + 4 hour only UV cycle)
- C-3: **Procedure:** Take at least 3 test specimens of treated tape from each roll selected for accelerated ageing. Expose the specimen as per clause 9 of ASTM 154-04 for a total of 100 hrs. Remove the test specimen at the end of the exposure period and condition them to standard atmospheric conditions for 24 hrs. When the test specimens have been conditioned, test them for breaking strength by the relevant test method given under clause 2 (Related Specifications) of this specification.

	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by:  Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by:  Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by:  Director	Page 20 of 25

#### APPENDIX - D

#### Method for Water Repellency Test – Immersion Absorption Test

**D-1 Test Specimen Length:** 20 cm X full width

**D-2 Apparatus Used:**

- a) **Immersion Tank:** Tank of at least 30 cm depth for immersion of specimen in the distilled water to check the water repellency of test specimen.
- b) **Sinker:** Sinker is attached to specimen for keeping the specimen submerged. It should be a rigid inverted L- Shaped metal hook (or any metallic mass tied with thread) of non-corrosive metal fastened to a weight sufficient to sink the specimen into the water up to 5 cm hydrostatic head of the water above the top of the specimen undergoing test. In testing narrow fabric, the horizontal end of the sinker hook shall be of sufficient length so that the portion of the specimens attached thereon may be spread out to permit full contact with water.
- c) **Laboratory Balance:** Laboratory balance with an accuracy of  $\pm 5$  mg.

**D-3 Procedure:** Following steps are to be followed to test the water repellency of narrow fabric:

- (a) The specimen shall be conditioned for 24 hrs at  $27 \pm 2^\circ\text{C}$  and  $65 \pm 2\%$  RH and weighed to the nearest 5 mg.
- (b) The specimen shall be attached to the sinker and immersed for a period of 60 minutes in the immersion tank filled with distilled water at a temperature of  $27 \pm 2^\circ\text{C}$ . The depth of the water shall be so regulated that, with the sinker resting on the bottom of the tank, the top of the specimen held in a vertical position should be under a 5 cm head of water.
- (c) After the immersion period, the specimen shall be removed from the tank and the sinker is detached. The specimen shall be hold out in a vertical manner without any jerks/shakes, etc.
- (d) Hold the specimen in vertical manner for 1 minute and then immediately weigh the specimen in closed container to the nearest 5 mg. Care shall be taken to keep evaporation of moisture from the specimen to a minimum.
- (e) Minimum 3 specimens should be tested.

**D-4 Calculation of Results:** The immersion absorption shall be calculated as follows:

$$\text{Immersion absorption, percent} = \frac{F-O}{O} \times 100$$

Where: F=Final weight of the specimen, as described in D-3 (d)  
O=Original conditioned weight of the specimen as described in D-3 (a)

Water absorption shall be reported as percentage of original conditioned weight of the specimen based on the average value (minimum 3- determinations) of F & O.

	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by <i>Gaurav Singh</i> Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by <i>[Signature]</i> Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by, <i>[Signature]</i> Director	Page 21 of 25

APPENDIX -E

**SUGGESTED METHOD OF TREATMENT OF NYLON TAPES TO OBTAIN U.V. RESISTANT FINISH COATING FOR SATISFACTION OF THE PROVISIONAL SPECIFICATION NO. ADRDE/SPECN/70**

**E-1 PREPARATION OF SOLUTION**

**a) Composition**

- |                                |   |            |
|--------------------------------|---|------------|
| 1. Rectified Spirit            | : | 100 Parts  |
| 2. Synpol B-30 (Butyral Resin) | : | 10 Parts   |
| 3. Carbon black (ISAF N220)    | : | 5 Parts    |
| 4. Butyl Recinoleate           | : | 10 Parts   |
| 5. Dynasylon (MEMO)            | : | 0.05 Parts |

**b) Method**

10 Parts of Synpol B-30 (Butyral Resin) should be added gradually in 50 parts of rectified spirit while stirring. Stirring should continue till a homogenous solution is obtained. To facilitate dissolution of the resin the container may be slightly warmed while the stirring is on. Put the prepared solution in a Jar Mill and add 5 parts of Carbon Black and 10 parts of Butyl Recinoleate and run the Mill for 48 hours. After this take out the solution in a suitable container and added 50 parts of the remaining rectified spirit add 0.05 parts of Dynasylon (Memo) before the solution is used for treatment. The solution should be kept in a closed container to avoid evaporation of rectified spirit.

**E-2 TREATMENT METHOD**

**a) U.V.R Treatment of Tapes**


U.V.R Treatment of nylon tapes is done by pad mangle machine. The solution should be kept in the reservoir of machine and nylon tapes passed through the solution and then through the solution and then through rollers which are duly adjusted for squeezing out the surplus solution. The squeezing and viscosity of the solution used to treat the tapes shall be maintained to obtain desired extraction % after drying and curing. The tapes are to be dried over night at room temperature or tapes are to be passed through a chamber for 45 minutes having temperature of 50°C to 60°C.

**E-3 CURING**

The dried tapes should be cured at 140°C to 150°C for 6 minutes in a chamber having the facility of air circulation and temperature control.

**E-4 SAFETY PRECAUTION**

During the presentation of solution or during UVR treatment on tapes there should be no naked flame nearby otherwise the solvent i.e. rectified spirit will catch fire.

	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakare, Scientist 'P'	Approved by, Director	Page 22 of 25

#### E-5 EQUIPMENT/MACHINE REQUIRED FOR UVR TREATMENT

1. Stirrer - Desired RPM 5000
2. Jar Mill - of suitable capacity
3. Pad Mangle Machine – A suitable mangle which can be adjusted to give necessary pressure to obtain desired extraction %.
4. Curing Chamber – The chamber should have arrangements to raise the temperature to the desired level and control the same during the treatment period. The temperature of the chamber should be uniform throughout with the help of air circulation/thermostat control device.

#### E-6 LIKEY SOURCES OF SUPPLY FOR CHEMICALS

1. Butyral Resin (Synpol B-30) : M/S Synthetic & Polymers (P) Ltd.,  
77, G.V.M.S., Audyogic Vasahat Ltd,  
Distt: Ahmedabad
2. Rectified Spirit : i) Distilleries through Excise Commissioner  
ii) Market
3. Butyl Recinoleate : M/S Amrut Industrial Products,  
Chemical House, Amrut Nagar, L.B.S. Marg,  
Post Box No. 46  
Thana- 400601 (Maharashtra)
4. Carbon Black : i) M/S Gunny Tex (P) Ltd.  
2658, Naya Bazar  
Delhi- 110006  
ii) M/S Amrut Industrial Products  
Gandhi Marg, P.B. No. 2445  
Bombay – 400002
5. Dynasylon Memo : M/S Dynamit Nobel Aktiengesel Schat  
Work Rhinnielden 7888, Rhein  
Felden/Baden, West Germany  
  
Indian representative:  
M/S Chika Ltd.  
Vohra House, 25/1, Asaf Ali Road  
New Delhi - 110002

	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by: DT29 VSE Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by,  Director	Page 23 of 25

## APPENDIX- F

### SUGGESTED PROCEDURE OF WR \_ UVR TREATMENT

- F-1 Preparation of Solution for WR treatment:**  
Aquateq- SPL, a Perfluoroalkyl based Fluorocarbon Compound (source of supply given below) should be used as WR (Water Repellent) on tape nylon. 30-50 g of Aquateq-SPL should be added gradually in 1 liter of cold water. Stirring should continue till a homogenous solution is obtained. It is imperative to ensure pH of substrate between 5 to 7 before treatment with Aquateq- SPL, to get optimum results.
- F-2** W.R treatment on nylon tape is done by pad mangle machine through pad-dry-cure method. The suitable amount of solution should be kept in the reservoir of the machine and nylon tape should pass through the solution and then through rollers which are duly adjusted for squeezing out the surplus solution. The tapes are to be dried by passing through a chamber having a temperature of 40°C to 50°C for 45 minutes.
- F-3 Curing:** The Tape after WR treatment and drying shall be cured so as to form a firmly adhered and evenly distributed deposit or coating on the Tape. The curing after WR treatment and drying shall be done in the temperature range of 130°-150°C for 5 minutes.
- F-4** After complete WR treatment (i.e. after curing), manufacturer must check the extractable material as a controlling measure to finalize the WR processing parameters (mangle pressure, expression percentage etc.). The prescribed range of extractable material of tape after WR treatment is 1-1.5% of the weight of dry WR treated tape, when extracted as per the method stipulated in Appendix 'E' of IS:4727. After WR treatment, UVR treatment should be done according to the clause no. 7.3 of this specification.
- F-5 SOURCE OF SUPPLY FOR AQUATEQ- SPL**  
The AQUATEQ- SPL can be procured from the source mentioned below:  
Associated Processing Aids,  
A/103, Gurudev Apts.Opposite Telephone Exchange,  
Chembur Naka, P.O. Box- 7219  
R.C. Marg, Mumbai-400071  
Fax: 022- 25277841  
E- Mail: [assochem@bom4.vsnl.net.in](mailto:assochem@bom4.vsnl.net.in)

 Prepared by: Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
	Recommended by Head, TDTM Vikas B Thakare, Scientist 'F'	Approved by, Director	Page 24 of 25

### APPENDIX-G

#### METHOD FOR DETERMINATION OF STIFFNESS (DROP ANGLE) OF TAPES

##### I G-1 TEST SPECIMEN

For the purpose of this test, all the UVR treated tapes rolls in the lot shall constitute the test specimen.

##### G-1 ATMOSPHERIC CONDITION FOR CONDITIONING AND TESTING

Prior to the test, the tape shall be conditioned to moisture equipment and tested in standard atmospheric conditions  $65 \pm 2\%$  RH and  $27 \pm 2^\circ\text{C}$  temperature.

##### II G-3 PROCEDURE

900 mm length of the tape shall be preconditioned by placing the tape on a horizontal surface and placing sufficient weight on the table to remove any longitudinal curvature. Immediately after the pre-conditioning period under the same atmospheric conditions, the same shall be extended 400 mm beyond the edge of the horizontal surface. The tape shall be sufficiently weighed to keep it flat on the horizontal surface. At the end of 4 hours period, measurements shall be made to determine the drop angle as shown below: -

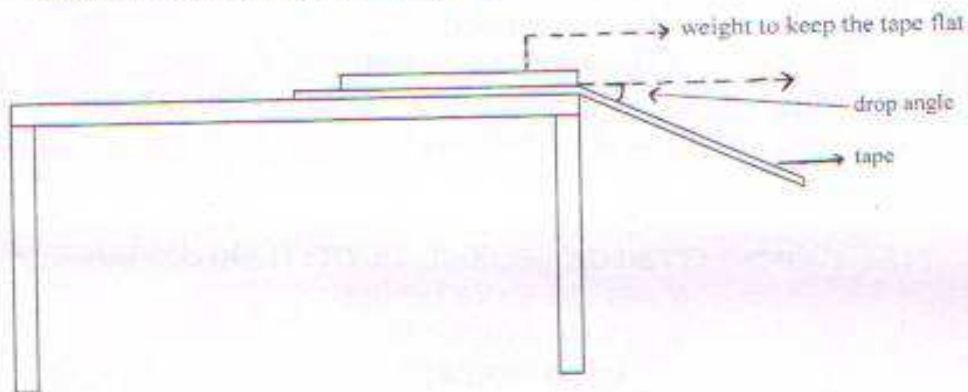


FIG:- SHOWING MEASUREMENT OF DROP ANGLE



	No. ADRDE/QMS/TDTM/SPECN/70(b)	Issue: 03 Dated: 20/08/2013	Revision no: Dated:
Prepared by SITG 121 Gaurav Singh, Scientist 'D', TDTM Mahesh Kumar Verma, TO 'A', TDTM	Recommended by Head, TDTM Vikas B Thakur, Scientist 'F'	Approved by,  Director	Page 25 of 25

## APPENDIX- II

### METHOD FOR DETERMINATION OF EXTRACTABLE MATERIAL AFTER WR & UVR TREATMENT

- H-1** In case of WR-UVR treated tapes; firstly the UVR treatment is to be extracted as per the method stipulated in Appendix – E of IS: 4727
- H-2** After the complete extraction of UVR treatment, WR treatment should be extracted as per the method stipulated in Appendix-E of IS: 4727 with a deviation i.e. using ethyl alcohol in the place of methyl ethyl ketone;

**H-3 Calculation:**

The total WR-UVR extractable material, % = (X+Y).

Where:  $X = (T-U)/T \times 100$

and  $Y = (U-W)/T \times 100$

T = wt. of WR-UVR treated tape in g

U = wt. of tape in g after extraction as per method given in H-1

W = wt. of tape in g after extraction as per method given in H-2