No. IV-21011/3/2010-Prov-I
Government of India
Ministry of Home Affairs

26, Man Singh Road, Jaisalmer House,
New Delhi, 15.12.2010

To
The DG: CRPF

Subject:- QRs for the Dope Dyed Polyester Viscose Uniform Cloth.

The QRs for the Dope Dyed Polyester Viscose Uniform as per Annexure, have been approved by the Competent Authority in MHA:-

2. Henceforth, CRPF should procure the above equipments required by them strictly as per the laid down Technical Specifications/QRs.

(S.B.Nanda)
Under Secretary

# CAPFs (CRPF, BSF, ITBP, CISF, SSB, NSG & ASSAM RIFLES) STANDARD

## SPECIFICATION FOR DOPE DYED POLYESTER VISCOSE UNIFORM CLOTH

*Submitted to:*

CRPF
New Delhi

*Prepared by :*

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# SPECIFICATION FOR DOPE DYED POLYESTER VISCOSE UNIFORM CLOTH

## RECORD OF AMENDMENTS

| Amendment No. and Date | Amendment pertains to Sl.No./Para No./Column No. | Authority | Amended by Name and Appointment (in block letter) | Signature and Date |
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# PREAMBLE

The Director General of CRPF has asked NITRA to prepare technical specifications for Dope dyed polyester viscose uniform cloth for Khakhi, Black, Olive green and Silver grey colour. The specification describes the fabric particulars and properties – ends/inch, picks/inch, weave, weight, yarn count, fibre composition, dimensions, color fastness to light, washing, perspiration, and rubbing; pH, dimensional change due to washing, tear strength, tensile strength, abrasion resistance etc.

Bureau of Indian Standards (BIS), American Association of Textile Chemists and Colorists (AATCC) and American Society for Testing and Materials (ASTM) test methods are considered to draw the specification.

This report contains 16 pages which describe the technical specifications of Dope dyed polyester viscose uniform cloth for CAPFs .

This technical specification will enable the CAPFs to prepare tender documents (technical details) at the time of placing orders for Dope dyed polyester viscose uniform cloth and final inspection as well.

# SPECIFICATION FOR DOPE DYED POLYESTER VISCOSE UNIFORM CLOTH

## CONTENTS

## 0.0 FORWARD

0.1. This specification has been prepared by CAPFs.

0.2. This specification is for use by the CAPFs.

0.3. This specification would be used for manufacture, quality assurance and procurement of the item.

0.4. Quality assurance authority for the item covered in this specification is Office of the CAPFs. All enquiries regarding this specification, including those relating to any contractual conditions contained therein shall be addressed to the Quality Assurance authority at the following address:

Office of the Director General of CRPF,
New Delhi

0.5. Copies of the specification can be obtained from:

Office of the Director General of CRPF,
New Delhi

0.6. This specification holds good only for the supply order for which it is issued.

0.7. The Quality Assurance Authority reserves the right to amend or modify this specification as and when required.

0.8. The Quality Assurance Authority is the competent authority to grant concessions, if any, in respect of any clause contained in this specification.

0.9. If Assam Rifle requires, vendor has to produce a certificate of conformity or undertaking from the dope dyed fibre manufacturers regarding confirmation that the fibre used in this uniform cloth is dope dyed.

0.10. For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS:2-1960 (Reaffirmed 2006). The number of significant places retained in the rounded off value should be the same as that of the specified value in this specification.

## 1.0 SCOPE

1.1 The specification prescribes the requirement of Dope dyed polyester viscose uniform cloth herein referred as "Uniform cloth" in Khakhi, Black, Olive green and Silver Grey colour.

1.2 This specification does not specify the design/ pattern and stitching of uniform from the "Uniform cloth"

1.3 This specification does not specify general appearance; feel etc of the "Uniform cloth"

## 2.0 MANUFACTURE AND FINISH

2.1 The "Uniform cloth" shall have plain weave. The cloth shall be woven from uniform and intimate blend of approximate 67 percent dope dyed polyester fabric and approximately 33 percent dope dyed viscose fibre (Refer Table 1). The selvedges shall be firm and straight. Manufacturer's name and year of manufacture shall be woven on both sides of the selvedges. The "Uniform cloth" shall be well singed. The "Uniform cloth" shall be 'Heat set' and fully shrunk.

2.2 The "Uniform cloth" should be supplied in the width of 138 ± 2 cm. The length of each piece shall be 40 ± 2 meters or as agreed between supplier and purchaser.

2.4 Freedom from Defect: The "Uniform cloth" shall be free from major flaws (defects) which shall not exceed 10 per 100 meters length (*see* Note). A list of major flaws (defects) is given in Annex B of IS 15853:2009 (see IS : 4125). The allowance for providing extra length of cloth in lieu of the flaws (defects) not exceeding the permissible limit may be agreed between the buyer and seller. It shall also be free from dyeing defects such as streaks, stains and uneven dyeing etc. The finished "Uniform cloth" shall be free

from sizing, filling and dressing materials and substance liable to cause subsequent tendering.

The "Uniform cloth" shall be free from any other defect which may significantly mark the appearance or serviceability.

Note- The number of defects shall be determined on all pieces under test and converted into number of defects per 100 meter length. (*See* 6.4)

## 3.0 REQUIREMENTS

3.1 The "Uniform cloth" shall conform to the requirements given in Table 1. Specification for colour shall be as given in Table 2A , 2B, 2C and 2D.

3.2 Sealed Sample: In order to illustrate or specify the indeterminable characteristics such as general appearance, luster and feel, a sample has been agreed upon and sealed; the supply shall be conformity with the sample in such respects.

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

## 4.0 MARKING

Each piece of cloth shall be marked with the following:

(a) Name of the material, namely Dope dyed polyester viscose uniform cloth;

(b) Composition, namely, Polyester 67 percent and Viscose 33 percent to be marked on every alternate meter of the cloth at a height not exceeding 2.5 cm from the selvedge;

(c) Length and width;

(d) Manufacturer's name, initials or trade-mark;

(e) Any other information required by the law in force and/or by the buyers.

## 5.0 PACKAGING & PACKING

The "Uniform cloth" shall be packed in polyethylene or polypropylene bags and or in box, as required by the buyer (see IS 2194 and IS 2195).

## 6.0 SAMPLING AND CRITERIA FOR CONFORMITY

6.1 The number of pieces to be selected at random from a lot for inspection shall be according to col. 1 and 2 of Table 3. To ensure randomness of selection, procedure given is IS : 4905 shall be followed.

6.2 The sampling procedure detailed in 6.2 to 6.4 shall give desired protection to the buyer and the seller, provided that the lot submitted for inspection is homogeneous. To achieve this, the manufacturer shall maintain a system of process control at all stages of manufacturing ensuring the cloth tendering by him for inspection to comply with the requirements of this standard in all respects.

*NOTE*: For effective process control the use of statistical quality control technique is recommended and helpful guidance may be obtained in this respect from 397(Part I) : 2003 and IS 397 (Part II) : 2003.

6.3 Lot: The number of pieces of cloth of same composition and constructional particulars delivered to a buyer against a dispatch note shall constitute a lot.

6.3.1 The conformity of a lot to the requirements of this specification shall be determined on the basis of the tests carried out on the samples selected from the lot.

6.4 The number of pieces to be tested at criterion for conformity for each of the characteristics shall be as follows:

| Characteristics | No. of Samples | Criterion for conformity |
|---|---|---|
| i) Visual inspection for freedom from major flaws (defects) | According to col 2 of Table 3 | All the pieces of cloth selected according to col 2 of Table 3 shall be visually examined for major flaws, meter by meter. The Total number of defects observed on sample piece shall be converted into number of defects per 100 meter length. Permissible number of non-conforming pieces not to exceed corresponding number given in col 3 of Table 3. |
| ii)Construction, Ends, picks, mass, length and width | According to col 4 of Table 3 | All specimens shall satisfy the relevant requirements. |
| iii) Blend composition, shrinkage, breaking strength, tearing strength, colour fastness, pH etc. | According to col 5 of Table 3 | All specimens shall satisfy the relevant requirements. |

**Table 1: Requirements of Dope dyed polyester viscose uniform cloth**

| Sl. No. | Characteristics | Requirements | Test Method |
|---|---|---|---|
| 1 | Approximate count of yarn (For guidance only), Ne<br>- Warp<br>- Weft | <br><br>$2/30^S$<br>$2/30^S$ | IS 3442:1980 |
| 2. | Weave | 1 Up 1 down, Plain | Visual |
| 3 | Composition ,%<br>- Polyester<br>- Viscose | <br>(67 ± 2)%<br>(33 ± 2)% | IS 3416(Pt I):1988 (Based on dry mass) |
| 4 | End/dm | 260 ± 5% | IS 1963:1981 |
| 5 | Picks/dm | 190 ± 5% | IS 1963:1981 |
| 6 | Width, cm | 138 ± 2 | IS 1954:1990 |
| 7 | Mass, $gm/m^2$ | 190 ± 5% | IS 1964 : 1970 |
| 8 | Breaking strength, Newton (Minimum)<br>- Warp-wise<br>- Weft-wise | <br>950<br>750 | IS 1969:1985 (5 cm X 20 cm between grip) |
| 9 | Elongation at break, % (Minimum)<br>- Warp-wise<br>- Weft-wise | <br>25<br>20 | IS 1969:1985 |
| 10 | Tearing Strength, Newton (Minimum)<br>- Warp-wise<br>- Weft-wise | <br>50<br>40 | IS 6489:1993 |
| 11 | Colour fastness to washing<br>- Change in colour<br>- Staining on adjacent fabric | <br>4 or better<br>4 or better | IS/ISO 105: C10 C(3) (Repeated four times) |
| 12 | Colour fastness to perspiration<br>- Change in colour<br>- Staining on adjacent fabric | <br>4 or better<br>4 or better | IS 971:1983 |
| 13 | Colour fastness to rubbing<br>- Dry<br>- Wet | <br>4 or better<br>4 or better | IS 766:1988 |

| | | | |
|---|---|---|---|
| 14 | Colour fastness to light | 6 or better | IS 2454:1985 |
| 15 | Dimensional Change due to relaxation, both directions, percentage, maximum | 1.0 | IS 2977: 1989 |
| 16 | Heat Shrinkage both directions, percentage, maximum | 2.0 | IS: 15853: 2009 |
| 17 | pH value of aqueous extract | 6.0-8.5 | IS 1390:1983 (Cold method) |
| 18 | Water soluble matter, %, Maximum | 1 | IS 3456: 1966 |
| 19 | Pilling resistance, Grade, Minimum | 4 | IS 10971:1984 |
| 20 | Air permeability, cc/sec/cm$^2$, Minimum | 14 | IS 11056:1984 |
| 21 | Moisture vapour transmission, g/m$^2$/day, Minimum | 1400 | ASTM E-96, (water method), RH: 50 ± 2 % and Temperature: (32 ± 3)°C |
| 22 | Colour difference (ΔE)<br>-For Khakhi uniform<br>-For Black uniform<br>-For Olive green uniform<br>-For Silver grey uniform | <br>≤ 1.0<br>≤ 1.0<br>≤ 1.0<br>≤ 1.0 | <br>See Table 2A<br>See Table 2B<br>See Table 2C<br>See Table 2D |
| 23 | Type of dyeing of Polyester & viscose fibre | Dope dyed | See Appendix A |

## Table 2A: Specification of colour-KHAKI

(AATCC Test method 173 : 2009 & AATCC Evaluation Procedure 7 : 2009)

| | | |
|---|---|---|
| **Colour** | : | **KHAKI** |
| **System** | : | **CIE LCH** |
| **Illuminant Observer** | : | **D 65** |
| **Standard Observer** | : | **10 Degree** |

**Tristimulus Values** :

| X | Y | Z |
|---|---|---|
| 21.262 | 21.571 | 13.300 |

**L C H** :

| L | C | H |
|---|---|---|
| 53.569 | 20.627 | 78.956 |

| | | |
|---|---|---|
| **CMC (l:c)** | : | **2:1** |
| **Colour difference, $\Delta E_{cmc}$** | : | **≤ 1.0** |

**Interpretation of Results :**

i) If $\Delta E_{cmc}$ is less than or equal to 1.0, then sample is acceptable.

ii) If $\Delta E_{cmc}$ is greater than 1.0, then sample is unacceptable.

***Note-1 :*** Absorbance/reflectance/ transmittance are affected by surface characteristic features of the substrate. Therefore comparison should be made between samples of same type i.e., identical fabric construction parameters and filament/ fibre composition.

***Note-2 :*** Test should be carried out after proper conditioning as per AATCC 173.

## Table 2B: Specification of colour-BLACK

(AATCC Test method 173 : 2009 & AATCC Evaluation Procedure 7 : 2009)

| | | |
|---|---|---|
| **Colour** | : | **Black** |
| **System** | : | **CIE LCH** |
| **Illuminant Observer** | : | **D 65** |
| **Standard Observer** | : | **10 Degree** |

**Tristimulus Values** :

| X | Y | Z |
|---|---|---|
| 1.980 | 2.067 | 2.275 |

**L C H** :

| L | C | H |
|---|---|---|
| 15.835 | 0.666 | 316.783 |

| | | |
|---|---|---|
| **CMC (l:c)** | : | **2:1** |
| **Colour difference, $\Delta E_{cmc}$** | : | **≤ 1.0** |

**Interpretation of Results :**

i) If $\Delta E_{cmc}$ is less than or equal to 1.0, then sample is acceptable.

ii) If $\Delta E_{cmc}$ is greater than 1.0, then sample is unacceptable.

***Note-1 :*** Absorbance/reflectance/ transmittance are affected by surface characteristic features of the substrate. Therefore comparison should be made between samples of same type i.e., identical fabric construction parameters and filament/ fibre composition.

***Note-2 :*** Test should be carried out after proper conditioning as per AATCC 173 using Diffuse (sphere) geometry spectrophotometer.

## Table 2C: Specification of colour- OLIVE GREEN

(AATCC Test method 173 : 2009 & AATCC Evaluation Procedure 7 : 2009)

| | | |
|---|---|---|
| **Colour** | : | **Olive Green** |
| **System** | : | **CIE LCH** |
| **Illuminant Observer** | : | **D 65** |
| **Standard Observer** | : | **10 Degree** |

**Tristimulus Values** :

| X | Y | Z |
|---|---|---|
| 3.037 | 3.248 | 3.184 |

**L C H** :

| L | C | H |
|---|---|---|
| 21.011 | 2.038 | 110.748 |

| | | |
|---|---|---|
| **CMC (l:c)** | : | **2:1** |
| **Colour difference, $\Delta E_{cmc}$** | : | **≤ 1.0** |

**Interpretation of Results :**

iii) If $\Delta E_{cmc}$ is less than or equal to 1.0, then sample is acceptable.

iv) If $\Delta E_{cmc}$ is greater than 1.0, then sample is unacceptable.

***Note-1 :*** Absorbance/reflectance/ transmittance are affected by surface characteristic features of the substrate. Therefore comparison should be made between samples of same type i.e., identical fabric construction parameters and filament/ fibre composition.

***Note-2 :*** Test should be carried out after proper conditioning as per AATCC 173 using Diffuse (sphere) geometry spectrophotometer.

## Table 2D: Specification of colour- SILVER GREY

(AATCC Test method 173 : 2009 & AATCC Evaluation Procedure 7 : 2009)

| | | |
|---|---|---|
| **Colour** | : | **Silver Grey** |
| **System** | : | **CIE LCH** |
| **Illuminant Observer** | : | **D 65** |
| **Standard Observer** | : | **10 Degree** |

**Tristimulus Values** :

| X | Y | Z |
|---|---|---|
| 7.962 | 8.449 | 9.658 |

**L C H** :

| L | C | H |
|---|---|---|
| 34.901 | 1.899 | 257.133 |

| | | |
|---|---|---|
| **CMC (l:c)** | : | **2:1** |
| **Colour difference, $\Delta E_{cmc}$** | : | **≤ 1.0** |

**Interpretation of Results :**

i) If $\Delta E_{cmc}$ is less than or equal to 1.0, then sample is acceptable.

ii) If $\Delta E_{cmc}$ is greater than 1.0, then sample is unacceptable.

***Note-1 :*** Absorbance/reflectance/ transmittance are affected by surface characteristic features of the substrate. Therefore comparison should be made between samples of same type i.e., identical fabric construction parameters and filament/ fibre composition.

***Note-2 :*** Test should be carried out after proper conditioning as per AATCC 173 using Diffuse (sphere) geometry spectrophotometer.

**Table 3 : Sample size and permissible number of non-conforming Uniform Cloth (Refer IS 15853:2009)**

| Lot size<br><br>(1) | Sample size<br><br>(2) | Permissible number of non-conforming pieces<br><br>(3) | Sub-sample size<br><br>(4) | Sub-sub sample size<br><br>(5) |
|---|---|---|---|---|
| Up to 100 | 5 | 0 | 3 | 3 |
| 101-150 | 8 | 0 | 3 | 3 |
| 151-300 | 13 | 1 | 5 | 3 |
| 301-500 | 20 | 1 | 5 | 3 |
| 501-1000 | 32 | 2 | 8 | 5 |
| 1001 and above | 50 | 3 | 13 | 5 |

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Approval of DG on N/S placed at Page 94/Corr.

## 8.0 REFERENCES

8.1 The list of referred standards is given below:

### LIST OF REFERED STANDARDS

| Sl. No. | Method/Spec. number | Title |
|---|---|---|
| 1 | IS:397(Part I) : 2003 | Method for statistical quality control during production : Part I Control charts for variable |
| 3 | IS:14452:1997 (RA 2006) | Textiles-Care Labeling code using symbols |
| 4 | IS:397 (Part II): 2003 | Method for statically quality control during production: Part 2 Control charts for attributes and count of defects |
| 5 | IS:6359: 1971 (RA 2004) | Method for conditioning of Textiles |
| 6 | IS 13510:2000 (RA 2006) | Textile-duck, Polyester/cotton blended, Rip-stop-Specification |
| 7 | IS:9543:1980 (RA 2004) | Spun polyester sewing threads |
| 8 | IS:10789:2000 (RA 2007) | Classification and terminology of stitch types used in seams |
| 9 | IS:11161:2000 (RA 2007) | Textiles-seam types-classification and terminology |
| 10 | IS:3442:1980 (RA 2004) | Methods for identification of crimp and count of yarn removed from fabric |
| 11 | IS:1963:1981 (RA 2004) | Method for determination of thread per unit length in woven fabric |
| 12 | IS:1964:1970 (RA 2006) | Methods for determination of weight per square meter and weight per linear meter of fabric |
| 13 | IS: 1954:1990 (RA 2007) | Determination of length and width of woven fabric |
| 14 | IS:1969:1985, (RA 2006) | Method for determination of breaking strength and elongation of woven fabrics |
| 15 | IS:6489:1993, (RA 2006) | Textiles-woven fabrics-determination of tear resistance by the falling pendulum method |
| 16 | IND/TC/0048(a) | Specification for cloth plain weave polyester viscose dope dyed |

| | | |
|---|---|---|
| 17 | IS:11056:1984, (RA 2006) | Method for determination of air permeability of fabrics |
| 18 | IS:15853:2009 | Textiles-Polyester blend suiting for uniform-specification |
| 19 | IS/ISO 105:C10 C(3):2006 | Method for determination of colour fastness of textile material to washing |
| 20 | IS 971:1983, Reaffirmed 2004 | Method for determination of colour fastness of textile material to perspiration |
| 21 | IS 689:1988, Reaffirmed 2004 | Method for determination of colour fastness of textile material to hot pressing |
| 22 | IS 766:1988, Reaffirmed 2004 | Method for determination of colour fastness of textile material to rubbing |
| 24 | IS 2454:1985, Reaffirmed 2006 | Method for determination of colour fastness of textile material to artificial light (Xenon lamp) |
| 25 | IS 1390 : 1983 (RA 2004) | Method for determination of pH value of aqueous extract of textile materials |
| 26 | AATCC Test method 173 : 2009 | CMC: Calculation of small colour differences for acceptability |
| 27 | AATCC Evaluation Procedure 7 : 2009 | Instrumental assessment of the change in colour of a test specimen |
| 29 | IS 3416 (Pt 1): 1988 | Method for quantitative chemical analysis of binary mixtures of polyester fibres with cotton or regenerated cellulose |
| 30 | ASTM E 96 | Standard test methods for water vapor transmission |

**Appendix-1**

## Identification of dope dyed Olive green/Silver grey colour Polyester and Viscose fibre blend

The methods given below are guidelines to identify whether the fibres are dope dyed or not. The methods given below shall be applicable only for Dope dyed polyester viscose uniform cloth mentioned in this specification.

**1. Identification of dope dyed polyester:**

**i) Dye identification test:** The material is carbonized as per IS 3416. Then carry out the dye identification test as per IS: 4472 pt-III. If the test shows absence of disperse dyes then it may be inferred that the polyester fibre is dope dyed.

**ii) Colour fastness to hot press:** The test shall be carried out as per the latest version of IS 689. However the temperature shall be 230°C with an exposure time 15 seconds (For dry press only) instead of 210°C as specified in IS 689. If the change in colour and staining on polyester fabric is 4/5 or better then the fabric might have been produced with dope dyed fibres.

**iii) Treatment with Lyogen DFT:** First carbonize the fabric sample as per method IS 3416 and then cut a test specimen of 10.0 X 4.0 cm size and place it between two un-dyed polyester fabrics to be assessed for staining and sew along all the four sides to form a composite specimen. Then immerse the above specimen in the bath containing 0.5 gram per liter Lyogen DFT for 45 minutes at around 130°C. The Material to Liquor ratio shall be 1:50 and pH of the bath shall be maintained at 4.5 using acetic acid. A blank composite specimen (without carbonized fabric sample) may also be treated in same way for comparison purpose in separate bath. Then remove the sample and wash under running tap water for 10 minutes. Then dry the sample at ≤ 60°C in shade. Assess the colour change and staining on the adjacent fabric.

If there is light staining on polyester (rating 4/5 or better) and no noticeable change in colour (rating 4/5 or better) then sample may be designated as dope dyed.

**2. Identification of dope dyed viscose:**

**i) Dye identification test:** The material is reverse-carbonized using Nitro-benzene so that Polyester is removed. Then carry out the dye identification test as per IS: 4472 pt-I. If the test shows absence of reactive, vat and sulphur dyes then it may be inferred that the viscose fibre is dope dyed.

**ii) Treatment with sodium hydro sulphite:** Take a test specimen of 10.0 X 4.0 cm size and immerses it in bath containing 2.0 gram per liter Sodium hydro sulphite and 2.0 gram per liter Sodium hydroxide for 15 minutes at around 55 °C. The material to liquor ratio shall be maintained 1:50. Then remove the sample and wash under running tap water for 10 minutes. Then dry the specimen at ≤ 60°C in shade.

There should be no noticeable change in colour (rating 4/5 or better when compared to grey scale of wash fastness test) if the material is made out of dope dyed fibres.

**iii) Treatment with Sodium chlorite:** Take a test specimen of 10.0 X 4.0 cm size and immerses the sample in a beaker containing 1.0 gram per liter Sodium chlorite (80%) for one hour at (80 ± 2)°C. The material to liquor ratio shall be maintained 1:50 and pH at 3.5 using acetic acid. Then remove the sample and wash under running tap water for 10 minutes. Then dry the specimen at ≤ 60°C in shade.

There should be no noticeable change in colour (rating 4/5 or better when compared to grey scale of wash fastness test) if the material is made out of dope dyed fibres.