

Framing of QRs/ Specifications and developing master sample of T-Shirt Half Sleeves Round Neck Disruptive Pattern (Regular & Green Pattern).

1. **Applicability-** These specifications relate to the manufacturing details of the T-Shirt Half Sleeves Round Neck Disruptive Pattern (Regular & Green Pattern)
2. **Salient Features:**
The salient features of the garment are: **Poly-Cotton T-Shirt**
3. **Materials**

The materials used in the manufacture and packing of the T-Shirt shall conform to the following Standard Specifications:

The T-Shirt shall be manufactured out of well and evenly single jersey knitted fabric. The constructional details of the fabric are as given under. The knitted fabric shall not be overloaded and pulled in length while calendaring.

Fabre Identification/ Composition: (IS5416-1985): Cotton + Polyester

S. No.	Specifications	Cotton + Polyester + Lycra	Test Method
1.	Fabric Identification/ Composition Except Neck For Neck	Cotton: $58 \pm 3\%$ Polyester: Remainder Cotton: $56 \pm 3\%$ Polyester: Remainder Elastane(Lycral), Min, %: 2	AATCC 20:2011 and AATCC 20A:2012
2.	Dimensional Stability	$\pm 3.5\%$ (Both directions)	(IS 2977-1989)
3.	Fabric Weight gm/sq mtr (g/m^2)	200-220	(IS 1964 : 2001)
4.	Colour Fastness to Rubbing	Dry: 3-4 or better Wet: 3-4 or better	(IS 766-1988)
5.	Colour Fastness to Light	4-5 or better	(IS 2454: 1985)
6.	Colour Fastness to Washing	Change in Colour: 4 or better Staining on Cotton: 4 or better	(IS/ISO 105 C 10 D (4): 2006)
7.	Colour Fastness to Perspiration	4 or better	IS 971:1983
8.	Spirality % Max (After one Wash)	± 4	(IS/ISO 16322-1: 2005) (Washing as per ISO 6330-2A at 60°C followed by flat dry)
9.	Nature of Dye	Vat class	(IS-4472-1 : 1967)
10.	pH Value of aqueous extract (Cold method)	6.0 to 8.5	(IS 1390 : 1983)
11.	Count per yarn, Ne (for manufacturer's guidance)	24's	IS:3442-1980
12.	Wales per Inch, Min Course per Inch, Min	32 48	Visual
13.	Type of Knit	Single Jersey (Plain Knit)	-

4. **Design** : The T-Shirt shall be round neck disruptive pattern (Regular & Green Pattern)

Portion to be stitched	Type of stitch	Thread in the Needles	Thread in the loopers
Round Neck – (Crew Neck) T-Shirt and armholes	Overlock & Flat Lock Stitches	80	80

5. **Manufacture and Workmanship/ Operation:**

S.No.	Operation	Stitch Code	Needle Size	Thread Size	Machine Used
1.	Front & Back Shoulder Joining	514	11-Ball Point	80/120	Four Thread Overlock Machines
2.	Sleeve Joining	514	11-Ball Point	80/120	Four Thread Overlock Machines
3.	Side Seam Joining	514	11-Ball Point	80/120	Four Thread Overlock Machines
4.	Neck Rib Joining	514	11-Ball Point	80/120	Four Thread Overlock Machines
5.	Top Stitch on Neck Rib	406	11-Ball Point	80/120	Two Needles Flat Lock Machines with needle gauge 4mm
6.	Sleeve & Bottom Hemming	406	11-Ball Point	80/120	Two Needles Flat Lock Machines with needle gauge 8mm

Note: The number of stitches shall not be less than 12 stitches per inches.

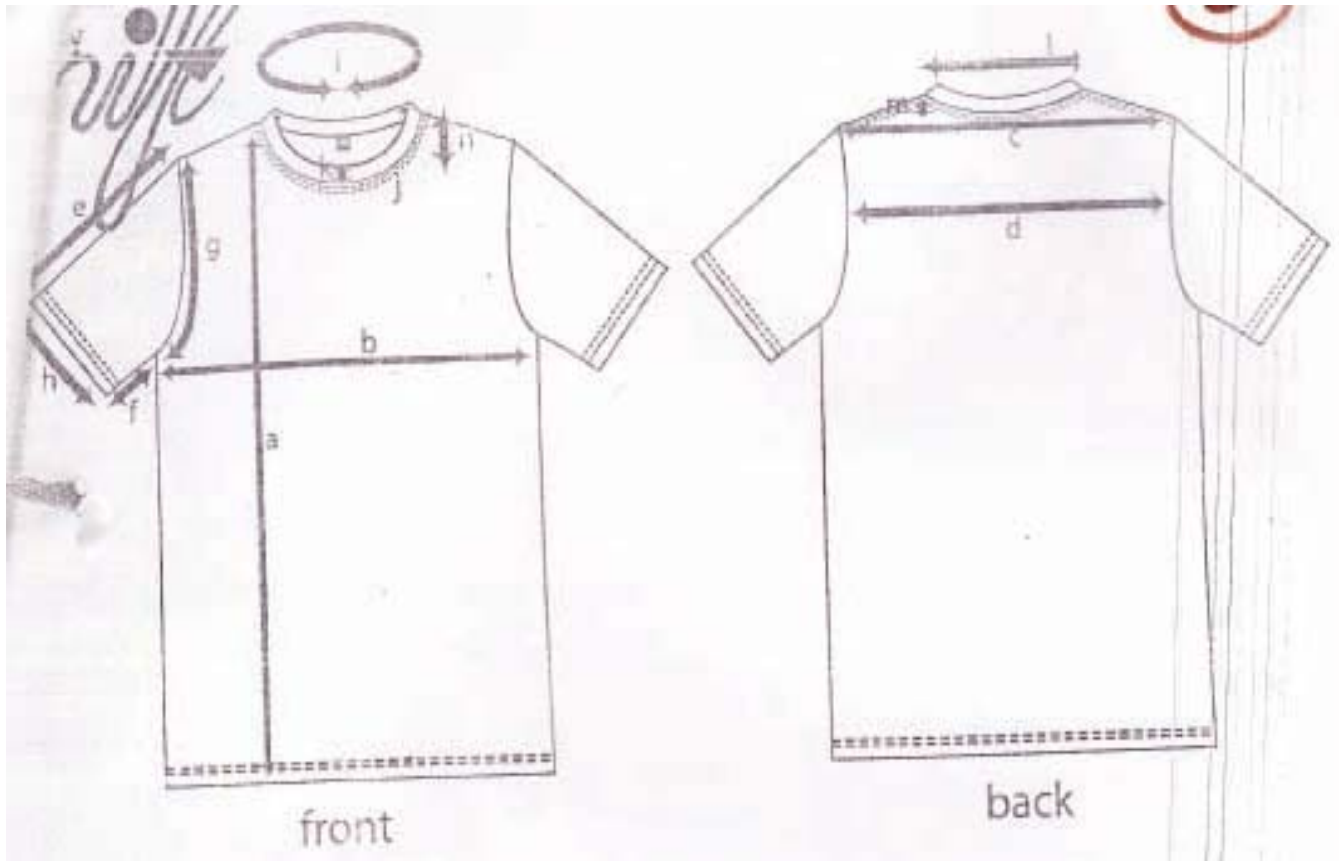
6. **Shape and dimensions**

The T-Shirt shall conform to the requirement given in (Annexure-A)

7. **Packaging**

S.No.	Materials	Dimension
1.	Re-Cycle Card-Board 300 gsm	26 cm x 22 cm
2.	Transparent Polybag (Printed on bag: Kindly dispose after used)	35 cm x 27 cm
3.	Plastic Packing Clip (U Shape)	4.0 cm x 7 cm x 3 cm
4.	Paper Strip/ Fabric Ribbon strip	If required
5.	Wash Care Label, Stamp-Ink on Center Back Neck	Standard Size 3 cm x 4 cm

MENS T-SHIRT



Size specification of T-Shirt (Half Sleeve Round Neck)		Mens Size in Inches			
S.No	Size	S	M	L	XL
a.	Length from (HSP)	28.5	29	29.5	30
b.	Chest width round	40	42	44	46
c.	Shoulder seam to seam	17.5	18	18.5	19
d.	Across Back 4" down from center back	16.5	17	17.5	18
e.	Sleeve length	8.5	9	9.5	10
f.	Inseam length	4	4.5	5	5.5
g.	Arm hole curve round	19	20	21	22
h.	Sleeve opening (round)	14	14	14.5	14.5
i.	Neck Rib round	17.5	18	18.5	19
j.	Neck round on seam	23	23.5	24	24.5
k.	Neck Rib height	1	1	1	1
l.	Neck width shoulder seam to shoulder seam	7.75	8	8.25	8.5
m	Back neck drop	11/8	11/8	11/8	11/8
n	Front neck drop	3	3	3	3

Framing of QRs/ Specifications and developing master sample of T-Shirt Half Sleeves Round Neck Disruptive Pattern (Regular & Green Pattern).

1. **Applicability-** These specifications relate to the manufacturing details of the T-Shirt Half Sleeves Round Neck Disruptive Pattern (Regular & Green Pattern)
2. **Salient Features:**

The salient features of the garment are: **100% Cotton T-Shirt**

3. **Materials**

The materials used in the manufacture and packing of the T-Shirt shall conform to the following Standard Specifications:

The T-Shirt shall be manufactured out of well and evenly single jersey knitted fabric. The constructional details of the fabric are as given under. The knitted fabric shall not be overloaded and pulled in length while calendaring.

Fabre Identification/ Composition: (IS5416-1985): 100% Cotton

S. No.	Specifications	Cotton + Polyester + Lycra	Test Method
1.	Fabric Identification/ Composition Except Neck For Neck	Cotton: 100% Cotton, % Max : 97 Elastane (Lycra) ,%: Remainder	AATCC 20:2011 and AATCC 20A:2012
2.	Dimensional Stability	± 3.5% (Both directions)	(IS 2977-1989)
3.	Fabric Weight gm/sq mtr (g/m ²)	200-220	(IS 1964 : 2001)
4.	Colour Fastness to Rubbing	Dry: 3-4 or better Wet: 3-4 or better	(IS 766-1988)
5.	Colour Fastness to Light	4-5 or better	(IS 2454: 1985)
6.	Colour Fastness to Washing	Change in Colour: 4 or better Staining on Cotton: 4 or better	(IS/ISO 105 C 10 D (4): 2006)
7	Colour Fastness to Perspiration	4 or better	IS 971:1983
8	Spirality % Max (After one Wash)	± 4	(IS/ISO 16322-1: 2005) (Washing as per ISO 6330-2A at 60°C followed by flat dry)
9	Nature of Dye	Vat class	(IS-4472-1 : 1967)
10	pH Value of aqueous extract (Cold method)	6.0 to 8.5	(IS 1390 : 1983)
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4. **Design** : The T-Shirt shall be round neck disruptive pattern (Regular & Green Pattern)

Portion to be stitched	Type of stitch	Thread in the Needles	Thread in the loopers
Round Neck – (Crew Neck) T-Shirt and armholes	Overlock & Flat Lock Stitches	80	80

5. **Manufacture and Workmanship/ Operation:**

S.No.	Operation	Stitch Code	Needle Size	Thread Size	Machine Used
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Note: The number of stitches shall not be less than 12 Stitch per inches.

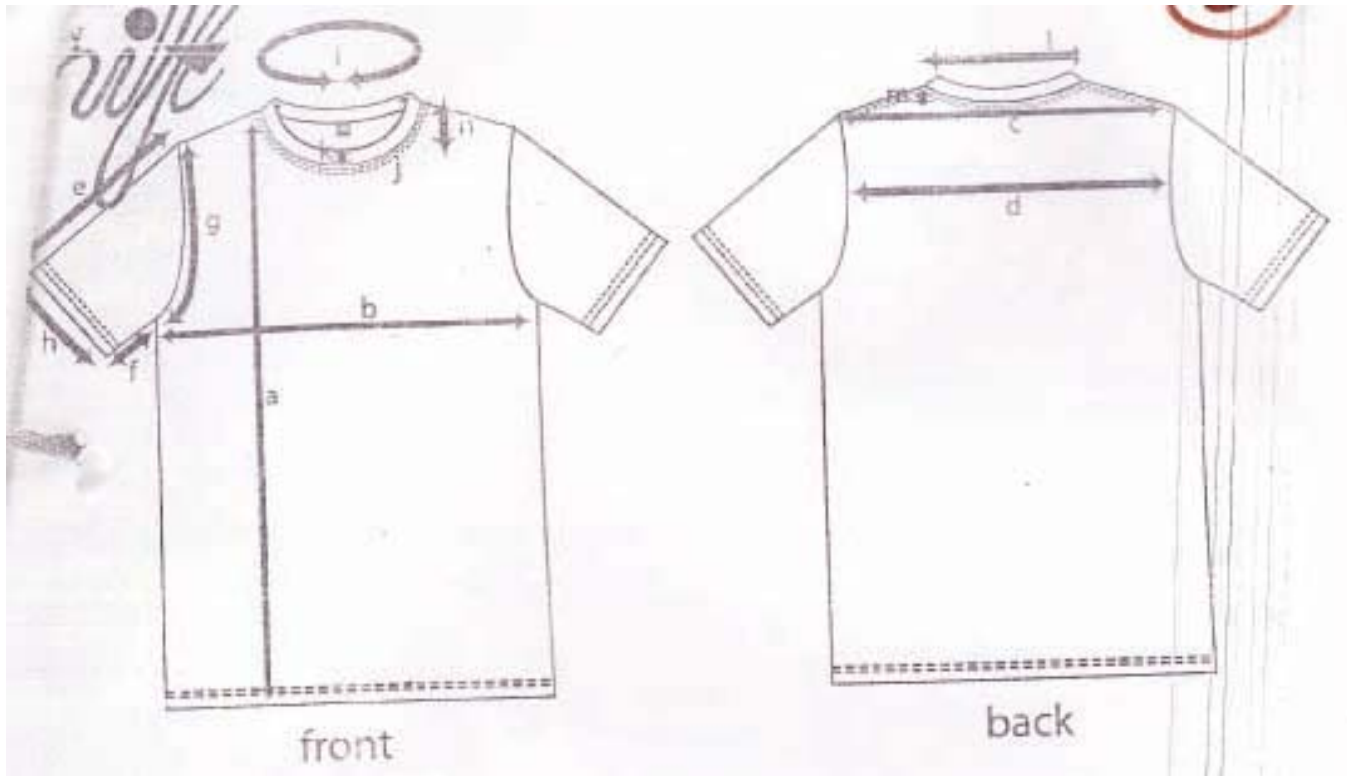
6. **Shape and dimensions**

The T-Shirt shall conform to the requirement given in (Annexure-B)

7. **Packaging**

S.No.	Materials	Dimension
1.	Re-Cycle Card-Board 300 gsm	26cm x 22cm
2.	Transparent Polybag (Printed on bag: Kindly dispose after used)	35cm x 27cm
3.	Plastic Packing Clip (U Shape)	4.0 cm x 7cm x 3cm
4.	Paper Strip/ Fabric Ribbon strip	If required
5.	Wash Care Label, Stamp-Ink on Center Back Neck	Standard Size 3cm x 4cm

MENS T-SHIRT



Size specification of T-Shirt (Half Sleeve Round Neck)		Mens Size in Inches			
S.No	Size	S	M	L	XL
a.	Length from (HSP)	28.5	29	29.5	30
b.	Chest width round	40	42	44	46
c.	Shoulder seam to seam	17.5	18	18.5	19
d.	Across Back 4" down from center back	16.5	17	17.5	18
e.	Sleeve length	8.5	9	9.5	10
f.	Inseam length	4	4.5	5	5.5
g.	Arm hole curve round	19	20	21	22
h.	Sleeve opening (round)	14	14	14.5	14.5
i.	Neck Rib round	17.5	18	18.5	19
j.	Neck round on seam	23	23.5	24	24.5
k.	Neck Rib height	1	1	1	1
l.	Neck width shoulder seam to shoulder seam	7.75	8	8.25	8.5
m	Back neck drop	11/8	11/8	11/8	11/8
n	Front neck drop	3	3	3	3

(a) Specification of colour used in the disruptive pattern shades

Machine used spectrophotometer

Sample No.1

Colour	L*	a*	B*	Accepted Sample
Base	68.77	6.13	14.49	$\Delta E = \pm 1$
Brown	58.85	4.75	8.42	
Dark Green	65.73	4.85	5.29	
Light Green	69.45	5.10	7.18	

Sample No.2

Colour	L*	a*	B*	Accepted Sample
Base	63.60	-1.65	15.80	$\Delta E = \pm 1$
Brown	63.35	-1.02	9.80	
Green	63.60	-1.40	10.95	
Black	62.33	-1.09	9.35	

CIELab: D65-10, Colour Control

- (b) The used pigments dyestuffs & Chemicals for the dyeing & printing of fabric disruptive pattern for CAPFs knitted T-Shirt Round Neck (100% cotton & PC) are environmentally friendly and approved by REACH (REACH is a European Community (EC) safety regulation that deals with the registration, evaluation, authorization and restriction of chemical substances)

QRs/ Specification of T-Shirt round neck disruptive pattern

The values used by CIE are called L*, a* and b* and the colour measurement method is called CIELAB

Sample description: knitted fabric
(Attached for reference)



ITBPF

Color	L*	a*	b*	Accepted Sample
Base-ITBPF	63.60	-1.65	15.80	$\Delta E = \pm 1$
Brown-ITBP	63.35	-1.02	9.80	
Green-ITBPF	63.60	-1.40	10.95	
Black-ITBPF	62.33	-1.09	9.35	

*Spectrophotometer: CIE Lab: D65-10 – Color Control

QRs/ Specification of T-Shirt round neck disruptive pattern

The values used by CIE are called L*, a* and b* and the colour measurement method is called CIELAB

Sample description: knitted fabric
(Attached for reference)



ITBPF

Color	L*	a*	b*	Accepted Sample
Base-ITBPF	68.77	6.13	14.49	$\Delta E = \pm 1$
Brown-ITBP	58.85	4.75	8.42	
Dark Green-ITBPF	65.73	4.85	5.29	
Light Green-ITBPF	69.45	5.10	7.18	

*Spectrophotometer: CIE Lab: D65-10 – Color Control

QRs/ Specification of T-Shirt.

The values used by CIE are called L*, a* and b* and the color measurement method is called CIELAB

Illuminate/ Observer Conditions

- (1) D65 10 Deg
- (2) U3000 10 Deg
- (3) F11 10 Deg

Sample description: Woven fabric (Attached for reference)



CRPF

Color	L*	a*	b*	Accepted Sample
Khaki-CRPF	50.70	2.84	20.27	$\Delta E = \pm 1$
Brown-CRPF	26.41	3.93	7.58	
Dark Olive-CRPF	25.03	-1.72	6.91	

*Spectrophotometer: DATACOLOR

QRs/ Specification of T-Shirt.

The values used by CIE are called L^* , a^* and b^* and the color measurement method is called CIELAB

Illuminate/ Observer Conditions

- (1) D65 10 Deg
- (2) U3000 10 Deg
- (3) F11 10 Deg

Sample description: Woven fabric (Attached for reference)



RAF-CRPF Pattern

Color	L^*	a^*	b^*	Accepted Sample
Light Blue Base	56.02	-5.08	-24.81	$\Delta E = \pm 1$
Indigo-RAF	26.46	3.85	-22.38	
Dark Blue	39.38	-3.23	-28.03	

*Spectrophotometer: DATACOLOR

QRs/ Specification of T-Shirt.

The values used by CIE are called L*, a* and b* and the color measurement method is called CIELAB

Illuminate/ Observer Conditions

- (1) D65 10 Deg
- (2) U3000 10 Deg
- (3) F11 10 Deg

Sample description: Woven fabric (Attached for reference)



CoBRA-CRPF

Color	L*	a*	b*	Accepted Sample
BASE Cobra CRPF	45.17	0.54	10.90	$\Delta E = \pm 1$
Green Cobra CRPF	30.43	-5.26	7.63	
Belgo Cobra CRPF	39.86	5.68	16.68	
Black Cobra CRPF	17.53	1.04	-3.26	

*Spectrophotometer: DATACOLOR

QRs/ Specification of T-Shirt.

The values used by CIE are called L*, a* and b* and the color measurement method is called CIELAB

Illuminate/ Observer Conditions

- (1) D65 10 Deg
- (2) U3000 10 Deg
- (3) F11 10 Deg



Sample description: Woven fabric (Attached for reference)

CISF

Color	L*	a*	b*	Accepted Sample
Dark Purple CISF	23.06	3.33	-3.67	$\Delta E = \pm 1$
Light Purple CISF	33.54	4.49	-5.78	
Light Grey Base CISF	45.14	-0.10	-0.28	
Dark Grey CISF	31.82	-0.71	-6.31	

*Spectrophotometer: DATACOLOR

QRs/ Specification of T-Shirt.

The values used by CIE are called L*, a* and b* and the color measurement method is called CIELAB

Illuminate/ Observer Conditions

- (1) D65 10 Deg
- (2) U3000 10 Deg
- (3) F11 10 Deg

Sample description: Woven fabric (Attached for reference)



CISF Pattern-1

Color	L*	a*	b*	Accepted Sample
Khaki Base CISF	51.34	4.22	19.52	$\Delta E = \pm 1$
Dark Khaki CISF	32.52	4.46	15.21	
Dark Brown	28.91	7.29	13.63	

*Spectrophotometer: DATACOLOR

QRs/ Specification of T-Shirt.

The values used by CIE are called L*, a* and b* and the color measurement method is called CIELAB

Illuminate/ Observer Conditions

- (1) D65 10 Deg
- (2) U3000 10 Deg
- (3) F11 10 Deg

Sample description: Woven fabric (Attached for reference)



SSB

Color	L*	a*	b*	Accepted Sample
Base Beige SSB	70.85	5.25	20.43	$\Delta E = \pm 1$
Black SSB	21.19	0.30	0.29	
Green SSB	34.10	-4.99	15.05	
Brown SSB	20.03	11.08	10.45	

*Spectrophotometer: DATACOLOR

BORDER SECURITY FORCE STANDARD



**SPECIFICATION FOR COLOUR CODE OF
CLOTH POLYESTER COTTON DISRUPTIVE PATTERN (LFCD) 50:50**

PREAMBLE

The Directorate General of Border Security Force (Provisioning Dte-Clothing Section), New Delhi has asked NITRA (as per their Letter No. 2/49/2011/BSF/Prov-CTS/502 dated nil April 2011 to prepare specifications for colour code of Cloth Polyester Cotton Disruptive Pattern (LFCD) 50:50.

This report contains 4 pages (excluding of Preamble and Contents). The developed specification is based on the sample submitted by BSF.

This specification will enable the BSF for procuring “Cloth PC Disruptive Pattern (LFCD) 50:50.

**SPECIFICATION FOR COLOUR CODE OF CLOTH POLYESTER COTTON
DISRUPTIVE PATTERN (LFCD) 50:50**

CONTENTS

S.No.	Subject	Page No.
1.	Figure of PC Disruptive Pattern Cloth	1
2.	Table-1 Specification of Colour of cloth Polyester cotton Disruptive Pattern- Brown Colour	2
3.	Table-2 Specification of colour of Cloth Polyester Cotton Disruptive Pattern- Green Colour	3
4.	Table-3 Specification of colour of Cloth Polyester Cotton Disruptive Pattern- Khaki Colour	4



BROWN
(Table-1)

GREEN
(Table-2)

KHAKI
(Table-3)

Fig. 1 : Cloth Polyester Cotton Disruptive Pattern (LFCD) 50:50

(For true colour refer sealed fabric sample with BSF)

Table-1 : Specification of colour of cloth Polyester Cotton Disruptive Pattern (LFCD) 50:50 (Brown Colour)

Guideline of AATCC Test Method 173 : 2005 & AATCC Evaluation Procedure-7:2003

Colour	:	<table border="1"><tr><td>BROWN</td></tr></table>	BROWN					
BROWN								
System	:	<table border="1"><tr><td>CIE LCH</td></tr></table>	CIE LCH					
CIE LCH								
Illuminant Observer	:	<table border="1"><tr><td>D-65</td></tr></table>	D-65					
D-65								
Standard Observer	:	<table border="1"><tr><td>10 Degree</td></tr></table>	10 Degree					
10 Degree								
Tristimulus Values	:	<table border="1"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>5.664</td> <td>5.640</td> <td>4.432</td> </tr> </tbody> </table>	X	Y	Z	5.664	5.640	4.432
X	Y	Z						
5.664	5.640	4.432						
LCH	:	<table border="1"> <thead> <tr> <th>L</th> <th>C</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>28.485</td> <td>8.448</td> <td>63.758</td> </tr> </tbody> </table>	L	C	H	28.485	8.448	63.758
L	C	H						
28.485	8.448	63.758						
CMC (l:c)	:	2:1						
Colour Difference, ΔE_{cmc}	:	≤ 3.0						

Interpretation of Results:

- i) If ΔE_{cmc} is less than or equal to 3, then sample is acceptable.
- ii) If ΔE_{cmc} is greater than 3, the sample is unacceptable.

Note-1 : Absorbance/ reflectance/ transmittance are affected by surface characteristic features of the substrate. Therefore comparison should be made between sample 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 Defuse (sphere) geometry spectrophotometer.

Table–2 : Specification of colour of cloth Polyester Cotton Disruptive Pattern (LFCD) 50:50 (Green Colour)

Guideline of AATCC Test Method 173 : 2005 & AATCC Evaluation Procedure-7:2003

Colour	:	<table border="1"><tr><td>GREEN</td></tr></table>	GREEN					
GREEN								
System	:	<table border="1"><tr><td>CIE LCH</td></tr></table>	CIE LCH					
CIE LCH								
Illuminant Observer	:	<table border="1"><tr><td>D-65</td></tr></table>	D-65					
D-65								
Standard Observer	:	<table border="1"><tr><td>10 Degree</td></tr></table>	10 Degree					
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Tristimulus Values	:	<table border="1"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>4.103</td> <td>4.654</td> <td>4.176</td> </tr> </tbody> </table>	X	Y	Z	4.103	4.654	4.176
X	Y	Z						
4.103	4.654	4.176						
LCH	:	<table border="1"> <thead> <tr> <th>L</th> <th>C</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>25.725</td> <td>5.988</td> <td>135.782</td> </tr> </tbody> </table>	L	C	H	25.725	5.988	135.782
L	C	H						
25.725	5.988	135.782						
CMC (l:c)	:	2:1						
Colour Difference, ΔE_{cmc}	:	≤ 3.0						

Interpretation of Results:

- i) If ΔE_{cmc} is less than or equal to 3, then sample is acceptable.
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Note-1 : Absorbance/ reflectance/ transmittance are affected by surface characteristic features of the substrate. Therefore comparison should be made between sample 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 Defuse (sphere) geometry spectrophotometer.

Table–3 : Specification of colour of cloth Polyester Cotton Disruptive Pattern (LFCD) 50:50 (Khaki Colour)

Guideline of AATCC Test Method 173 : 2005 & AATCC Evaluation Procedure-7:2003

Colour	:	<table border="1"><tr><td align="center">KHAKI</td></tr></table>	KHAKI					
KHAKI								
System	:	<table border="1"><tr><td align="center">CIE LCH</td></tr></table>	CIE LCH					
CIE LCH								
Illuminant Observer	:	<table border="1"><tr><td align="center">D-65</td></tr></table>	D-65					
D-65								
Standard Observer	:	<table border="1"><tr><td align="center">10 Degree</td></tr></table>	10 Degree					
10 Degree								
Tristimulus Values	:	<table border="1"> <thead> <tr> <th align="center">X</th> <th align="center">Y</th> <th align="center">Z</th> </tr> </thead> <tbody> <tr> <td align="center">16.918</td> <td align="center">17.722</td> <td align="center">10.822</td> </tr> </tbody> </table>	X	Y	Z	16.918	17.722	10.822
X	Y	Z						
16.918	17.722	10.822						
LCH	:	<table border="1"> <thead> <tr> <th align="center">L</th> <th align="center">C</th> <th align="center">H</th> </tr> </thead> <tbody> <tr> <td align="center">49.157</td> <td align="center">19.275</td> <td align="center">87.970</td> </tr> </tbody> </table>	L	C	H	49.157	19.275	87.970
L	C	H						
49.157	19.275	87.970						
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Colour Difference, ΔE_{cmc}	:	≤ 3.0						

Interpretation of Results:

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Note-1 : Absorbance/ reflectance/ transmittance are affected by surface characteristic features of the substrate. Therefore comparison should be made between sample 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 Defuse (sphere) geometry spectrophotometer.

**Table for scale of sampling and permissible Number based on 4%
AQL ISO 2859-1999**

Lot Size in Nos	Sampling Plan for						
	Visual Examination / Dimensional check at the time of Sampling (L-1)		Sample size for detail check at Bulk QA stage (L-2)	Physical Parameters (for laboratory tests) (S-4)		Chemical parameters for laboratory tests	
	Sample Size (Nos)	Acceptance (Nos)		Sample Size (Nos)	Acceptance (Nos)	Sample Size (Nos)	Acceptance (Nos)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Up to 280	13	1	32	13	1	5	0
281 to 500	20	2	50	13	1	5	0
501 to 1200	32	3	80	20	2	5	0
1201 to 3200	50	5	125	32	3	8	1
3201 to 10,000	80	7	200	32	3	8	1