

TECHNICAL SPECIFICATIONS OF T-SHIRT AND BERMUDA
(OPERATIONAL UNIFORM)

(1) T-SHIRT (COLOUR ORANGE)

0.0 FORWARD

- 0.1. This specification has been prepared by Office of the Directorate General, National Disaster Response Force (NDRF), on the authority of The Director General of NDRF.
- 0.2. This specification is for use by the NDRF.
- 0.3. This specification would be used for manufacture, quality assurance and procurement of the item.
- 0.4. All enquiries regarding this specification, including those relating to any contractual conditions contained therein shall be addressed to the:
Office of the Directorate General of NDRF, Ministry of Home Affairs, 6th Floor, NDCC-II Building, Jai Singh Road, New Delhi-110003
- 0.5. Copies of the specification can be obtained from:
Office of the Directorate General of NDRF, Ministry of Home Affairs, 6th Floor, NDCC-II Building, Jai Singh Road, New Delhi-110003
- 0.6. This specification holds good only for the supply order for which it is issued.
- 0.7. The NDRF Authority reserves the right to amend or modify this specification as and when required.
- 0.8. 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 “T-Shirt Colour Orange” herein referred as “T-Shirt”.
- 1.2 This specification does not specify general appearance; feel etc of the “T-Shirt”.

2.0 REFERENCES

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

3.0 MANUFACTURE AND FINISH

- 3.1 The T-Shirt shall be manufactured as per standard manufacturing techniques with raglan sleeve. Mandarin collar T shirt shall have the front zipper opening. The size

charts and dimensions of components are shown in the Table-1. The design and shape of the T-shirt shall be as per Figure 1 to 3.

- 3.2 **Orange knitted Fabric:** This fabric shall be used to manufacture “T-Shirt”. The knitted fabric (for guidance of knitted structure, Annexure-C may be referred) shall be made using 100% polyester multifilament yarns. The fabric used for “T-Shirt” shall be well singed, ‘Heat set’ and fully shrunk. The knitted fabric shall be treated with water repellent finishes. The treatment is given in such a way that the water when sprayed over the outer side (surface) fabric of the T-shirt, it should spread fast on the outer surface. Due to faster spreading, the evaporation of water from the surface will be fast. Beside this, water should not penetrate into the inner surface of fabric used in the T-Shirt. In case of water penetrates through the outer side of the fabric it should be able to push out the water from inside to the outer surface of the fabric with or without rubbing on the fabric. It will give dry feel to the wearer. The water repellent finishing should not affect the air permeability property of the fabric and after finishing it should be maintained

The water repellency, on face side (Spray test), Rating will be made as per IS:390:1975 method. Observations shall be done on same test specification on bode side and rated as per the following:

- i) Face Surface - 50 Maximum
- ii) Back Surface - 90 Minimum

NDRF should be written on the back side of the T-Shirt with silver colour retro reflective tape as shown in the Figure-2 and Figure-3. The size of the NDRF in length should be 20 cm and 6.5 cm in height. For more clarification, NDRF may be contacted.

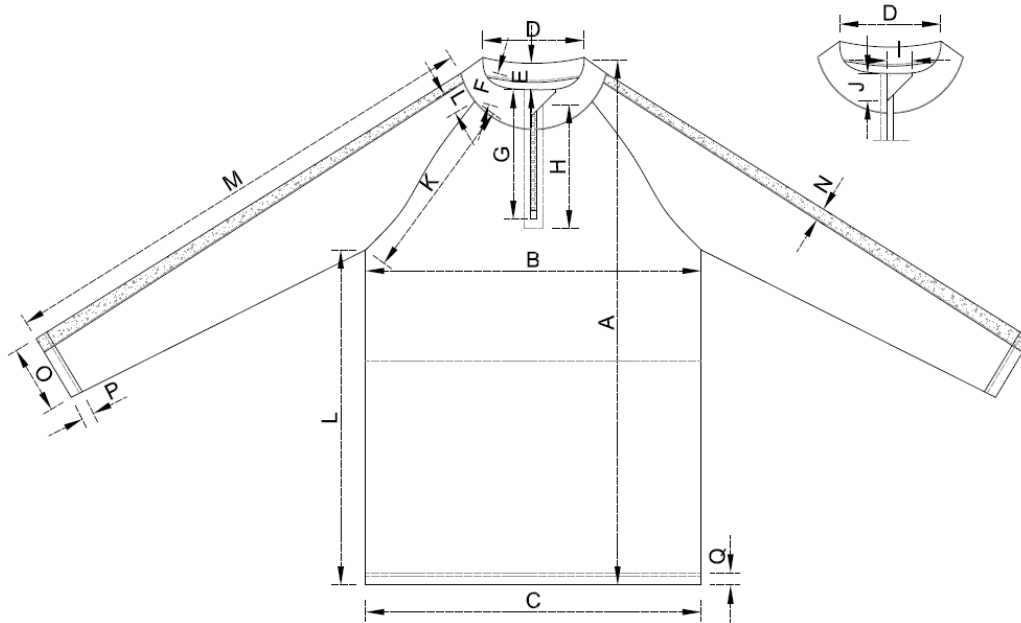


Fig. 1: Front of T-Shirt

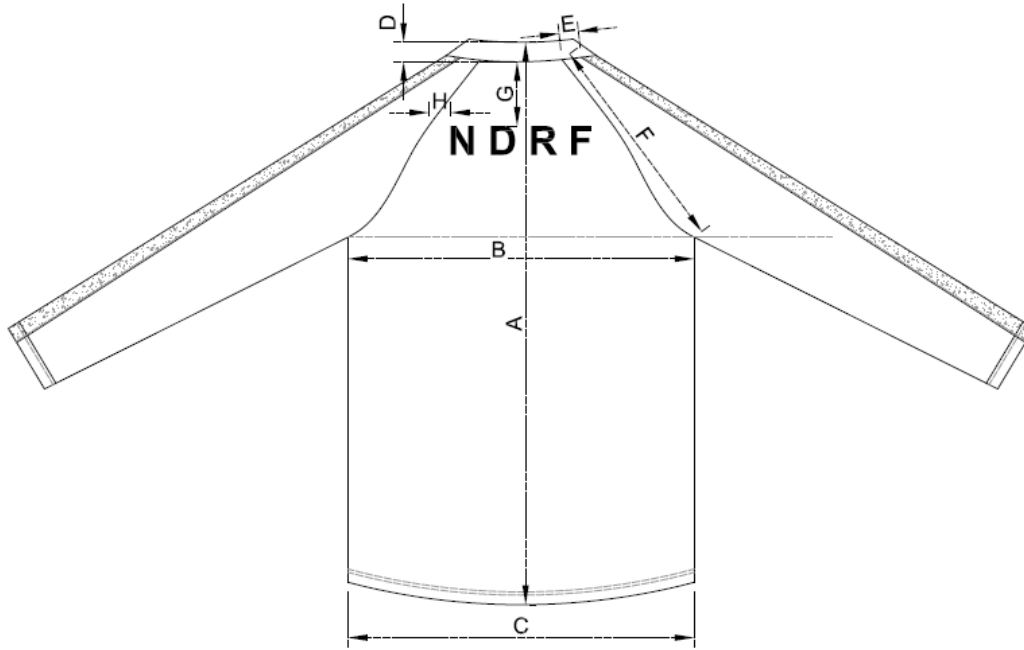


Fig. 2: Back of T-Shirt

3.3 **Freedom from Defect:** The '*T-Shirt*' shall be visually examined. It shall be evenly stitched, free from missed stitches, holes, cuts and puckering defects. The colour of the sewing thread used for stitching shall not bleed or stain. The '*T-Shirt*' shall be free from dyeing defects such as uneven dyeing, streaks, stains.

The '*T-Shirt*' shall be free from any other defect which may significantly mark the appearance or serviceability.



**Fig.3 Picture of various parts of T-Shirt
(For true colours refer sealed sample)**

Table- 1 Measurement Chart for T-Shirt**(All measurements are in cms)****FRONT****(Tolerance ± 1.0 cm)**

S. No.	Measuring Point	Notation as given in Figure	Size (cm)				
			(38)	(40)	(42)	(44)	(46)
			S	M	L	XL	XXL
1.	Body Length (HSP to Bottom)	A.	67	69	71	73	75
2.	Chest width (2.5 cm below from armhole)	B.	50	52	54	56	58
3.	Bottom width	C.	50	52	54	56	59
4.	Neck Width	D.	21.5	22.5	23.5	24.5	25.5
5.	Front Neck Drop at center	E.	7.5	7.5	7.5	7.5	7.5
6.	Collar width at center front	F.	5	5	5	5.5	5.5
7.	Zipper Opening	G.	20	20	20	20	20
8.	Placket Length	H.	22	22	23	23	23
9.	Placket Width	I.	4.5	4.5	4.5	4.5	5
10.	Placket Over Lap at Front (Neck)	J.	3.5	3.5	3.5	3.5	4.5
11.	Arm Hole at Raglan Sleeve in front	K.	28	28	29.5	30	31
12.	Raglan width at neck in front	L.	6	6.5	6.5	6.5	7
13.	Sleeve Length	M.	71.5	73.5	75.5	75.5	77.5
14.	Reflective tape width	N.	5	5	5	5	5
15.	Sleeve opening	O.	11.5	12.5	13.5	14.5	15.5
16.	Sleeve fold	P.	2.25	2.25	2.25	2.25	2.25
17.	Bottom fold	Q.	2.25	2.25	2.25	2.25	2.25

Note : Read this table along with the write-up given in section 3.0*Table- 1 Measurement Chart for T-Shirt****(All measurements are in cms)****BACK****(Tolerance ± 1.0 cm)**

S. No.	Measuring Point	Notation as given in Figure	Size				
			(38)	(40)	(42)	(44)	(46)
			S	M	L	XL	XXL
1.	Body Length	A.	70	71	72	74	76
2.	Chest	B.	50	52	54	56	58
3.	Bottom width	C.	50	52	54	56	59
4.	Collar width at center back	D.	5	5	5	5	5
5.	Raglan width at neck	E.	4.5	4.5	5	5	5
6.	Arm Hole at Raglan Sleeve	F.	30	31	32	34	34
7.	NDRF Label from CB	G.	15	15	15	15	15

4.0 STITCHING

4±0.5 stitches per cm shall be employed for assembling the “T-Shirt”. The stitching shall be done with even tension and all loose ends shall be securely fastened off. Polyester Sewing thread shall be used. The colour of swing threads shall match with the colour of “T-Shirt” cloth.

5.0 WORKMANSHIP AND FINISH

The “T-Shirt” shall be free from workmanship defects i.e. texture, knitting, weaving and dyeing flaws. The “T-Shirt” shall not have missed stitches, hole, cut, oil stains or any other defect which may significantly affect the appearance or serviceability of “T-Shirt”.

6.0 SEALED SAMPLE

In order to illustrate or specify the indeterminable characteristics such as general appearance luster and feel of the “T-Shirt”, a sample has been agreed upon and sealed; the supply shall be conformity with the sample in such respects. The custody of the sealed sample shall be a matter of prior agreement between the buyer and seller.

7.0 MARKING

A suitable cloth label shall be securely stitched on the inner side of the waist (back side) of each ‘T-Shirt’. Care labeling instruction shall be given and it shall be fastened at the place of the ‘T-Shirt’ as per the buyer instructions.

Following shall be marked on the cloth label:

- (a) Name of the material, namely, ‘T-Shirt’
- (b) Size in cm
- (c) Any other information required by the buyer.

NOTE: The Indication on the cloth label shall be such that the colour from the label shall not bleed on the ‘T-Shirt’ during storage or use.

8.0 PACKAGING & PACKING

The ‘T-Shirt’ shall be packed in polyethylene or polypropylene bags and or in box, as required by the buyer. However, on each box the following shall be indicated:

- (a) Name of material
- (b) Size in cm
- (c) Quantity per box
- (d) Indication of the source of manufacture and
- (e) Any other information as required by the buyer or the law in force.

The boxes containing ‘T-Shirt’ shall be packed as agreed to between the buyer and seller.

9.0 SAMPLING AND CRITERIA FOR CONFORMITY

Sampling and criteria for conformity of the lot shall be as per the requirement of NDRF.

10.0 REQUIREMENTS

The “T-Shirt” shall conform to the requirements given in Table 3 and 4. The slide fastener shall be Orange in colour. The length of slide fastener shall be 20±1 cm. The other requirement of the slide fasteners shall be as given in the Table 3. The vendor shall supply extra raw materials for testing purpose, if required.

TABLE 3: Requirements of Orange knitted fabric of T-Shirt

Sl. No.	Characteristics	Requirements	Test Method
1	Approximate count of yarn (For guidance only),	150 Denier (100% multifilament Polyester, Around 100 filaments)	IS 3442:1980
2	Blend composition, %	100% Polyester	IS 667: 1981 and IS 3416 (pt-1) :1988 (Dry mass basis)
3	Mass, gm/m ²	200±20	IS 1964:1970
4	Bursting Strength, Newton/cm ²	150±10	IS 1966: 1976
5	Colour fastness to washing - Change in colour - Staining on adjacent fabric	4 or better 4 or better	IS/ISO 105 C10 C(3) :2010
6	Colour fastness to perspiration - Change in colour - Staining on adjacent fabric	4 or better 4 or better	IS 971:1983
7	Colour fastness to rubbing - Dry - Wet	4 or better 4 or better	IS 766:1988
8	Colour fastness to light	4 or better (on Blue wool)	IS 2454:1985
9	Dimensional Change due to relaxation, both directions, percentage, maximum	2.0	IS 2977:1989
10	pH value of aqueous extract	6.0-8.5	IS 1390:1983 (Cold method)
11	Colour	$\Delta E_{cmc} \leq 2.5$	See Table 4
Slide fastener			
12	Designation	Medium - Chain width: 6.00±0.3 mm - Thickness: 2.60 mm (min.)	IS 14181: 2002 (Part-1)
13	Type	Closed end	IS 14181: 2002 (Part-1)
14	Colour	Orange	Visual
15	Security of interlocking of textile chain to cross wise strength	650N	IS 14181: 2002 (Part-1)
16	Security of attachment of	250N	IS 14181: 2002 (Part

	puller to slider		
17	Security of slider lock holding	40N	IS 14181: 2002 (Part
Retro reflective Material			
18	Colour	Silver	Visual
19	Co-efficient of retro reflection for separate performance material (Normal state-without wash), cd/(lx.m ²), Minimum	330 (Coefficient of retro reflection at two rotation angles $\epsilon_1=0^\circ$ and $\epsilon_2=90^\circ$ should not differ) 15%	BS EN ISO 20471: 2013 (Observer angle 12', Entrance angle 5°)

TABLE 4 Specification of colour of Orange knitted fabric (T-Shirt)
(AATCC Test method 173 : 2009 & AATCC Evaluation Procedure 7 : 2009)

Colour	:	ORANGE		
System	:	CIE LCH		
Illuminant Observer	:	D 65		
Standard Observer	:	10 Degree		
Tristimulus Values	:	X	Y	Z
		29.857	19.345	4.020
L C H	:	L	C	H
		51.088	70.583	43.678
CMC (l:c)	:	2:1		
Colour difference, ΔE_{cmc}	:	≤ 2.5		

Interpretation of Results:

- i) If ΔE_{cmc} is less than or equal to 2.5, then sample is acceptable.
- ii) If ΔE_{cmc} is greater than 2.5, 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.

References

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
2.	IS:14452:1997	Textiles-Care Labeling code using symbols
3.	IS:397 (Part II): 2003	Method for statically quality control during production: Part 2 Control charts for attributes and count of defects
4.	IS:6359: 1971	Method for conditioning of Textiles
5.	IS:9543:1980	Spun polyester sewing threads
6.	IS:10789:2000	Classification and terminology of stitch types used in seams
7.	IS:11161:2000	Textiles-seam types-classification and terminology
8.	IS:1963:1981	Method for determination of thread per unit length in woven fabric
9.	IS:1964:1970	Methods for determination of weight per square meter and weight per linear meter of fabric
10.	IS:1969:1985	Method for determination of breaking strength and elongation of woven fabrics
11.	IS: 2977: 1989	Fabrics (other than wool)-Method for determination of dimensional changes on soaking in water
12.	IS 6489: 1993	Woven fabrics-Determination if tear resistance by falling pendulum method
13.	IS/ISO 105 C10 C(3): 2010	Method for determination of colour fastness of textile material to washing
14.	IS 971:1983,	Method for determination of colour fastness of textile material to perspiration
15.	IS 766:1988	Method for determination of colour fastness of textile material to rubbing
16.	IS 2454:1985	Method for determination of colour fastness of textile material to artificial light (Xenon lamp)
17.	IS 1390 : 1983	Method for determination of pH value of aqueous extract of textile materials
18.	AATCC Test method 173 : 2009	CMC: Calculation of small colour differences for acceptability
19.	AATCC Evaluation Procedure 7 : 2009	Instrumental assessment of the change in colour of a test specimen
20.	IS 3416 (Pt D): 1988	Method for quantitative chemical analysis of binary mixtures of polyester fibres with cotton or regenerated cellulose
21.	IS 8156: 1994	<u>Fasteners for consumer goods-synthetic hook and loop fastener</u>
22.	BS EN ISO 20471: 2013	<u>High visibility clothing: Test method and requirements</u>
23	IS 14181: 2002	<u>Synthetic (Plastic) slide fastener- special purpose</u>

B-1 Conditioning of test specimens and atmospheric conditions for testing:

The test specimen shall be tested in prevailing atmospheric conditions. In case of dispute, the sample shall be conditioned and tested in the standard atmosphere as given in IS 6359.

Knit Structure

Dial Needle		1	2	3	4	5	6	7	8	9	10	11	12
	1	K	M	K	M	K	M	K	M	K	M	K	M
2	K	M	K	M	K	M	K	M	K	M	K	M	K
Cylinder Needle		1	2	3	4	5	6	7	8	9	10	11	12
	1	T	K	T	K	T	K	M	K	M	K	M	K
	2	M	K	M	K	M	K	M	K	M	K	M	K
	3	M	K	M	K	M	K	T	K	T	K	T	K
4	M	K	M	K	M	K	M	K	K	K	M	K	

(8- lock 24 gauge knitting machine)

Knit structure repeat (12 feeders)

K= Knit, T= Tuck, M=Miss

(2) TRUNK WEAR BERMUDA (COLOUR ORANGE)

0.0 FORWARD

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- 0.8 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 “Trunk Wear Bermuda (Orange colour)” herein referred as “Bermuda”
- 1.2 This specification does not specify general appearance; feel etc of the “Bermuda”

2.0 REFERENCES

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

on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3.0 MANUFACTURE AND FINISH

3.1 The design and shape of the '*Bermuda*' shall be as per Figure 1, 2, 3 and 4.

3.2 **Orange Knitted Fabric:** This fabric shall be used to manufacture "Bermuda". The knitted fabric (for guidance of knitted structure, Annexure-C may be referred) shall be made using 100% polyester multifilament yarns. The fabric used for "Bermuda" shall be well singed, 'Heat set' and fully shrunk. The knitted fabric shall be treated with water repellent finishes. The treatment is given in such a way that the water when sprayed over the outer side (surface) fabric of the Bermuda, it should spread fast on the outer surface. Due to faster spreading, the evaporation of water from the surface will be fast. Beside this, water should not penetrate into the inner surface of fabric used in the Bermuda. In case of water penetrates through the outer side of the fabric it should be able to push out the water from inside to the outer surface of the fabric with or without rubbing on the fabric. It will give dry feel to the wearer. The water repellent finishing should not affect the air permeability property of the fabric and after finishing it should be maintained.

The water repellency, on face side (Spray test), Rating will be made as per IS: 390:1975 method. Observations shall be done on same test specification on bode side and rated as per the following:

- i) Face Surface - 50 Maximum
- ii) Back Surface - 90 Minimum

3.3 **Drawstring:** To tight and loose Bermuda, an orange colour 100% round polyester string (suitable diameter and 1540mm \pm 20 mm length) shall be used. The both end of the string shall be finished with plastic/metal aglets (refer image 3). For more information about the round string and aglet, sample held in the custody of NDRF may be referred.

3.4 **Pockets:** Bermuda shall have two side pockets. Pocket bags shall be made with same fabric and color like waistband and Bermuda. Raw edges of pocket bag shall be finished with over edge stitch.

One small packet shall be stitched at the front waist level inside the Bermuda. For more clarification, sample held in the custody of NDRF may be referred.

3.5 The raw fabric edges at the bottom portion of the '*Bermuda*' shall be folded and sewn to form a hem of 25 \pm 3 mm width.

3.6 Waist of the '*Bermuda*', shall be finished with elasticized band and draw string. Edge of the fabric shall be turned into of 55 \pm 2 mm (i.e width of the waist band) and stitched with 55 \pm 2 mm wide elastic tape throughout the waist band. For more clarification, sample held in the custody of NDRF may be referred.

3.7 In the front side of Bermuda (Fig. 1 and Fig. 2), NDRF shall be written using Retro reflective tape. The size of the NDRF should be 20 cm in length and 6.5 cm in height. For more clarification, sample held in the custody of NDRF may be referred.

3.8 **Dimensions:** The dimensions of *'Bermuda'* when measured shall conform to the requirements given in Table 1A , Table 1B and Table 1C. Dimensions of the Bermuda shall be measured as per Annex B. For the measurement of *'Bermuda'*, take a *'Bermuda'*; lay it flat on a horizontal surface. Remove all creases and wrinkles without distorting it. Measure corrects to the nearest millimeter the dimensions given in Table 1A, Table 1B and Table 1C.

3.9 **Freedom from Defect:** The *'Bermuda'* shall be visually examined. It shall be evenly stitched, free from missed stitches, holes, cuts and puckering defects. The colour of the sewing thread used for stitching shall not bleed or stain. The *'Bermuda'* shall be free from dyeing defects such as uneven dyeing, streaks, stains.

The *'Bermuda'* shall be free from any other defect which may significantly mark the appearance or serviceability.



Front side of Bermuda



Back side of Bermuda



Side pocket

Fig.1 Picture of various parts of Bermuda
(For true colours refer sealed sample)

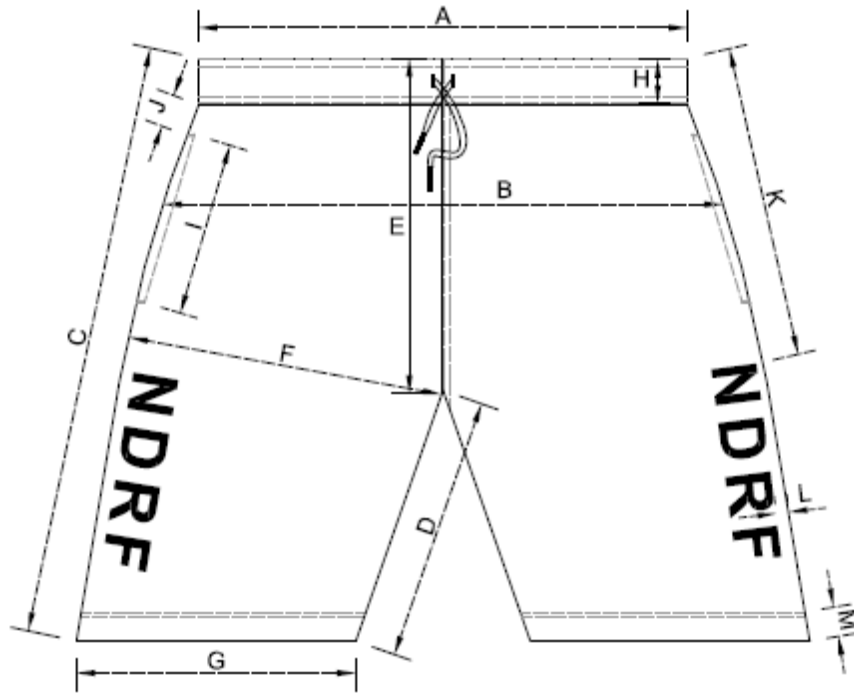


Figure 2 : Front view of the 'Bermuda'

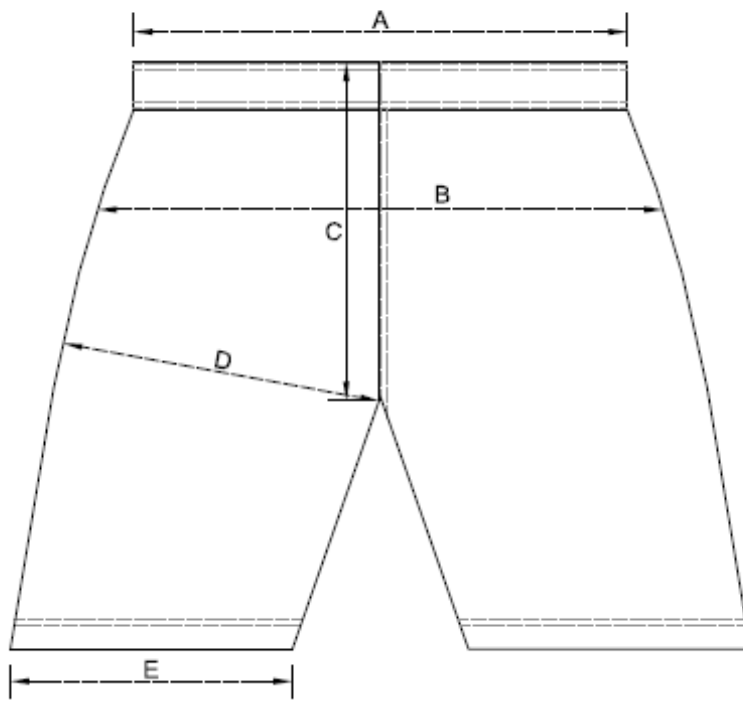


Figure 3 : Back view of the 'Bermuda'

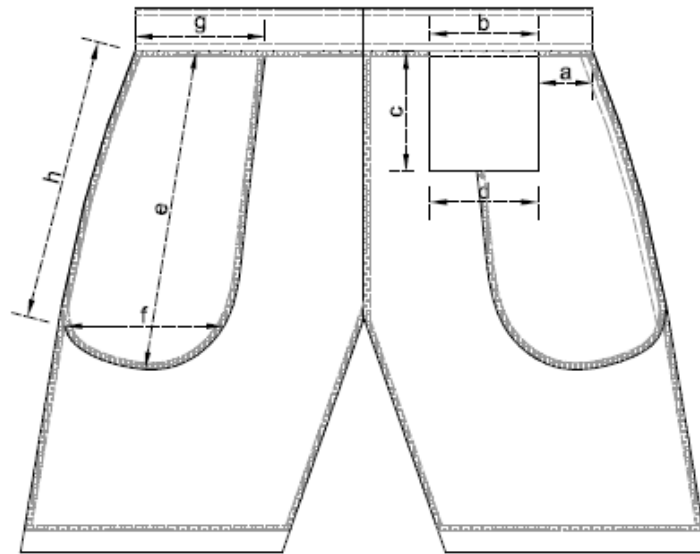


Figure 4 : Inside view of the ‘Bermuda’

Table-1 A
Dimension of 'Bermuda'
(All measurements in cms)
FRONT
(Tolerance ± 1.0 cm)

S. No	Measuring Point	Notation as given in Figure-2	Size (cm)				
			(36)	(38)	(40)	(42)	(44)
			S	M	L	XL	XXL
1.	Waist	A.	36.5	38.5	40.5	42.5	44.5
2.	Hip	B.	54	58	59	60	60
3.	Out seam (including waistband)	C.	50	52	52	53	54
4.	Inseam (Crotch to hemline)	D.	22.5	22.5	22.5	22.5	22.5
5.	Front rise	E.	35	36	37	38	39
6.	Crotch width	F.	35.5	36	37	38	39
7.	Bottom opening	G.	30	31	32	33	34
8.	Waist band width	H.	5.5	5.5	5.5	5.5	5.5
9.	Side Pocket opening	I.	15	15	15	15	15
10.	Front pocket from side seam at waist	J.	3	3	3	3	3
11.	Distance of NDRF from Waist to N	K.	25.5	26.5	27.5	28.5	29.5
12.	Distance of NDRF from out seam	L.	1	1	1	1	1
13.	Bottom opening width	M.	2.25	2.25	2.25	2.25	2.25

Table-1 B
Dimension of 'Bermuda'
(All measurements in cms)
BACK
Tolerance ± 1.0 cm

S. No	Measuring Point	Notation as given in Figure- 3	Sizes (cm)				
			(36)	(38)	(40)	(42)	(44)
			S	M	L	XL	XXL
1.	Waist	A.	36.5	38.5	40.5	42.5	44.5
2.	Hip	B.	56	58	58	60	62
3.	Back rise	C.	43	44	45	46	47
4.	Crotch width	D.	40.5	41.5	42	43	44
5.	Bottom opening	E.	37	37.5	38	38.5	39

Table-1 C
Dimension of ‘Pockets ’
(All measurements in cms)
Tolerance ±1.0cm

S. No	Measuring Point	Notation as given in Figure- 4	Sizes (cm)				
			(36)	(38)	(40)	(42)	(44)
			S	M	L	XL	XXL
Pocket at waist (Inside of the Bermuda)							
1.	Pocket Position From Out Seam	a.	5	5	5	5	5
2.	Pocket Opening At Waist Seam	b.	9	9	9	9	9
3.	Pocket Length	c.	11	11.5	12	12	12.5
4.	Pocket width	d.	10	10	10	10	10
Side Seam Pocket Bag							
5.	Pocket bag length (from waist band)	e.	28	28	28	28	28
6.	Pocket bag width	f.	17	17	17	17	17
7.	Pocket bag attached at waist	g.	12	13	13	13	13
8.	Pocket bag attached to out seam	h.	24	24	24	24	24

Draw String length: 1540mm ± 20 mm,

4.0 STITCHING

Over Lock stitch having at least 4±0.5 stitches per cm shall be employed for assembling the “Bermuda”. The stitching shall be done with even tension and all loose ends shall be securely fastened off. Sewing thread colour shall match with the “Bermuda” cloth.

5.0 WORKMANSHIP AND FINISH

The “Bermuda” shall be free from workmanship defects i.e. texture, weaving, dyeing flaws etc. The “Bermuda” shall not have missed stitches, hole, cut, oil stains or any other defect which may significantly affect the appearance or serviceability of “Bermuda”.

6.0 SEALED SAMPLE

In order to illustrate or specify the indeterminable characteristics such as general appearance luster and feel of the “Bermuda”, a sample has been agreed upon and sealed; the supply shall be conformity with the sample in such respects. The custody of the sealed sample shall be a matter of prior agreement between the buyer and seller.

7.0 MARKING

A suitable cloth label shall be securely stitched on the inner side of the waist (back side) of each 'Bermuda'. Care labeling instruction shall be given and it shall be fastened at the place of the 'Bermuda' as per the buyer instructions.

Following shall be marked on the cloth label:

- (a) Name of the material, namely, 'Bermuda'
- (b) Size in cm
- (c) Any other information required by the buyer.

NOTE: The Indication on the cloth label shall be such that the colour from the label shall not bleed on the 'Bermuda' during storage or use.

8.0 PACKAGING & PACKING

The 'Bermuda' shall be packed in polyethylene or polypropylene bags and or in box, or as agreed between the buyer and seller. However, on each box the following shall be indicated:

- (a) Name of material
- (b) Size in cm
- (c) Quantity per box
- (d) Indication of the source of manufacture and
- (e) Any other information as required by the buyer or the law in force.

9.0 SAMPLING AND CRITERIA FOR CONFORMITY

Sampling and criteria for conformity of the lot shall be as per the requirement of NDRF.

10.0 REQUIREMENTS

The "Bermuda" shall conform to the requirements given in Table 3, Table 4 and Table 5. The vendor shall supply extra raw materials for testing purpose, if required.

TABLE 3: Requirements of Bermuda

Sl. No.	Characteristics	Requirements	Test Method
Orange Knitted Fabric			
1	Approximate count of yarn (For guidance only),	150 Denier (100% multifilament Polyester, around 100 filaments)	IS 3442:1980
2	Blend composition, %	100% Polyester	IS 667: 1981 and IS 3416 (pt-1) :1988 (Dry mass basis)
3	Mass, gm/m ²	200±20	IS 1964:1970
4	Bursting Strength, Newton/cm ²	150±10	IS 1966: 1976
5	Colour fastness to washing - Change in colour - Staining on adjacent fabric	4 or better 4 or better	IS/ISO 105 C10 C(3) :2010
6	Colour fastness to perspiration - Change in colour - Staining on adjacent fabric	4 or better	IS 971:1983

		4 or better	
7	Colour fastness to rubbing - Dry - Wet	4 or better 4 or better	IS 766:1988
8	Colour fastness to light	4 or better (on Blue wool)	IS 2454:1985
9	Dimensional Change due to relaxation, both directions, percentage, maximum	2.0	IS 2977:1989
10	pH value of aqueous extract	6.0-8.5	IS 1390:1983 (Cold method)
11	Colour	$\Delta E_{cmc} \leq 2.5$	See Table 4
Retro reflective Material			
12	Colour	Silver	Visual
13	Co-efficient of retro reflection for separate performance material (Normal state-without wash), cd/(lx.m ²), Minimum	330 (Coefficient of retro reflection at two rotation angles $\epsilon_1=0^\circ$ and $\epsilon_2=90^\circ$ should not differ) 15%	BS EN ISO 20471:2013 (Observer angle 12', Entrance angle 5°)

TABLE 4 Specification of colour of Orange knitted fabric (BERMUDA)
(AATCC Test method 173 : 2009 & AATCC Evaluation Procedure 7 : 2009)

Colour	:	ORANGE		
System	:	CIE LCH		
Illuminant Observer	:	D 65		
Standard Observer	:	10 Degree		
Tristimulus Values	:	X	Y	Z
		29.857	19.345	4.020
L C H	:	L	C	H
		51.088	70.583	43.678
CMC (1:c)	:	2:1		
Colour difference, ΔE_{cmc}	:	≤ 2.5		

Interpretation of Results:

- i) If ΔE_{cmc} is less than or equal to 2.5, then sample is acceptable.
- ii) If ΔE_{cmc} is greater than 2.5, 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.

References

Sl. No.	Method/Spec. number	Title
1.	IS:6359: 1971	Method for conditioning of Textiles
2.	IS:9543:1980	Spun polyester sewing threads
3.	IS:10789:2000	Classification and terminology of stitch types used in seams
4.	IS:11161:2000	Textiles-seam types-classification and terminology
5.	IS:1963:1981	Method for determination of thread per unit length in woven fabric
6.	IS:1964:1970	Methods for determination of weight per square meter and weight per linear meter of fabric
7.	IS:1969:1985	Method for determination of breaking strength and elongation of woven fabrics
8.	IS: 2977: 1989	Fabrics (other than wool)-Method for determination of dimensional changes on soaking in water
9.	IS 6489: 1993	Woven fabrics-Determination of tear resistance by falling pendulum method
10.	IS/ISO 105 C10 C(3): 2010	Method for determination of colour fastness of textile material to washing
11.	IS 971:1983,	Method for determination of colour fastness of textile material to perspiration
12.	IS 766:1988	Method for determination of colour fastness of textile material to rubbing
13.	IS 2454:1985	Method for determination of colour fastness of textile material to artificial light (Xenon lamp)
14.	IS 1390 : 1983	Method for determination of pH value of aqueous extract of textile materials
15.	AATCC Test method 173 : 2009	CMC: Calculation of small colour differences for acceptability
16.	AATCC Evaluation Procedure 7 : 2009	Instrumental assessment of the change in colour of a test specimen
17.	IS 3416 (Pt I): 1988	Method for quantitative chemical analysis of binary mixtures of polyester fibres with cotton or regenerated cellulose
18.	IS 8156: 1994	<u>Fasteners for consumer goods-synthetic hook and loop fastener</u>
19.	BS EN ISO 20471: 2013	<u>High visibility clothing: Test method and requirements</u>
20.	IS 9686: 1980	<u>Specification of elastic tape</u>

B-1 Conditioning of test specimens and atmospheric conditions for testing:

The test specimen shall be tested in prevailing atmospheric conditions. In case of dispute, the sample shall be conditioned and tested in the standard atmosphere as given in IS 6359.

Knit Structure

Dial Needle		1	2	3	4	5	6	7	8	9	10	11	12
	1	K	M	K	M	K	M	K	M	K	M	K	M
2	K	M	K	M	K	M	K	M	K	M	K	M	K
Cylinder Needle		1	2	3	4	5	6	7	8	9	10	11	12
	1	T	K	T	K	T	K	M	K	M	K	M	K
	2	M	K	M	K	M	K	M	K	M	K	M	K
	3	M	K	M	K	M	K	T	K	T	K	T	K
4	M	K	M	K	M	K	M	K	K	K	M	K	

(8- lock 24 gauge knitting machine)

Knit structure repeat (12 feeders)

K= Knit, T= Tuck, M=Miss