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Specn No. CQAE/9320/1372/(f)

GOVERNMENT OF INDIA

MINISTRY OF DEFENCE

(DIRECTORATE GENERAL OF QUALITY ASSURANCE)

SPECIFICATION No.

CQAE/9320/1372/(f)

Supersedes Specification No CQAE/9320/1372/(e)

FOR

POLYCHLOROPRENE COATED NYLON FABRIC
(DOUBLE TEXTURE AND SINGLE TEXTURE FABRIC)

CAT/PART No. 14/9320-000085 and 14/9320-000083

ISSUED BY

CONTROLLERATE OF QUALITY ASSURANCE

ENGINEERING EQUIPMENT

AUNDH CAMP. PUNE - 411 027.

DATE: AUG 2004

PRICE: Rs 150/-

Received vide letter no CQAE/FE/4364 dt. 31/9/04
dt. 6/9/04

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की प्रमाणित प्रतिलिपि
Certified Copy of
Specification at
this date 15 Sep 04

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CQAE, Aundh Camp.
Pune 411027

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Specn No. CQAE/9320/1372 (I)

RECORD OF AMENDMENTS

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AMENDMENT DETAILS OF AMENDMENT CARRIED OUT BY & DATE

Superseded as if
(a) All the hand written amendments in previous specn have been computerised and incorporated.
(b) Index sheet, content sheet, foreword etc made as per ISG 031 format
(c) Incorporation of firm's identification mark and acceptance marking in clause 14.1 and 14.2 to specn & clause 13.1 to T/S added.
(d) Add after existing entries of SCOPE (clause 01)
"and all other defence equipment wherever applicable"
(e) Clause No 6.2.2 added in page No 21 of Test schedule

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DEFENCE SPECIFICATION

FOR

POLYCHLOROPRENE COATED NYLON FABRIC
(DOUBLE TEXTURE AND SINGLE TEXTURE FABRIC)

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CONTROLLER.

FOREWORD

- 0.1 This specification has been prepared by the Controllerate of Quality Assurance (Engineering Equipment), Aundh Camp, Pune-411 027 on behalf of Director General Quality Assurance, Ministry of Defence, New Delhi.
- 0.2 This specification has been prepared to lay down general requirements. This would be used to guide manufacture/Quality Assurance/ Inspection of POLYCHLOROPRENE COATED NYLON FABRIC (DOUBLE TEXTURE FABRIC AND SINGLE TEXTURE FABRIC).
- 0.3 This specification consisting of 27 pages.
- 0.4 pages and supersedes specn No.CQAE/9320/1372/(e)
- 0.5 This specification shall be used for tender enquiry, procurement, manufacture and quality assurance proposes of the equipment covered in the specification.
- 0.6 This specification is restricted document and therefore should not be communicated to anyone who is not authorised to receive it.
- 0.7 This specification with accompaniments should be returned to issuing /purchasing authority on completion of tender formalities or completion of supply order.
- 0.8 The Controller, CQAE, Aundh camp, Pune-411 027 is the authority holding sealed particulars (AHSP) and doubt, regarding any statement covered by this specification shall be referred to the AHSP who will clarify the same. In case of any anomaly the AHSP's decision on technical requirement shall be final and binding on the supplier. Any legal or contractual condition shall be referred to the contract placing authority.
- 0.9 The Quality Assurance Authority for the item covered in this specification is the CONTROLLER, CQAE PUNE - 411 027 and Quality Assurance of the area concerned will be the Senior Quality Assurance Officer (SQAO) of Senior Quality Assurance Establishment located at Mumbai, Kolkata, Chennai, New Delhi or an officer nominated by him. SQAO shall carry out bulk Quality Assurance of the item.
- 0.10 Clause by clause reference of this specification should be confirm in writing along with tender enquiry documents/quotation otherwise the tender documents are liable to be rejected due to incomplete /inadequate details.
- 0.11 No deviation for stipulated parameter of specification /drawing will be accepted without the concurrence in writing by AHSP and no request will be entertained directly from sub-contractor, if any. The main contractor shall remain responsible for the quality of the product.
- 0.12 The contractor shall extend to the defence QA authority or his authorized representative all reasonable facilities for QA and testing of the equipment including gauges free of cost. In order to ensure that the stores ordered are produced strictly as per this governing specification the QA Authority or his

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authorized representative will be provided free access from raw material to dispatch stage at the manufacturer's works at all times during the currency of the contract. If the need is felt; he will also have free access to procurement document including books of accounts. In case any sub orders are placed on sub contractors, the prior approval of sub contractors by AHSP shall be obtained and copies of sub contract shall be provided to AHSP and the QAO of the area concerned. All inspection and test facilities shall be provided free of cost for the sub contracted items.

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- 0.13 Advance or Pilot samples, if any, stipulated in the contract are required to be submitted to the inspection authority at CQAE Pune - 411 027 on cost delivery free transportation /handling cost within stipulated delivery period for testing and approval before undertaking bulk manufacture of item and bulk manufacture, if undertaken by the contractor, prior to approval of advance /pilot sample will be at the risk and cost of the supplier /contractor. The bulk supplies will be effected strictly as per the approved advance/pilot sample including any improvement /modification suggested during approval of the advance/pilot sample.
- 0.14 Stage inspection will be carried out right from raw material stage to dispatch of the stores and such stage inspection shall not be construed as absolving the contractor of his responsibility in carrying out a comprehensive pre-inspection on his own part and stage inspection by defence QA agency is without any prejudice to the right to reject the complete /offered article manufactured from such stage inspected components/sub assemblies/assemblies, if found not conforming to specified requirements.
- 0.15 Any defects as notified during inspection by QA agency shall not be rectified /repaired without prior approval of the defence QA agency.
- 0.16 The manufacturer/contractor is required to incorporate latest technology state of the art manufacturing procedures and test methods in turning out the product in meeting the requirements of reliability, serviceability, interchangeability and durability of the product.
- 0.17 The warning/safety aspects of the store have to be kept as per standard practice. Guidance in manufacture of the store shall be taken from patent or samples, if any available with the defence authorities.
- 0.18 Copies of any national or international or any other specifications, instructions or guidelines stipulated in this specification for reference shall be obtained from the publishers of the respective documents. The latest version of these documents shall be applicable.
- 0.19 This specification shall be used for the sole purpose of manufacturing and supplying the store to the defence indenter against a specific contract only and not for any other purpose whatsoever.
- 0.19 The manufacturer/suppliers are required to provide all necessary technical information to fully identify the item. This information is required for defence codification purposes only and in no way jeopardize the commercial interest of the suppliers. Non-compliance of this requirement by contractor is likely to render his bid for supplying defence equipment being rejected.

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01. SCOPE

This specification covers the general and technical requirement, material, manufacture, fabrication and quality assurance including test and performance of POLYCHLOROPRENE COATED NYLON FABRIC (DOUBLE TEXTURE FABRIC AND SINGLE TEXTURE FABRIC), hereinafter called "Proofed Fabric" used for fabrication of Float of Bridge Assault Floating, Heavy Class 50 T (KM) and all other defence equipment whenever applicable.

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02. RELATED SPECIFICATION /REFERENCE

2.1 IS Specifications

The following specifications published by Bureau of Indian Standards have been made use of in formulating this specification. These specifications are obtainable on payment from Bureau of Indian standards, 9 Bahadur Shah Zafar Marg, New Dehi-110 002:

<u>Specification No</u>	<u>Title</u>
IS -380	French Chalk Technical
IS-1912	Country Jute Twine, 3 Ply
IS - 1963	Method for determination of threads per unit length woven fabric
IS - 1964	Method of determination of weight per square metre and weight per linear metre of fabric
IS-2500 (Pt I)	Sampling Inspection Procedure, Attributes Sampling Plan.
IS-2500 (Pt II)	Sampling Inspection Procedure Tables, Inspection by variables.
IS-2508	Low density Polyethylene films.
IS-2818 (Pt II)	Indian Hessian Cloth.
IS-4905	Method of Random Sampling.
IS-7016 (Pt I)	Methods of test for coated and treated fabric, Determination of Roll Characteristics.
IS-7016 (Pt II)	Method of test for coated and treated fabric, Determination of breaking strength and Extension at break.

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2.2 Defence Specification

IND/ENG/PROV/1193/(d) - Polychloroprene Adhesive.

Notes

- (i) Indian Standard specifications are obtainable from Bureau of Indian Standard, Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi - 110002. These Standards are mandatory for production and supply of this store.
- (ii) Copies of the drawings are obtainable from the Controller, CQAE, Aundh Camp, Pune-411027 on payment of hire charges (non refundable).
- (iii) Reference to this specification in relation to any Indian Standard / any other specification/drawing in any tender enquiry / supply orders / acceptance of Tenders means the paper particulars (above documents) shall be latest one and the current edition at the date of such tender/contract/AT/SO.

03. MATERIAL

Polychloroprene coated nylon fabric consists of following material: -

- a) Basic Fabric: Nylon 66 only.
- b) Rubber proofing compound (Polychloroprene synthetic rubber)

04. GENERAL AND COMPONENT DESCRIPTION

The Polychloroprene proofed Nylon Fabric, Single Texture (KK 200) and double texture (KK-600_) is used for manufacture of floats for Bridge Assault Floating, Heavy, Class 50 T (KM) Floats made out of these fabric are pneumatic and when inflated, serve as floating pier for the KM Bridge.

4.1 Basic Fabric

This shall be woven from high tenacity Nylon Yarn, Nylon 66. The fabric shall be rubber friendly. It should not show any weft bands and laying folds and should not have any slack or tight edges. The fabric should be absolutely level and should have an undrawn square co-ordinate system with straight filaments. It should be knot free and nap free and satisfactorily woven and have uniform elongation values with regards to warp and weft. The physical and mechanical properties of Basic nylon fabric are given below: -

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Physical and Mechanical Properties of basic fabric :-

) Width in Cm -		140
) Weight in g/m sq. -		200 (min)
) Breaking strength in kgf (min)	Warp -	300
	Weft -	300
Test specimen between grips 5 x 20 cm, Rate of Traverse grips 45cm/minute)		
j) Max. percentage elongation at specified breaking strength of 300 kgf.	Warp -	25
	Weft -	25
e) Count of Yarns(Denier)	Warp -	840
	Weft -	840
i) Threads per cm.(min)	Warp -	10
	Weft -	11
g) Weave	-	Plain
h) Finish		Heat Set
i) Material		Nylon 66.
k) Length of roll in m		As required.

1.2 The manufacturer of KK -200/KK-600 shall carry out thorough checks of raw material (basic fabric) when received from the suppliers. All tests applicable will be conducted using sampling plan as per IS 2500(part II). Only materials found conforming to above parameters shall be used in production of KK-200/ KK-600. The manufacturer will provide a copy of the Test Certificate for the basic fabric to the Inspecting Officer alongwith the pre inspection report for the rubberised fabric.

2 Rubber Proofing Compound

Polychloroprene synthetic rubber composition(Reinforced with Carbon Black) shall be highly resistant to ageing, weathering, sea water and abrasion on vulcanisation. The compound/composition shall not contain any other rubber or reclaim. Weight of the polychloroprene rubber content in coated layers percentage (min) shall be 60% for both KK-200 and KK-600 fabric. The rubber roofing compound shall be non-irritant and free from objectionable odor.

PROCESSING/MANUFACTURING

5.1 The process of manufacture of proofed fabric as described below is for guidance. The manufacturer can adopt appropriate manufacturing process or control to achieve the properties specified for final proofed fabric.

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5.2 Pre-treatment of basic Fabric

The basic fabric shall be scoured and then satisfactorily heat set to remove any crease or folding. The basic fabric shall be given appropriate primer treatment with materials like isocyanates or any other such material under proper controlled condition to impart a firm bonding between basic nylon fabric and rubber coating during subsequent proofing operation.

5.3 Application of Polychloroprene Rubber Proofing Compound:

The polychloroprene rubber proofing compound shall be applied by either calendaring or alternatively by spreading or any suitable technique on pre-treated basic nylon fabric to achieve the following:-

5.3.1 Single texture fabric (KK-200): - Total coating weight of rubber compound on each side shall be $450 + 10\% - 5\% \text{ g/ m}^2$

5.3.2 Double texture fabric (KK-600):- Total coating weight of number of layers of polychloroprene rubber compound on intermediate layer and outer layer of each side shall be:-

a) Intermediate layer = $250 + 10\% - 5\% \text{ g/ m}^2$

b) Outer layer (on each side) = $400 + 10\% - 5\% \text{ g/ m}^2$

MECHANICAL REQUIREMENTS AND TOLERANCE

The coated fabrics, thus made after duly heat set/vulcanising/ curing shall meet the following technical requirements:-

Sl. No.	Test/characteristics	Requirements Single texture fabric (KK-200)	Requirements Double texture fabric (KK-600)	Method of tests
1	2	3	4	5
i)	Width (mm)	1300 (min)	1300 (min)	IS-7016(Pt I)
ii)	Acceptable length of roll (m)	35 (min)	50 (min)	-
iii)	Weight (g/ m^2)	$1150 + 10\% - 5\%$ (1092.5 to 1265)	$1550 + 10\% - 5\%$ (1472.5 to 1705)	IS-7016(Pt I)

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Breaking strength
(gf (min)

Before ageing	Warp: 275	500	IS-7016(Pt II)
After dry ageing (100 ± 2° C 96 hours)	Weft : 220	450	

Percentage Extension
at specified
breaking strength

Before ageing	Warp :Min 18 Max 30	Min 15 Max 25	IS-7016(Pt II)
After dry ageing (100 ± 2° C 96 hours.)	Weft :Min 18 Max 30	Min 20 Max 30	

Tear strength
(gf (min)

Before ageing	Warp : 10	20	As per
After dry ageing	Weft : 10	20	Appx'A'

Adhesion bonding
between rubber
footing & fabric

in shear kgf/ 5 cm (Min)			
Before ageing			
After dry ageing (100 C ± 2° C or 96 hours)			
After water ageing (50 ± 2° C or 72 hours)	Warp: 275 Weft: 220	500 450	As per Appx 'C'

Adhesion bonding
between fabric
pieces in kgf

5 cm width 5 cm long (min)			
Before ageing			
After dry ageing (100 ± 2° C 96 hours)	Warp: NA	6	As per Appx 'D'
After water ageing (50 ± 1° C 72 hours)	Weft: NA	6	

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ix) Polychloroprene Rubber content weight in coated layers in % (min)	60	60	As per Appx 'B'
x) Air leak proofness	No leakage in fabric at a pressure of 200 g/ cm ² .	No leakage in fabric at a pressure of 400 g/ cm ² .	As per Appx 'E'.

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NOTES:

1. The specific requirement of the rolls in suitable length would be as per choice of the indenter and as mentioned in tender enquiry. The quotations shall be specific as regards the length of the rolls that are to be supplied.
2. The lengths 35 m and 50 m mentioned above are the final acceptable length, which excludes flag allowance and rejected portion.
3. The conditioning of test specimen: Before starting the tests like breaking strength, extension at specified breaking strength, Tear strength, Adhesion bonding between rubber coating and Fabric Ply, Adhesion bonding between the fabric plies, the test specimen prepared as described at Appendix 'A' and 'B' to this specification shall be conditioned initially for a minimum period of 24 hours at 27 +/- 2 Deg C and 65 +/- 5% relative humidity.

4. Methods prescribed for ageing of specimen are as follows

4.1 Accelerated Dry ageing:

Test specimens shall be kept in air circulating oven maintained at temperature of 100 Deg +/- 2 Deg C for 96 hours continuously. After 96 hours of dry ageing these specimens shall be taken out and cooled at room temperature and then after conditioning, be utilised for testing.

4.2 Water Ageing:

The test specimen shall be immersed in water suitably. The temperature is raised gradually to 50 +/- 1 Deg C and held for 72 hours. After 72 hours of water ageing, these specimen shall be taken out and dried at room temperature and utilised for testing.

07. WORKMANSHIP AND FINISH

The polychloroprene proofed nylon fabric single texture (KK-200) and double texture (KK-600) shall be flexible. In case of double texture fabric the two cloth layers shall be firmly adhered to the proofing compound. The proofed fabric shall be free from bare places, rubber patches on the surface, oil and other stains

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which are liable to affect the serviceability of the finished fabric. It shall also be reasonably free from creases, wrinkles, thin places, pin holes, thick coating and other manufacturing defects.

08. PRE-INSPECTION BY CONTRACTOR

8.1 The contractor shall submit pre-inspection report which should include basic fabric acceptance certificate and all test results, with method of tests adopted, visual and dimensional check. The contractor shall offer the advance sample/bulk only after satisfying himself that the stores conform to the requirement of specification.

8.2 The contractor will give notice of one week to the Quality assurance Authority in case of advance sample and Quality Assurance Officer for bulk supply to plan the programme suitably.

09. QUALITY ASSURANCE

9.1 Advance Sample

9.1.1 The contractor shall have to submit advance sample if so indicated in the supply order or A/T, alongwith pre-inspection report as per clause 08 of specification prior to the commencement of bulk production. He should submit 3 metres of Advance Sample of Polychloroprene proof nylon fabric, single texture/double texture alongwith adhesive of 1kg and cross linking agent (CLA) of 200 gm conforming to the characteristic as per IND/ENG/PROV/1193/(d), according to the supply order requirement to the Controller, CQAE, Aundh Camp, Pune-411 027 in finished condition as per requirement of this specification for testing and approval.

9.1.2 The advance sample of polychloroprene proof nylon fabric (single texture/double texture) will be subjected to check the various parameters stated in the specification. Clearance for bulk production will only be granted after the acceptance of advance sample as per this specification. The Advance sample shall be subjected to destructive tests for testing the quality of finished proofed fabric.

9.1.3 Place of Inspection

Normally the quality assurance check will be done at the manufacturer's premises. QA Check of basic fabric we also be carried out and respective suppliers premises. However, as decided by the quality assurance authority, stores may be checked at any approved laboratory at any place in India and Contractor shall bear the cost of testing, if so needed.

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9.1.4 Testing Facilities

The contractor shall provide all the necessary testing facilities to Quality Assurance Officer for tests to be carried out at manufacturer's premises.

9.2 Bulk Quantity

9.2.1 The bulk supplies/production shall be checked for its quality by the quality assurance officer as indicated in the supply order at manufacturer's premises. The Quality Assurance of bulk will be undertaken on acceptance of Advance Sample by the Controiler, CQAE, Aundh Camp, and Pune-411 027. The QA check of bulk supplies shall be undertaken in the following stages:

9.2.1.1 The quality check of raw material and the stores in stage, before manufacturing of stores, shall be the responsibility of the contractor. However, the quality Assurance Officer or his authorised representative shall be afforded access to any part of the factory premises to satisfy himself on quality of stores without being in any way made responsible, thereafter to maintain the Quality of finished proofed fabric.

9.2.1.2 It is mandatory on the part of the manufacturer to carry out thorough pre-inspection of his stores thus manufactured to ensure that the stores fully conform to this specification in every respect. He should tender such stores which conform to this requirement of specification to Quality Assurance Officer with his pre-inspection reports (and check sheet). A certificate stating necessary pre-inspection test have been carried out on this stores, along with the detailed report (test report) on approved check sheet which will include dimensional and various test details as stipulated in the specification shall be submitted by the manufacturer while tendering the bulk. If pre-inspection of lot as required has not been carried out by the manufacturer, the inspection call letter will be disposed of and the lot is liable for REJECTION.

9.2.1.3 The QA officer shall forward bulk sample of 3 metres in length alongwith adhesive 1 kg and cross linking agent of 200 gm to CQAE, Pune as per specific norms.

9.2.2 The bulk supplies shall be strictly in accordance with the approved advance sample. No deviation from the approved advance sample will be granted on any account for the quality of stores in bulk supplies.

9.2.3 Facilities for Quality Assurance Check

The contractor shall provide all testing facilities required to carry out checks as per specification. He should provide reasonable accommodation to QA Officer

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during quality check of stores. The place of inspection shall be cleaned and free from any foreign particles which may cause damage to the fabric.

9.2.4 Marking of Rejections:

The rejected stores will be suitably destroyed or kept in bond room by the Quality Assurance Officer in mutual consultation with the contractor, so that they are not resubmitted by the contractor during the run of contract.

9.2.5. Notification of results of Inspection

On completion of the inspection the contractor will be furnished with the necessary inspection certificates by the QA Officer.

9.2.6 Quality Assurance Acceptance Inspection:

The bulk production Quality Assurance Acceptance inspection shall be performed strictly as per Test Schedule No- CQAE/TS/1251/(f) attached to the specification. The store when tested as per the Test Schedule and meeting the requirement of specification may be accepted for further processing.

10. SAMPLING

The Quality Assurance Authority shall be the sole judge in deciding the sampling procedure to be adopted during the quality check of proofed fabric. Unless otherwise specified separately, the sampling plan indicated in Test Schedule No.- CQAE/TS/1251/(f) shall be taken as guidelines for quality check of proofed fabric.

11. QUALITY CONTROL AND TEST REQUIREMENT

In-process quality control shall be exercised during the manufacture of basic fabric and proofed fabric by conducting inspection and test applicable. The various standards to be achieved are as given below.

11.1 Visual Inspection

The proofed fabric when examined, should be free from visual defects which are categorised as under:-

11.1.1 Critical Defects

- a) Loose rubber which can be easily separated from fabric ply when pulled hand.
- b) Pin holes.
- c) Cuts/tear on body of fabric.
- d) Blisters.

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- f) Thick/thin coating.
- g) Rough surface or surface with filaments.
- h) Embedded foreign particles/matters.
- i) Pits on body of proofed fabric.
- j) Bare unproofed portion on the body of fabric
- k) Crease.
- l) Any sort of patchwork.
- m) Wrinkles of following description:-

ma) Extending beyond 40 Cm from both the edges, irrespective of height.

mb) Exceeding 3 Cm of height, irrespective of length (within 40 Cm from any edge).

mc) Having height more than 1 cm (but less than 3 cm) exceeding two numbers in one metre length (within 40 cm from any edge.)

1.1.2 Major Defect

- a) Unproofed fabric exceeding 5 mm in width and 3 cm in length from either edges on any side.
- b) Variation of width exceeding 5 mm when measured at 3 m interval along the length.
- c) Imperfect surface roughness, but without embedded foreign particles.

1.1.3 Minor Defect:

- a) Uneven colour difference
- b) Minor oil and white spots.
- c) Maximum three wrinkles having height upto 1 cm within 40 cm from any edge in 1 m length.

a) The location of every critical and major defect or group of the defects shall be marked with yellow marking pencil which shall be termed as 'FLAG'.

b) For each critical and major defect or group of defects flagged, 10 cm length of fabric or actual fabric length having the defect, whichever is more, will be deducted while arriving at the acceptable length of proofed fabric.

c) Total 3 Nos of Flags are permissible in a roll of 35 m length. 4 No.s of flags are permissible in a roll of 50 m length. However, in such rolls at least two clear lengths of 12 m each should be free from any flags. The acceptable length excluding flag and rejection portion shall be 35 metres or more for Single Texture Fabric and 50 metres or more for Double Texture Fabric.

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- d) More than any one of critical defects in 1.5 m length and any defect in 2 m each from both end will be considered for rejection and deducted from the total length for acceptance.
- e) The proofed fabric shall be absolutely wrinkle free. Wrinkles more than specified under minor defects at selvages are not permitted. Manufacturer may adhere to proper base fabric and heat set to avoid this defect.
- f) If the wrinkles are evenly spread on the sides of the edge, then wrinkles on both edges will be considered as one wrinkle.
- g) The proofed fabric shall be absolutely flat when unrolled.

12. TEST METHODS

The methods of tests and analysis to be followed during some tests are as given in Appendices enclosed to this specification. Any test method other than specified in the specification should have a written approval from the Quality Assurance Authority.

12.1 The list of Appendices enclosed is as under:

- a) The method for Determination of Tear strength by wing - Appendix 'A' (Single rip) Tear test.
- b) Procedure for Determination of Polychloroprene rubber - Appendix 'B' content in coated layer.
- c) Adhesion Bonding between Rubber Proofing and fabric layer. - Appendix 'C'
- d) Adhesion between fabric plies (for Double texture fabric only) - Appendix 'D'
- e) Method for Air leakproofness test. - Appendix 'E'.

13 CRITERIA FOR CONFORMITY

Aspects regarding criteria for conformity to the specification standards and tests to be conducted in detail have been laid down in Test Schedule No. CQAE/TS/1251/(f), enclosed with this specification. The contractor must make himself conversant with test procedure, characteristics for creation of test facilities and manufacturing of his products to the specification requirement.

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MARKING

14.1 Manufacturer's Identification Mark

Each roll of proofed fabric shall be stamped with manufacturer's identification/trade mark at intervals of 5m lengths, diagonally along the boarder of the fabric.

14.2 Acceptance Mark

Each accepted roll of proofed fabric of required length should be marked with inspection mark (Rubber Stamp) using indelible clearly visible yellow colour ink/paint at the beginning, at intervals of 5m lengths diagonally, opposite to the manufacturer's identification marking, and at the end of the roll, 10 cm from the boarder of the fabric.

14.3 Packing Mark

Each package of roll shall be legibly marked with following information. This information may be stenciled in indelible black ink with 15 mm high character /numerical:-

- a) Nomenclature.
- b) AT/SO No and date.
- c) Manufacturer's name or trademark.
- d) Lot No and date of manufacture.
- e) Roll No and accepted length in metre.
- f) Gross weight of the packages in kg.
- g) Name of consignee.
- h) Warning "USE NO HOODS" and its Hindi version shall be printed in red ink on the package.

PACKING

Finished fabric of acceptable quality duly sorayed with French char. as per IS-380, shall be packed in the following manner before marking :-

15.1 The finished and accepted fabric shall be rolled lengthwise without folding at any point. Each roll shall be securely wrapped in polyethyiene sheet of 0.04 mm thickness conforming to IS: 2538 and finally packed/wrapped in minimum two layers of hessian cloth heavy, weighing 299 to 329 gm/ m² conforming to IS - 2818 (Pt II) to form a bale. The size of the hessian cloth shall be sufficiently large to wrap the roll completely. This is ensured by having an overlap of at least 15 cm, where top and bottom coverings meet. The seams and ends of the bale shall be sewn with jute twine 3 ply/strands conforming to IS-1912 with stitching

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care should be exercised to avoid piercing/scratching of the finished fabric. Each package shall be provided with ears/ loops for handling of package.

16. WARRANTY

Each lot of finished proofed fabric supplied against the order shall be deemed to bear a warranty of the contractor against all defects in material, workmanship, finish and performance for a period of 12 months from the date of receipt of stores at the consignee end. If the stores supplied are found to be defective by the consignee during this period, the purchaser shall be entitled to call upon the contractor to rectify/replace the defective store immediately within such a period as may be fixed by the purchaser/Quality Assurance Authority for the purpose. The stores so replaced/rectified shall be deemed to bear a warranty period as mentioned above from the date of replacement/rectification.

17. SUGGESTION FOR IMPROVEMENTS

Any suggestion for improvement of this document may be forwarded to The Technical Controller, Controllerate of Quality Assurance (Engineering Equipment), Aundh Camp, Pune-411 027.

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Appendix 'A'
(Refer Para 12)

TEST METHOD FOR DETERMINATION OF TEAR STRENGTH BY WING
(SINGLE RIP) TEAR TEST.

A.1 DEFINITION: The tear strength is the maximum force required to tear a specified specimen, the force being substantially parallel to the major axis of the test specimen.

A.2 APPARATUS: A power driven tensile testing machine of suitable capacity having constant rate of traverse of 300 +/- 10 mm/minute fitted with either dial gauge or an autographic recorder is to be used.

A.3 TEST SPECIMENS: From different places at random of each of the fabric sample, cut 20 specimens of 200 mm x 125 mm size, 10 each in warp and weft direction. Out of 20 test specimens, 10 test specimens (Five in warp and 5 in weft direction) shall be for tear strength test before ageing of specimens and remaining 10 test specimens (5 in warp and 5 in weft direction) shall be for Tear Strength test after ageing of specimens.

A longitudinal cut/slit, of 75 mm in length, shall be made in it beginning from the middle of Width, to form two Wings. At a point 38 mm down the cut/slit, a line shall be drawn across each wing, making an angle of 65 deg with centre cut/slit facing the apex of the cut.

Only 4 test specimens (two in warp and two in weft) shall be tested for tear strength before ageing of specimen and 4 test specimens (two in warp and two in weft directions) shall be tested for tear strength after the ageing of specimen. The remaining test specimens shall be kept untested for audit/verification test, for 30 days after the date test report.

A.4. TEST PROCEDURE: The grips of tensile testing machine shall be brought 50 mm apart. The two wings of the specimen shall be clamped with 65 Deg line along the proximate edge of the jaws such that the point of tear shall lie in the line of symmetry of the grips during the test. The machine shall be operated and the specimen is torn over a distance of 25 mm.

A.4.1 If the tear in the specimen splits out of the straight line of threads, the test shall be repeated on another specimen.

A.5 EVALUATION: If the testing machine is provided with dial only, 4 to 6 successive peak values registered on the dial when the cross thread ruptures, shall be recorded after allowing the tear to propagate through the first cross thread rupture to stabilise the conditions of tear. The mean tear strength of the

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specimen is the arithmetic mean of 4 to 6 successive peak values registered. The average for warp and weft directions of any individual specimen shall not be less than the minimum value given in the specification.

A.5.1 If the tensile testing machine is provided with an autographic recorder the tear strength shall be evaluated from the trace obtained on the recorder chart.

Appendix B
(Refer Part 101)

PROCEDURE FOR DETERMINATION OF POLYCHLOROPRENE RUBBER
CONTENT IN COATED LAYERS

B.1 SCOPE: This method covers determination of polychloroprene rubber content by sodium carbonate fusion method in rubber (not containing any other chlorine containing material).

B.2 PROCEDURE: Separate the vulcanised rubber layers completely from the fabric, divide it into fine particles and weigh accurately about 0.5 gm of sample. Prepare 4 such samples, 3 samples shall be tested and one sample shall be kept for audit/ verification. Transfer the weighed rubber pieces into platinum crucible containing a bed of Na₂CO₃ (AR Quality) and completely cover the rubber particles with more quantity of Na₂CO₃. Place another smaller platinum/nickel crucible (upside down) inside the larger platinum crucible (containing embedded rubber particles) seal the gap all around the periphery of smaller crucible and top it up with Na₂CO₃. Ensure that Na₂CO₃ sealing is perfect so as to completely entrap the escaping gas.

B.3 Heat the platinum/nickel crucible on Bunsen Flame first gently for about 30 minutes and then vigorously to red heat for one hour or heat at 750 deg C in a muffle furnace, to allow complete fusion of rubber with Na₂CO₃.

B.4 Remove the burner/remove from furnace and allow the crucibles to cool down to room temperature. Transfer the crucibles with contents to a one litre pyrex beakers. Dissolve the contents in distilled water and add HNO₃ (preferably 10 N to 15 N) to neutralise the excess of Na₂CO₃. Add few millilitre of HNO₃ in excess and filter the contents in another beaker. Wash the filter paper with distilled water. Remove the residue. To the filtrate add AgNO₃ (AR 10 per cent) solution to precipitate AgCl. Complete the precipitation. Filter the contents through sintered glass crucible which is previously weighed to constant weight. Wash with the distilled water containing few drops of HNO₃, Keep the crucible in oven at 105 Deg C to evaporate the moisture and dry it to constant weight. Determine the weight of silver chloride. The percentage polychloroprene of the proofing shall be calculated as per following:-

$$\begin{aligned} \text{Polychloroprene} & & \text{Weight of AgCl ppt} \times 100 \times 35.5 \\ \text{Rubber content (\%)} & = & \frac{\text{-----}}{143.5 \times 0.37 \times \text{wt of sample taken.}} \end{aligned}$$

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B.5 Alternatively the parr bomb peroxide combustion method (as per IS 1502) using chloride free sodium peroxide should be followed. Usually sodium peroxide will be necessary.

Appendix C

(Refer Para 12)

ADHESION BONDING BETWEEN RUBBER PROOFING AND FABRIC LINES

C.1 Specification of Adhesive: A requisite quantity of adhesive Type W, conforming to CQAE specification NoIND/ENG/PROV/1993/12, shall be thoroughly mixed with the specified percentage of cross linking agent.

C.2 Test specimens and Procedure: Two pieces of 5 cm x 20 cm size of polyamide nylon fabric (double or single texture fabric) shall be taken. Top surface of one piece and bottom surface of other piece shall be roughened to a length of 5 cm at one of the ends. Clean the roughened portion with toluene. Apply prepared adhesive on roughened portion uniformly with a brush and leave in tacky dry state (Approx 20 - 40 minutes). These two pieces shall be bonded together. A 5 Cm x 5 Cm bond (with a loose end on either side) is obtained. This will act as a specimen. 18 such specimens, 9 in warp and 9 in weft direction, shall be prepared as described above. After 48 hours from the time of application of adhesive, four specimens shall be tested before ageing (Two in warp and two in weft) of specimens and four specimens shall be tested after ageing (two in warp and two in weft) and four more specimen shall be tested after ageing (two in warp and two in weft) for bond strength using Tensile testing machine with a rate of separation of bond at 100 ± 10 mm /minute. The coating layer shall not fail or separate from the base fabric below the specified values in any case. Remaining specimens shall be kept untested. These shall be kept for 30 days for audit/ verification from the date of test report.

Appendix D

(Refer Para 12)

ADHESION BETWEEN FABRIC PLIES

(For double textured fabric only)

D.1 TEST SPECIMEN

Cut 18 strips of 2.5 cm width and 15 cm length, nine strips in warp and nine strips in weft direction randomly distributed over the test samples.

At the one end of strips, separate the two-nylon ply using a razor blade. Dipping the ends in solvent such as NYLON may help in separation.

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swelling of intermediate rubber layer. Pull apart the two or proofed fabric ply about 3 cm in length. Allow it to dry.

D.2 TESTING

Fix two proofed fabric plies in two strips (Jaws) of tensile testing machine. Test adhesion of fabric plies with rate of separation of grips at 5 cm / min. During the test, reading should be taken at suitable spaced intervals.

Four specimens (two in warp and two in weft) shall be tested before age test specimen. Four specimens (two in warp and two in weft) shall be tested after dry ageing of test specimen.

Four more test specimens (two in warp and two in weft) shall be tested after water ageing. Balance specimens shall be kept for 30 days for audit/verification from date of test report.

Appendix 'E'

(Refer Para 12)

METHOD FOR AIR LEAKPROOFNESS TEST

E.1 GENERAL

Cent percentage quality control of the proofed fabric (single texture Fabric/KK-200 and Double Texture Fabric/KK-600) in respect of Air leakage test shall be made. KK 200 fabric being single texture, shall be checked for this test on the rolls at every 5 m length at random location along the width of the fabric while carrying out visual inspection. Manufacturer shall provide facilities of test by arranging the test rig along the line with inspection table for visual inspection.

E.2 PROCEDURE

The proofed fabric shall be suitably clamped in a specially designed test rig to cover the full width and appropriate length of the proofed fabric with leak proof grip. Air at a pressure of 200 g/cm² and 400 g/cm², shall be applied to the single and double texture fabrics respectively for 5 minutes from bottom. Soap solution shall then be applied all over the fabric under air pressure and the surface shall be examined for presence of any pinholes. Appearance of bubbles on the surface indicates the presence of pinholes.


NOTE : For checking Air leakproofness of proofed fabric in the Laboratory, test specimens drawn at random from different portion of sampled fabric of 65 cm x 65 cm shall be tested for air leakproofness in a test rig.

QUALITY ASSURANCE ACCEPTANCE PROCESS AND TEST SCHEDULE
FOR BULK INSPECTION

POLYCHLOROPRENE COATED NYLON FABRIC
(DOUBLE TEXTURE FABRIC/SINGLE TEXTURE FABRIC)

GENERAL

01. This quality assurance acceptance process and test schedule lays down the quality assurance acceptance checks, test and performance requirements.
02. This test schedule is issued to guide the manufacturer on the inspection process and tests. Nothing in this Schedule absolves manufacturer his responsibility to ensure that the quality assurance requirements are met with strictly as per terms of contract and supplies are upto the requirement of the contract specification, contract agreement and advance sample sentencing report.
03. During the application of the schedule, if it is found that further aspects which should advantageously be included in this schedule, such aspects should be brought to the notice of the Controller, CQAE, Aundh Camp, Pune-411 027.
04. For proper conduct of checks/tests, it is necessary that all the relevant standards, specifications are studied properly; test/recording procedure and computation of test results are properly understood. A detailed quality assurance check sheet for various check and test and their systematic recording shall be prepared by the manufacturer and got approved before its use. The pre inspection report to be submitted by the firm alongwith each inspection call letter during bulk supply shall be on these formats.
05. The manufacturer shall extend to the inspection authority, i.e. Controller CQAE or his authorised representative and Inspecting Officer (SQAQO) and inspection staff free of cost all assistance including the complete test facilities like laboratory for testing of proofed fabric and special test arrangements like a Flat table of not less than 12 m x 1.5 m size, test rig for checking air leak proofness tensile testing machine with auto recorder with attachment as per IS:7016 (Part II), thermostatic controlled electric oven etc. The manufacturer shall produce on demand or shall arrange all measuring instruments needed for measurement of dimensions and labour requirement if any, for handling of stores under inspection. He shall arrange proper lighting and ventilation arrangements at inspection bay, so as to give reasonably comfortable working condition to the Quality Assurance Officer/Staff for detailed specification/ checks /tests


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RANDOM SAMPLING METHOD AND SAMPLING PLANS

06. The samples of proofed fabric to be drawn from master rolls for various tests & inspection shall be at random, without regard to their quality as described in IS: 4905. These samples shall be serially numbered and clearly marked for their easy identification at later date. The number of samples to be drawn to meet the sample size (number of units or product in the sample) shall be as per various sampling plan given below:

06.1 100% visual inspection shall be carried out for all the rolls strictly as per clause 11.1 of specification for proofed fabric for critical/major/minor defects and rolls segregated as per note under clause 11 of specification.

06.2 Single Sampling variable Plan for variability unknown standard deviation on method or range method.

06.2.1 This sampling plan shall be adopted for testing of various critical major, parameters as classified below in clause 07 for proofed fabric and packaging material. The sentencing of proofed fabric shall be based on relevant calculations as described in IS:2500 (Part II) adopting AQL No of 4% for critical parameters and 6.5% for the major parameters. The sample size based on inspection Level III as given below for various lots:

No. of rolls i.e., Lot size	No. of rolls to be selected	No. of sample to be selected	Length of Basic/Proofed Fabric to be cut for testing.
Upto 50	3	3 (one from each roll)	3 meters
51 to 100	4	4 (one from each roll)	3 meters
101 to 200	5	5 (one from each roll)	3 meters

06.2.2 In case of total requirement of KK-200/KK-600 is limited to 05 rolls or less 100% checking /testing may be resorted to at the discretion of inspection authority.

Note:

1. Length of fabric upto 35 m for Single texture proofed fabric (KK-200) and upto 50 m for Double texture fabric (KK-600) shall be considered as one roll.
2. For the purpose selection of samples, the number of rolls, which are found satisfactory after initial visual inspection, as described at clause 10, will be taken as a lot.

Quik samples of coated fabrics sent by SQAE's for testing at CQAE lab should be accompanied by adhesive 1 kg with CLA 0.2 kg. Para 2.2.1.3 of specification refers.

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07. CLASSIFICATION OF PARAMETERS

7.1 Critical parameters of Proofed fabric are

- a) Breaking strength
- b) Percentage of elongation at break
- c) Tear strength
- d) Adhesion bonding
- e) Polychloroprene Rubber content
- f) Air leak process

7.2 Major parameters of proofed fabric are

- a) Dimensions
- b) Weight of proofed fabric.

7.3 Major parameters of packing materials are

- a) Weight
- b) Dimensions

08. QUALITY ASSURANCE ACCEPTANCE, CHECKS, TESTS & INSPECTION

Following specifications, standards and documents shall be referred for guidance:-

- i) Specification No CQAE/9320/1372/(f)
- ii) Specification No IND/ENG/PROV/1193/(d)
- iii) Advance sample report relevant to proofed fabric under inspection (to be supplied separately after advance sample inspection).
- iv) Approved advance sample of proofed Fabric (if any).
- v) IS: 2500 (Part II) - Sampling inspection Tables - inspection by variables for percent defective.
- vi) IS: 4905 - Method of random sampling.

09. EXAMINATION OF MANUFACTURER'S PRE-INSPECTION REPORT

The manufacturer of proofed Fabric alongwith inspection call letter shall produce his pre-inspection report indicating the total quantity and No of rolls offered duly completed in all respect. The pre-inspection report shall be on the approved check sheet and shall include complete visual examination, test report of various tests of fabric and packing material. In case the pre-inspection report is not

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submitted or found to be incomplete, the inspection call letter shall be disposed of indicating the reasons.

INITIAL VISUAL INSPECTION

In case the firm's inspection call letter is found acceptable before proceeding with the detailed inspection, initial visual inspection of the lot offered shall be carried out. This will include counting of total number of roll length offered and identification marking. In case no discrepancies are found in the lot offered, further inspection shall be continued.

TESTING OF PROOFED FABRIC

In case, no deficiencies are found during initial visual inspection, samples from selected rolls shall be drawn at random as per sampling plan indicated at para 6.1 above and shall be tested for width, weight, Breaking Strength Extension at break, Tear Strength, Adhesion bonding tests, Polychloroprene rubber content, Air leakproofness test as specified in this specification. (Refer clause 6 of specification). The tests shall be carried out only at Govt or reputed firms/recognised test Laboratory. Three metres of samples will be required for carrying out all tests as per specification, at AHSP lab. Till the test results are obtained, the complete lot of proofed fabric offered, shall be bonded and kept under properly sealed and locked condition in a bond room. Only in case samples qualify in the tests further inspection shall be performed. In case the samples of proofed fabric fail to qualify in these tests, the lot shall be sentenced as REJECTED by affixing 'Rejection Inspection Mark' on all the rolls at an interval of 5 metres and rejection inspection note issued. If need be, rejected lot/rolls be segregated and kept under bonded condition.

INSPECTION OF PROOFED FABRICS FOR VISUAL EXAMINATION, FINISH, WORKMANSHIP, IDENTIFICATION AND MARKING

When the proofed fabrics qualify in the tests prescribed above before proceeding further inspection, the bonded seal of Proofed Fabrics shall be examined and its condition checked. In case of any evidence of tampering, the lot shall be sentenced as rejected and rejection note issued indicating the reasons for rejection. In case of no discrepancy, whole lot shall be subjected to visual examination including the identification marking of individual rolls as described in this specification and observations recorded in a tabular format for levying the penalty.

3. FINAL SAMPLING, PACKAGING AND RELEASE OF PROOFED FABRIC ROLLS FOR DESPATCH AND QUALITY ASSURANCE RECORD

13.1 In case the proofed fabric rolls qualify in all the above tests/check

specification. Accepted rolls shall be then got packed as described in the specification along with marking mentioned in the clause 14 of this specification. The packages shall be also stamped with Inspection Mark after checking for their adequacy.

13.2 While issuing Inspection Note, total length of proofed fabric. The packaging details, and the manner in which the proofed fabrics are stamped with Acceptance Inspection (rubber stamp mark detail) shall be indicated under the remark column.

13.3 A complete test report of samples of proofed fabric and quality assurance inspection details/observations shall be systematically recorded and maintained on the check sheet for future record and audit by Inspection Authority.

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GREEN COATED NYLON FABRIC
WIRE AND WOVEN TYPE FABRIC

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