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## MANUFACTURING DATA FOR SUN HAT, COMBAT, MULTICAM®

### 1.0 SCOPE

#### 1.1 Scope

This Manufacturing Data covers the materials, design and construction requirements for the Sun Hat, Combat, MULTICAM® for use by the Canadian Special Operations Forces Command (CANSOFCOM).

#### 1.2 Intended Use

This Sun Hat, Combat, MULTICAM® is intended to provide soldiers with protection from sun in temperate weather conditions.

#### 1.3 Classification

Sun Hats covered by this Manufacturing Data are classified as follows: Sun Hat, Combat, MULTICAM®.

### 2.0 GENERAL

#### 2.1 Intellectual Property

The information, data, know-how, formulas, algorithms, software, processes, systems, methods, designs, text, works, figures, tables, sketches, photographs, plans, drawings, specifications, samples, reports, names, inventions and/or ideas contained herein (hereinafter "Intellectual Property") is the exclusive property of Her Majesty The Queen in Right of Canada as represented by the Minister of National Defence (hereinafter referred as "DND"). No one has the right to reproduce, disclose, disseminate, or utilize, in any manner or in any form, this Intellectual Property, or any part thereof, without the prior written consent of DND. For further information on the restrictions applicable to this Intellectual Property, or to request consent from DND, please contact the Contracting Authority.

#### 2.2 Applicable Documents

The following documents form part of this Manufacturing Data to the extent specified, and are supportive of this Manufacturing Data when referenced; all other document references are to be considered supplemental information only. In the event of a conflict between the documents referenced and the contents of this Manufacturing Data, then the contents of this Manufacturing Data must take precedence:

#### *DND Specifications and Standards (provided upon request)*

- D-80-001-028/SF-001 Specification for Cord, Plaited, Spun, Synthetic Fibre
- D-80-001-055/SF-001 Specification for Label, Clothing and Equipment

CAN/CGSB Standards (email: [ncr.cgsb-ongc@pwgsc.gc.ca](mailto:ncr.cgsb-ongc@pwgsc.gc.ca))

- CAN/CGSB-4.2-M Textile Text Methods
- CAN/CGSB-4.131-M Cotton-Covered or Polyester-Covered, Polyester Thread
- CAN/CGSB-4.139 Polyester Staple Thread
- CAN/CGSB-54.1-M Stitches and Seams, Parts I and II
- CAN/CGSB-86.1-2003 Care Labelling of Textiles

FED Standards (Download Documents: <http://assist.daps.dla.mil/quicksearch/>)

- FED-STD-595C - Colors Used in Government Procurement

2.2.1 Order of Precedence

The order of preference is as follows:

- (a) In the event of inconsistency between contract documents, such as contract, Manufacturing Data, drawing and sealed pattern, the order of precedence shall be contract, Manufacturing Data, drawing and sealed patterns;
- (b) In the event of a conflict between the text of this manufacturing data and the references cited herein, the text of this manufacturing data must take precedence;
- (c) In the event of inconsistency within this manufacturing data, the Contracting Authority must be contacted for clarification; and
- (d) Nothing in this document supersedes applicable laws and regulations, unless a specific exemption has been obtained.

2.3 Material Standards

The following material standards are supplemental to this standard:

- (a) Specification for Cloth, Nylon Cotton, Lightweight, MULTICAM®: and
- (b) Specification for Cloth, Coated, Taffeta, Nylon, Polyurethane.

2.4 Definitions

Earth Tone	By definition, earth tone is considered a color scheme that draws from a color palette of browns, tans, grays, greens, oranges, whites and some reds. The colors in an earth tone scheme are muted and flat in an emulation of the natural colors found in soils, moss, trees and rocks. For the purpose of this specification, the earth tone color (where specified) must be based on the predominantly brown, tan and gray color series (lusterless) within FED STD-595C, where those colors do not include any elements of orange, red and white.
MULTICAM®	A proprietary design for a computer generated digital camouflage pattern patented by Crye Precision Ltd.

### 2.5 Layout Sketches

Schematic layout sketches for the Sun Hats are included as part of this Annex. The sketches are designed to provide a general layout of the Sun Hats only. They are not to scale and are not representative of the style, fit, colour scheme or form of the final garment. The following sketches are included in Appendix 1:

- (a) Figure 2 - Front and Back View;
- (b) Figure 3 - Front and Back Details;
- (c) Figure 4 - Side View; and
- (d) Figure 5 - Inside Details;

### 2.6 Patterns

DND will provide patterns as follows:

- (a) Sealed pattern: DSSPM 109-99 - Hat, Sun, Temperate Weather, Combat, CADPAT™ (TW) (Sealed for construction and design only); and
- (b) Paper patterns - Paper patterns for all sizes under Style Code HSHWC13. Size 7 will be used for tendering purposes.

Note: The patterns for the Hat, Sun, Temperate Weather, Combat, CADPAT™ (TW) are to be used for the construction of the Sun Hat, Combat, MULTICAM®. Sealed Pattern DSSPM 109-99 has the following deviations:

- (a) Brim width has been shortened to 4.4 cm (1.75 in) wide;
- (b) Webbing is only applied to accommodate reversible cat's eyes;
- (c) Neck flap is eliminated from storage pouch; and
- (d) Loop tape eliminated from sweatband.

## 3.0 **REQUIREMENTS**

### 3.1 Design

The design must be in accordance with Sealed Patterns DSSPM 109-99 and must incorporate the following features:

- (a) Brim around entire circumference of sidewall;
- (b) Two (2) black screened vents and retention washers on each side of hat;
- (c) Cord chinstrap with toggle;
- (d) Concealable phosphorescent tabs (Cat's-eyes); and
- (e) Webbing bar tacked at the back of the hatband for the attachment of camouflage materials.

Note: Unless otherwise specified, these garments must be governed by the Scale of Measurements at Appendix 2.

### 3.2 Materials

The following applies:

- (a) Shell Material - The shell material must be Cloth, Nylon/Cotton, MULTICAM®;
- (b) Brim Interlining - The brim interlining consists of one (1) layer of each of the following materials:
  - i. Coated Nylon (upper layer) - The coated-nylon material must be Cloth, Coated, Taffeta, Nylon, Polyurethane;
  - ii. Adhesive Web (middle layer) - The adhesive web must be a polyamide web having a weight of 20 g/m<sup>2</sup> (0.59 oz/yd<sup>2</sup>). Style Web 20 from Veratex Lining Limited (5425 Ave Casgrain, Suite 701, Montreal, Quebec H2T 1X6) has been known to meet these requirements; and
  - iii. Stiffener (bottom layer) - The stiffener interlining must be a cross laid base, binder bonded material as follows:
    - a. 100% polyester;
    - b. Weight: 115g/m<sup>2</sup> (3.39 oz/yd<sup>2</sup>) (+/- 10%);
    - c. Thickness: 0.95 mm (0.037 in); and
    - d. Colour: White;
- (c) Sweatband Interlining - The sweatband interlinings must of one (1) layer of each of the following materials:
  - i. Sweat Absorption Layer - The sweat absorption layer must be a non-woven, non- fusible felt material as follows:
    - a. Fiber Content: Polyester with an acrylic binder;
    - b. Weight: 142 g/m<sup>2</sup> (4.19 oz/yd<sup>2</sup>) (+/- 10%);
    - c. Thickness: 1.10 mm (0.043 in) (+/- 10%); and
    - d. Colour: White;
  - ii. Cover Layer - The cover layer must:
    - a. Fiber Content: 80 to 90% polyester and 10 to 20% rayon;
    - b. Weight: 36 to 42 g/m<sup>2</sup> (1.06 to 1.24 oz/yd<sup>2</sup>);
    - c. Colour: White; and
    - d. Style number 226 available from Veratex Lining Ltd, 5425 Casgrain Avenue, Suite 701, Montreal, Quebec, H2T 1X6, (514) 274-4495 has been known to meet these requirements;
- (d) Chinstrap - The chinstrap cording must be Cord, Plaited, Spun Synthetic Fibre conforming to Type I (lightweight) in black;
- (e) Webbing - The webbing must be as follows:
  - i. Textile, Spun Polyester, double jacquard weave;
  - ii. Weight: 19 g/m (0.56 oz/yd) (+/- 5%);
  - iii. Warp Ends: 192 with 19 picks/cm;
  - iv. Thickness: 1.7 mm (0.067 in) (+/- 10%);
  - v. Width: 14.3 mm (0.56 in); and
  - vi. Colour: Black;

- (f) Screened Vents and Retention Washers - The screened vents and retention washers must be as follows:
  - i. Brass with a dull, black, chemical finish;
  - ii. Outside rim diameter: 14.3 mm (0.56 in);
  - iii. Outside screening diameter: 11.1 mm (0.437 in); and
  - iv. Screen item number D53, and washer item number C658 available from Stimpson Co Inc, 900 Sylvan Ave, Bayport, NY, 11705-1097, (516) 472-2000, Fax (516) 472-2425, has been known to meet these requirements;
  
- (g) Toggle - The toggle must be as follows:
  - i. Black, cylindrical, round tipped, plastic type with a non- metallic tension adjustment mechanism; and
  - ii. Cord Stopper, style number LC-SR available from YKK Canada Inc. (3939 Thimens Blvd, Ville St. Laurent, Quebec, H4R 1X3, (514) 332-3350, Fax (514) 332-6040) has been known to meet this requirement;
  
- (h) Thread - The thread for seaming and stitching must be:
  - i. Be polyester thread (R50 Tex) conforming to CAN/CGSB-4.139-94 Size 50 or polyester, cotton-covered or polyester-covered, Size 75 (R50 Tex) conforming to CAN/CGSB-4.131-93 Class A or B; and
  - ii. Be a non-florescent earth tone colour to match the MULTICAM® camouflage pattern;
  
- (i) Luminescent (Phosphorescent) Material - The luminescent material must be SPOT-LITE® GLO Film, Series 4100 CLL flexible plastic-backed film with pressure sensitive acrylic adhesive and 90 pound liner. This material is available from Hanovia Incorporated (6 Evans Street, Fairfield, New Jersey 07004, Phone (973) 651-5510 or Fax (973) 651-5550)).

3.3 Sizing

The Sun Hats must be available in the following sizes in accordance with the Scale of Measurements at Appendix 2:

Size (inches)	NSN
6 1/2	8415-20-011-7454
6 5/8	8415-20-011-7455
6 3/4	8415-20-011-7456
6 7/8	8415-20-011-7457
7	8415-20-011-7458
7 1/8	8415-20-011-7459
7 1/4	8415-20-011-7460
7 3/8	8415-20-011-7461
7 1/2	8415-20-011-7462
7 5/8	8415-20-011-7463
7 3/4	8415-20-011-7464
7 7/8	8415-20-011-7465

3.4 Cutting

The following applies:

- (a) The Sun Hats must be cut using duplicates of Government supplied paper patterns as follows:
  - i. Paper patterns include seam allowance but do not include ‘make-up’ allowance; and

- ii. The Contractor is responsible for adding ‘make-up’ allowance to suit their production methods without changing the design, grade or requirements for the Sun Hats;
- (b) The shell parts of the Sun Hats must:
- i. Be cut in the direction of the warp as shown on the paper patterns; and
  - ii. Be cut from the same print run of material with the exception of the sweatband, the inside crown binding, and the inside pocket pieces.

### 3.5 Sewing

The following applies:


- (a) Seams must be as follows:
  - i. Conform to CAN/CGSB-54.1-M; and
  - ii. Be a minimum of 9.5 mm (0.375 in) wide unless otherwise specified;
- (b) Stitching must be either lock stitched Type 301 conforming to CAN/CGSB-54.1-M, having not less than nine (9) nor more than eleven (11) stitches per 2.5 cm (1 in);
- (c) Serging may be done using any of the 500 series stitches with a minimum of 10 cover stitches per 2.5 cm (1 in);
- (d) The tension of the needle and bobbin threads must be adjusted to ensure correctly formed stitches; and
- (e) Bartacks must be 9.5 to 11 mm (0.375 to 0.4375 in) long and not exceed 2.4 mm (0.09375 in) in width.

### 3.6 Marking and Care Label

The Sun Hats must include a Marking and Care Label, in French and English, as follows:

- (a) A label, nominally 5.0 cm (2 in) long by 3.2 cm (1.25 in) wide, positioned on the top inner side of the sun hat (see Figure 5), and stitched around all edges;
- (b) Be a Type I label (Label, Woven, Coated and Printed) in accordance with D-80-001-055/SF-001;
- (c) Care symbols in accordance with CAN/CGSB-86.1-2003 including the following:
  - i. Washing – Symbol 6 (Warm water);
  - ii. Bleaching – Symbol 3 (Do not bleach);
  - iii. Drying – Symbol 2 (Tumble Dry on Low Heat); and
  - iv. Ironing/Pressing – Symbol 5 (Do Not Iron);
- (d) Marking label (see Figure 1) in accordance with D-80-001-055/SF-001 including the following:
  - i. NATO Stock Number as required for each size;
  - ii. Size (twice the size of all other lettering);
  - iii. Company name;
  - iv. Contract number;
  - v. Month and year of manufacture (MM/YYYY);
  - vi. Space to write personal identification; and
  - vii. Care Symbols.

Figure 1: Marking and Care Label

NSN/NNO: 8415-21-914-XXXX	
<b>Size/Taille: 6 5/8</b>	
Company Name	Date of
Contract Number	Manufacture
ID: _____	
	

3.7 Construction

The Sun Hats are to be manufactured in accordance with the following requirements:

- (a) **Brim** - The Sun Hats must have a brim as follows (see Figure 5):
- i. Constructed of the following layers (top to bottom):
    - a. One (1) ply of shell material on top;
    - b. Brim interlining as follows:
      1. One (1) ply of adhesive web;
      2. One (1) ply of coated-nylon; and
      3. One (1) ply of stiffener;
    - c. One (1) ply of shell material on bottom;
  - ii. All layer to be placed together such that they are flush at the outer brim edge;
  - iii. The top shell layer to be fused to the coated nylon layer with the adhesive web;
  - iv. Brim to be topstitched through all layers as follows:
    - a. Lines of stitching to run parallel to the circumference of the brim (parallel rings) or be a spiral pattern; and
    - b. Stitching to be evenly spaced at 6.4 mm (0.25 in) ± 2 mm (0.0625 in);
  - v. Outer edge of the brim to be finished as follows:
    - a. Outside edge of the brim to be bound with bias cut shell material to a finished width of 9.5 mm (0.375 in);
    - b. Binding starts and finishes at the center back, with the turned end of the binding lapped a minimum of 12.5 mm (0.5 in) on the opposite end of the binding; and
    - c. Finished binding to have a clean finish with no raw edges exposed;
- (b) **Phosphorescent Tab Loop Assemblies (Cat's-eye)** - The Sun Hats must have phosphorescent tab loop assemblies (Cat's-eye) as follows (see Figure 3):
- i. Constructed from one (1) ply of shell material as follows:
    - a. Each long edge to be folded in 9.5 mm (0.375 in);
    - b. One raw end of the loop is then folded up to within 6.4 mm (0.25 in) of the other raw end, wrong sides together;
    - c. The longer end is then folded down over the other raw end 6.4 mm (0.25 in) and the long edges topstitched 1.5 mm (0.0625 in) gauge;
  - ii. Include luminescent (phosphorescent) strips as follows:
    - a. Two (2) strips constructed of the luminescent (phosphorescent) material with finished dimensions of strip to be 2.5 cm ( 1 in) wide by 1.3 cm (0.5 in) high; and
    - b. Strips are placed on top of the raw edges of the loops, 3.2 mm (0.125 in) from the folded edge then edge stitched to the shell loops in a box formation using a thread that is tone to tone with the phosphorescent strips;

- iii. The loop is then closed by folding it in half and securely edge stitching the short ends together such that the finished loop is 2.5 cm (1 in) wide by 2.2 cm (0.875 in) high; and
  - iv. When fed over the webbing, the loop function such that it can be turned by hand into the desired position and not roll around the webbing freely;
- (c) **Webbing Attachment** - The Sun Hats must have a webbing attachment as follows:
- i. Located such that the center of the webbing is positioned on the center back of the hatband;
  - ii. Anchored to the hatband as indicated on the paper patterns as follows:
    - a. An ease of 3.2 mm (0.125 in) to 6.4 mm (0.25 in) to be allowed per loop such that the webbing does not lay flat on the hatband;
    - b. Phosphorescent 'Cat's-eye' assemblies are to be fed onto the webbing prior to attaching to the hatband; and
    - c. At each mark, stitch through the webbing, the hatband and the sidewall with a straight stitch three (3) times ensuring the stitching does not extend past webbing;
- (d) **Hatband and Sidewall Assembly** - The hatband and sidewall must be assembled as follows:
- i. Fold and edge stitch 2 mm (0.0625 in)  $\pm$  2 mm (0.0625 in) the top edge of the hatband to the outside sidewall; and
  - ii. The center back seams of the inside and outside sidewalls are then stitched 9.5 mm (0.375 in) gauge and finished with the seam allowances facing each other, ensuring that the webbing ends are secured into the center back seam;
- (e) **Screened Vent Attachment** - The Sun Hats must have screened vents as follows (see Figure 4):
- i. Include four (4) vents, two (2) positioned on each side of the Sun Hat as indicated on the paper patterns; and
  - ii. Vents are to be attached in accordance with the manufacturer's instructions, leaving no raw edges exposed;
- (f) **Inside Crown Pocket** - The Sun Hats must have an inside crown pocket as follows (see Figure 5):
- i. The raw edges of the inside pocket pieces are turned under twice and topstitched at 6.4 mm (0.25 in) gauge;
  - ii. The pocket pieces are then lapped over each other to form the inside crown;
  - iii. The outer pocket edges, crown edge and top sidewall edges are stitched together and the raw edges bias bound so that no raw edges are exposed; and
  - iv. The crown is edge stitched through all layers from the top;
- (g) **Sweatband** - The Sun Hats must have a sweatband as follows (see Figure 5):
- i. Constructed of the following:
    - a. Outer layer consisting of one (1) ply of shell material; and
    - b. Sweatband interlining as follows:
      - 1. Middle layer consisting of one (1) ply of sweat absorption material; and
      - 2. Inner layer consisting of one (1) ply of cover layer material;
  - ii. The top edge of the shell layer is serged and folded over the top edges of the sweatband interlining 9.5 mm (0.375 in), and the folded edge is stitched 2 mm (0.0625 in) gauge catching all layers of the sweatband;
  - iii. The bottom edge of the shell layer is then folded over the bottom edges of the sweatband interlining 9.5 mm (0.375 in), and the folded edge is stitched 2 mm (0.0625 in) gauge catching all layers of the sweatband; and



- iv. The right side back edge is then folded under and lapped over the left back edge and topstitched, ensuring that the right side overlaps by approximately 19 mm (0.75 in) from the center back to reduce bulk;
- (h) **Final Assembly** - The Sun Hats are then assembled as follows:
- i. The bottom edges of the sidewall assembly are stitched to the inside edge brim assembly at 9.5 mm (0.375 in) gauge;
  - ii. Include a chin strap made of cording that is 76 cm (30 in) long for all sizes;
  - iii. The bottom long edge of the sweatband is then edge stitched to the sidewall and brim assembly seam allowance, ensuring that the ends of the chinstrap are secured in the stitching;
  - iv. The bottom edge of the outside hatband must be edge stitched through all layers ensuring that the sweatband is facing in and up.
  - v. The sweatband is then secured as follows:
    - a. A series of seven (7) single bartacks are placed evenly around the circumference of the sweatband; and
    - b. Bartacks are to be through all layers of the hatband and sweatband, ensuring that the sweatband is in the appropriate position when stitching;
  - vi. The toggle is then placed on the chinstrap and secured by knotting the end of the cording.

**APPENDIX 1 LAYOUT SKETCHES**

Figure 2: Front and Back View

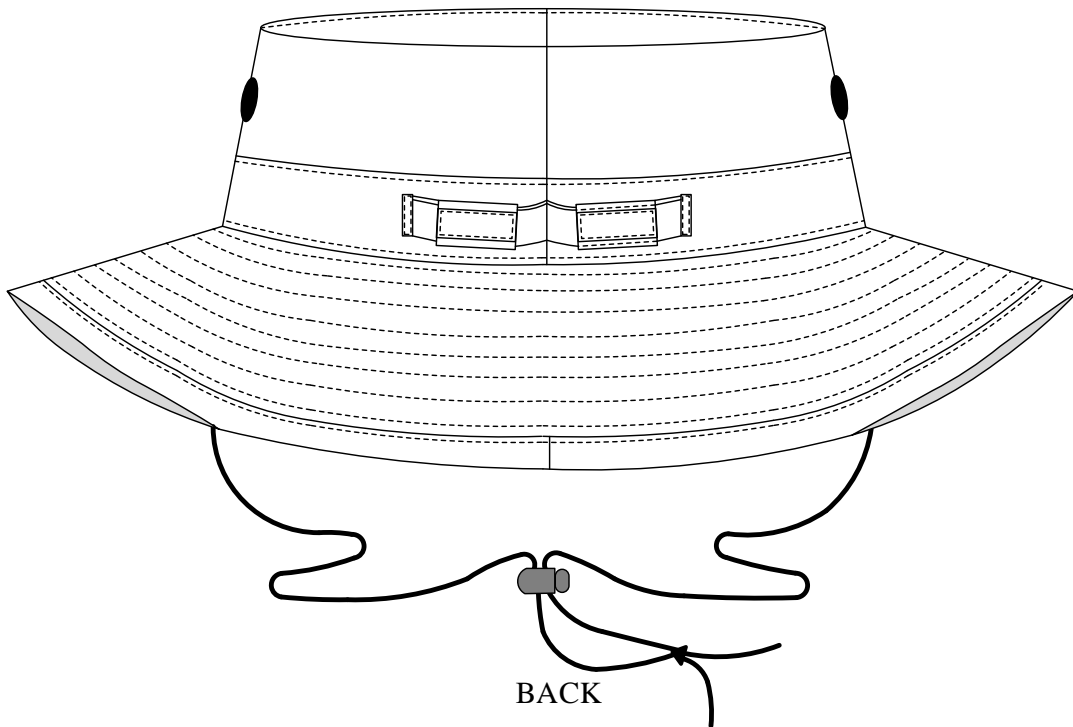
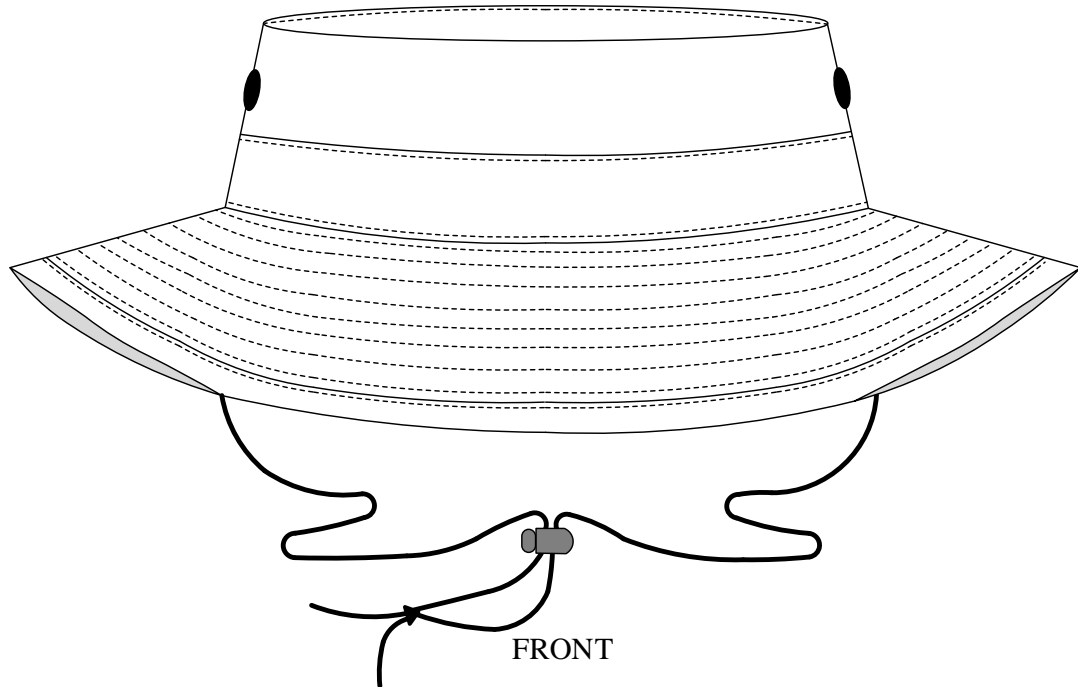


Figure 3: Front and Back Details

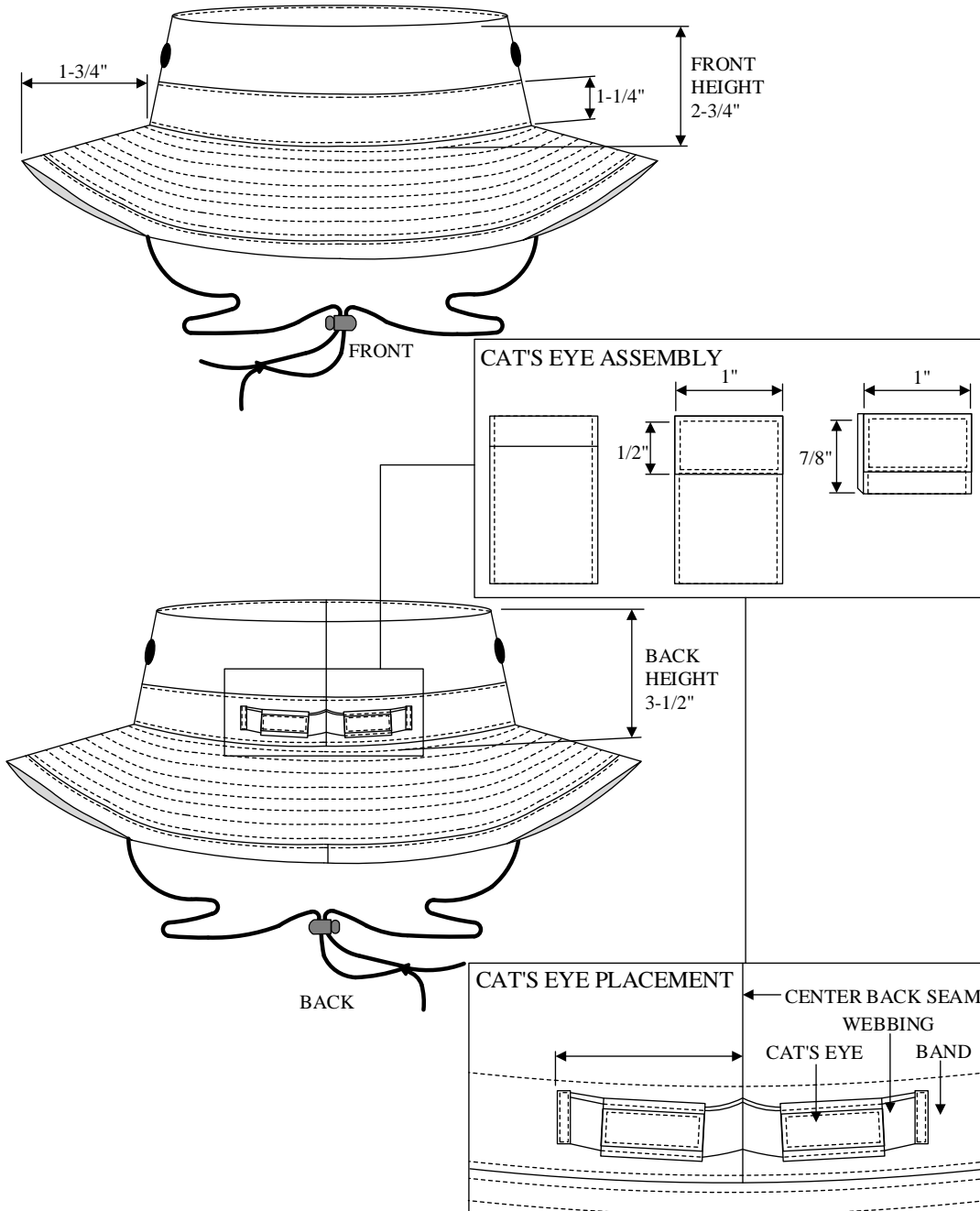


Figure 4: Side View

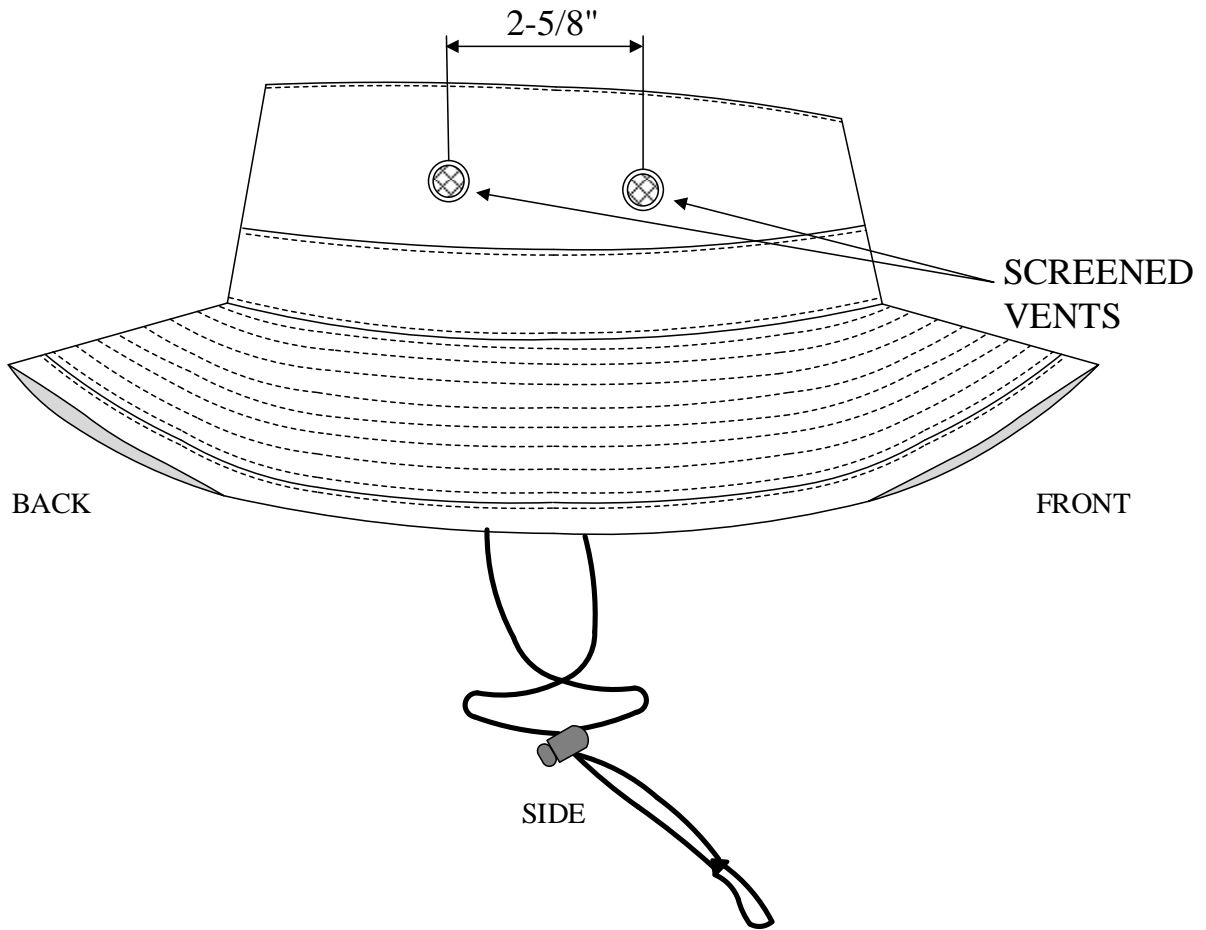
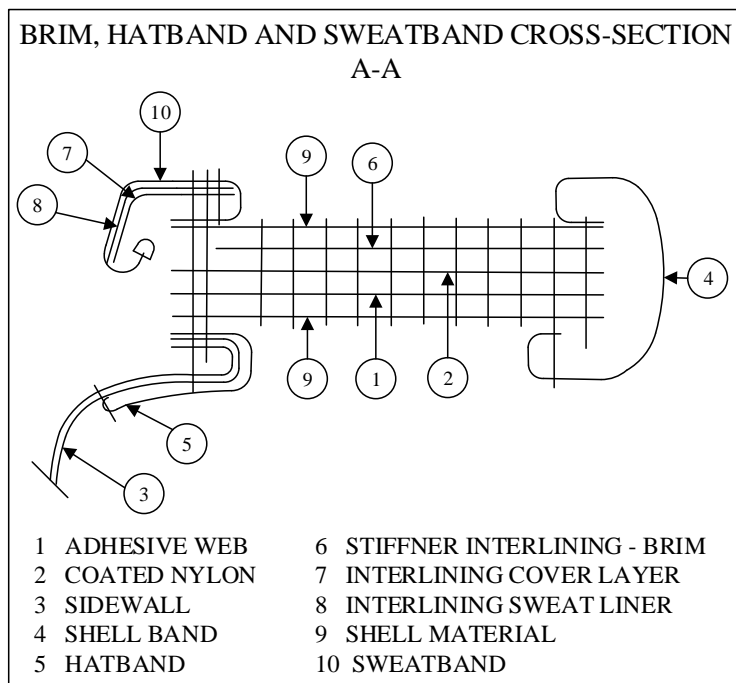
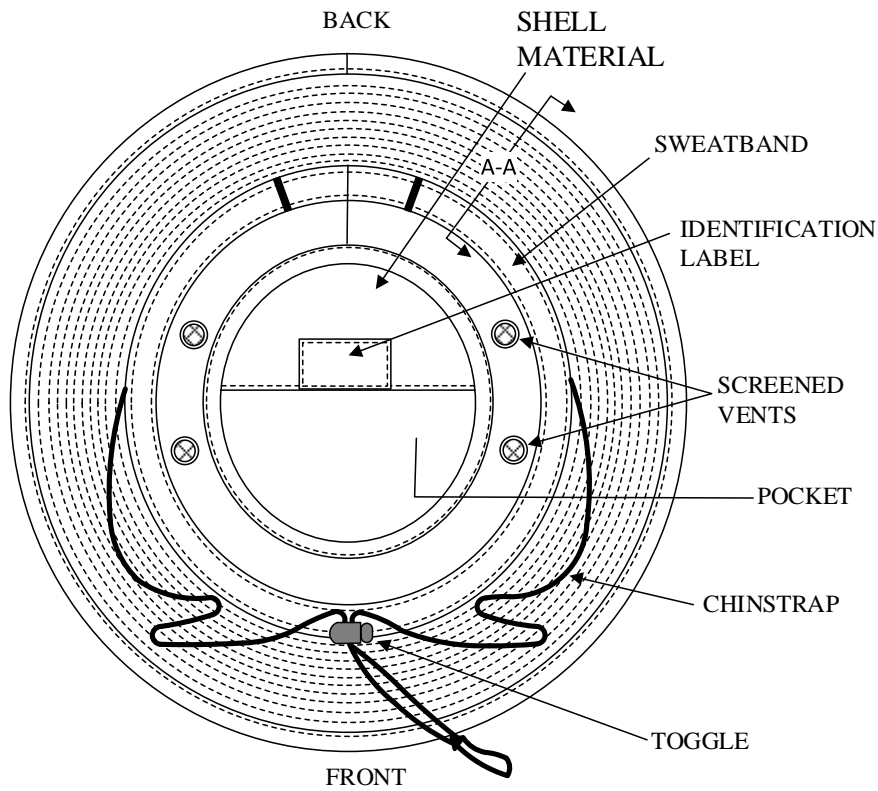


Figure 5: Inside Details



**APPENDIX 2 SCALE OF MEASUREMENTS**

REF	SIZE												TOL
	6-1/2	6-5/8	6-3/4	6-7/8	7	7-1/8	7-1/4	7-3/8	7-1/2	7-5/8	7-3/4	7-7/8	
<b>A</b>	20-1/2	20-7/8	21-1/4	21-5/8	22	22-3/8	22-3/4	23-1/8	23-1/2	23-7/8	24-1/4	24-7/8	N/A
<b>B</b>	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4	+1/8
<b>C</b>	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4	2-3/4	+1/8
<b>D</b>	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	+1/8
<b>E</b>	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	+1/8

