

**INCH-POUND**  
MIL-DTL-44117B  
21 October 2011  
**SUPERSEDING**  
MIL-H-44117A  
22 December 1986

## MILITARY SPECIFICATION

### HELMET, COMBAT VEHICLE CREWMAN, BALLISTIC SHELL, (DH-132B)

This specification is approved for use by all Departments and Agencies of the Department of Defense (DoD).

#### 1. SCOPE

1.1 Scope. This document covers the requirements for the DH-132B combat vehicle crewman's (CVC) helmet consisting of a ballistic shell and an inner helmet with attached microphone headset (see 6.9).

1.2 Classification. The helmet will be available in the following sizes as specified (see 6.2).

1.2.1 Complete Helmet Assembly (see Drawing 8-2-600)

1.2.1.1 Sizes.

Small - Small inner helmet with Medium shell  
Medium - Medium inner helmet with Medium shell  
Large - Large inner helmet with Large shell

1.2.2 Individual subassemblies. When needed individual subassemblies will be available as replacement parts as specified below (see 6.2).

Outer Helmet Assembly - (see Drawing 8-2-601)  
Inner Helmet Assembly (liner minus pads) - (see Drawing 8-2-602-3)  
Inner Helmet Assembly (liner with pads) - (see Drawing 8-2-618)  
Attachment Tab Assembly - (see Drawing 8-2-604)

Comments, suggestions, or questions on this document should be addressed to Attn: DLA Troop Support Standardization Team, 700 Robbins Avenue, Philadelphia, PA 19111-5096. Since contact information can change, you may want to verify the currency of the address information using Acquisition Streamlining and Standardization Information System (ASSIST) online database <https://assist.daps.dla.mil/>

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Buckle Assembly (also comes with inner helmet assembly) - (see Drawing 8-2-605)  
 Chin Strap Pad Assembly (comes with inner helmet assembly) - (see Drawing 8-2-611)  
 Chinstrap Assembly - (see Drawing 8-2-603)  
 Pads (also comes with inner helmet assembly) - (see Drawing 8-2-618)  
 Earcup seals (see Contracting Activity)

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in Sections 3, 4 or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in Sections 3, 4 and 5 of this specification whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, Standards and Handbooks. The following specifications, standards and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the solicitation or contract.

## FEDERAL STANDARDS

FED-STD-595/34094– Camouflage Green 483

## DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-32075 - Label: For Clothing, Equipage, and Tentage (General Use)  
 MIL-DTL-44050 - Cloth, Ballistic, Aramid  
 MIL-DTL-46593 - Projectile, Calibers .22, .30, .50 and 20MM Fragment-Simulating  
 MIL-DTL-64159 - Camouflage Coating, Water Dispersible Aliphatic Polyurethane,  
 Chemical Agent Resistant

## DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-662 - V50 Ballistic Test for Armor

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation or contract.

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### DRAWINGS

#### U.S. ARMY RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER

- 8-2-57 CVC Helmet, Wiring Diagram, Test Set
- 8-2-600 CVC Helmet, DH-132B Assembly (includes 8-2-601 & 8-2-618)
- 8-2-601 CVC Outer Helmet Assembly (includes 8-2-604, 8-2-616, 8-2-644, 8-2-658, and 8-2-659)
- 8-2-602 CVC Inner Helmet (Less Pads) Assembly (includes 8-2-603, 8-2-606, 8-2-611, 8-2-612, 8-2-614, and 8-2-616)
- 8-2-603 CVC Chin Strap Assembly (includes 8-2-605, 8-2-615)
- 8-2-604 CVC Attachment Tab Assembly
- 8-2-605 CVC Buckle Assembly
- 8-2-606 CVC Tab Assembly, Snap Fasteners
- 8-2-607 CVC Beading, Edge
- 8-2-610 CVC Post
- 8-2-611 CVC Pad Assembly, Chin Strap
- 8-2-612 CVC Ring, Earcup Securing
- 8-2-613 CVC Nape Strap Assembly
- 8-2-614 CVC Tunnel Assembly, Cordage
- 8-2-615 CVC Tab, Pull
- 8-2-616 CVC Tab, Attachment Assembly
- 8-2-617 CVC Pads
- 8-2-618 CVC Inner Helmet (With Pads) Assembly (includes 8-2-602 & 8-2-617)
- 8-2-644 Helmet. Ground Troops, Parachutist's Assembly
- 8-2-647 Helmet. Ground Troops Parachutist's A-Nut and Post
- 8-2-658 CVC Shell, Ballistic, Medium and Small (DH-132B)
- 8-2-659 CVC Shell, Ballistic, Large (DH-132B)
- 8-2-661 Helmet, Ground Troops' Parachutist's: Pinwheel Preform
- 8-2-830 Dimensions for Examination of DH-132B Helmet Shell Production Lots

(Copies of documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

#### CODE OF FEDERAL REGULATIONS (CFR)

Federal Motor Vehicle Safety Standards and Regulations (FMVSS)  
Standard # 218 - Motorcycle Helmets

(Copies are available online at <http://www.gpoaccess.gov/CFR> or from U.S. Government Printing Office 732 North Capitol Street NW, Washington, DC 20401.)

#### US ARMY ABERDEEN TEST CENTER

#### Protective Equipment Testing Procedures (Internal Operating Procedure)

(IOP) PED-003 Helmet Ballistic Testing Procedures dated February 1, 2011

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Distribution authorized to the Department of Defense and US DoD contractors only critical technology, February 2011. Refer other requests to Commander, US Army Aberdeen Test Center, ATTN: TEDT-AT-CO, 400 Collieran Road, Aberdeen Proving Ground, Maryland 21005-5059.

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC Evaluation Procedure 9 - Visual Assessment of Color Difference of Textiles

(Copies of are available on line at <http://www.aatcc.org> or from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709-2215.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/ASA S12.6- Methods for Measuring the Real-Ear Attenuation of Hearing Protectors

(Copies are available online at <http://webstore.ansi.org/ansidocstore> or from American National Standards Institute, 25 West 43rd Street, 4th floor, New York, NY 10036, or online from the Acoustical Society of America at <http://asastore.aip.org/> Acoustical Society of America Standards Secretariat, 2 Huntington Quadrangle , Suite 1NO1 Melville, NY, 11747-4502).

AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies are available online at <http://www.asq.org> or from the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203.)

ASTM INTERNATIONAL

ASTM D 2000 - Standard Classification System for Rubber Products in  
Automotive Applications

ASTM D 6193 - Standard Practice for Stitches and Seams

(Copies of documents are available online at <http://www.astm.org> or from the ASTM INTERNATIONAL, 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428 2959.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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## 3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.2.

3.2 Standard sample. The finished helmet shall match the standard sample for shade and appearance, and shall, unless otherwise indicated, be equal to or better than the standard sample with respect to all characteristics for which the standard sample is referenced (see 6.4).

3.3 Design. The Type I complete helmet assembly shall consist of a shell molded from laminated resin coated reinforcing material, with edge beading and a coated outer surface. The helmet shall have an attached communications/microphone headset. Helmets and components shall conform to applicable drawing requirements specified herein. The helmet assembly shall be in three sizes: Small and Medium according to Drawing 8-2-658, and Large according to Drawing 8-2-659.

3.3.1 Helmet. The finished helmet shall meet the requirements of this specification, referenced drawings, and parts lists.

3.3.2 Helmet, complete assembly. A complete helmet assembly shall consist of the components below and be in accordance with Drawing 8-2-600.

- a. Outer helmet shell assembly 8-2-601-1&2
- b. Inner helmet assembly 8-2-602-1 through 3
- c. Headset microphone kit (see 6.2)
- d. Labels
- e. Instruction Manual

3.3.3 Helmet subassemblies. When specified in the procurement document, modular subassemblies shall be provided separately from the helmet (see 6.2). The design of the modular subassemblies shall conform to the drawings as follows:

Outer Helmet Assembly - (see Drawing 8-2-601)  
 Inner Helmet Assembly (liner minus pads) - (see Drawing 8-2-602-3)  
 Inner Helmet Assembly (liner with pads) - (see Drawing 8-2-618)  
 Attachment Tab Assembly - (see Drawing 8-2-604)  
 Buckle Assembly (also comes with inner helmet assembly) - (see Drawing 8-2-605)  
 Chin Strap Pad Assembly (comes with inner helmet assembly) - (see Drawing 8-2-611)  
 Chinstrap Assembly - (see Drawing 8-2-603)  
 Pads (also comes with inner helmet assembly) - (see Drawing 8-2-618)  
 Headset-Microphone Kit (see contracting activity)

Spare/Replacement parts (intermediary steps) of items listed above:

Tab Assembly (stitched into inner helmet assembly) - (see Drawing 8-2-606)  
 Edge Beading (glued to the shell) - (see Drawing 8-2-607)  
 Earcup securing ring (stitched into inner helmet assembly) - (see Drawing 8-2-612)  
 Tunnel assembly cordage (stitched to liner) - (see Drawing 8-2-613)

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Pull tab (fastened to the buckle assembly and non replaceable) - (see Drawing 8-2-615)  
Attachment Assembly Tab (stitched to the liner) - (see Drawing 8-2-616)

3.4 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the requirements of this document, and promotes economically advantageous life cycle costs. This does not permit the use of material reclaimed from any other contract that has failed a previous lot inspection.

3.5 Materials and components. Materials and components shall be as specified on the applicable drawings and as specified herein.

3.5.1 Ballistic material. The reinforcing material specified in 3.5.1.1 shall be coated on both sides with equal amounts of the laminating resin specified in 3.5.1.2.

3.5.1.1 Cloth, ballistic, aramid (reinforcing material). The aramid ballistic cloth (reinforcing material) for the helmet shell shall conform to Type III, Class 3 of MIL-DTL-44050.

3.5.1.2 Laminating resin. The resin for coating and laminating the reinforcing material shall be a catalyzed system composed of 50 percent phenol formaldehyde and 50 percent polyvinyl butyral resins when tested as specified in 4.5.2. The resin content of the coated reinforcing material shall be 15 to 18 percent solids by weight (volatile free, see 6.7) based on the uncoated reinforcing material weight. The color and appearance of the material with the resin shall be pigmented to match the color of the standard sample 3.2 and the coating specified in 3.5.3 when tested as specified in 4.2.

3.5.2 Edging. The edge shall be made of a rubber compound in a suitable matching color and shall conform to the Grade, Type, Class, and suffix requirements of 3BC 615 AF17 Z of ASTM D 2000. The suffix letter Z indicates the special requirements that the edging when used in conjunction with the specified adhesive in 3.5.2.1 and procedure specified in 3.6.9.2 shall meet the adhesion requirements of 3.7.4 and 3.7.5 when tested as specified in 4.5.3 and 4.5.4. The edging design and dimensions shall conform to Drawing 8-2-644 and 8-2-607. The length shall be sufficient to conform to the contours of the helmet. As an option, the edging may be a one piece molded construction.

3.5.2.1 Adhesive for bonding helmet shell edge beading. The adhesive shall be of a synthetic rubber-base type, as specified on Drawing 8-2-601 and 8-2-607, for bonding the helmet shell edge beading and it shall meet the requirements specified in 3.7.4 and 3.7.5 when tested as specified in 4.5.3 and 4.5.4.

3.5.3 Coating. The coating for finishing the helmet shell shall conform to MIL-DTL-64159. The color shall be FED-STD 595/34094— Camouflage Green 483 unless otherwise specified in the contract or solicitation.

3.5.4 Texturing of coating. Texturing aggregate incorporated in the second coat (see 3.6.9.3) for the outer surface of the helmet shell shall be banded silica sand as specified in 3.5.4.1 or walnut shell flour as specified in 3.5.4.2.

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3.5.4.1 Sand texturing. The aggregate for sand texturing shall be banded silica sand, water washed and kiln dried, free of salts and deleterious matter, and containing not more than 1.5 percent of dirt or foreign matter. The sand aggregate shall be that known commercially as No. 70 and shall have a screen analysis as follows:

Sieve No. (U.S. Standard)	Percent Accumulated
No. 40	0.5 (maximum)
No. 50	6.0 ( $\pm 3$ )
No. 70	34.0 ( $\pm 5$ )
No. 100	82.0 ( $\pm 5$ )
No. 140	97.0 (+ 3, - 5)

The coating-sand mixture shall contain six (6) pounds of sand to one (1) base gallon of coating and shall be reduced to spraying consistency.

3.5.4.2 Walnut shell flour texturing. The aggregate for walnut shell flour texturing shall be a 40/100 mesh grade walnut shell flour. The coating-walnut shell flour mixture shall contain ten (10) ounces of walnut flour to one (1) base gallon of coating and shall be reduced to spraying consistency.

3.5.4.3 Replacement attachment strip kit. The replacement attachment strip kit shall consist of the following:

Attachment Strip (replacement for component of Outer Helmet Assembly  
 -Drawing 8-2-601-4) - 1 each  
 Adhesive Pack, 1/ - 1 each  
 Paper Instruction Label (see 3.5.4.3.1) - 1 each

1/ The adhesive pack shall contain a two-part polyurethane, black in color, of A-85 Shore hardness, 3.5 grams per pack net weight, and a mixing stick.

3.5.4.3.1 Paper identification and instruction label (strip kit). The label paper shall be a white commercial quality writing or printing paper having a minimum basis weight of 20 pounds (17 by 22/500). Printing shall be black. Size of characters shall be 1/8 ( $\pm 1/32$ ) inch high for the instruction label and 1/4 ( $\pm 1/32$ ) inch high for the identification label. The contents of the label shall be as follows with the identification label first:

(Identification label contents)

Item description  
 Stock number  
 Contract number  
 Contractor's name

Instructions for use of replacement attachment strip kit:

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## 1. Kit contents:

- a. Attachment strip - 1 each
- b. Adhesive pack (with mixing stick) - 1 each

## 2. Install replacement attachment strip on helmet as follows:

- a. Abrade the inner section of the helmet in the area where the previous attachment strip was located using 80 grit aluminum oxide abrasive cloth (NSN 5350-00-192-5047) to the point of leaving a rough surface.
- b. Wash abraded area with a lint free cotton cloth wet with denatured ethyl alcohol.
- c. Allow to air dry for 5-10 minutes.
- d. Mix the adhesive pack components following directions on the packet.
- e. Apply the mixed adhesive to the back (smooth) side of the attachment strip and to the abraded area in the helmet.
- f. Set attachment strip in place and allow to remain untouched for 15-20 minutes.

3.5.4.4 Replacement attachment tab kit. The replacement attachment tab kit shall consist of the following:

Attachment Tab (Drawing 8-2-604)	- 1 each
Screw, Item 7 (Drawing 8-2-601)	- 1 each
Washer, Item 8 (Drawing 8-2-601)	- 1 each
A-Nut and Post (Drawing 8-2-647 and 8-2-610)	- 1 each
Paper Instruction Label (see 3.5.4.4.1)	- 1 each

3.5.4.4.1 Paper identification and instruction label (tab kit). The paper and printing requirements shall be as specified in 3.5.4.3.1.

(Identification label contents)

Item description  
 Stock number  
 Contract number  
 Contractor's name

Instructions for use of replacement attachment tab kit:

## 1. Kit contents:

- a. Attachment Tab - 1 each
- b. Screw - 1 each
- c. Washer - 1 each
- d. A-nut and Post - 1 each

## 2. Install replacement tab on helmet shell as follows:



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- a. Install post through tab eyelet and place washer on post. Align tab eyelet and post with hole in shell. Snap fastener socket on tab (must face in-ward).
- b. Install washer on screw and apply thread sealing compound (NSN 8030-00-058-5398) to screw threads. Insert screw through helmet shell and thread into post. Screw head shall be on outside of helmet.

3.5.5 Instruction manual. An instruction manual shall be furnished by the contractor with each helmet. The manual shall be placed into the crown of the helmet. The text printing, collation, folding, and stitching of the manual shall be in accordance with the standard sample (see 6.4). The cover shall be antique white book paper conforming to best commercial practices. The text paper shall be white offset book paper conforming to best commercial practices.

### 3.5.6 Identification labels/markings.

3.5.6.1 Helmet shell. Each helmet shell shall have a permanent type identification label/marking applied to the interior surface of the helmet shell in the location shown on Drawing 8-2-601. The label shall be white, approximately 1 by 2 inches in size, and the characters shall be black, 3/32 inch high minimum. The label, after being applied to the helmet, shall be coated with clear lacquer or resin. The label/marking shall have the following information:

Nomenclature  
Size  
Serial number  
Lot number

3.5.6.2 Inner helmet. The inner helmet shall have an identification label/marking attached to the nape strap in accordance with requirements specified on Drawing 8-2-613.

3.5.6.3 Special marking, helmet shell and inner helmet. In addition to the markings required on the labels specified in 3.5.6.1 and 3.5.6.2 for the helmet shell and inner helmet, the labels/markings shall include, using characters 3/32 inch high, the following information: Manufactured under license agreement granted by the U.S. Government pursuant to Contract No. XXXXXXX with (Manufacturer's name).

3.5.6.4 Bar code Label/Tag Each finished helmet or individual component (when purchased separately) shall be individually Bar-Coded with a Type VIII, Class 17 label/tag conforming to MIL-DTL-32075. The label/tag shall be located so that it is completely visible when packaged as specified in section 5.1.

3.6 Construction. The construction shall conform in all respects to Drawings 8-2-57, 8-2-600 through 8-2-607, 8-2-610, 8-2-611 through 8-2-618, 8-2-644 (edging requirement only), 8-2-647, 8-2-658, 8-2-659, 8-2-661 (Pinwheel configuration only), and 8-2-830 and as specified herein.

3.6.1 Helmet shell. The helmet shell shall be a laminate structure composed of resin coated reinforcing material compression molded by heat and pressure.

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3.6.1.1 Forming of shell before molding. Forming of the helmet shell shall be accomplished using either pinwheel preforms or a combination of pinwheel preforms and rectangular panels. For either method, metallic fastening devices, such as staples, are not permitted unless they are in the trim area. Application of resin shall not be permitted in this operation. Spot welding or sewing with thread shall be permitted provided that evidence of these methods is not visible on the outside surface of the finished helmet.

3.6.1.1.1 Pinwheel preform construction. The pinwheel preforms shall be similar in configuration to that shown on Drawing 8-2-661 but may vary in size. The pinwheels shall each be one continuous, integral piece of fabric. To facilitate forming of the preform, the pinwheels may be cut up to within 2 1/2 inches of the center point of the pinwheel, leaving an uncut area measuring a minimum of 5 inches across in any direction. There shall be no more than eight legs, of approximately equal dimensions, on each pinwheel. A maximum of one pinwheel, may be formed by using two (2) half pinwheels joined together with a minimum 3 inch by 5 inch rectangle of the same material used for the pinwheels. The 5 inch dimension shall be centered and parallel to the butted joint of the two (2) half pinwheels. This segmented pinwheel layer may be located anywhere within the preform layup other than the innermost or outermost preform layer. The pinwheel preforms shall be assembled with four crown plies, similar to Drawing 8-2-661 so that there are not less than 33 layers of fabric throughout any cross-sectional area of the shell. The pinwheel preforms shall be superimposed over each other such that the gaps of each layer are offset from the gaps of all other layers. Gaps in the pinwheel preforms shall not exceed 3/32 inch in width. There shall be no pleat, wrinkle, or crease greater than 1/2 inch length. Any pleat, wrinkle, or crease 1/2 inch or less in length shall be smooth.

3.6.1.1.2 Combination pinwheel preform and rectangular panel construction. The combination pinwheel preform and rectangular panel construction shall consist of rectangular panels sandwiched between a single outer and a single inner fabric layer of pinwheel construction. The panels shall be rectangular in shape, cut in the warp and filling direction and the size may vary providing that no dimension is less than 3 inches. In addition to rectangular panels, the crown may contain circular or oval-shaped plies provided that the radius to any point on the periphery is not less than 2 1/2 inches. The individual preform layers shall be superimposed over each other such that the gaps of any two adjacent layers are offset by a minimum of 1/2 inch. The panels shall be laid up so that there are not less than 33 layers of fabric, including the inner and outer pinwheel layers, throughout any cross-sectional area of the shell. There shall be no pleat, wrinkle or crease greater than 1/2 inch in length. Any pleat, wrinkle, or crease 1/2 inch or less in length shall be smooth.

3.6.1.2 Molding of shell. The shell shall be formed during a single molding cycle, which is defined as the time between the closing and opening of the mold one time only (breathing degassing, or pinching off is not considered opening or closing the mold in this context). The shell shall not be remolded after this single molding cycle. The outer and inner surfaces of the molded shell shall be smooth. Both the inside and outside surfaces shall be free from any hole, void, delamination, pimple, blister, cracking, crazing, dry spot, area of non-resin flow, or pit greater than 1/8 inch in diameter and greater than the depth of one ply. Permissible gaps and pits shall be filled with epoxy resin composition to provide smooth and continuous surfaces on both surfaces of the shell. There shall be no pleat, wrinkle, or crease on the inside or outside of the helmet shell, except as allowed in 3.6.1.1.1 or 3.6.1.1.2. Any presence or evidence of delaminations and/or blistering

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shall not be acceptable. Rework on these items to repair delamination and blistering shall not be permitted or authorized.

3.6.1.3 Holes for attachment of components. Holes for attaching the helmet components shall be drilled in accordance with the dimensional requirements of Drawing 8-2-830; this shall be accomplished before finishing. There shall be no delamination of the shell material greater than 0.125 inch as a result of the drilling operation.

3.6.2 Stitching. All stitching be in accordance with ASTM D 6193 and shall be as specified in Drawing 8-2-602 and as specified in 3.6.3, 3.6.4, 3.6.5, and 3.6.6.

3.6.3 Type 301 stitching. Unless otherwise specified, ends of all stitching shall be backstitched or overstitched 1/2 inch minimum, except where ends are turned under in a hem or held down by other stitching. Thread tension shall be maintained so that there will be no loose stitching resulting in loose bobbin or top thread, or no excessively tight stitching resulting in puckering of the sewn materials. The bottom and top thread interlock shall be embedded in the sewn materials.

3.6.3.1 Repairs of type 301 stitching. Repairs of type 301 stitching shall be as follows:

a. When a thread break or bobbin run-out occurs during sewing, the stitching shall be repaired by restarting the stitching a minimum of 1/2 inch back from the end of the stitching. 1/

b. Any thread break, or two or more consecutive skipped or run-off stitches noted during inspection of the item (in-process, or end item) shall be repaired by overstitching. The stitching shall start a minimum of 1/2 inch in back of the defective area, continue over the defective area, and continue a minimum of 1/2 inch beyond the defective area onto the existing stitching. Loose or excessively tight stitching shall be repaired by removing the defective stitching, without damaging the materials, and re-stitching in the required manner.1/

1/ When making the above repairs, the ends of the stitching are not required to be backstitched.

3.6.4 Bartacking. Unless otherwise specified, bartacks, if used, shall be 3/4 ( $\pm 1/16$ ) inch long, 1/8 ( $\pm 1/32$ ) inch wide, and contain 42 stitches per bartack. Bartacking shall be free of thread breaks and loose stitching.

3.6.5 Automatic stitching. Automatic stitching machines may be used to perform any of the required stitch patterns provided the requirements for the stitch pattern, stitches per inch, size and type of thread are met; and at least three or more tying, overlapping, or back stitches are used to secure the ends of the stitching.

3.6.6 Thread ends. All thread ends shall be trimmed to a length of not more than 1/4 inch.

3.6.7 Setting of snap fasteners. On all textile and leather components, the holes punched before inserting the male or female part of the snap fasteners shall be smaller than the outside diameter of the fastener barrel so that the barrel must be forced through the hole. The fasteners

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shall be securely clinched without cutting the adjacent material, and no more than two splits shall occur in the button on the eyelet barrel.

3.6.8 Finish of hardware. Hardware components specified to be finished black on the applicable drawings shall be uniformly coated and free from flaking.

3.6.9 Finish of helmet shell and attachment of edge beading.

3.6.9.1 Outside surface preparation. Prior to attachment of edge beading and application of protective coating, all permissible surface gaps and pits on the outside surface of the helmet shell shall be filled with epoxy resin composition to provide a smooth and continuous surface. Cutting and filling of blisters of any size shall not be permitted. The outside surface of the shell shall be prepared for coating as required in order to meet the performance requirements specified in 3.7.7. If abrasion is included in surface preparation, abrading to the point where the aramid cloth fibers become visibly cut and raised shall be prohibited and dust from the abrading operation shall be completely removed before application of the coating. The prepared surface shall not be allowed to become contaminated by oil, grease, dust or other foreign matter prior to coating.

3.6.9.2 Attachment of edge beading. The edge beading shall be attached to the helmet shell as specified on Drawing 8-2-601 and 8-2-607. The beading shall be attached after the outside surface of the helmet shell has been prepared for finishing as specified in 3.6.9.1.

3.6.9.3 Coating of helmet shell outer surface. Following the surface preparation specified in 3.6.9.1 and attachment of edge beading specified in 3.6.9.2, the coating specified in 3.5.3 shall be applied to the outside surface of the helmet shell. The coating shall completely and uniformly cover the shell surface. A second coat of the same coating containing the texturing aggregate specified in 3.5.4 shall be applied uniformly on the outside surface of the helmet shell. The coating shall not be applied to the edge beading. The finishing equipment shall be capable of applying the texturing aggregate coating mixture without settling of the texturing aggregate, clogging of nozzle or lines, or other condition that would produce a non-uniform appearance.

3.6.10 Earcups. Seals shall be replaceable and manufactured from polyurethane film.

3.7 Performance

3.7.1 Ballistic resistance. The V50 ballistic limit for each helmet shell shall be not less than 2,150 feet per second when tested as specified in 4.4.5.

3.7.2 Impact resistance. The helmet assembly shall not transmit an impact energy impulse to a standard head form accelerometer in excess of 75 g-force when tested as specified in 4.4.5.

3.7.3 Sound attenuation. The helmet assembly shall meet the minimum acoustical attenuation values listed in Table I when tested as specified in 4.4.5.

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TABLE I. Sound attenuation

Octave band center frequency (Hz)	Real ear attenuation (dB)
125	14
250	16
500	21
1,000	23
2,000	28
3,150	35
4,000	35
6,300	35
8,000	30

3.7.4 Adhesion of the shell edge beading before aging. The edge beading shall remain firmly bonded to the shell when tested as specified in 4.4.5. Unbonded areas up to a total of two inches in length are acceptable, providing no individual unbonded area is more than 1/2 inch in length and 1/8 inch in width. There shall be a minimum distance of 1/2 inch between any two unbonded areas.

3.7.5 Adhesion of the shell edge beading after aging. When tested as specified in 4.4.5, the edge beading shall not peel back more than 1/4 inch from the helmet shell.

3.7.6 Communication equipment operation. When communication equipment (headset-microphone assembly) is specified in the contract or solicitation, it shall function satisfactorily after installation in the helmet, when tested as specified in 4.4.5.

3.7.7 Water immersion. The coating on the outside surface of the helmet shell shall show no evidence of softening, peeling, or blistering when tested as specified in 4.4.5.

3.8 Repairs. Except as otherwise specified herein, repairs to the helmet assembly shall not be permitted.

3.9 Replacement of defective components. During the spreading, cutting, and manufacturing process, textile and leather components having material defects or damages that are classified as defects in 4.4.2.4, 4.4.2.5 and 4.4.3 shall be removed from production and replaced with nondefective components.

3.10 Workmanship. The finished helmet assembly shall conform to the quality of product established by this specification. The occurrence of defects shall not exceed the acceptable quality limits as specified in the contract and/or order, except where otherwise indicated (see 6.2).

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2).

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## b. Conformance inspection (see 4.3).

4.2 First article inspection. A first article inspection shall be performed on the item (completed helmet assembly or subassembly) as specified in the procurement document (see 6.2). The first article inspection shall be unacceptable if the requirements in Table II are not met.

TABLE II. First article inspection

Inspection	Requirement	Verification
Visual examination (completed helmet assembly as noted)	3.2, 3.3.2, 3.5.3, 3.5.6.1, 3.5.6.2, 3.5.6.3, 3.5.6.4, 3.6.2, 3.6.3, 3.6.4, 3.6.6, 3.6.8, 3.6.10, 3.8, 3.9, & 3.10	4.4 Table VII and Table VIII
Color and shade matching	3.5.1.2	AATCC Evaluation Procedure 9, Opt A <u>1/</u>
Materials and components	3.5.2, 3.5.1.1, 3.5.2.1, 3.5.3, 3.5.6.4, 3.7.4, & 3.7.5	4.4 Table III
Dimensional examination (completed helmet assembly or subassembly)	3.6	4.4.1.1 Table IV, Drawing #'s 8-2-605, 8-2-644, 8-2-647, 8-2-601, & 8-2-604
End item testing	3.7	4.4.5, 4.5.1, 4.5.3, 4.5.4, 4.5.5, 4.5.6, 4.5.7, & 4.5.8, Table IX

1/ when viewed using sources simulating artificial daylight D75 illuminant with a color temperature of 7500 ( $\pm$  200) $^{\circ}$ K illumination of 100 ( $\pm$  20) foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2856 ( $\pm$  200) $^{\circ}$ K.

4.2.1 First article samples. Unless otherwise specified in the procurement document, first article samples shall be provided. The sample size will be specified in the procurement document. The sample unit shall be one completed item (helmet assembly, subassembly) as specified in the procurement document (see 6.2) and the lot size shall be expressed in units of items.

4.3 Conformance inspection. Conformance inspection shall include the tests of 4.4.1 through 4.5.8 as applicable, Table II and Tables VIII and IX. In process inspection shall be in accordance with 4.4.2 and the requirements of Tables IV, V, VI and VII. Sampling for inspection shall be performed in accordance with ANSI/ASQ Z1.4 and with acceptance quality limits as specified in the contract and/or order, except where otherwise indicated (see 6.2).

4.4. Material and component verification. The material and components cited under Table III shall be verified in accordance with the verification methods cited in their respective documents. For materials or components specified under Section 3 but not cited under Table III, specifically: ballistic material (3.5.1), laminating resin (3.5.1.2), banded silica sand (3.5.4.1), walnut shell flour (3.5.4.2) and polyurethane earcups (3.6.10) see 6.2. The Government also reserves the right to conduct additional testing to ensure compliance with contract parameters.

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TABLE III. Material and component verification

Materials and components	Requirement paragraph	Verification
Edging	3.5.2	ASTM D 2000
Cloth, Ballistic, Aramid	3.5.1.1	MIL-DTL-44050
Adhesive	3.5.2.1, 3.7.4, 3.7.5	4.4.5
Coating	3.5.3	MIL-DTL-64159
Bar code label/tag	3.5.6.4	MIL-DTL-32075

4.4.1 In process inspection. Visual and dimensional examinations of the helmet and its components or subassemblies shall be made at any point or during any phase of the manufacturing process to determine whether construction details which cannot be examined in the finished product are in accordance with requirements specified in Sections 3. Materials and components which can be classified as a defect in accordance with Table VI, Table VII, and or Table VIII shall be removed from production.

4.4.1.1 Visual and dimensional examination of components. Components shall be visually and dimensionally examined in accordance with Table IV. The sample unit and sample size shall be as designated below and in Table IV unless otherwise specified in the solicitation or contract. Any measurement not conforming to the specified dimension shall be cause for rejection of the applicable component lot.

<u>Lot size</u>	<u>Sample size</u>
800 or less	2
801 up to and including 22,000	3
22,001 and more	5

TABLE IV. Inspection of components for dimensions

Component	Dimensional Requirement (Drawing #)	Number of Determinations (Per unit)	Results reported Numerically To nearest	Sample unit
Buckle	8-2-605	<u>1</u> /	<u>2</u> /	1 buckle
Edge beading	8-2-644 8-2-607	<u>1</u> /	<u>2</u> /	1 yard or 1 piece of molded construction
Post	8-2-647 8-2-610	<u>1</u> /	<u>2</u> /	1 post
Attachment strip/Fastener tape	8-2-601	<u>1</u> /	<u>2</u> /	1 Attachment strip/fastener tape
Attachment tabs	8-2-604	<u>1</u> /	<u>2</u> /	1 attachment tab

1/ One determination shall be made for each specified dimension.

2/ Results shall be reported to the nearest .001 inch or 1/64th of an inch unless otherwise indicated in the drawings.



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4.4.2 Visual and dimensional examination of cut parts. Inspection shall be made during the manufacturing process to determine whether cut lengths and sizes of cut parts of the components in Table V conform to the applicable dimensional requirements as specified in the drawing or part number. In addition, inspection shall be made during the manufacturing process to ensure that holes pre-punched in textile and leather components for installation of snap fasteners meet the requirements of the tolerances referenced in the following Drawings 8-2-601, 8-2-602, 8-2-603, 8-2-604, 8-2-605, 8-2-606, 8-2-615, 8-2-616, & 8-2-618 and that application of adhesives where required is uniform. In-process inspection of cut parts shall be performed on the individual layers that will be used to form an assembled preform and also on preform assemblies before molding to verify compliance with Government approved method per Drawing 8-2-661 and the requirements specified in 3.6.1.1.1 or 3.6.1.1.2 as applicable. Whenever nonconformance is noted, corrections shall be made to the affected parts and in-process lot. Components that cannot be corrected shall be removed from production.

TABLE V. In-process dimensional inspection of cut parts.

Examine	Component	Drawing
Specified dimensions	Pads, chin strap pad assembly	8-2-611-1
	Netting, chin strap pad assembly	8-2-611-2
	Cover, chin strap pad assembly	8-2-611-3
	Ring, earcup securing	8-2-612
	Pull tab, chin strap	8-2-615
Cut size or length	Panels, inner helmet	8-2-602
	Straps, chin strap assembly	8-2-603-1 and 2
	Tabs, snap fastener	8-2-606-1 and 2
	Pads, inner helmet <u>1/</u>	8-2-617

1/ Inspection of the inner helmet pads shall also include inspection for the specified thickness.

4.4.2.1 In-process helmet construction inspection. Inspection shall be made during the manufacturing process to verify that all materials, dimensions, and processes on the drawings specified in 3.6 are adhered to and comply with all contract and QALI requirements

4.4.2.2 Visual examination of helmet shell prior to finishing (immediately off the mold). Every helmet shell prior to the finishing operation shall be examined for any evidence of a blister or delamination. Any blister or delamination, as well as any evidence of a blister or delamination that was modified by any means after molding (see 3.6.1.2), shall be classified as a defect and the shell shall be rejected. The Government may verify the results of the contractor's examination by 100 percent examination or by sampling inspection. The Government shall reject the lot immediately when one defective helmet shell is found.

4.4.2.3 Dimensional examination of helmet shell production lots after drilling of holes. The helmet shell shall be examined to determine if: the shell thickness 1/; hole locations 2/; hole diameters, peripheral contour 3/; and inside, height dimensions 4/ conform to the dimensional requirements specified on Drawing 8-2-830. Any of these dimensions exceeding the specified tolerance shall be classified as a defect 5/. The lot shall be expressed in units of helmet shells of



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one size only. The sample unit shall be one helmet shell after drilling of holes (without edge beading). The inspection level shall be in the contract (see 6.2).

1/ The thickness of the helmet shell shall be measured to the nearest 0.001 inch at five different locations. One measurement shall be taken at the approximate top center of the helmet and the other four measurements shall be taken in the approximate center of each of the four quadrants not less than 3-1/2 inches from the top center. All five measurements shall be averaged. If the averaged thickness is not within tolerance, it shall be scored as a defect.

2/ Reference Drawing 8-2-830. Chord dimensions between holes, taken from the inside of the helmet shell, shall be checked and any failure to conform to any of the dimensions specified on Drawing 8-2-830 shall be scored as a defect. Dividers should be used in measuring the chord distance from the bottom of the holes to the bottom of the holes involved.

3/ The peripheral contour dimensions shall be checked by measuring the inside length of the helmet between the points at 0° and at 180° as shown on Drawing 8-2-830. The inside width shall be measured between the points at 90° and 270° as shown on Drawing 8-2-830. Any failure to conform to any of the dimensions specified on Drawing 8-2-830 shall be scored as a defect.

4/ If all ten benchmarks appear on the helmet shell, the measurement of the height dimension is not necessary.

5/ Reference Drawings 8-2-658 & 8-2-659. All measurements deviating from finished dimensions/tolerances in 4.4.2.3 shall constitute Major defect #164 in Table VI.

4.4.2.4 Visual examination of helmet shells prior to application of coating and edge beading. The helmet shells prior to the application of coating and edge beading shall be examined for the defects listed in Table VI. The lot shall be expressed in units of helmet shells of one size only. The sample unit shall be one helmet shell before application of coating and edge beading. The inspection level shall be in the contract (see 6.2).

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TABLE VI. Visual examination of helmet shells prior to application of coating

Examination	Defect	Classification	
		Major	Minor
Helmet shell (exterior and interior)	Any fabric fibers visibly cut or raised on the shell body except along edge	101	201
	Seriously affecting appearance or serviceability.		
	Not seriously affecting appearance or serviceability	102	202
	Any surface dent, depression, or area not smooth		
	Seriously affecting appearance or serviceability.	103	203
	Not seriously affecting appearance or serviceability		
	Any delamination; pimple, or blister	104	204
	Any evidence of cracking		
	Seriously affecting appearance or serviceability.	105	205
	Not seriously affecting appearance or serviceability		
	Any evidence of dry spot, any area of non-resin flow or other molding deficiency	106	206
	Seriously affecting appearance or serviceability.		
	Not seriously affecting appearance or serviceability	107	207
	Any cloth gap, any pit except those specified as permissible (see 3.6.1.1.1, 3.6.1.1.2, and 3.6.1.2)		
	Any raised pleat or wrinkle or crease (groove) longer than 1/2 inch but less than 1 inch	108	208
	Any raised pleat or wrinkle or any crease 1/2 inch or less in length that is not smooth		
	Any raised pleat or wrinkle or any crease 1 inch or longer	109	209
	Any permissible gap or pit not resin filled as specified (see 3.6.1.2)		
	Any unauthorized repair or reworking	110	210
	Any evidence of metallic fasteners		
	Any benchmarks omitted or obliterated <u>1/</u>		
	Any delamination of the shell material greater than 0.125 inch as a result of drilling		

1/ Reference drawing 8-2-658 and 8-2-659.

4.4.2.5. Visual examination of inner helmet prior to installation of pads and headset. The inner helmet shall be examined for the defects listed in Table VII. The lot shall be expressed in units of inner helmets of one size only. The sample unit shall be one inner helmet prior to installation of pads and headset. The inspection level shall be in the contract (see 6.2).

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TABLE VII. Visual examination of inner helmet

Examine	Defect	Classification	
		Major	Minor
Webbing	Any hole, cut, tear, or frayed edge	111	
	Edges scalloped, not firmly and tightly woven. Ends not clipped as required		209
	Needle chews: - 1/8 inch or more in length - up to 1/8 inch in length	112	210 211
Fastener tape	Any hole, cut, or tear	113	
	Hooks flattened or missing, impairing function	114	
Cloth, netting	Any cut or tear	115	
Cloth, simplex	Any hole, cut, tear, or needle chew	116	
Cloth, oxford (edge binding)	Any hole, cut, tear, or needle chew	117	
	Any abrasion marks, broken or missing yarns, or multiple floats		212
Leather	Cut, hole, or tear	118	
	Finish flaky, peeling, or cracked	119	
	Grain surface of leather not facing outside	120	
	Deep scratch, heavy vein, or abraded area		213
	Color not as specified		214
Hardware General  Snap fastener	Broken or malformed; corroded areas; burrs or sharp edges	121	
	Finish omitted or not as specified, where required	122	
	Any required component improperly installed causing failure to serve intended purpose	123	
	Clinched excessively tight, cutting adjacent material	124	
	Clinched loosely, permitting any component to rotate freely	125	
	NOTE: Inspect for a loosely clinched stud and eyelet by grasping the stud between the thumb and index fingers and determine if the stud can be rotated freely.		
	NOTE: Inspect for a loosely clinched button and socket by grasping the button and socket with the fingers of the left and right hands and determine if either can be rotated freely. If either the stud, button, or socket can be rotated freely, a defect shall be scored.		
	Incorrect style	126	
	Three or more splits in eyelet or button barrel		215
	Any fastener on chin strap or on inner helmet for attaching chin strap not functioning properly (i.e. fails to snap closed, provide a secure closure, or open freely)	127	

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TABLE VII. Visual examination of inner helmet - Continued

Examine	Defect	Classification	
		Major	Minor
Seams and stitching Open seams	More than 1/2 inch 1/2 inch or less  NOTE: A seam shall be classified as open when one or more stitches joining a seam are broken or when two or more consecutive skipped or run-off stitches occur.	128	216
Seams and stitch types	Wrong seam or stitch type	129	
Stitch tension	Loose, resulting in loose bobbin or top thread		217
	Locks not embedded in the material		218
	Excessively tight, resulting in puckering of material		219
Stitches per inch	Two or more stitches less than minimum specified		220
	One stitch less than minimum specified	130	
	Overstitched less than 1/2 inch in each , direction beyond defective stitching area		221
Thread breaks skipped stitches or run-off	NOTE: Thread breaks or two or more consecutive skipped or run-off stitches not overstitched shall be classified as open seams		
Stitching ends	Not secured as specified (except when caught in other stitching)		222
Rows of stitching	Any row missing except on box-x stitching	131	
	- two or more rows omitted on box-x stitching	132	
	- one row omitted on box-x stitching		223
Components and assembly	Any required component or operation omitted (unless otherwise classified herein)	133	
	Any component misplaced or not assembled as specified	134	
	Number of folds at ends of webbing, where required, less than number specified		224
	Any, unauthorized repair	135	

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TABLE VII. Visual examination of inner helmet - Continued

Examine	Defect	Classification	
		Major	Minor
Binding	Loosely applied but not exposing raw edge of netting	136	225
	Loosely applied exposing raw edge of netting		
Cleanliness	Grease or oil stains clearly noticeable; thread ends not trimmed throughout as specified		226
Color of textile components	Color of any textile component not as specified		227
Identification label	Omitted, incorrect, illegible, not coated, or not as specified		228

4.4.2.6. Dimensional examination of inner helmet prior to installation of pads and headset. The inner helmet shall be examined for compliance with all dimensions shown on the applicable drawings including stitch margins and gage. Any dimension exceeding the applicable tolerance shall constitute a defect. The lot shall be expressed in units of inner helmets of one size only. The sample unit shall be one inner helmet prior to installation of pads and headset. The inspection level shall be in the contract (see 6.2). All measurements deviating from the finished dimensions and tolerance as specified in the applicable Drawings 8-2-600, 8-2-602, and 8-2-618 shall constitute a Major defect #137.

4.4.3. End item visual examination of the completed helmet assembly. The helmet assembly shall be examined for the defects listed in Table VIII. The lot shall be expressed in units of complete helmet assemblies of one size only. The sample unit shall be one helmet complete with all components. The inspection level shall be in the contract (see 6.2). All measurements deviating from the finished dimensions and tolerance as specified in 4.4.3 shall constitute a Major defect #138.

TABLE VIII. End item visual examination

Examine	Defect	Classification	
		Major	Minor
Exterior finish coating of shell	Any scuffed area or scratch	139 140    141	229
	Thin film (shell showing through)		230
	Finish wet or tacky to the touch coating:		231
	- texturing aggregate omitted		
	- texturing aggregate not uniformly distributed		
	- texturing aggregate overrun extending onto interior surface of shell		232
	Coating furrows, flakes, or peels when scratched with the fingernail		233
	Blemish, such as peeling, blistering, or flaking		

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TABLE VIII. End item visual examination - Continued

Examine	Defect	Classification	
		Major	Minor
Exterior finish coating of shell Continued	Not a smooth, uniform coating (i.e., run or sag affecting an area more than one square inch) 1/ Foreign matter (such as dirt, stain, oil or grease) embedded in or appearing on the finish Color of finish not as specified Any unauthorized repair	142 143	234 235
Shell edge beading	Any cut, tear, or hole Not fully positioned over edge of helmet shell Any area not adhered to shell greater than 1/2 inch in length and 1/8 inch in width Multiple unadhered areas the total length of which are 2 inches or more in length or any two unadhered areas less than 1/2 inch apart Ends not butted together: - open by more than 1/8 inch - open by 1/16 inch up to 1/8 inch Coated with helmet shell finish Excessive glue on beading or helmet shell	144 145  146 147	236   237 238 239
Snap fasteners (applicable to snaps for attaching inner helmet to shell)	Any fastener not functioning properly (i.e. fails to snap closed, provide a secure closure or to open freely) Clinched excessively tight, cutting webbing Clinched loosely, permitting either component to rotate freely Incorrect style	148 149 150 151	
Screws, posts, and washers on helmet shell	Any screw not securely tightened Any screw too tight, causing cutting or crushing of shell Post on outside surface of shell in lieu of inside Washer omitted Any burr or sharp edge Not finished -(when applicable) Corroded	152  153	240 241 242 243 244
Attachment tabs on helmet shell	Any hole, cut, tear, or frayed edge Scalloped edges, not firmly and tightly woven Ends not clipped as required Ends not double folded	154  155	245 246
Fastener tape on helmet shell	Any hole, cut, or tear Any area not firmly adhered to shell	156 157	

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TABLE VIII. End item visual examination - Continued

Examine	Defect	Classification	
		Major	Minor
Headset assembly	Any wire cut, cracked, or abraded	158	
	Earcups not installed in inner helmet as specified	159	
	Any component omitted, cracked, chipped, broken, bent, or malformed	160	
Pads, inner helmet	Any pad installed with dimpled or scored surface of pad facing outside in lieu of inside or any pad with pimpled or scored surface omitted		247
Replacement attachment strip/tab kits	Any required component missing or not as specified	161	248
	Label printing not as specified		
	Label content not as specified: - identification label	162	249
	- instruction label Label content not in specified sequence		250
Identification label on helmet shell	Omitted, incorrect, illegible, or not as specified		251
Barcode Label/Tag	Bar code omitted or not readable by scanner or Human Readable Interpretation (HRI)		252
	Omitted or illegible.		253
	Not visible on folded and or packaged item Causes damage to item		254
		163	
Instruction booklet	Omitted, printing or figures illegible, any page omitted		255

1/ The helmet shell shall be examined from a distance of approximately 3 feet.

4.4.4 End item dimensional examination of completed helmet assembly. The attachment tabs and fastener tape on the helmet shell shall be examined for dimensional defects in accordance with drawings referenced in 3.6. The sample unit shall be one complete helmet assembly. The Lot shall be expressed in terms of complete helmet assemblies of one size only. Any dimension exceeding the applicable tolerance as specified in Table IV shall constitute a defect. The inspection level shall be in the contract (see 6.2).

4.4.5 End item testing. The complete helmet assembly shall be tested for the characteristics listed in Table IX. The lot shall be expressed in units of helmets of one size only. The sample unit shall be one complete helmet assembly. When only shells are procured sound attenuation, impact resistance and communication equipment operation shall not apply.

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TABLE IX. End item tests

Characteristic	Requirement	Test method	Inspection level	AQL (Defects per hundred units)
Ballistic resistance <u>1/</u> , <u>2/</u>	3.7.1	4.5.2	S-2	<u>3/</u>
Impact resistance <u>4/</u>	3.7.2	4.5.8	S-2	2.5 <u>5/</u>
Sound attenuation <u>4/</u>	3.7.3	4.5.6	S-2	2.5 <u>5/</u>
Adhesion of beading before aging <u>2/</u>	3.7.4	4.5.3	S-2	2.5
Adhesion of beading after aging <u>2/</u>	3.7.5	4.5.4	S-2	2.5
Communication equipment operation	3.7.6	4.5.7	100 percent of lot	<u>6/</u>
Water immersion <u>7/</u>	3.7.7	4.5.5	S-1	2.5

1/ Ballistic testing shall be performed on the helmet shell only. The inner helmet assembly shall be removed prior to testing, be refitted with a new shell and returned to the lot.

2/ Helmet shells used for ballistic resistance testing may also be used afterwards for the edge beading tests.

3/ Any test failure shall be cause for rejection of the lot.

a. All foam components for the Headset-Microphone shall be Ether-Type foam.

b. The foam shall meet a requirement of 55 ( $\pm$  5) pounds per inch reticulated and a density of 1.7 pounds ( $\pm$  0.2) pounds/cubic foot.

4/ Sample size for sound attenuation testing shall be 0.2 percent of lot quantity for each lot for this contract unless otherwise specified (see 6.2 and 6.10).

5/ All test reports shall contain the individual values utilized in expressing the final result.

6/ Any helmet failing this test shall be rejected and removed from the lot.

7/ Helmet shells that pass the water immersion test may be reattached to the inner helmet assembly and returned to the lot.

#### 4.5 Methods of inspection.

##### 4.5.1 Test conditions.

4.5.1.1 Test conditions for ballistic testing procedures. Unless otherwise specified all tests shall be performed in accordance with IOP-PED-003 Helmet Ballistic Testing Procedures.

4.5.1.2 Test conditions for non-ballistic testing procedures. Unless otherwise specified, all tests shall be performed at 23°( $\pm$  2) °C, 73° ( $\pm$  4)°F and relative humidity of 50 ( $\pm$  5) percent, and the test samples shall be exposed to these conditions for at least 24 hours prior to test.

4.5.2 Ballistic resistance test. The ballistic resistance test shall be conducted in accordance with IOP-PED-003 Helmet Ballistic Testing Procedures. The ballistic threat shall be a 17-gr Fragment Simulating Projectile (FSP) in accordance with MIL-DTL-46593 except that hardness may be measured on sample projectiles from each lot. Any helmet having a V50 BL (P) ballistic



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resistance below the requirement as specified in 3.7.1 shall be considered a test failure. The test reports shall contain the following information:

- 1) Helmet description including exact materials.
- 2) Name of organization/company performing tests.
- 3) Type of gun barrel, caliber and propellant used.
- 4) Test projectile with exact nomenclature.
- 5) Conditioning of helmet including temperature and humidity.
- 6) Velocity measurements of each test shot used to test the armor (regardless of whether that Particular velocity was used in the V50 BL (P) Determination).
- 7) PP (partial penetration) and CP (complete penetration) annotated next to each shot velocity.
- 8) Yaw angle, when required.
- 9) Angles of target obliquity.
- 10) Angle of spall/debris ejection, if applicable
- 11) Calculated V50 BL (P).

4.5.3 Adhesion of edge beading to helmet shell before aging. The adhesion of the edge beading shall be tested on both the outside and inside of the helmet shell around its entire periphery. The beading shall be considered unbonded when the edge can be rolled back on itself and away from the shell by applying force with the ball of the thumb. If the unbounded areas exceed the limitations specified in 3.7.4, the test shall be considered a failure.

4.5.4 Adhesion of edge beading to helmet shell after aging. The helmet shell shall be placed on its crown in a circulating air oven at 160° ( $\pm 5$ )°F for 4 hours minimum but for not more than 24 hours. The helmet shell shall then be removed from the oven and conditioned at the standard conditions specified in 4.5.1.2. After conditioning, the adhesion of the edge beading shall be tested as follows:

- a. Perform the adhesion test in two separate areas, one at the approximate center of one of the ear sections and the other in the rear of the helmet shell.
- b. Using a sharp knife, cut through the edging along the outer corner for a distance of 2 inches. At one end of the cut, make another cut through and across the outer side of the beading and peel it back to form a tab  $1/2 (\pm 1/8)$  inch in length.
- c. To one of the tabs, attach a 1.5 pound weight. Position and secure the helmet so that the weight pulls at a right angle to the plane of the adhesive line to be tested. Make suitable gage marks on the beading and shell for the measurement of the amount of peel back after completion of the test. Suspend the weight for a minimum of 1 hour and measure the amount of peel back of the tab to the nearest  $1/16$  inch. Test the other tab in the same manner.
- d. The test shall be considered a failure if one or more of the tabs peels back in excess of the limitation specified in 3.7.5.

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4.5.5 Water immersion of helmet shell. The helmet shell shall be immersed in tap water at 60° to 80°F for 16 hours minimum. At the expiration of this time, the helmet shell shall be removed and allowed to air dry or shall be forced air dried under the same temperature conditions. The coating on the outside surface of the helmet shell shall be examined, and any evidence of softening, blistering, or peeling of the finish shall constitute failure of the test.

4.5.6 Sound attenuation. Sound attenuation of the helmet shall be determined in accordance with ANSI/ASA S12.6. Failure of the helmet to meet any of the values specified in 3.7.3 shall constitute failure of the test.

4.5.7 Communication equipment operations. The communication equipment shall be considered satisfactory if continuity is indicated when the helmet is tested with the switch on the left earcup of the helmet checked in both the center position and forward position. The test equipment shall incorporate the test circuit shown on Drawing 8-2-57.

4.5.8 Impact resistance. Each helmet tested shall be impacted with two identical impacts within one to two minutes of each other in seven locations as follows: Apex, right front, left front, right rear, left rear, right side, and left side. The included drop height shall be 18 inches, and the anvil shall be a 1.9-inch radius steel hemisphere. The impact area shall be a minimum of 1 inch above the peripheral edge of the helmet shell. In addition, the headform is to be so located, prior to mounting, that a tangent plane between the headform and hemisphere is as nearly horizontal as can be obtained for all seven impact sites. Acceptance is based on the maximum value of the fourteen impact results. Impact resistance shall be measured in accordance with the method of helmet testing as set forth in FMVSS Standard 218 except as specified herein. The helmet test apparatus shall be of the rigid anvil type utilizing an appropriately instrumented (accelerometers) standard headform, as outlined in FMVSS Standard 218. Total headform and associated equipment weight, center of gravity, and alignment shall conform to FMVSS Standard 218. Instrumentation and equipment calibration, before and after all tests, shall be in accordance with FMVSS Standard 218. A modular elastomer programmer will be used for calibrations. All test reports shall contain the individual values.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Department or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

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6.1 Intended use. The helmet is intended for use by combat vehicle crewman.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Complete helmet or subassembly when applicable.
- c. Size of helmet desired (see 1.2).
- d. The specific issue of individual documents referenced (see 2.2).
- e. When a first article is required (see 3.1, 4.2, 6.3).
- f. When specified Headset Microphone Kit (see 3.3.3).
- g. Conformance inspection acceptance quality limits (see 4.3 and 4.4).
- h. Material and component methods of verification (see 4.4).

NOTE: Certificates of Conformance (CoCs) will be provided for material verification, unless otherwise specified in the contract.

- i. Inspection level and testing criteria if other than specified (see 4.4.5).
- j. Packaging (see 5.1).

6.3 First article. When a first article is required, it will be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample consisting of one completed helmet assembly. The contracting officer should include specific instructions in all acquisition instruments regarding arrangements for selection, inspection, and approval of the first article.

6.4 Samples. For access to samples, address the contracting activity issuing the solicitation.

6.6 Certification of sound attenuation and impact resistance testing laboratories. The U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL 36362, is responsible for certification of sound attenuation and impact resistance testing.

6.7 Volatile free. Volatile free is considered as being a sample of coated material that has been subjected to 320 °F for 5 minutes in a forced air circulating oven.

6.8 Certificates of conformance (CoCs). Certificates of Conformance (CoCs) may be provided for material verification, unless otherwise specified in the contract (see 6.2).

6.9 This document covers the requirements for the DH-132B combat vehicle crewman's (CVC) helmet which is a replacement for the DH-132A combat vehicle crewman's (CVC) helmet due to new ballistic testing requirements and improved ballistic protection.

6.10 Testing for sound attenuation and impact resistance will be the responsibility of the contractor unless otherwise specified in the contract or solicitation(see 6.2).

NOTE: The Contractor is free to arrange this testing sequence in any way he sees fit providing the results of one test does not interfere with the performance of the next test. Acceptance of the first lot will be deferred pending verification by the Government. The Government reserves the right to verify part of or all tests on subsequent lots (see 6.2).

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6.10 Subject term (key word) listing.

Body armor

Headgear

6.11 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army – GL

Navy - NU

Preparing activity:

DLA-CT

Review activities:

Army –MD, AV

Navy - MC

Project number: 8470-2010-001