INCH-POUND
AR/PD 10-01 Rev A
02 JUNE 2011

SUPERSEDING
AR/PD 10-01
20 MAY 2010

PURCHASE DESCRIPTION
NAPE PAD

This Purchase Description will be approved for use by the Department of the Army, and will be available 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 ballistic protective Nape Pad which provides ballistic protection to the area below the Advanced Combat Helmet and Enhanced Combat Helmet at the nape (back of the neck). This is a Critical Safety Item. This specification delineates the Nape Pad end item and its component performance requirements (see paragraph 6.1). This Nape Pad is functionally integrated with the Improved Outer Tactical Vest (IOTV) (FQ/PD 07-05), Advanced Combat Helmet (ACH) (AR/PD 10-02), and Enhanced Combat Helmet (ECH) (GL-PD-09-04).

1.2 Classification. The Nape Pad will be available in one type in the following classes and sizes as specified.

1.2.1 Classes. Class 1 – Universal Camouflage Pattern (UCP)
Class 2 – Operation Enduring Freedom Camouflage Pattern (OCP)

1.2.2 Schedule of sizes.
Small / Medium / Large (S/M/L)
Extra Large / Extra Extra Large (XL/XXL)

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, 5, and 6 of this requirement. 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 documents cited in sections 3 and 4 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 issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the Solicitation (see paragraph 6.2).

COMMERCIAL ITEM DESCRIPTIONS

A-A-55126	- Fastener Tape, Hook and Pile, Synthetic
A-A-59826	- Thread, Nylon

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-32075	- Label: For Clothing, Equipage, and Tentage (General Use)
MIL-DTL-46593	- Projectile, Calibres .22, .30, .50 and 20mm Fragment-Simulating

(Copies of purchase descriptions required by contractors in connection with specification procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-662	- V_{50} Ballistic Test for Armor
MIL-STD-810	- Environmental Engineering Considerations and Laboratory Tests
MIL-STD-3027	- Performance Requirements and Testing of Body Armor
MIL-STD-1916	- DOD Preferred Methods for Acceptance of Product

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094 or www.dsp.dla.mil using Assist Quick Search).

PURCHASE DESCRIPTIONS

FQ/PD 07-05	- Body Armor, Multiple Threat, Interceptor, Improved Outer Tactical Vest
AR/PD 10-02	- Helmet, Advanced Combat
GL/PD 09-04	- Helmet, Enhanced Combat
GL/PD 10-07	- Cloth, Duck, Textured Nylon
GL/PD 07-19	- Retention System, Advanced Combat Helmet

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.

DRAWINGS
Project Manager – Soldier Protective Equipment, Program Executive Office – Soldier, Fort Belvoir, VA

Drawing No. 2-1-2519	- Universal Camouflage Pattern 60 inches
Drawing No. 2-1-2519-1	- Universal Camouflage Pattern Desert Sand 500
Drawing No. 2-1-2519-2	- Universal Camouflage Pattern Urban Gray 501
Drawing No. 2-1-2519-3	- Universal Camouflage Pattern Foliage Green 502

NOTE: For any other camouflage patterns noted in the solicitation and/or contract, please contact the contracting activity for the necessary drawings and/or patterns.

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

U.S. ARMY DEVELOPMENTAL TEST COMMAND, ABERDEEN PROVING GROUND, MD

ITOP 04-2-805 - FR/GE/UK/US Projectile Velocity and Time-Of-Flight Measurement

(Copies of documents are available by sending to Commander, US Army Test and Evaluation Command, ATTN: AMSTE-TM-T, Aberdeen Proving Ground, MD 21105-5055)
Justification: Alignment with decision to use striking velocity for all testing.

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 the documents which are Department of Defense adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see paragraph 6.2).

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC – 8	- Colorfastness to Crocking: AATCC Crockmeter Method
AATCC – 15	- Colorfastness to Perspiration
AATCC – 16	- Colorfastness to Light
AATCC – 22	- Water Repellency: Spray Test
AATCC – 61	- Colorfastness to Laundering: Accelerated
AATCC – 70	- Water Repellency: Tumble Jar Dynamic Absorption Test
AATCC – 96	- Dimensional Changes In Commercial Laundering of Woven and Knitted Fabrics Except Wool
AATCC -118	- Oil Repellency: Hydrocarbon Resistance Test
AATCC -119	- Color Change Due to Flat Abrasion (Frosting) Screen Wire Method
AATCC - 127	- Water Resistance Hydrostatic Pressure Test
AATCC – 135	- Dimensional Changes of Fabrics after Home Laundering
AATCC Procedure 1	- Gray Scale For Color Change

AATCC Procedure 2	- Gray Scale for Staining
AATCC Procedure 8	- AATCC 9-Step Chromatic Transference Scale
AATCC Procedure 9	- Visual Assessment of Color Difference of Textiles

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D-204	- Sewing Threads
ASTM D-1683	- Failure in Sewn Seams of Woven Fabrics
ASTM D-4485	- Standard Specification for Performance of Engine Oils
ASTM D-6193	- Standard Practice for Stitches and Seams
ASTM G21-90	- Test Method for Evaluation of Fungi on Synthetic Polymeric Materials
ASTM D-1388	- Stiffness of Fabrics
ASTM D-1777	- Standard Method for Testing Thickness of Textile Materials
ASTM D-3575	- Materials Flexible Cellular Made from Olefin Polymers
ASTM D-3774	- Standard Test Methods for Width of Textile Fabric
ASTM D-3776	- Mass Per Unit Area (Weight) of Woven Fabric
ASTM D-3884	- Abrasion Resistance of Textile Fabrics, (Rotary Platform, Double Head Method)
ASTM D-3886	- Abrasion Resistance of Textile Fabrics, (Inflated Diaphragm)
ASTM D-5034	- Breaking Force and Elongation of Textile Fabrics (Grab Test)
ASTM D-6193	- Standard Practice for Stitches and Seams
ASTM D-6413	- Vertical Flame Test for Textiles
ASTM D-1149	- Deterioration-Cracking in an Ozone Controlled Environment

(Applications for copies should be addressed to the American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103-1187)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/ASQ Z1.4-2008	- Sampling Procedures and Tables for Inspection by Attributes

SATRA TECHNOLOGY CENTER

SATRA TM31	- Abrasion Resistance – Martindale Method

(Copies of this document are available online at http://www.satra.co.uk or SATRA Technology Centre, Wyndham Way, Telford Way, Kettering, Northamptonshire, NN16 8SD United Kingdom.

Beneficial comments, suggestions, or questions on this document should be addressed to: Product Manager - Soldier Protective Equipment, Program Executive Office - Soldier, US Army, 10170 Beach Road, Bldg 328T, Fort Belvoir, VA 22060.

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.

3. REQUIREMENTS

3.1 First Article Testing (FAT) and Lot Acceptance Testing (LAT). When specified in contract purchase order, complete Nape Pad and multiple threat samples, representing full production quality, shall be subjected to FAT in accordance with 4.2 or LAT in accordance with paragraph 4.3.

3.2 Materials and components. The materials and components shall conform to applicable specifications, standards, and patterns required herein unless otherwise noted in the contract or solicitation.

3.2.1 Outer cover camouflage material. The outer cover camouflage material shall be a lightweight, durable, abrasion resistant synthetic cloth which is non-raveling and has a durable water resistant finish and is flame resistant (see 3.5.4). The weight of the finished fabric shall be no greater than 9.0 ounce/square yard. The cloth shall be printed in the print camouflage pattern (see 6.2) in accordance with 3.3.1.1 and 3.3.1.2. The outer cover camouflage material pattern shall conform to the specified Drawings associated with its camouflage print (see 6.2). The outer cloth shall meet requirements as specified in 3.3.1.1, 3.3.1.2, 3.5.2, 3.5.3, 3.5.4, 3.5.6, and as specified in Appendix A, Table I.

3.2.2 Outer cover spacer mesh. The outer cover spacer mesh shall be a 22 gauge, 70 denier spacer fabric polyester spacer mesh comprised of a large aperture mesh face joined to a tricot knit backing via an array of monofilament fibers running perpendicular to the face. The stiff fibers create a distinct "space" between the two faces which allows for improved air flow through the fabric and additional padding for the wearer. The outer cover Spacer Mesh shall conform to the requirements in Appendix A, Table II. The outer cover Spacer Mesh shall meet the colorfastness requirements as specified in 3.5.6. The color shall be black.

3.2.3 Insert cover material. The Insert Cover material shall be textured cloth with Durable Water Resistant (DWR) finish. It shall conform to requirements in Appendix A, Table III. The insert cover material shall also meet the requirements of 3.5.3 and 3.5.6. The color of the insert cover material shall be black.

3.2.4 Thread, outer cover. The thread used for the outer cover shall conform to A-A-59826 Type II (bonded, nylon) size B/2, Tex size 51 Nominal, with a minimum breaking strength of 6.0 lbs. The shade shall be Foliage Green 504 for Class 1 and Tan 499 for Class 2.

3.2.5 Thread, insert. The thread used for the Armor layers shall conform to A-A-59826 Type II (bonded, nylon), Tex size 76-112 Nominal, with a minimum breaking strength of 9.0 lbs., size E or F. Color is at the option of the contractor.

3.2.6 Webbings and tapes. Webbings and tapes shall be heat cut smooth with no burrs or residual melt (see Appendix C, Tables I and II). The color shall be specified in the contract or solicitation (see 6.2).

3.2.6.1 Fastener tape, hook, and loop. Hook and loop fastener tapes utilized on the outer cover shall conform to A-A-55126, Type II, class 1, 1-1/2 in width (see Appendix C, Tables I and II) or Extruded Type III class 4, 1/12 in width as an alternate. The color of the hook and loop tape shall be Foliage Green 504 for Class 1 and Tan 499 for Class 2 (see Appendix A, Table VII-B for spectral reflectance requirement). The length of the hook and loop tape shall be 1-3/4 inch. Hook and/or loop tape strap shall be placed in accordance with patterns, attached to the Fixator Strap.

3.2.6.2 Elastic webbing. Elastic webbing used for the outer cover attachment loops shall be manufactured from nylon yarn, with a nominal size of 20/2 count (420 denier in the warp and filler directions). The webbing shall be MIL-W-5664 Type II, Class 1 elastic, 28 gauge, 20 ends. The webbing shall meet the requirements of 3.5.2, 3.5.3, and 3.5.6. Physical properties shall conform to the requirements in Appendix A, Table IV. The color of the elastic webbing shall be Foliage Green 504 for Class 1 and Tan 499 for Class 2 (see Appendix A, Tables VII, VII-A, and VII-C for spectral reflectance requirement). The length of the elastic webbing shall be 2-inches. The elastic shall be heat cut smooth with no burrs or residual melt. The elastic webbing shall be placed in accordance with patterns, attached to the outer cover.

3.3 Design. The design of the Nape Pad shall be such that it integrates with both the "X-harness" and the "H-harness" retention systems used with the ACH and ECH. The Nape Pad is comprised of an outer cover of printed camouflage material (see 6.2) (side away from head) and highly moisture wicking, comfortable material facing the neck. The outer cover of the Nape Pad houses a removable, soft insert that is made of ballistic protective materials. The Nape Pad will attach to the helmets Retention System and the hook and loop tabs on the outer cover shall be used to firmly attach the Nape Pad to the helmet shell at the location between helmet (center, lower, back edge) underneath the existing helmet pad. Appendix E, Figure 1 shows the various parts of the Nape Pad. Note that the patterns (see 3.3.1) shall cover size, shape, placement, and construction. Appendix E, Figure 1 is for reference only.

3.3.1 Patterns. The Government shall furnish patterns for the baseline design from which the contractor can use applicable parts to create cutting working patterns. General compliance with patterns is needed to meet interface requirements with fielded personnel combat equipment. The working patterns include the size, directional lines, placement marks, notches, and include seam allowances. All the parts and components of the Nape Pad shall be cut within a tolerance of (+1/16"+/-0") in accordance with the pattern parts indicated. Pattern parts and materials are listed in Table I below.

Table I – Pattern Parts and Materials

Nomenclature	Pattern Nomenclature	Number Required and Material
Outer cover Camouflage Panel A, sm/med/lrg	SMLOUTERCVRA	1, Outer cover Camouflage Material (3.2.1)
Outer cover Camouflage Panel B, sm/med/lrg	SMLOUTERCVRB	1, Outer cover Camouflage Material (3.2.1)
Outer cover Spacer Mesh Panel, sm/med/lrg	SMLOUTSPMESH	1, Outer cover Spacer Mesh Material (3.2.2)
Ballistic Layers, sm/med/lrg	SMLBALLISTICS	Contractor Determined Qty
Ballistic Cover, sm/med/lrg	SMLBALCOVER	2,
Outer cover Camouflage Panel A, xl/2xl	XL2XLOUTCVRA	1, Outer cover Camouflage Material (3.2.1)
Outer cover Camouflage Panel B, xl/2xl	XL2XLOUTCVRB	1, Outer cover Camouflage Material (3.2.1)
Outer cover Spacer Mesh Panel, xl/2xl	XL2XLOTSPMSH	1, Outer cover Spacer Mesh Material (3.2.2)
Ballistic Layers, xl/2xl	XL2XLBALL	Contractor Determined Qty
Ballistic Cover, xl/2xl	XL2XLBALCOVER	2,
Fixator Strap, all sizes	FIXATORSTRAP	1, Outer cover Camouflage Material (3.2.1)
The Fixator Strap is the same size for both size Nape Pads.		

3.3.1.1 Class 1, UCP execution. The pattern on the printed finished cloth (side and sleeve material) shall be reproducible to the standard sample in respect to design, colors and registration of the respective areas. The pattern repeat shall be 36.00 (+1.25, –2.50) inches in the warp direction. The various areas of the pattern shall be properly registered in relation to each other and shall present definite sharp demarcations with a minimum of feathering or spew. Each pattern area shall show solid coverage; skitteriness exceeding that shown on the standard sample in any of the printed areas will not be acceptable. When the standard sample is not referenced for pattern execution, a pattern drawing shall be provided and the pattern shall match Drawing 2-1-2519.

3.3.1.2 Class 2, OCP execution. The pattern on the printed finished cloth(s) shall reproduce the standard sample in respect to design, colors and registration of the respective areas. The pattern repeat of the OCP pattern shall be 225.255 (+1.25, -2.50) inches in the warp direction. The various areas of the pattern shall be properly registered in relation to each other and shall present definite sharp demarcations with a minimum of feathering or spew. Each pattern area shall show solid coverage; skitteriness exceeding that shown on the standard sample in any of the printed areas will not be acceptable. When the standard sample is not referenced for pattern execution, a pattern drawing provided by the Government at the time of award shall be used (see sections 2.2.2 and 6.2). Resin bonded pigments are not permitted.

Pattern	Color Shade	Drawing Number
Camouflage Desert Sand	Desert Sand 500	2-1-2519-1
Camouflage Urban Gray	Urban Gray 501	2-1-2519-2
Camouflage Foliage Green	Foliage Green 502	2-1-2519-3

3.3.2 Weight. The maximum finished weight for the small/medium/large Nape Pad shall be 3.25 ounces and the maximum finished weight for the extra-large/extra extra-large Nape Pad shall be 3.82 ounces. Testing shall be in accordance with 4.5.6.

3.3.3 Thickness. The thickness of the finished Nape Pad shall be measured to the nearest 0.001 inch when tested according to ASTM D-1777, Testing Option 1. Thickness shall not exceed 0.625 inch thickness from back to front in the left and right of the finished Nape Pad (webbings or fasteners excluded).

3.3.4 Finished measurements. Finished dimensions of the outer cover for each size shall conform to Appendix E, Figure 2. Finished dimension for the insert shall be in accordance with Appendix E, Figure 3. Measurements shall be in accordance with Appendix C, Table III. In addition to the specified finished measurements, the outer cover and the insert shall successfully pass the Insertion Demonstration Verification when tested in accordance with 4.7.1.

3.4 Construction. Unless otherwise specified, the components shall be manufactured in accordance with the requirements in Appendix C, Table IV. Seam constructions identified below, in accordance with ASTM D-6193, shall be utilized in the construction of the Nape Pad.

3.4.1 Seams and stitching. All stitches, seams, and stitching shall be stitched in accordance with ASTM D-6193 as specified in Appendix C, Table IV. Seam allowance is included in patterns furnished and is specified in Appendix C, Table IV. All stitching shall be back-tacked 1/4" to prevent raveling and demonstrate good stitching quality with no loose ends, consistent stitches per inch, even tension with no loose needle or bobbin threads. Thread ends shall be trimmed to 1/4" inch max. Fabric, webbings and fastener tapes shall not ravel.

3.4.2 Repairs of stitching. When thread breaks, skipped stitches, run-offs, or bobbin run-outs occur during stitching, the stitching shall be repaired; and loose or excessively tight stitching shall be repaired by removing the defective stitching without damaging the materials, and re-stitching in the required manner. Stitching shall be repaired by re-stitching to 3/4"-1" back of the end of the broken stitch or defective area onto the existing stitching, continue over the defective area onto existing stitching to 3/4"-1" beyond.

3.4.3 Bartacks. Bartacks shall be placed within 1/8" ± 1/16" of the heat cut edge. No stitch run-off is allowed and there shall be no needle cutting of bartack. Double bartacks (one on top of the other) will be avoided to prevent needle cutting and weakening of the attachment point. Bartack requirements shall meet requirements specified in Appendix C, Table IV.

3.4.4 Workmanship. Finished Nape Pads shall conform to the quality of product established by this specification. The workmanship shall conform to the quality specified for seams and stitching, bartacks and box-stitches, and be free from defects as specified in 4.5.1.

3.5 Operating requirements.

3.5.1 Intended use. The Nape Pad will be worn with the ACH/ECH for ballistic protection of the nape. The finished Nape Pad must meet the requirements of section 3 (including Ballistic Protection Requirements) and pass the testing criteria as specified in section 4 of this specification.

3.5.2 Spectral reflectance. The infrared reflectance for the outer cover Camouflage Material, the elastic webbing initially and after laundering shall conform to the requirements specified in Appendix A, Tables VII, VII-A, and VII-C when tested as specified in 4.5.9. The infrared reflectance for the loop material for class 1 and 2 initially and after laundering shall conform to the requirements specified in see Appendix A, Table VII-B when tested as specified in 4.5.9.

3.5.3 Fungus resistance. All materials, with the exception of the Armor Layer, used in the construction of the Nape Pad shall not support fungus growth. All components shall neither support fungus growth nor experience damage due to the presence of fungus spores or adjacent fungus growth. The visual grade rating shall be less than 2.0 when tested in accordance with 4.5.8.

3.5.4 Flame resistance. The finished cloth shall exhibit flame resistance when tested in accordance with 4.5.14 in both the warp and fill directions. The average melt/drip that occurs after removal of source flame shall be less than 1 droplet. The average after flame in each direction, warp and fill, shall be no longer than 3.0 seconds, the average afterglow in each direction, warp and fill, shall be no longer than 2.0 seconds and the average char length in each direction shall be no longer than 4 ½ inches for samples prior to laundering (0 washes) and after laundering (5 washes). The average will be taken by combining all the subtests for their respective tests. Laundering shall be conducted according to AATCC Method 135, and the vertical flame testing shall be conducted according to ASTM D-6413.

3.5.5 Matching. The webbing and cloths shall match the color and appearance of the standard sample when tested as specified in 4.5.12.

3.5.6 Colorfastness. The finished textiles, with the exception of the Armor Layer, shall meet the colorfastness requirements in Table II below when tested as specified in 4.5.10.

Table II – Colorfastness Requirements

Characteristic	**Requirement**
Laundering (after 3 cycles)	Equal to or better than 3-4 when compared to an unlaundered sample. 1/ 2/
Fastness to accelerated laundering (black only)	Equal to or better than 3-4 when compared to an unlaundered sample. 1/ 2/
Light (after 40 standard fading hours or 170 kilojoules)	Equal to or better than 3.0 when compared to an unlaundered sample. 2/
Fastness to Crocking	Equal to or better than 3.5 when compared to an unlaundered sample. 1/ 3/
Frosting (300 cycles) (Black only)	Equal to or better than 3-4 when compared to an unlaundered sample. 3/
Fastness to Perspiration	Equal to or better than 3-4 when compared to an unlaundered sample. 1/ 2/
1/ Or better than the standard sample 2/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change 3/ Rated using the AATCC Evaluation Procedure 8, AATCC 9-step Chromatic Transference Scale	

3.6 Ballistic material system operating requirements.

3.6.1 The armor layer. The Armor Layer of the Ballistic Insert shall be comprised of contiguous layers of ballistic protective material cloth, sewn together in a single stack in a configuration that allows maximum flexibility and comfort for the wearer. The ballistic insert shall not exceed a maximum 0.30 inch thickness when tested in accordance with ASTM D-1777, Option 1. Adjacent layers within the ballistic material system shall demonstrate abrasion resistance against each other for a minimum of 2,000 cycles when tested in accordance with 4.5.15. This requirement applies to layers of a homogenous filler, any two adjacent layers of different materials if a hybrid filler is used and filler layer in contact with insert cover.

3.6.2 Insert cover. The Armor Layers shall be sealed into its own cover. Radio frequency welding has been shown to be a satisfactory sealing means. There is no pattern supplied for the Insert cover. The inner edge of the seal is approximately 3/16 inch from the shape of the Armor Layer. However this will vary with manufacturing methods. The seal width shall be per the dimensions in Appendix A, Table VI. With the ballistic insert enclosed in its outer cover as an end item, the Nape Pad shall be tested to meet stiffness requirement in accordance with 3.6.3.

3.6.3 Stiffness. The ballistic insert stiffness shall not exceed 297 cm-g when tested as specified in ASTM D-1388 and calculated as specified in 4.6.6. A lower stiffness result is desired, without compromising the other performance properties required by this purchase description.

3.7 Ballistic performance requirements. The ballistic material system utilized in the Nape Pad shall provide protection from fragmentation and handguns and meet or exceed the ballistic requirements specified in 3.7.1 and 3.7.2.

3.7.1 Fragmentation protection. The ballistic material system utilized in the Nape Pad shall provide consistent fragmentation performance. Appendix B, Table I specifies the minimum V_{50} requirements when tested with Right Circular Cylinders (RCC) (dry and wet) and Fragment Simulating Projectiles (dry). Appendix B, Table I also specifies the minimum ballistic performance that shall be maintained after conditioning to hot and cold temperatures, accelerated aging, and POL contamination. Testing is in accordance with 4.6.

3.7.2 Handgun protection. The ballistic material system utilized in the Nape Pad shall be engineered to provide handgun protection at no added weight to the fragmentation system. Appendix B, Table II specifies the minimum dry V_{50}, V_0 and transient deformation requirement for the material system against the 9mm, 124 gr., FMJ Remington projectile for 3 hits at 0° obliquity and 2 hits at 30° obliquity when testing in accordance with 4.6. Ballistic materials that provide the required or desired 9mm performance must not exceed the weight requirement.

3.8 Support or ownership requirements.

3.8.1 Labels. A product label shall be sewn to the inner side of the outer cover facing the neck. The label shall be in accordance with Type VI of MIL-DTL-32075 Labels: For Clothing, Equipage, and Tentage (General Use), color white. The label shall be 1-1/2 inch in length and 1-1/4 inch in width and shall be visible after being stitched to the outer panel big hem. The label shall be marked with item nomenclature, contract number, lot number, NSN, size, and contractor's name.

An additional label shall be applied to the outside of the Insert, adhered to the side of the Insert that faces the body. The label on the insert shall contain a unique serial number. The serial number shall enable the manufacturer to determine lot information on all materials used in the Nape Pad. The label shall be marked with item nomenclature, contract number, lot number, NSN, size, and contractor's name and shall indicate "THIS SIDE TOWARDS BODY" and "DO NOT MACHINE DRY". Inks must be permanent. The label shall be of sufficient strength to withstand abrasion during field use and cleaning and remain intact for a minimum of 2 years.

3.8.2 Use and care instruction. An instruction pamphlet will be furnished within each Nape Pad (see 5.1) in the packaging. The pamphlet will be one page in length; two sided and contain the information in Appendix F, Figures 1 and 2.

3.9 Responsibility for compliance. All items shall meet all requirements of section 3 and 4 of this specification. The absence of any inspection requirements shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the government for acceptance shall conform with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements; however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the government to accept defective material. If there is a conflict between the stated requirements and the ANSI standard, the more restrictive requirement shall apply.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as outlined below. The Government reserves the right to perform any of the inspections set forth where such inspections are deemed necessary to ensure the supplies conform to prescribed requirements.

a) First Article Testing (FAT) (see 4.2)

b) Lot Acceptance Testing (LAT) (see 4.3)

4.1.1 Certificates of conformance. When Certificates of Conformance (CoC) are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

4.2 First Article Testing (FAT). When a FAT is required (see 6.2), Nape Pads submitted in accordance with 3.1 shall be inspected and examined for requirements listed in 4.5. The FAT will be tested to ensure ballistic performance is met as required in 3.7. The FAT ballistic tests shall be conducted on 15 inch x 15 inch shootpacks (see 6.4) representing the ballistic system proposed and shall be tested in accordance with all conditions specified. The performance requirements are verified by observation and operation that the properties, characteristics and parameters of the item meet the functional requirements specified in applicable paragraphs of Section 3 (3.7) and tested as specified in 4.6.

4.2.1 Material qualification. At any point after a FAT has been approved, any material change must be tested in accordance with the appropriate paragraph of this Purchase Description and approved by the government.

4.2.2 Ballistic qualification. At any point after a FAT has been approved, any material or process change to the ballistic package will be required to pass all ballistic FAT requirements as specified in paragraph 4.6 and any other requirement potentially affected by the proposed change.

4.3 Lot Acceptance Testing (LAT). LAT shall be conducted on each lot of Nape Pads in production. A lot shall be defined by end items (Nape Pads) constructed from the same lot of ballistic material. A LAT shall consist of conformance inspection of the Nape Pad end item, including ballistic QA verification testing. Random sampling for inspection shall be performed in accordance with ANSI/ASQ Z1.4 Inspection Level 1. For non-ballistic characteristics - Minor Defects AQL is 4.0, Major Defects AQL is 1.5 and the Combined AQL is 6.5. Conformance inspection shall be considered met if the Nape Pads contained in the lot sample:

A) Pass Visual and Dimensional inspections including Workmanship: Nape Pads will be inspected and examined for conformance to the specifications and patterns, and demonstrate acceptable workmanship as defined in 4.5.1 and 4.5.2.

B) Meet ballistic V_{50} performance meeting requirements as specified in 3.7.1 for the 17 grain FSP when tested in accordance with 4.6 when tested at zero degree obliquity dry on clay backing. The V50 will be a combined V_{50} limit calculated using all 60 individual data points from the 3 shots (center, right, left) taken from twenty (20) Nape Pad samples.

4.4 Demonstration verification. The performance requirement is verified by observation and operation that the properties, characteristics and parameters of the item meet the functional requirements specified in applicable paragraphs of Section 3. Pass or fail criteria are simple accept or reject indications of functional performance since no quantitative values exist or are difficult to measure.

4.5 Requirements and verifications. Appendix C, Table I delineates requirements verified through visual methods, including physical measurements in order to determine that no deficiencies exist.

4.5.1 End item visual inspection. The end items shall be inspected for the defects listed in Appendix C, Table II. The lot size shall be expressed in units of Nape Pads. The sample unit shall be one completely fabricated Nape Pad or individual component.

4.5.2 End item dimensional inspection. The end item shall be inspected for finished measurements in Appendix C, Table III. The inspection sample size shall be expressed in units of 10 finished components of the same system.

4.5.2.1 Linear measurements. Linear measurements of the outer cover and the insert are taken in a flat, relaxed state, with a straight edge 90-degree measuring device. Measurements taken to the nearest 1/16 inch and shall meet the finished dimensions in Appendix A, Table V and VI. Dimensional measurements are taken as shown in Appendix E, Figures 2 and 3.

4.5.3 In process visual examination of cut parts, insert materials, and patterns. The cut parts for the nape pad outer cover assembly and the insert components shall be 100% inspected by vendor after the cutting process to determine that parts containing defects such as a hole, cut, or other defect as specified by the Armor Material manufacturer are removed from production. As an alternative, the Armor Material may be inspected prior to cutting. In addition inspection shall be made of working patterns, to assure that they conform to government patterns in all respects.

4.5.4 In-process examination of armor material and armor layer assemblies for size and material defects. The Armor Material shall be 100% inspected by vendor for defects prior to cutting into shapes. After cutting and sewing, the Armor Layer Assembly shall be inspected to ensure the assembly contains the correct number of plies, the armor materials have not shifted or become misaligned during sewing, and its periphery is ± 1/8 inch of the Armor Layer pattern. The Armor Layer Assemblies shall be 100% inspected by the vendor to ensure the Assembly contains the correct number of layers.

4.5.5 Area of coverage. Square inches of coverage are measured by digitized patterns and comparison to working patterns.

4.5.6 Weight. The finished Nape Pad will be examined for weight. Maximum weight for each size is specified in 3.3.2. Weights are taken on a tarred scale and measured to the nearest 0.01 ounce. Finished Nape Pads submitted / pulled for FAT / LAT shall be inspected 100% for weight. Any Nape pad LAT resulting in overweight Nape Pads shall be cause for quarantine and 100% certification of the subject lot. It is recommended that manufacturers consider strategic weight monitoring practices during manufacturing processes to avoid Nape pad rejection at vendor cost and risk of shipping non-conforming product.

4.5.7 Thickness. Thickness is measured to the nearest 0.001 inch when measured under 0.5 psi when tested according to ASTM D-1777.

4.5.8 Fungus test. Verification of compliance with the fungus requirement will be performed through the use of coupon sampling. A fungus test will be performed on all non-certified materials. Tests will be performed in accordance with Method 508.6 of MIL-STD-810. A sample of each material will be placed in the fungus test chamber for 28 days.

4.5.9 Spectral reflectance. Spectral reflectance shall be evaluated initially and after laundering as described in GL/PD 10-07. The accelerated three laundering shall be performed using AATCC 61 Option 1A except a 4 gram sample size shall be used. When evaluating the camouflage print fabric, each color shall be tested separately. (Note: A sample size large enough to evaluate spectral reflectance shall be used. Ten (10) stainless spheres and 1993 AATCC Standard Reference Detergent without optical brightener shall be used. Spectral reflectance, initially and after laundering, shall be obtained from 600 to 860 nanometers (nm), at 20 nm intervals on an integrating sphere spectrophometer or a spectoradiometer.

The calibration of the instrument shall be traceable to the National Institute of Standards and Technology Perfect Reflecting Diffuser Calibration as stated in a Certificate of Traceability supplied by the instrument calibration standards. The spectral bandwidth shall be less than 26 nm at 860 nm. Reflectance measurements may be made by either the monochromatic or polychromatic mode of operation. When the polychromatic mode is used, the spectrophometer shall operate with the specimen diffusely illuminated with the full emission of a source that simulates either CIE Source A or CIE Source D65. The Camouflage print fabric specimen Class 1 or Class 2 (see Appendix A, Tables VII, VII-A, VII-B, and VII-C) shall be measured as a single layer backed with four layers of the same shade. The measured areas shall be taken on a minimum of two (2) different areas and the data averaged. The measured areas shall be taken at least 6 inches away from the selvage. The specimen shall be viewed at an angle no greater than 10 degree from normal, with the specula component included. Photometric accuracy of the spectrophotometer shall be within 1 percent, and wavelength accuracy within 2 nm. The diameter for standard aperture size used in the color measurement device shall be 0.3725 inches or larger for the Camouflage Print Class 1 or Class 2 (always use the largest aperture possible). Specimens shall be oriented in different directions during testing. When the measured reflectance values for any color at four or more wavelengths do not meet the limits specified in 3.5.2, it shall constitute a test failure.

4.5.10 Laundering procedure. The test specimens and ballast shall be placed in an automatic washing machine set on permanent press cycle, high water level and warm (105 degrees F +/-5 degrees F) wash temperature, with 0.5 ounce (14 grams) of 1993 AATCC Standard Reference Detergent. The duration of the laundering cycle shall be 30 +/-5 minutes. After laundering, the specimens and ballast shall be dried in an automatic tumble dryer set on permanent press cycle, 150 to 160 degrees F for approximately 15 minutes. The laundering equipment (washer and dryer) shall be in accordance with AATCC 135-1992.

4.5.11 Resistance to POL, insect repellant, sweat and seawater. The outer cover camouflage material and the insert cover material shall be tested, after one laundering per section 4.5.10, and after exposure to DEET, POL's; motor oil, gasoline and weapon lubricant, sweat and sea water for hydrostatic resistance in accordance with AATCC TM 127. A specimen for each test liquid (i.e., DEET, motor oil, etc.) shall be 8 by 8 inches. The specimen shall be laid flat; face side up, on a glass plate, 8 by 8 inches by ¼ inch and three drops of each test liquid shall be applied to the center of the specimen. A glass plate the same dimensions shall be placed on the specimen and a four pound weight placed in the center of the glass plate assembly. After 16 hours, remove the specimen and test immediately for hydrostatic resistance. DEET test liquid shall be diethyltoluamide (O-I-503 Type II, Concentration A). The motor oil shall conform to ASTM D-4485, Grade CD-II. The weapon lubricant shall conform to MIL-PRF-63460 or commercial Break Free CLP, Santa Ana, CA or equal. The perspiration solution shall be made up in a 500 ml glass beaker by combining 3.0 grams sodium chloride, 1.0 gram of trypticase soy broth powder, 1.0 gram normal propyl propionate, and 0.5 gram liquid lecithin. Add 500 ml of distilled water, add a magnetic stirring bar, and cover the beaker. Place the beaker on a combination hot plate / magnetic stirring apparatus. While stirring, heat the solution to 50 degrees C, until all ingredients are dissolved. While stirring, cool the solution to 35 degree C, remove cover and dispense immediately with pipette or other suitable measuring device. Dispense 2 ml of perspiration solution onto the center of the specimen.

A glass plate (do not rinse) of the same dimensions shall be placed on the specimen and a four pound weight placed in the center of the glass plate assembly. After 16 hours, remove and air dry specimen before testing for hydrostatic distance. Sea water formulation is 3% sodium chloride / 0.5% magnesium chloride. Sample preparation shall be the same as perspiration.

4.5.12 Matching. The color and appearance of the finished cloth and components (webbings, tapes) shall match the standard sample when viewed using AATCC Evaluation Procedure 9, with source simulating artificial daylight D75 illuminant with a color temperature of 7500 ± 200°K illumination of 100 ± 20 foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2856 ± 200°K. All matching/shade analysis must be conducted in a Government authorized lab unless otherwise specified in the contract or procuring documents.

4.5.13 Elongation of elastic webbing. Specimens for the test shall be full width, at least six inches long and shall be marked with a two inch gage length so located that when the specimen is inserted in the jaws of a suitable testing machine, having jaws wider than the webbing, the gage length is located between the jaws. The initial distance between the jaws of the machine shall be three inches. The jaws shall separate at a rate of 12 inches per minute under no load. The load required to produce 50 percent elongation of the two inch gage length shall be noted. The Elastic Webbing shall meet the requirements in paragraph 3.2.6.2.

4.5.14 Flame resistance. The outer cover shall meet the flame resistance of ASTM D-6413 Vertical Flame Test for Textiles and pass the requirements of 3.5.4.

4.5.15 Ballistic filler abrasion resistance. Testing shall be performed in accordance with ASTM D-3886 with the following exceptions: When a woven material is part of the ballistic layer system, it shall be used as the abradant mounted on the surface abrasion head; both the face and back of the test specimen shall be evaluated; the diaphragm shall be inflated to 4.0 psi with a 5.0 lb load. The abraded specimen shall be visually examined and rated according to the following criteria. A Grade of 1 or 2, per the list below, constitutes a failure.

1. Severe change in surface appearance with most or all fibers in the center of the abrasion area being worn off or broken.
2. Moderate change in surface appearance with significant breakage of fibers in the center of the abrasion area and no appearance of a hole.
3. Slight change in surface appearance and minimal fiber breakage.
4. No fabric structure change.

4.6 Ballistic performance.

4.6.1 Ballistic testing. General procedures and requirements are provided in 4.6.2 (see 6.5 for definitions). FAT will be conducted on 15 x 15 inch shoot packs of the proposed ballistic material system (see 6.4). LAT will be conducted on the end item constructed of the approved ballistic material system. Failure to meet the requirements of any sub-test will constitute failure for the entire FAT or LAT (See Appendix D for shoot pack FAT requirements).

4.6.2 Conditions. Dry specimens and specimens after wet, hot temperature, cold temperature, accelerated aging, and POL conditioning will be tested for ballistic performance as specified in 3.7.1. The dry condition is the standard test condition specified in 3.7.2. All specimens will be visually inspected after conditioning for coloration, distortion, melting, cracking, or other physical defects and noted.

4.6.2.1 Wet condition. Seawater shall be utilized for wet test conditions. The seawater formulation is 3% sodium chloride/0.5% magnesium chloride. The wet condition is achieved by completely submerging the specimen in sea water at 68 ± 10 degree F for 24 hours. The specimens are submerged such that the fluid is in contact with all exterior surfaces to allow maximum fluid penetration. A ten pound weight shall be placed on a 15" x 15" plate to distribute load to allow for maximum fluid penetration. After submersion, excessive water will be drained from the specimen by hanging vertically for 15 minutes. Ballistic testing of the specimen shall begin within 5 minutes of the completion of draining and shall be completed within 60 minutes.

4.6.2.2 Temperature extremes condition. For the hot temperature extreme, the sample shall be heated in an oven operating at 155 +/- 10 degrees Fahrenheit for 6 ± 1/4 hours continuously. The test specimen shall be removed from the oven, mounted and ballistically tested as specified in 4.6.2. For cold temperature extreme, the test specimen shall be cold temperature exposed to -60 +/-10 degree F for 6 +/- 1/4 hours continuously. The test specimen shall be removed from refrigeration, mounted and ballistically tested as specified in 4.6.2 within 5 minutes with tests completed within 60 minutes. If the test is not completed within 60 minutes the specimen shall be reconditioned for at least 1 hour at the temperature specified above.

4.6.2.3 Accelerated aging. Accelerated aging of the sample shall be performed in general accordance with ASTM D1149, with the following modifications. The entire sample under test will be subjected to treatment. All samples will be conditioned for 72 hours at 40°C while maintaining a minimum of 50 parts per hundred million of ozone. The sample does not require any additional tensile strain during accelerated aging conditioning. After accelerated aging conditioning, the sample must remain at ambient atmospheric conditions for 24 hours prior to ballistic testing, not to exceed 36 hours from completion of conditioning. Verify that the conditioned samples perform as specified in 3.7.1.

4.6.2.4 POL contamination. The ballistic material system specimens shall be immersed in each of the following: motor oil at room temperature and gasoline at room temperature. The motor oil shall conform to ASTM D-4485, Grade CD-II. The specimens shall be placed flat in a pan with 1/8 – 1/4 inch of the POL fluid. A ten pound weight shall be placed on a 15" x 15" plate to distribute load to allow for maximum fluid penetration. The loaded specimen shall remain immersed for 4 hours at room condition. The specimen shall be hung vertically to drip dry for 15 minutes, excess oil shall be wiped from the surface to facilitate handling of the specimen. The specimen shall be ballistically tested within 30 minutes, with testing completed within 60 minutes. If the testing is not completed within 60 minutes another specimen shall be conditioned as specified above and the testing shall continue with the second panel.

4.6.3 Ballistic test criteria. For all Protection Ballistic Limits (BL); V_{50} and V0 acceptance tests for the Nape pad; at a minimum; require the following information by the government to validate performance:

a) Armor specimen description including exact materials, thickness, and areal density of armor system or ballistic system nomenclature, and sizes and weights of all components.
b) Conditioning of armor specimen.
c) Test projectile with exact nomenclature or threat code when required.
d) Temperature and humidity measurements.
e) Yaw angle.
f) Angles of target obliquity.
g) Velocity measurements of each test shot used to test the armor (regardless of whether that particular velocity was used in the V_{50} or V_0 determination).
h) Velocity loss and/or corrected striking/residual velocity for fragment simulating projectiles.
i) PP (Partial Penetration) and CP (Complete Penetration) next to each shot velocity as determined.
j) Back Face Deformation measurements recorded to the nearest tenth of a millimeter rounding following standard ASTM E29 if applicable.
k) Name of company performing tests.
l) Type of gun barrel and serial number, caliber, and propellant type and weight, twist rate.
m) Range measurements including distances from gun barrel to velocity measurement devices and target.
n) Calculated Ballistic Limit. In a situation where the V_{50} BL or V_0 data sheet would compromise the Security Classification Guide for Armor Materials (see 2.2), the data sheet should exclude the specific projectile used during testing.
o) Penetrated plies of soft armor for system tests.
p) Clay drop temperatures, locations, depth and clay box number.
q) Remarks or notes for all testing anomalies, unfair hits, etc.
r) All shot locations.
s) Revision number/level of all ballistic software used by test lab (i.e. FARO software including smoothing function, etc).

4.6.3.1 Projectile velocity determination. Projectile velocity and time of flight measurements shall be in accordance with ITOP 4-2-805. Instrumental velocity shall be translated into strike velocity at the target and the strike velocity shall be used for ballistic requirements. Projectile velocity measurement methods shall employ either high velocity lumiline screens or electrical contact screens which either open or close an electric circuit by passage of the projectile through the detector. Contact screens may consist of metallic foils separated by a thin insulating layer, or may consist of a circuit printed on paper with the circuit spacing such that the projectile passing through the screen will break the circuit. An electric counter type chronograph measuring to the nearest microsecond or as a maximum to the nearest 10 microseconds will be used with these measuring devices. As an alternative, radiographic equipment calibrated to capture the projectile at various time intervals of flight can be used. For fragment simulating projectiles, velocity correction methodology shall be used to calculate the actual striking velocity and, where appropriate, actual residual velocity.

4.6.3.2 Weapon mounting configuration. The spacing from the weapon muzzle to the first pair of triggering devices shall be sufficient to prevent damage from muzzle blast and obstruction from smoke in case optical devices are used. Recommended distances can be found in ITOP 4-2-805. Spacing between triggering devices is a function of the expected velocity of the projectile being fired. In many instances, physical restriction, such as short overall distance from muzzle to test sample dictates the spacing of the triggering devices. The last pair of triggering devices shall be placed at least four (4) feet (122 cm) in front of the test sample and should be protected from possible damage resulting from fragments.

4.6.3.3 Environmental test conditions. All ballistic tests shall be performed at a temperature of 68 ± 10 degrees Fahrenheit and 50 ± 20 % relative humidity. Temperature and humidity measurements shall be recorded before the beginning of day's test firings and every two hours thereafter.

4.6.3.4 Projectile yaw determination. Projectile yaw shall be measured for each firing by yaw cards, flash radiograph or photography. Any round for which yaw is determined to be greater than 5 degrees shall be disregarded in the calculation of the ballistic limit. The measurement system employed should be capable of measuring yaw within an accuracy of 1.0 degrees.

4.6.4 V_{50} BL calculation. V_{50} Ballistic Limits for FAT shall be determined using shootpacks representing the proposed ballistic system (see 6.4). V_{50} Ballistic Limits for LAT shall be determined using production representative Nape Pads selected from the presented lot (see 6.2). V_{50} Ballistic Limit shall be determined in accordance with MIL-STD-662 and ITOP 4-2-805.

a) First Article (Shootpacks). Three (3) Partial Penetrations (PPs) and three (3) Complete Penetrations (CPs) within a 125 ft/sec velocity spread or five (5) PPs and five (5) CPs within a 150 ft/sec velocity spread yield the minimum allowable V_{50} BL determination that will be accepted as reliable test results. If the velocity spread is unable to be achieved, the test will be deemed inconclusive; therefore a contingency sample must be used.

b) Lot Acceptance (Nape Pads). The combined V_{50} ballistic limit shall be obtained by marking a left, right and center point of impact on each of a minimum of twenty (20) Nape Pads in order to obtain 3 data points for each item tested. Ballistic limit testing shall be conducted to obtain a total of 60 data points. The combined V_{50} ballistic limit shall be calculated using all 60 individual left, right and center data points using an inverse prediction method. The quantity of twenty (20) Nape Pads is established by Subject Matter Experts with Special Inspection Level (SIL) S-3 considered. This quantity is applicable to Lot sizes up to 35,000. Lot sizes over 35,000 but less than 500,001 would require thirty two (32) Nape Pads and Lot sizes over 500,000 would require 50 Nape Pads (see Appendix D for a summarized LAT matrix that includes required contingencies).

4.6.4.1 PP and CP determination for V_{50}.

a) FAT (Shootpacks). Complete and partial penetrations (see 6.5) will be determined based on the impressions left on an aluminum witness sheet. A 0.020 in. (0.051 mm thick 2024 T3 sheet of aluminum) will be placed 6 + 1/2 in. (152 + 12.7 mm) behind and parallel to the target. The aluminum witness sheet will be at least 15 x 15 in. size and be of sufficient size to capture all fragments resulting from the ballistic event, mounted rigidly around its parameter and placed so that the target impact location is approximately at the center of the aluminum sheet. Restraint is required during testing so that the material is not pulled through the ballistic test window frame. Unrestrained or improperly restrained materials will tend to pull down the projectile line of flight. Restraint provides for more accurate and reproducible data if uniformly applied. The following test conditions apply:

    - For all size test panels a metallic (approximately 0.20 inch thick aluminum or steel) frame with minimum 1.4 inch width shall be employed to restrain the test material during ballistic impact.
    - The test panel will be sandwiched between 2 frames and restrained with mechanical or pneumatic clamping devices at each of the four comers of the frame.
    - The restraining frames will be cut so that a ballistic window with minimum sizing of 12.0 x 12.0 inch square will be used.
    - Shot spacing shall be measured on the center of the impact point.
    - The minimum size test panel that will be evaluated shall be no smaller than 15 in. x 15 in.
    - No shots shall be closer than 2.5 inches from any edge of the sample.
    - Test shots shall be sufficiently spaced so that sequential shots are not influenced by previous impact areas. A minimum shot spacing of 2.5 inches is required but 3.0 inches is recommended.
    - Depending on the test panel size it may be necessary to use 2-3 panels for the V_{50} determination.
    - Samples can be reconditioned to initial shape after every shot, if desired, but this is not required due to the higher test costs and some materials may not require this action. At a minimum the test specimen shall be reconditioned when excessive pulling from the restraining fixture is exhibited. Excessive pulling is defined by the fabric extending greater than 2.0 inches beyond the original rear surface plane of the armor or the distance between the rear armor surface is within 4.0 inches of the witness sheet.

b) LAT (Production Representative Samples). A complete penetration will have occurred when the projectile, fragment of the projectile, or fragment of the armor material is imbedded or passes into the clay backing material. Fibrous materials that are emitted from the back of the test specimen and rests on the outer surface of the clay impression are not considered a complete penetration.

    - Impacts shall be a minimum of 3 inches away from any edge of the clay box and shall be a minimum of 4 inches away from any previous impact.

4.6.4.2 V_{50} test sample mounting.

a) First Article (Shootpacks). Restraint is required during testing so that the material is not pulled through the ballistic test window frame. Unrestrained or improperly restrained materials will tend to be pulled down the projectile line of flight. Restraint provides for more accurate and reproducible data if applied consistently. Unless otherwise stated the following conditions shall be performed during V_{50} testing. The armor test sample shall be secured on the test target mount with the impact side at the appropriate angle to the line-of-flight of the projectile. The frame supports, clamps or mounting fixtures must be capable of retaining the sample and withstanding shock resulting from ballistic impact by the test projectiles. The test sample mount shall be capable of adjustment of moving the sample in the vertical and horizontal directions so that the point of impact can be located anywhere on the sample and so that appropriate degree obliquity impacts can be achieved anywhere on the sample. The test sample mount shall be capable of rotating on the vertical or horizontal axis so that various obliquity attack angles can be achieved.

b) Lot Acceptance. The back of the armor test specimen will be attached to a block of non-hardening, oil-based molding clay as to minimize or eliminate movement of the test samples before, during, or after the ballistic event. The fixator strap shall be open during testing (as shown in Appendix E, Figure 1A) to represent the as worn position. The clay block (see 4.6.5.1) shall be rigidly held by a suitable (metal) stand. The armor test sample shall be secured in the vertical position, perpendicular to the projectile line of flight. The frame supports must be capable of retaining the sample and withstanding shock resulting from ballistic impact. The test sample mounting shall be capable of adjustment for moving the sample in the vertical or horizontal positions so that the point of impact can be located anywhere on the sample.

   The first shot will be fired at the center of the Nape Pad, the second shot to the right (or left) of center, and the third shot fired to the remaining side, (left or right) of center. Due to the size of the Nape Pads, maintaining a 2.5 inch requirement from any edge is not possible when testing end items. Therefore, shots shall be placed within +/- 0.25 inch of the centerline of the ballistic package to maximize impacted area. Shot spacing between shots must still be maintained. Test shots shall be sufficiently spaced so that sequential shots are not influenced by previous impact areas. A shot spacing of 1.5 inches +/-0.25 between shots is required. Closer shot spacing data shall be permitted in the event that a failure does not occur.

4.6.5 V_0 determination for acceptance. Instrumental velocity shall be translated into strike velocity at the target and the strike velocity shall be used for ballistic requirements. For V_0 or full protection (no complete penetrations), a minimum velocity (muzzle plus 50 ft/sec) will be the requirement. The following conditions apply; No complete penetration at the maximum specified shot pattern specified is the minimum requirement. Closer positioning of shots without complete penetration is a desired requirement.

- Test samples should be 15.0 x 15.0 inch square size panels and configured in the proposed final armor material system for the FAT only (see 6.4).

- Samples will be mounted on clay block described below (see sections 4.6.5.1, 4.6.5.2, and 4.6.5.3).
- The first shot will be 2.75 –0/+1/4" inch from any edge.
- The next shot shall be located 3.5 inch –0/+1/2" from the first shot and at the weakest point in the configuration, e.g.; seamed area or non-uniform area of design.
- The third shot location should be positioned 3.5 inch –0/+1/2" from any of the 2 previous test shots.
- The fourth and fifth shots shall be located 3.5 inch –0/+1/2" from any previous test shots and tested at 30 degrees obliquity.
- The transient deformation shall be measured (see sections 4.6.5.1, 4.6.5.2, and 4.6.5.3) after the third and fifth test firings.
- Test shots should be staggered at least 0.50 inch off the horizontal and vertical lines of any previous shots.
- Test specimens shall be reconditioned to a smooth shape after every shot.

4.6.5.1 Clay box measurement. The back of the armor test specimen will be attached to a block of non-hardening, oil-based modeling clay so that no movement of the test samples occurs before, during or after the ballistic event. The clay material fixture shall be in the form of a single block at least 5.5 inches thick and 24 x 24 inches in length and height with 0.75 inch plywood backing. The clay shall be conditioned for at least 3.0 hours and worked thoroughly to remove any voids. A new clay conditioned block shall be used for each body armor sample. The clays consistency shall be such that a depression of 25 ± 3mm in depth is obtained when a 1 kg ± 10 gm (2.2 lb ± 0.35 oz) cylindrical steel mass, 44.5 ± 0.5 mm (1.75 ± 0.02 in) in diameter and having a hemispherical striking end, is dropped from a height of 2 m ± 2 cm (6.56 ft + 0.8-in**)** onto one of its square faces. During the three drop tests for each block, the center of each impact location shall be at least 6.0 inches from any previous impact site and 4.0 inches from any edge of the clay block. A guide tube or other means may be used as required to assure that the striking end of the cylindrical mass impacts the backing material squarely at the desired location. Depressions and BFDs will be measured with instruments capable of ± 0.4mm accuracy. The calibration drop indentations will be filled with temperature conditioned clay prior to conduct of the V0 test shots. The clay boxes will be numbered so as to be recognized by an overhead camera. The specimen will be strapped or taped to the surface of the clay material. Ballistic testing will be performed at 0 degrees obliquity and 30 degree obliquity. Back-face deformations in the clay will not exceed 44.0 mm. when measured from the original undisturbed surface of the backing material to the lowest point of the depression. The specimen may be smoothed between shots.

4.6.5.2 Back Face Deformation (BFD) measurement. Back face deformations in the clay are measured from the original undisturbed surface of the clay backing material to the post-impact surface with the reference direction perpendicular to the front surface (facing the line-of-fire) of the box. Indentation measurements will utilize laser scanner measurement instruments, which provide a means to accurately establish the difference between the original undisturbed clay surface and the post-impact surface. The BFD measurement is the maximum-distance-length, which is the length of the longest line segment parallel to the reference direction between the pre-impact clay surface and the post-impact (BFD) clay surface, where the reference direction is defined to be perpendicular to the front surface (facing the line-of-fire) of the box containing the clay backing material. Deformations will be recorded in mm to the nearest tenth digit following standard ASTM E29 "Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications" ("Five-even" rule)(Rounding Method) (i.e., 44.050 = 44.0, 44.051 = 44.1 and 47.950 = 48.0).

The laser scanner measurement instruments and associated software must be approved for use by ATEC. Prior to changes to this software, research will be conducted and the results will be vetted through the Testing Integrated Process Team (IPT) and Product Manager prior to implementation:

-Uniform sample: 0.5mm
-Wrap with Auto Noise Reduction
-Clean function w/ smooth option
-Fill holes (curvature based hole filling)
-Remove intersecting triangles
-Remove spikes at 10%
-3D Compare to find deepest point

The software package must have the tolerances set such that areas of discontinuity less then 0.7mm x 0.7mm are not included.

4.6.5.3 Test sample mounting. The molding clay block shall be rigidly held by a suitable (metal) stand. The armor test sample must remain coplanar throughout the test and shall be secured in the vertical position, perpendicular to the projectile line of flight. The frame supports must be capable of retaining the sample and withstanding shock resulting from ballistic impact. The test sample mounting shall be capable of adjustment for moving the sample in the vertical or horizontal positions so that the point of impact can be located anywhere on the sample and rotation on the vertical axis so that 0 and 30 degree obliquity impacts can be achieved anywhere on the sample. The specimen shall be smoothed between shots.

4.6.6 Flexibility. The Armor layer assembly shall be tested in accordance with ASTM D-1388, Standard Test Method for Stiffness of Fabrics, to determine the flexural rigidity in units of cm-g for each component. These results are then used to calculate an overall Armor Layer system flexibility as follows:

$$System\ Stiffness = \sum_{Components}\left[(G_{i,\,warp} + G_{i,\,fill}) / 2\right] \times Layers_i$$

Where:

i	= Different fabric components in the system
$G_{i,warp}$	= Flexural Rigidity in the warp direction (cm-g)
$G_{i,fill}$	= Flexural Rigidity in the fill direction (cm-g)
$Layers_i$	= Number of total layers of the component system

The System stiffness shall be less than 297 cm-g when calculated as above.

Example Calculation:
A system is composed of (example) 12 plies of material a and 6 plies of material b. Component flexural rigidities are as follows:

Material A:	*Material B:*
$G_A,warp = 4.000$ *cm-g*	$G_B,warp = 7.000$ *cm-g*
$G_A,fill = 6.000$ *cm-g*	$G_A,fill = 8.000$ *cm-g*

System stiffness = [(4.000+6.000)/2 X 12] + [(7.000+8.000)/2 X 6] = 105.000 cm-g
The calculated system stiffness is less than 297 cm-g and is therefore acceptable.

4.7 Operating requirements verification. Complete each verification in this paragraph.

4.7.1 Insertion demonstration verification. One barehanded person shall demonstrate the Insert can be inserted into the Nape Pad cover in a flat smooth position without bunching anywhere in its finished configuration, without using tools or special aids. The Insert shall also be easily removable by hand without breaking seams or damaging the item.

5. PACKAGING

5.1 Packaging. The individual Nape Pad shall be placed into a plastic unit pack along with a use and care instruction pamphlet containing an 8 step photo/instruction explaining to the user how to correctly use the Nape Pad and attach it for wear with the helmet. The clear plastic unit pack must contain the UPC adhesive label marked with NSN and "Nape Pad" and it's Size, along with UPC info required. For acquisition purposes, the contract or order shall specify complete packaging requirements (see 6.2). When DoD personnel perform material packaging, those personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements.

The Inventory Control Point packaging activity within the Military Department of defense Agency, or within the Military Department's Systems Command, maintains packaging requirements. 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.).

6.1 Intended use. The Nape Pad provides ballistic protection: protection from conventional fragmenting munitions. The area of protective coverage of the nape (back neck area) is dictated by the patterns which shall be furnished by the procuring activity. Changes to the patterns that will impact shape and area of coverage must be approved by the Government prior to use in production of this item.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a) Title and date of this document.
b) When first article, and pre-production items are required. When a first article is required, the contracting officer should include specific instructions in acquisition documents regarding requirements and arrangements for quantity, selection, inspection, examination, testing and approval of the first articles.
c) Size tariff.
d) Conformance (Lot Inspection) requirements.
e) Contractually approved ballistic package(s) to include package name, complete description, and FAT acceptance letter.
f) Warranty provisions if desired.
g) Class required.

6.3 Standard sample. For access to standard samples, contact the procuring activity issuing the invitation for bid.

6.4 Simulant/surrogate shoot-pack. A Simulant/Surrogate Shoot-Pack system of body armor may be used to represent the ballistic resistant materials. The surrogate shoot pack system will consist of (1) a ballistic filler packet and (2) a ballistic filler carrier. The baseline ballistic filler packet will be 15 x 15 inches in size consisting of X plies proposed ballistic material system used in the Nape Pad. The ballistic packet will be stitched diagonally across the 4 corners with a 5-inch line of 50 TEX Aramid thread at 5 to 10 stitches per inch. The face fabric will consist of 500 denier 7.5 oz. / Sq. Yd., urethane back coated, textured nylon, Cordura. The insert pocket will be stitched on three sides to the face fabric with nylon or polyester thread. The ballistic filler carrier back cover will consist of 500 denier 7.5 oz. / Sq. Yd. urethane back coated, textured nylon, Cordura. The front and back filler carrier covers will be stitched together on 3 sides with nylon or polyester thread to form a pocket to hold the ballistic filler packet. The fourth side will remain unstitched but will have a minimum of 5 inches of not less than 0.5 inch hook and loop fastener centered and stitched to the top. When the ballistic filler is an asymmetric system of different materials, the filler packet will be labeled to clearly indicate the strike face from the back face.

6.5 Ballistic testing definitions. The following definitions are provided to assist in understanding the test procedures:

Fair Impact. A projectile that impacts the armor at an angle of incidence no greater than 5 degrees from the intended angle of incidence and does not violate the shot spacing or edge spacing requirements will be considered a fair impact.

Partial Penetration (PP). Any fair impact that is not a complete penetration shall be considered a partial penetration.

Complete Penetration (CP) for V_{50} Testing. A complete penetration occurs when the impacting projectile or any fragment thereof, or any fragment of the test specimen, perforates the witness plate resulting in a crack or hole which permits light passage when a 60-watt, 110-volt bulb is placed behind the witness plate.

Complete Penetration (CP) for Acceptance Testing. A complete penetration will have occurred when the projectile, fragment of the projectile or fragment of the armor material is imbedded or passes into the clay backing material used to measure transient deformation. Paint or fibrous materials that are emitted from the back of the test specimen and rests on the outer surface of the clay impression are not considered a complete penetration.

Over Velocity. Striking velocity that is higher than the specified requirement.

Under Velocity. Striking velocity that is lower than the specified requirement.

Areal Density (AD). A measure of the weight of the armor per unit area, usually expressed in pounds per square foot (lb. /ft 2) or kilograms per square meter (kg/m 2) of surface area.

Obliquity. A measure, normally in degrees, of the extent to which the impact of a projectile on an armor material deviates from a line normal to the target. Thus, a projectile fired perpendicular to an armor surface at 0 degrees obliquity.

Yaw. Projectile yaw is the angular deviation of the longitudinal axis of the projectile from the line of flight at a point as close to the impact point on the target as is practical to measure.

V_{50} Ballistic Limit (BL). In general, the velocity at which the probability of penetration of an armor material is 50 percent.

6.6 Contents of labels, and use and care instructions: See Appendix F.

6.7 National stock numbers.

NSN/MCN	Sizes	Item	Camouflage Pattern
8470-01-568-1028	Small / Medium / Large	Nape System	UCP
8470-01-568-1023	Extra-Large / Extra Extra-Large	Nape System	UCP
8470-01-584-1750	Small / Medium / Large	Nape System	OCP
8470-01-584-1839	Extra-Large / Extra Extra-Large	Nape System	OCP
8470-01-F01-0142	Small / Medium / Large	Outer Cover	UCP
8470-01-F01-0143	Extra-Large / Extra Extra-Large	Outer Cover	UCP
8470-01-F01-0140	Small / Medium / Large	Outer Cover	OCP
8470-01-F01-0141	Extra-Large / Extra Extra-Large	Outer Cover	OCP
8470-01-F01-0145	Small / Medium / Large	Ballistic Insert	-
8470-01-F01-0146	Extra-Large / Extra Extra-Large	Ballistic Insert	-

Note: UCP – Universal Camouflage Pattern
OCP – Operation Enduring Freedom Camouflage Pattern

6.8 Suggested sources of supply. The following are suggested sources of supply.

Outer cover Camouflage Material: Duro Textiles LLC, 110 Chance St, Fall River, MA, style 330 Denier Cordura printed with Army Universal Pattern (Class 1) or Multi-Cam Camouflage print pattern (Class 2), with non-ravel ¼ oz Urethane, DWR finish

Outer cover Spacer Mesh: Emtex Inc, 42B Cherry Hill Drive, Danvers, MA, Drilex #622, style EM-ASP929

Insert Cover Material: Brookwood Companies, 275 Putnam Road, Plainfield, CT, style S20025-200D Black Heat Seal

Elastic webbing: Textile Network, Inc., 501 E. Simpson Street, Lafayette, CO, style 041 Elastic

Label for Insert Cover: Avery Dennsion, 1 Wilcox Street, Sayre, PA 18840, PAXAR 1600HST Heat Seal Transfer Tape

APPENDIX A – MATERIAL PROPERTIES

Table I – Outer Cover Camouflage Material Requirements

Characteristic	Requirement
Breaking Strength; lb. (min.) Warp X Filling	360 X 270
Dimensional Stability; % (max.) Warp X Filling	3.0 X 2.0
Abrasion Resistance; (min.) Number of Cycles	1000
Water Repellency; Spray Rating (min) Initially After 1 Laundering	 100,100,90 90,80,80
Hydrostatic Resistance; cm (min) Initially and After 1 Launderings After 1 Laundering and POL Contamination After 1 Laundering and Insect Repellent Contamination After 1 Laundering and Sweat Contamination After Laundering & Sea Water Contamination	35 35 35 35 35 35
Dynamic Absorption; % (max.) After 1 Laundering	20
Resistance to Organic Liquids; (min) Before and After 1 Laundering	No wetting of n-dodecane

Table II – Outer Cover Spacer Mesh Requirements

Characteristic	Requirement
Weight; oz / per sq. yd.	9.5 -11.16
Abrasion Dry (Martindale); cycles	12000 rev. (750 cycles) (Note 1)
Tear Strength, Fill; min. pound-force (LBF)	12.89
Tear Strength, Warp; min. (LBF)	13.09
Tensile Strength Fill; min. (LBF)	128.2
Tensile Strength Warp; min. (LBF)	142.5
Melting Temperature (°F)	420 – 460

Note 1 – The abraded specimen shall be visually examined and rated according to the following criteria:

1. Severe change in surface appearance with most or all fibers in the center of the abrasion area being worn off or broken.
2. Moderate change in surface appearance with significant breakage of fibers in the center of the abrasion area and no appearance of a hole.
3. Slight change in surface appearance and minimal fiber breakage.
4. No fiber structure change.

A Grade of 1 or 2 constitutes a failure.

Table III – Insert Cover Material Requirements

Characteristic	Requirement
Weight; oz. / per sq. yd.	5.8 +/-0.3
Breaking Strength; lb. (min.) Warp X Filling	200 X 170
Dimensional Stability; % (max.) Warp X Filling	3.0 x 2.0
Abrasion Resistance: (min.) Number of Cycles	1000
Water Repellency: Spray Rating (min) Initially After 1 Laundering	 100,100,90 90,80,80
Hydrostatic Resistance: cm (min) Initially and After 1 Laundering After 1 Laundering and POL Contamination After 1 Laundering and Insect Repellent Contamination After 1 Laundering and Sweat Contamination After Laundering & Sea Water Contamination	35 35 35 35 35
Dynamic Absorption: % (max.) After 1 Laundering	20
Resistance to Organic Liquids (min) After 1 Laundering	No wetting of n-dodecane

Table IV – Elastic Webbing Physical Requirements

Characteristic	Requirement
Width; inch	1 ±.0625
Thickness; inch	0.030 to 0.095
Weight; ounces/yard	1.032 max
Stretch	3 – 3.5 lbs. to produce 50% elongation at room temperature.

Table V – Outer Cover Finished Dimensions

Code	Description	Dimension (in) S/M/L	Dimension (in) XL/XXL	Tolerance (in)
A1	Outer cover width	7-1/4	8-1/2	± 1/4
A2	Outer cover height at center	3-1/4	3-1/4	± 1/4
A3	1-1/2 in Hook tape and 1-1/2 in Loop tape length	1-3/4	1-3/4	± 1/8
A4	1-1/2 in Hook tape length	1-3/4	1-3/4	±1-8
A5	1-1/2 in Loop tape length	1-3/4	1-3/4	±1/8
A6	Elastic Strap Length	2	2	± 1/8
A7	Length of Opening in Elastic Strap	Not less than 1-1/2	Not less than 1-1/2	n/a
A8	Fixator Strap tunnel height	2-1/8	2-1/8	±1/8
A9	Outer cover apex to Fixator strap tunnel	3/4	3/4	±1/8
A10	Distance from edge of hook and loop tape to stitch	1/8	1/8	±1/16
A11	Fixator Strap total length	6-5/8	6-5/8	±1/4

Table VI – Insert Finished Dimensions

Code	Description	Dimension (in) S/M/L	Dimension (in) XL/XXL	Tolerance (in)
B1	Insert width	7	7-15/16	± 1/4
B2	Insert middle height	2-3/4	2-3/4	± 1/4
B3	Seal Width	Not less than 1/8 in	Not less than 1/8 in	Na

Table VII – Spectral Reflectance Requirements (Class 1)

	Outer cover Camouflage Material Universal Camouflage Pattern						Elastic Webbing	
	Desert Sand 500		Urban Gray 501		Desert Sand 500		Foliage Green 504	
Wavelength (nm)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)
600	28	40	12	26	8	18	8	18
620	30	42	14	26	8	18	8	18
640	34	48	14	28	8	20	8	20
660	38	56	14	30	10	26	10	26
680	44	60	18	34	10	26	10	26
700	46	66	24	38	12	28	12	28
720	48	68	26	42	16	30	16	30
740	48	72	30	46	16	30	16	30
760	50	74	32	48	18	32	18	32
780	54	76	34	48	18	34	18	34
800	54	76	34	50	20	36	20	36
820	54	76	36	54	22	38	22	38
840	56	78	38	54	24	40	24	40
860	56	78	40	56	26	42	26	42

Table VII-A – Spectral Reflectance Requirements (Class 2)

	Outer cover Camouflage Material Multi-Cam Camouflage Pattern						Elastic Webbing	
	Cream 524 and Tan 525		Pale Green 526, Olive 527 and Brown 529		Cream 524 and Tan 525		Pale Green 526, Olive 527 and Brown 529	
Wavelength (nm)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)
600	22	44	10	30	3	12	8	20
620	24	45	11	30	3	12	8	20
640	24	45	11	32	4	12	8	22
660	25	45	12	32	4	13	8	24
680	28	48	14	35	4	18	12	24
700	28	54	19	40	6	25	12	34
720	30	58	22	43	6	27	16	42
740	32	60	25	46	10	29	22	46
760	36	61	27	48	14	33	30	50
780	38	62	28	50	18	36	34	54
800	40	62	29	50	20	37	36	56
820	44	65	30	51	20	38	38	58
840	46	66	32	51	21	39	38	58
860	48	67	33	52	21	40	40	60

Table VII-B – Spectral Reflectance Requirements for Loop Only (see 3.2.6.1)

Wavelengths Nanometers (nm)	Foliage Green 504		Tan 499	
	Min	Max	Min	Max
600	8	18	8	26
620	8	18	8	26
640	8	20	8	30
660	10	26	8	34
680	10	26	12	38
700	12	28	12	40
720	16	30	16	46
740	16	30	22	50
760	18	32	30	50
780	18	34	34	54
800	20	36	36	56
820	22	38	38	58
840	24	40	38	58
860	26	42	40	60

Table VII-C – Spectral Reflectance Requirements for Elastic Webbing (Tan 499 Only) (see 3.2.6.2)

Wavelengths Nanometers (nm)	Tan 499	
	Min	Max
600	8	20
620	8	20
640	8	22
660	8	26
680	10	26
700	12	34
720	16	42
740	16	46
760	18	50
780	18	54
800	20	56
820	22	58
840	24	58
860	26	60

APPENDIX B – BALLISTIC PROTECTION REQUIREMENTS

Table I – Fragmentation Protection; Minimum V_{50}

Fragment Projectile	V_{50} @ 0 degree DRY: ft/sec	V_{50} @ 0 degree WET: ft/sec	V_{50} @ 45 degree DRY: ft/sec
2 gr. RCC 1/	2710	2575	2800
4 gr. RCC	2400	2300	2460
16 gr. RCC	2050	1920	2080
64 gr. RCC	1660	1610	1660
16 gr. RCC; After hot and cold temps After POL and After Accelerated Aging	 2000 1900	 N/A N/A	 N/A N/A
17 gr. FSP 2/	1850	N/A	N/A
1/Right Circular Cylinders shall be in accordance with Appendix B, Figure 1. 2/Fragment Simulating Projectile – MIL-DTL—46593B with Amendment 1, 1 April 2006, with the exception of Hardness Testing per MIL-STD-1916, Verification Level II.			

Table II – Handgun Protection Requirements

Projectile – 9mm 124 gr. FMJ Remington	V_{50} @ 0 degree, min (ft/sec)	V_0 @ 0 and 30 degree (ft/sec)	Deformation, max, (mm)
Required	1525	1400 +50/-0	44
Desired	1625	1500 +50/-0	44

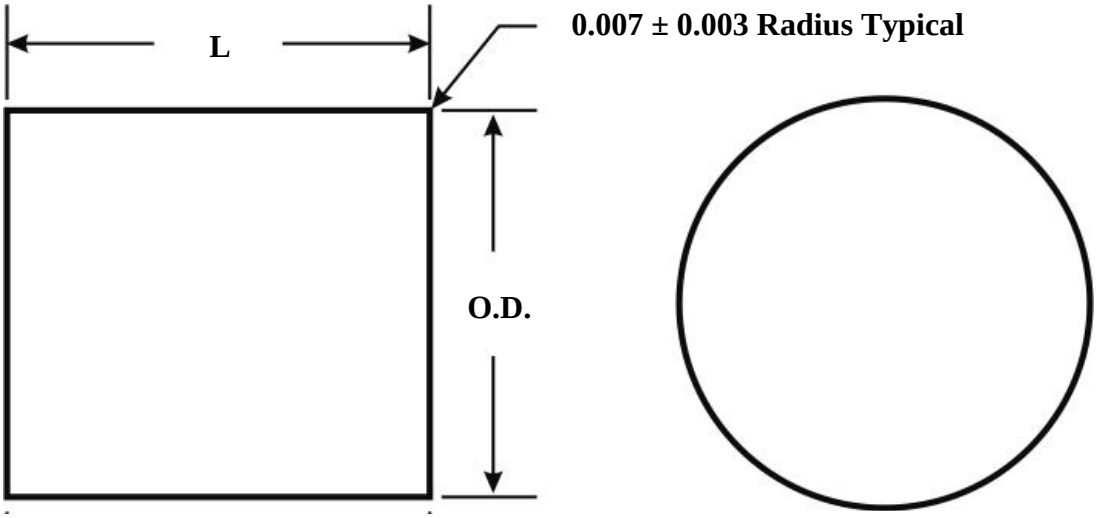


Figure 1 – Right Circular Cylinders

Table III – Right Circular Cylinders

Weight (Grains)	* Outside Diameter (OD) (inches)	Length (L) (inches)
2 ± 0.10	0.111 ± 0.001	0.111
4 ± 0.15	0.134 ± 0.001	0.147
16 ± 0.5	0.219 ± 0.001	0.221
64 ± 1.0	0.344 ± 0.001	0.355

Notes:

1. * O.D. is nominal diameter of drill rod as furnished.
2. Adjust Length (L) to meet the indicated weight (grains).
3. Material is AISI 4340 heat treated to Rockwell "C" hardness of 29 ± 2.

APPENDIX C – REQUIREMENTS AND VERIFICATIONS

Table I – Requirements and Verifications

Characteristic	Requirement Paragraph	Verification Paragraph	First Article	Conformance
Design	3.3	4.2, 4.3, 4.4	X	COC
Pieces cut from Patterns	3.3.1	4.4, 4.5	X	X 3/
Seams and stitching	3.4, 3.4.1	4.5, 4.5.1, 4.5.2, Appendix C Table IV	X	X 3/
Outer cover Camouflage Material:				
Weight	3.2.1, 3.3.2	ASTM D-3776, Option B or C	X	COC
Camouflage Pattern Execution	3.2.1, 3.3.1.1, 3.3.1.2	4.1.1, 4.5.12	X	COC
Fungus Resistance	3.2.1, 3.5.3	4.5.8	X	COC
Infrared Reflectance	3.2.1, 3.5.2	4.5.9	X	COC
Flame Resistance	3.2.1, 3.5.4	4.5.14	X	COC
Colorfastness				
- Laundering, 3 cycles	3.2.1, 3.5.6	AATCC 61 Option A	X	COC
- Light Exposure	3.2.1, 3.5.6	AATCC 16, Option 1 or 3	X	COC
- Crocking	3.2.1, 3.5.6	AATCC 8	X	COC
- Frosting	3.2.1, 3.5.6	AATCC 119	X	COC
- Perspiration acid and Alkaline	3.2.1, 3.5.6	AATCC 15	X	COC
Breaking Strength	3.2.1, Appendix A, Table I	ASTM D-5034, G-E or G-T	X	COC
Dimensional Stability	3.2.1, Appendix A, Table I	AATCC 96, Option 1C, A	X	COC
Abrasion Resistance	3.2.1, Appendix A, Table I	ASTM D-3884 1/	X	COC
Water Repellency	3.2.1, Appendix A, Table I	AATCC 22	X	COC
Hydrostatic Resistance	3.2.1, Appendix A, Table I	4.5.11, AATCC 127	X	COC
Dynamic Absorption	3.2.1, Appendix A, Table I	AATCC 70	X	COC
Resistance to Organic Liquids	3.2.1, Appendix A, Table I	AATCC 118	X	COC
Outer cover Spacer Mesh				
Colorfastness				
- Laundering, 3 cycles	3.2.2, 3.5.6	AATCC 61 Option A	X	COC

Table I – Requirements and Verifications (continued)

Characteristic	Requirement Paragraph	Verification Paragraph	First Article	Conformance
- Accelerated Laundering	3.2.2, 3.5.6	4.5.10	X	COC
- Light Exposure	3.2.2, 3.5.6	AATCC 16, Option 1 or 3	X	COC
- Crocking	3.2.2, 3.5.6	AATCC 8	X	COC
- Frosting	3.2.2, 3.5.6	AATCC 119	X	COC
- Perspiration acid and Alkaline	3.2.2, 3.5.6	AATCC 15	X	COC
Shade	3.2.2	4.5.12	X	COC
Weight	3.2.2, Appendix A, Table II	ASTM D-3776	X	COC
Abrasion Dry (Martindale)	3.2.2, Appendix A, Table II	SATRA TM31-A	X	COC
Tear Strength	3.2.2, Appendix A, Table II	ASTM D-2261	X	COC
Tensile Strength	3.2.2, Appendix A, Table II	ASTM D-5034	X	COC
Melting Temperature	3.2.2, Appendix A, Table II	ASTM D-276, Sec 26-31	X	COC
Insert Cover Material:				
Weight	3.2.3	ASTM D-3776, Option B or C	X	COC
Fungus Resistance	3.2.3, 3.5.3	4.5.8	X	COC
Colorfastness				
- Laundering, 3 cycles	3.2.3, 3.5.6	AATCC 61 Option A	X	COC
- Accelerated Laundering	3.2.3, 3.5.6	4.5.10	X	COC
- Light Exposure	3.2.3, 3.5.6	AATCC 16, Option 1 or 3	X	COC
- Crocking	3.2.3, 3.5.6	AATCC 8	X	COC
- Frosting	3.2.3, 3.5.6	AATCC 119	X	COC
- Perspiration acid and Alkaline	3.2.3, 3.5.6	AATCC 15	X	COC
Shade	3.2.3	4.1.1, 4.5.12	X	COC
Breaking Strength	3.2.3, Appendix A, Table III	ASTM D-5034, G-E or G-T	X	COC
Dimensional Stability	3.2.3, Appendix A, Table III	AATCC 96, Option 1C, A	X	COC
Abrasion Resistance	3.2.3, Appendix A, Table III	ASTM D-3884 1/	X	COC

Table I – Requirements and Verifications (continued)

Characteristic	Requirement Paragraph	Verification Paragraph	First Article	Conformance
Water Repellency	3.2.3, Appendix A, Table III	AATCC 22	X	COC
Hydrostatic Resistance	3.2.3, Appendix A, Table III	4.5.11, AATCC 127	X	COC
Dynamic Absorption	3.2.3, Appendix A, Table III	AATCC 70	X	COC
Resistance to Organic Liquids	3.2.3, Appendix A, Table III	AATCC 118	X	COC
Elastic Webbing:				
Fungus Resistance	3.2.6.2, 3.5.3	4.5.8	X	COC
Infrared Reflectance	3.2.6.2, 3.5.2	4.5.9	X	COC
Colorfastness				
- Laundering, 3 cycles	3.2.6.2, 3.5.6	AATCC 61 Option A	X	COC
- Light Exposure	3.2.6.2, 3.5.6	AATCC 16, Option 1 or 3	X	COC
- Crocking	3.2.6.2, 3.5.6	AATCC 8	X	COC
- Frosting	3.2.6.2, 3.5.6	AATCC 119	X	COC
- Perspiration acid and Alkaline	3.2.6.2, 3.5.6	AATCC 15	X	COC
Width	3.2.6.2, Appendix A, Table IV	ASTM D-3774	X	COC
Thickness	3.2.6.2, Appendix A, Table IV	ASTM D-1777, Testing Option 2	X	COC
Weight	3.2.6.2, Appendix A, Table IV	ASTM D-3776, Option D	X	COC
Stretch	3.2.6.2, Appendix A, Table IV	4.5.13	X	COC
Armor Layer:				
Abrasion Resistance	3.6.1	4.5.15	X	COC
Ballistic Protection	3.7, Appendix B, Tables I and II	4.6	X	X 2/
Weight	3.3.2	4.5.6	X	X 2/
Thickness (Armor Layer)	3.6.1	ASTM D-1777, Testing Option 1	X	X 2/
Stiffness (Flexibility)	3.6.3	4.6.6	X	X 2/

Table I – Requirements and Verifications (continued)

Characteristic	Requirement Paragraph	Verification Paragraph	First Article	Conformance
Nape Pad End Item:				
Finished Measurements	3.3.4, Appendix A, Tables V and VI	4.5.2, 4.5.2.1	X	X 3/
Label	3.8.1	4.5.1, Appendix C, Table II	X	X 3/
Insertion Demonstration Verification	3.3.4	4.7.1	X	X 3/
Thickness (Nape Pad)	3.3.3	ASTM D-1777, Testing Option 1	X	X 2/
Use and Care Instruction	3.8.2	4.5.1, Appendix C, Table II	X	COC
Workmanship	3.4.4	4.5, 4.5.1, Appendix C, Table II	X	X 3/

1/ H-18 abrasive wheel with 500 gm load shall be used.
2/ LAT verification via Government Test Lab.
3/ LAT and COC shall be verified by the DCMA QAR via test, inspection, demonstration, or analysis on the end item assembly or lower level as appropriate. Supporting data shall be available for Government review. The Government reserves the right to inspect or test such items to verify the validity of the certification.

When laundering is required as part of another test, it shall be in accordance with 4.5.10.

Table II – End Item Visual Defects

Examine	Defect	Classification	
		Major	Minor
Cloth	Any hole (except drill hole), cut or tear.	101	
	Any exposed drill hole.		201
	Any abrasion marks, broken or missing yarns or multiple floats.	102	
	Any mend, darn or patch.	103	
	Needle Chews.	104	
Webbing or Tape	Any hole, cuts tears or smash.	105	
	Not firmly and tightly woven, edges frayed or scalloped.	106	
	Multiple floats.		202
	Abrasion mark, slub, or broken end or pick.	107	
	Ends not fused as required.		203
Fastener Tape	Any hole, cut or tear, hooks flattened, broken or missing, impairing function.	108	
Seams and Stitching:	Incorrect Style.	109	

Table II – End Item Visual Defects (continued)

Examine	Defect	Classification	
		Major	Minor
Open Seams	1/4 inch or less.		204
	More than 1/4 inch. NOTE: A seam shall be classified as an open seam when one or more stitches joining a seam are broken or when two or more consecutive skipped or runoff stitches occur.	110	
Raw Edges	More than 1/2 inch when securely caught in stitching. NOTE: Raw edges not securely caught in stitching shall be classified as open seams.		205
Seam & Stitch Type	Wrong seam or stitch type.	111	
Stitch Tension	Tension loose, resulting in loose bobbin or top thread.		206
	Excessively tight, resulting in puckering of material.		207
Bartacks/Boxstitch	Any bartack or boxstich omitted.	112	
	Any bartack or boxstich not as specified or not in specified location.		208
	Loose stitching, incomplete or broken.		209
Stitching Ends	Not secured as specified.		210
Thread Breaks, Skipped Stitches, or Run-Offs.	Thread breaks, two or more consecutive skipped stitches, or run-off stitches shall be classified as open seams if not over stitched as specified		211
Component & Assembly	Any area of ballistic insert layer bunched (i.e. does not lie flat).	113	
	Any component part omitted or not as specified (unless otherwise classified herein).	114	
	Needle Chews.	115	
	Any mend, darn, patch, holes, splice or other unauthorized repair.	116	
Location Markings	Drilled.	117	
	Printed marking more than 1/32 inch in width or location marking not covered by component part		212
Label	Missing, incorrect, illegible.	118	
Use & Care Pamphlet	Omitted, printing or figures illegible, any page missing.		213

Table III – End Item Dimensional Examination

Examine	Defect	Classification	
		Major	Minor
Dimensional (overall)	Smaller than nominal dimensions and tolerance less applicable minus tolerance indicated, but not smaller than nominal dimensions less twice the applicable minus tolerance.		200
	Larger than nominal dimensions plus applicable plus tolerance but not larger than nominal dimensions plus twice applicable tolerance.		215
	Smaller than nominal dimensions indicated and less twice the applicable minus tolerance.	119	
	Larger than nominal dimensional indicated and twice the applicable plus tolerance.	120	
Component and Location Dimensions	Not within specified tolerance.		216
Stitch Margin or Gage	Not within specified tolerance.		217
Box, Box-X and stitching	Dimensions not within specified tolerance.		218
Fastener tape, or webbing	Not spaced within specified tolerance		219
Insert	Not able to be removed; or Insert material not completely sealing Armor Layer with minimum 1/8 inch.	121	

Table IV – Construction

Operation	Stitch Type	Seam Type	Seam allowance (in)	S.P.I.
Finishing Outer cover Edges				
a. Overlock edge of Outer cover Camouflage Panel B.	504	SSa-1	1/4	6-10
b. Fold edge of Outer cover Camouflage Panel B at 1/2 inch from edge.				
c. Stitch folded edge of Outer cover Camouflage Panel B at 1/4 inch from edge.	301	Efa-1	1/4	8-10
d. Double fold straight edge of Outer cover Camouflage Panel A at 1/2 inch from edge (1 inch total), insert Label in center of seam back side to back side				
e. Double stitch Outer cover Camouflage Panel A edge at 1/8 inch and 3/8 inch from edge (1/4 inch between stitches)(if a double needle machine in used, 5/16 inch between stitches is also acceptable with 1/8 inch from edge).	301	Efb-2	1/8	8-10

Table IV – Construction (continued)

Operation	Stitch Type	Seam Type	Seam allowance (in)	S.P.I.
Creating Fixator Strap				
a. Hem ends ½" of Fixator and stitch ¼" from edge. b. Hem sides of Fixator ½" and stitch ¼" from edge. Fold Fixator Strap in center, long-ways, and stitch at ¼" from edge.	301	SSa-1 SSc-1 SSa-1	1/4	8-10
b. Position 1-1/2 in hook and loop tapes IAW patterns, sew to Fixator Strap at 1/8 inch from edges.	301	SSc-1 OSf-1 SSak-1 SSv-1	1/8	8-10
Positioning Attachments on Outer Panel				
a. Position Fixator Strap on Outer cover Camouflage Panel A IAW positional markings on Outer cover Camouflage Panel A. Stitch above the top and underneath the bottom of the hook tape IAW patterns. Put three stitch lines in each case.	301	SSbd-1	-	8-10
Elastic Strap Placement				
a. Position elastic strips side to side with hook tape and Fixator Strap, aligning center lines.				
b. Bartack upper and lower edges of elastic strips in relevance to Fixator Strap. Distance between upper and lower bartacks shall be 1-5/8 inch. Backtack 0.945" x 0.118 in	Bartack	-	-	42 stitches
Creating Outer Cover				
a. Align two front pieces according to the positional markings with Outer cover Camouflage Panel A overlapping Outer cover Camouflage Panel B at notches.				
b. Align Outer cover Spacer Mesh Panel with front pieces front side to front side according to notches.				
c. Stitch parts together at 1/4 inch from edge.	301	SSa-1	1/4	8-10
d. Overlock unfinished hem of outer cover	504	SSa-1	1/4	6-10
Armor Layer				
a. Stack armor layers. Stitch together 0.2 to 0.5 in from edge.	301	SSA-1	0.2-0.5	5-8

APPENDIX D – BALLISTIC PERFORMANCE VERIFICATION

FIRST ARTICLE TESTING PROTOCOL

Nape Pad First Article testing shall be conducted in accordance with paragraph 4.6 and the following:

First Article Test Matrix

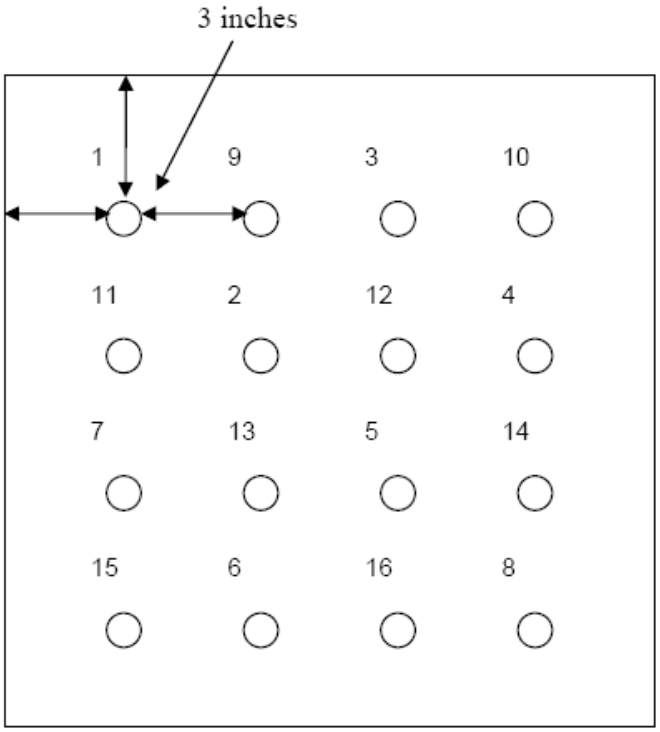
TEST	Frag, 2gr	Frag, 4gr	Frag, 16gr	Frag, 64gr	FSP, 17gr	9mm Handgun	Need	Spec Para
V_{50}, dry, 0°	X	X	X	X	X		5 shoot pack	3.7.1 4.6.1
V_{50}, wet, 0°	X	X	X	X			4 shoot pack	3.7.1 4.6.2.1
V_{50}, dry, 45°	X	X	X	X			8 shoot pack	3.7.1
V_{50}, high T			X				1 shoot pack	3.7.1 4.6.2.2
V_{50}, low T			X				1 shoot pack	3.7.1 4.6.2.2
V_{50}, Accelerated aging			X				1 shoot pack	3.7.1 4.6.2.3
V_{50}, POL oil			X				1 shoot pack	3.7.1 4.6.2.4
V_{50}, POL gas			X				1 shoot pack	3.7.1 4.6.2.4
V_{50}						X	1 shoot pack	3.7.2
V_0						X	1 shoot pack	3.7.2
Contingency							8 shoot pack	3.7.1
Total							32 shoot pack	

FAT Testing Instruction:

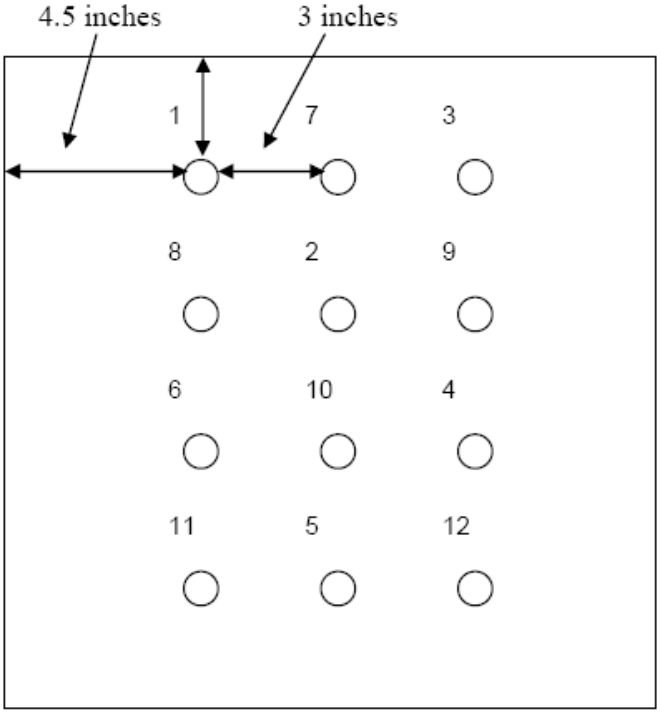
For all V_{50}, shot patterns as specified below. Starting velocity shall be approximately 100 fps above required minimum V_{50}. Follow up & down procedure as specified in MIL-STD-662F.

Diagram I. First Article Test Shot Patterns

0 degree obliquity
16 shots



45 degree obliquity
12 shots



LOT ACCEPTANCE TESTING PROTOCOL

Nape Pad Lot Acceptance Test Matrix:

Lot Size	**Threat**	**Required Test Articles***	**Required Data Points**	**Requirement**
≤ 35,000	17 grain FSP	26	60	≥ 1850 ft/s
35,001 - 500,000		42	96	
≥ 500,001		65	150	

*Required test articles have contingency samples built in.

APPENDIX E – NAPE PAD FIGURES

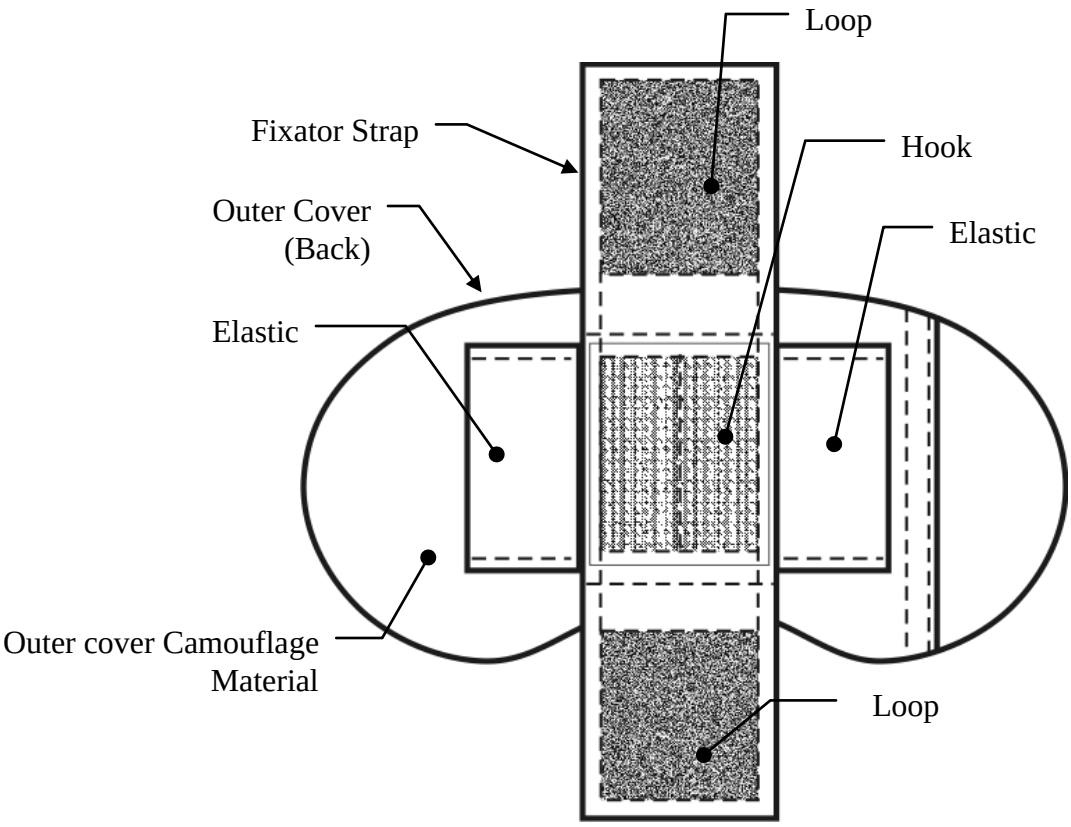


Figure 1A – Outer Cover Back – Fixator Strap Open

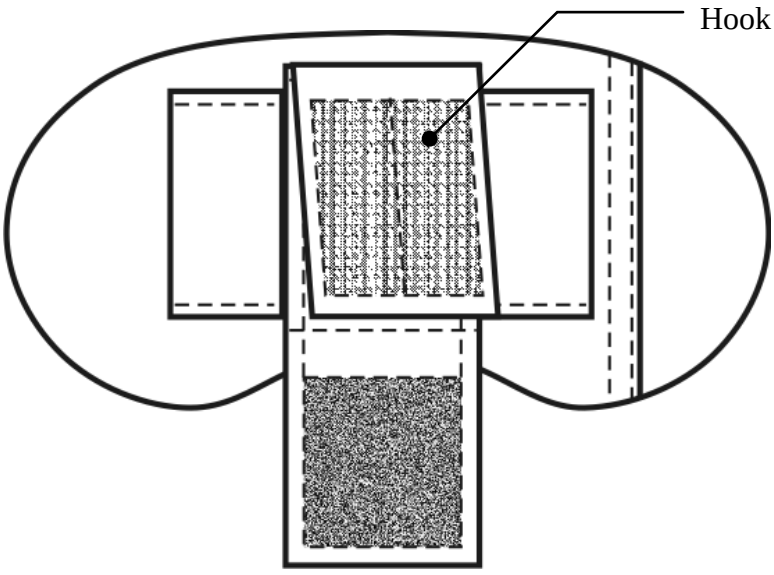


Figure 1B – Outer Cover Back – Fixator Strap Partially Closed

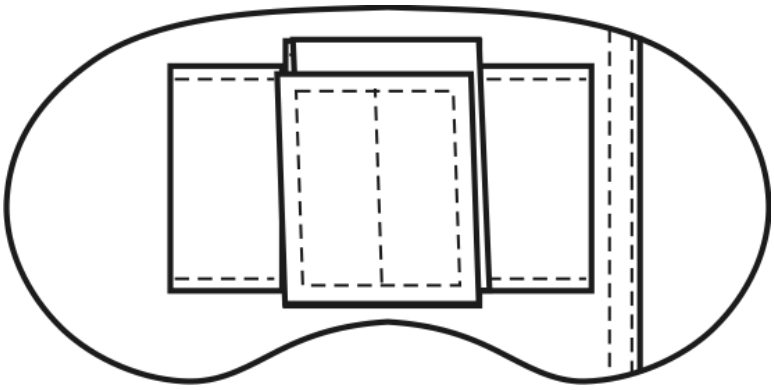


Figure 1C – Outer Cover Back – Fixator Strap Closed

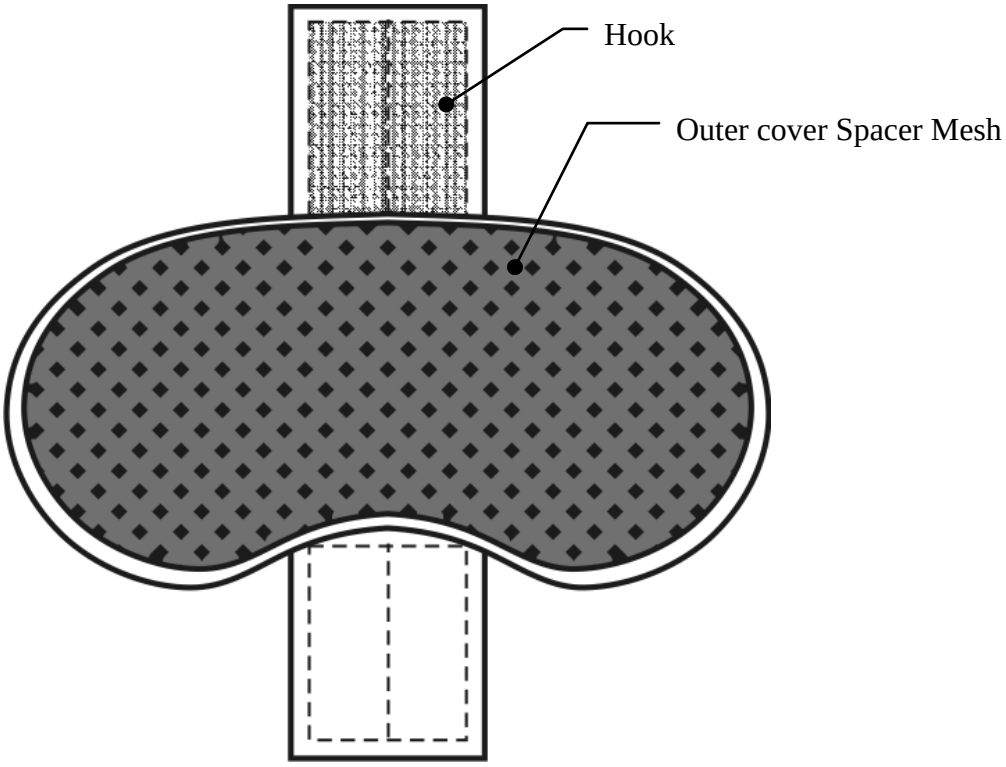


Figure 1D – Outer Cover Front

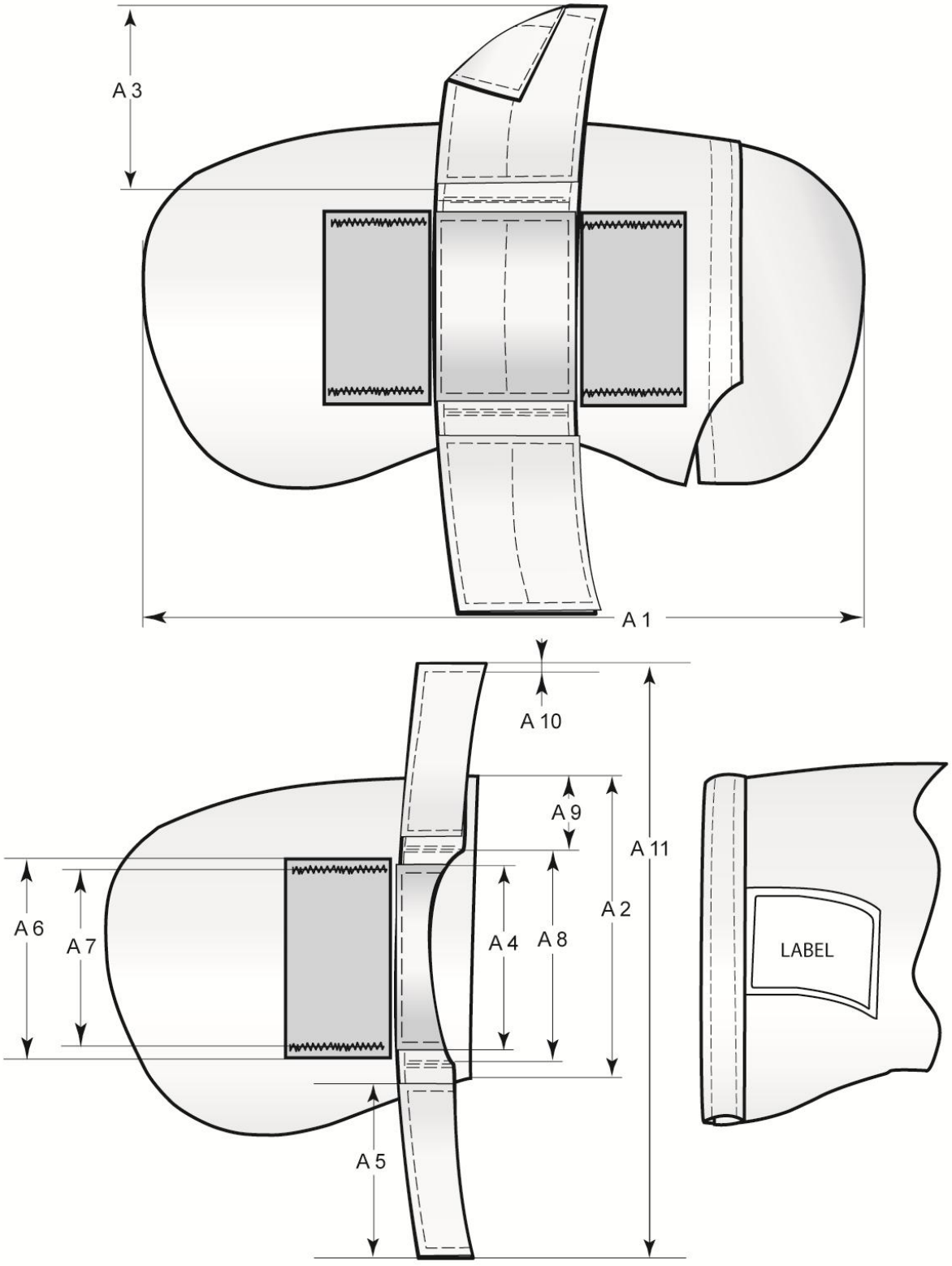


Figure 2 – Outer Cover Finished Dimensions

Note: Corresponding dimensions can be found in Appendix A, Table V.

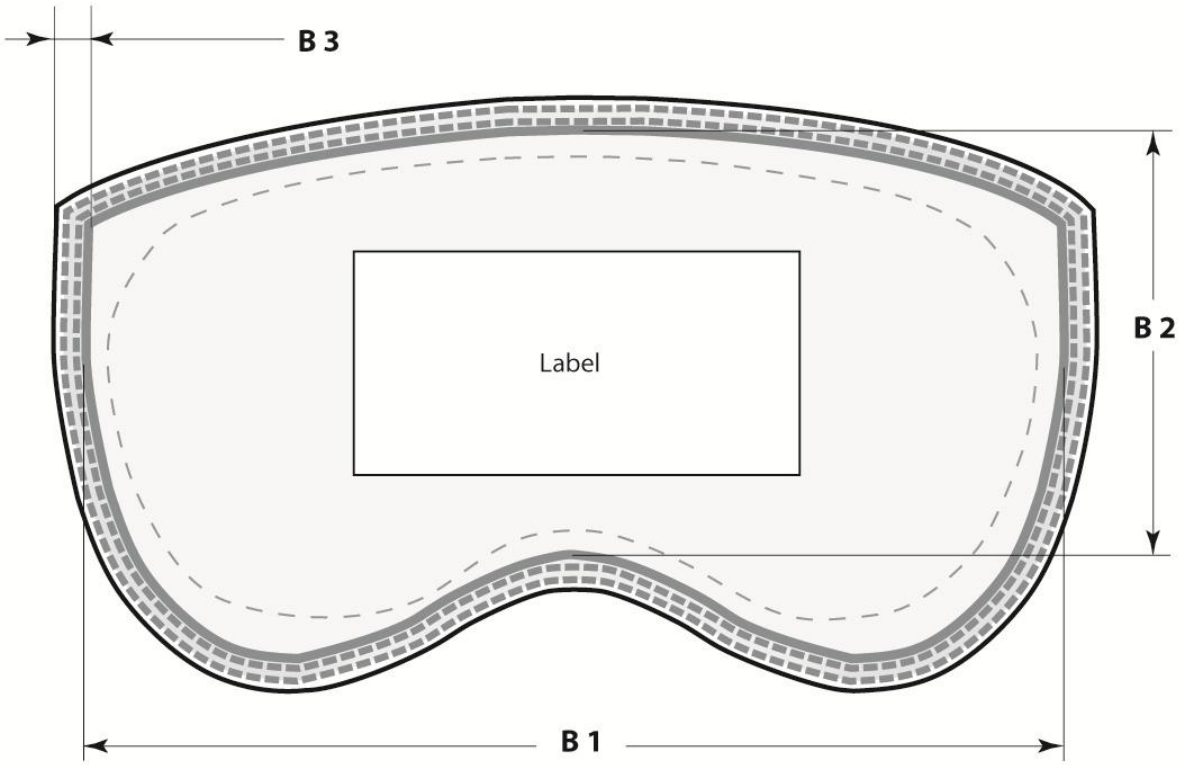
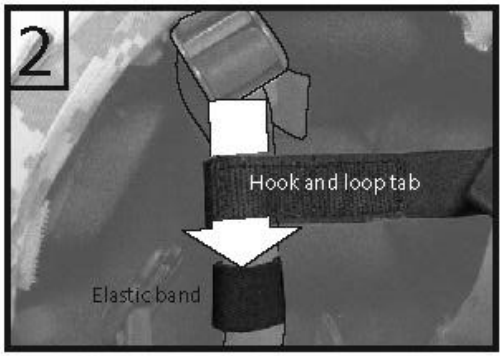


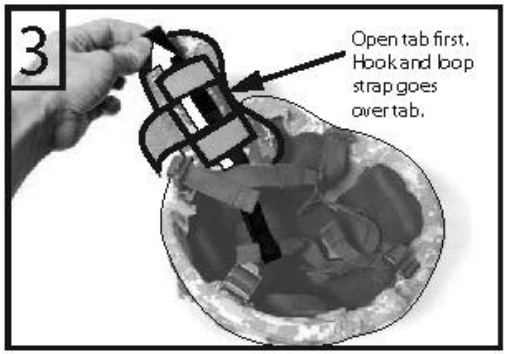
Figure 3 – Insert Finished Dimensions

Note: Corresponding dimensions can be found in Appendix A, Table VI.

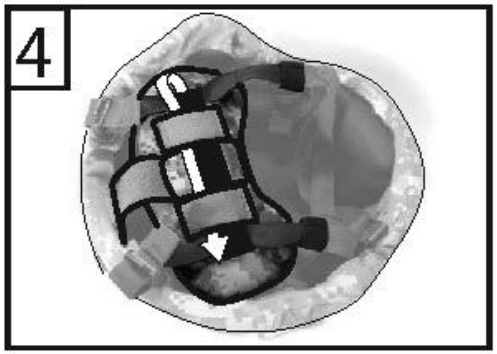
APPENDIX F – USE AND CARE PAMPHLET



2. Make sure elastic bands are moved below hook and loop strap as shown.

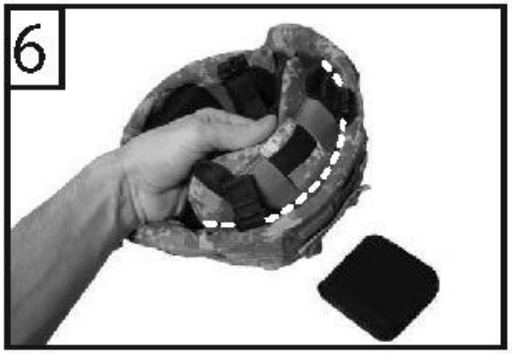


3. Orient Nape Pad so that camouflage side faces out and mesh side faces the wearer. Open hook and loop tab as shown. Install Nape Pad on hook and loop strap as shown. (Note orientation of Nape Pad)

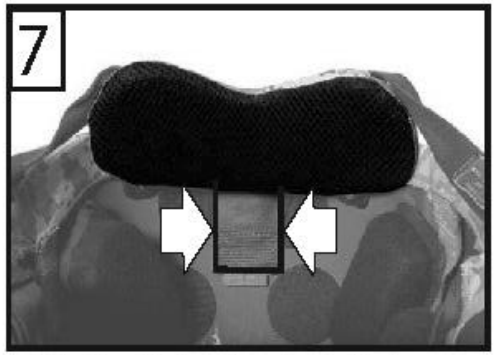


4. Thread free end of hook and loop strap around chin strap webbing and back through Nape Pad elastic loops.

5. Remove rear trapezoidal comfort pad and set it aside.

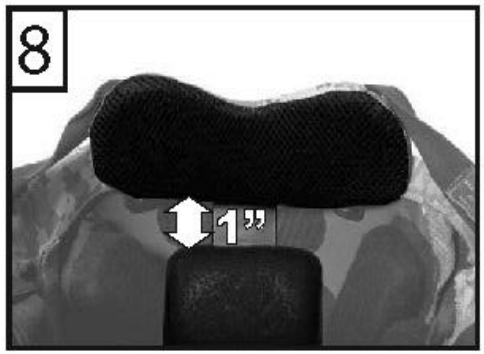


6. Slide Nape Pad toward ACH shell until shell and Nape Pad overlap by approximately ½".



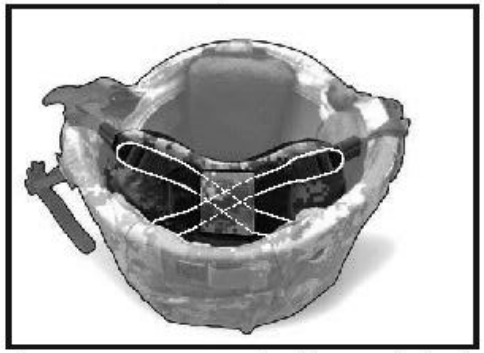
7. With Nape Pad overlapping shell edge, press hook and loop tab against interior of shell to secure it as shown.

Figure 1 - Instructions (inside of sheet)



8. Reinstall rear comfort pad, positioning it so there is approx. 1" of space between Nape Pad and rear comfort pad as shown. (This allows Nape Pad to retract into the ACH shell when you arch your neck back. Adjust this spacing to suit your specific needs.)

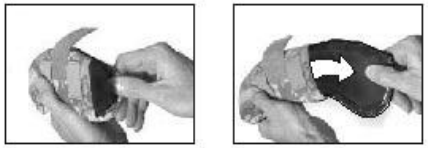
For X-Style Straps:



Place intersecting parts of webbing under hook and loop tabs of Nape Pad and orient Nape Pad as shown above. Secure hook and loop tabs over webbing. Proceed directly to step 8.

CARE INSTRUCTIONS

1. Do not machine wash or dry any parts.
2. To clean: Remove soft ballistic panel from outer fabric carrier through opening in carrier as shown.



3. Clean soft ballistic panel by wiping exterior with a moistened sponge or cloth. (Do not submerge ballistic panel in water. If panel becomes wet, allow to air dry away from direct heat or sunlight.)
4. Hand wash carrier in cold or warm water, using ONLY mild detergent or soap.
5. Rinse carrier in clean, warm water.
6. Air dry indoors or in shade, away from heat sources.
7. Once clean and dry, re-insert ballistic panel into carrier through opening in carrier, insuring that the label on the ballistic panel faces toward wearer.
8. Do not attempt to dye item to fix discolorations.

TURN IN YOUR NAPE PAD IF:

1. It has been hit by a bullet or fragment.
2. The carrier is torn or damaged beyond repair.
3. The soft armor is bunched and cannot be flattened.
4. The hook and loop tab no longer securely attaches the Pad to the helmet.
5. The elastic is torn beyond repair.
6. The carrier can no longer be adequately cleaned or is discolored.
7. The soft armor panel has been saturated with any chemical.

Pad, Advanced Combat Helmet, Nape

8415-01-568-1028 Small/Medium/Large
8415-01-568-1023 Extra-Large/Extra-Extra-Large

INSTALLATION INSTRUCTIONS

Your Nape Pad is designed to help protect against fragments from ground-level threats, while adding stability to your helmet- all with as little added weight and bulk as possible.

For H-Style Straps:

1. Remove existing ACH nape pad by unfastening the hook and loop strap that holds existing nape pad to chin strap as shown above.

Figure 2 - Instructions (outside of sheet)