10 FEBRUARY 2011

PERFORMANCE SPECIFICATION
BODY ARMOR SYSTEM, COMBAT VEHICLE CREWMAN (BASC)

1. SCOPE

1.1 Description. This purchase description provides for a multiple threat body armor system consisting of a base vest and modular components for tailoring protection levels to defeat multiple ballistic hazards across the battlefield continuum and manage armor weight. The Body Armor, Combat Vehicle Crewman (BASC) is a critical safety item. This specification delineates system, subsystem, component, and subcomponent level performance requirements to accomplish the end item body armor performance (see paragraph 6.1). The BASC is functionally integrated with the Pouch Attachment Ladder System (PALS).

1.2 Classification. Expected BASC components: base vest assembly, throat, yoke and collar assembly, lower back protector assembly, groin protector assembly, cummerbund assembly (if used), Enhanced Small Arms Protective Insert (ESAPI) plate pockets (front, back, side) and small arms protective inserts. The BASC will be issued separately as three subsystems. This performance specification is limited to the first of the following three subsystems:

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: Trevor Scott, (508) 233-5580, DSN 256-5580, trevor.scott2@us.army.mil, US Army Natick Soldier RDEC Kansas Street, Natick, MA 01760

A) The BASC subsystem; projected as consisting of the base vest assembly, throat, yoke and collar assembly, lower back protector assembly, groin protector assembly, cummerbund assembly (if used), ESAPI plate pockets (front, back, side).

COMPONENT
Base Vest Assembly
Yoke and Collar Assembly
Throat Protector
Lower Back Protector Assembly
Groin Protector Assembly
Cummerbund Assembly (if used)
ESAPI Plate Pockets

B) The Small Arms Protective Inserts (SAPI) subsystem; consisting of one set of Ballistic Plates to be used with the BASC.

COMPONENT	SIZES
SAPI	5 sizes; X-Small, Small, Medium, Large, X-Large

C) The Enhanced Side Small Arms Protective Insert (E-SSAPI); consisting of one set of E-SSAPI.

COMPONENT	SIZES
Enhanced Side SAPI (E-SSAPI)	One size

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this performance 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).

SPECIFICATIONS
DEPARTMENT OF DEFENSE

MIL-DTL-32075 - Label: For Clothing, Equipage, and Tentage (General Use).

MIL-PRF-5038	- Tape, Textile and Webbing, Textile, Reinforcing Nylon
MIL-PRF-63460	- Lubricant, Cleaner and Preservative for Weapons and Weapons Systems (Metric)
CO/PD 00-03	- Small Arms Protective Inserts (SAPI)
CO/PD 05-02	- Improved, Small Arms Protective Inserts (ISAPI)
CO/PD 04-19	- Enhanced, Small Arms Protective Inserts (ESAPI)
FQ/PD 07-03	- X Small Arms Protective Inserts (XSAPI)
CO/PD 06-20	- Enhanced Side Ballistic Insert (ESBI)
A-A-55301	- Webbing, Textile Textured or Multi-Filament
A-A-55126	- Fastener Tape, Hook and Pile, Synthetic
MIL-W-4088	- Webbing, Textile Woven Nylon
MIL-C-43734	- Cloth, Duck, Textured Nylon
MIL-STD-662F	- V50 Ballistic Test for Armor
MIL-STD-3027	- Performance Requirements and Testing of Body Armor
MIL-DTL-46593B	- PROJECTILE, CALIBERS .22, .30, .50, AND 20 mm FRAGMENT-SIMULATING
MIL-W-17337	- Webbing, Textile, Woven Nylon
A-A-59826	- Thread, Nylon
MIL-DTL-508	- Cloth, Oxford, nylon, 3 Ounce
MIL-STD-810	- Environmental Engineering Considerations and Laboratory Tests
MIL-C-7020	- Cloth, Parachute, Nylon Rip-Stop and Twill Weave
MIL-E-20652	- Eyelets, Metallic, Rolled Flange Type; and Eyelet Washer
MIL-F-10884	- Fasteners, Snap
MIL-W-5664	- Webbing, Textile Elastic

(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).

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.

MANUALS

TM 10-8400-203-23 General Repair Procedures for Individual Equipment; Chapter 25, Maintenance of Interceptor Body Armor System
GSA Federal Standardization Manual 2000

TEST OPERATING PROCEDURES

USATECOM ITOP 4-2-805 Projectile Velocity and Time of Flight Measurements

Requests for above may be addressed to Defense Technical Information Center (DTIC), 8725 John J. Kingman Road, Suite 0944, Ft. Belvoir, VA 22060-6218, (703) 767-8274, http://stinet.dtic.mil/, or msorders@dtic.mil

(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.)

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.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC Method 8	- Colorfastness to Crocking; AATCC Crockmeter Method
AATCC Method 15	- Colorfastness to Perspiration
AATCC Method 16	- Colorfastness to Light
AATCC Method 22	- Water Repellency; Spray Test
AATCC Method 61	- Colorfastness to Laundering, Home and Commercial: Accelerated
AATCC Method 70	- Water Repellency: Tumble Jar Dynamic Absorption Test
AATCC Method 96	- Dimensional Changes in Commercial Laundering of Woven and Knitted Fabrics except Wool
AATCC Method 118	- Oil Repellency: Hydrocarbon Resistance Test
AATCC Method 119	- Color Change Due to Flat Abrasion (Frosting): Screen Wire Method
AATCC Method 127	- Water Resistance: Hydrostatic Pressure Test
AATCC Procedure 1	- Gray Scale for Color Change
AATCC Procedure 2	- Gray Scale for Staining

(Applications for copies should be addressed to the American Association of Textile Chemists and Colorists, PO Box 12215, Research Triangle Park, NC 27709-2215 or www.aatcc.org).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D-204	- Sewing Threads
ASTM D-1388	- Stiffness of Fabrics
ASTM D-1424	- Tearing Strength of Woven Fabrics by Falling-Pendulum Type (Elmendorf) Apparatus
ASTM D-1683	- Failure in Sewn Seams of Woven Fabrics
ASTM D-1693	- Standard Practice for Stitches and Seams
ASTM D-1777	- Standard Method for Testing Thickness of Textile Materials
ASTM D-3575	- Materials, Flexible Cellular, Made From Olefin Polymers
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-4485	- Standard Specification for Performance of Engine Oils
ASTM D-5034	- Breaking Force and Elongation of Textile Fabrics (Grab Test)
ASTM D-6193	- Standard Practice for Stitches & Seam

ASTM G21-90 - Test Methods for Evaluation of Effect of Fungi on Synthetic Polymeric Materials

(Applications for copies should be addressed to ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959 or www.astm.org)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
ANSI/ASQ Z1.4-2003 - Sampling Procedures and Tables for Inspection by Attributes

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
International Standard 11092: 1993 - Measurement of thermal and water vapor resistance under steady state conditions

(Applications for copies should be addressed to the American National Standards Institute, 25 West 43rd Street, 4th Fl., New York, New York, 10036, Tel: (212)642-4900, Fax: (212)398-0023, http://www.ansi.org).

2.4 Order of Precedence. 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 Test and Lot Acceptance Test. When specified, complete BASC samples, unless otherwise stated, representing full production quality, shall be subjected to First Article Testing (FAT) in accordance with 4.2 and Lot Acceptance Testing (LAT) in accordance with 4.3.

3.2 Materials and Components. The materials and components shall conform to applicable specifications, standards, and patterns (see paragraph 3.3) required herein.

3.2.1 Cloth Outer and Inner Shell. The cloth(s) utilized to fabricate the outer shell and inner shell shall be made from lightweight, durable, synthetic cloths meeting the characteristics outlined in Appendix A, Table I when tested as specified in paragraph 4.5 (Appendix C, Table I). Color: Coyote 498.

3.2.1.1 Weight of Finished Fabric. The weight of the finished outer shell fabric shall be no greater than 12.0 oz/ yd^2. The weight of the finished middle and inner shell fabric shall be no greater than 8.0 oz/yd^2.

3.2.2 Cloth Collar, Throat Protector, and Front Vest Inner Liner Material. The material next to the skin shall be highly abrasion resistant, non-abrasive to skin, pliable to enable the collar to roll down, resistant to oil penetration and dry rot and able to remove oils when cleaned. The cloth shall be similar in performance to MIL-C-508, Oxford, Nylon, 3 oz. Type I, Class 3. Color: Coyote 498.

3.2.3 Cloth Ballistic Panel Cover. Ballistic panel cover shall be similar to 70 Denier 1.9 oz. Nylon Ripstop. Color: Coyote 498.

3.2.4 Webbing and Tapes. Webbings and tapes shall be heat cut smooth with no burrs or residual melt. Color: Coyote 498.

3.2.4.1 Matching, Webbing. The color of the webbing shall match the solid Coyote 498 shade BASC outer shell standard sample when viewed under filtered tungsten lamp which approximates artificial daylight having a correlated color temperature of 7500 ± 200K, with illumination of 100 ± 20 foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2300 ± 200 K.

3.2.5 Webbing, Elastic. Elastic webbing shall be heat cut smooth with no burrs or residual melt. Color: Coyote 498.

3.2.5 Fasteners, Hook and Loop. Hook and loop fasteners shall conform to A-A-55126, Type II, Class 1 or Class 4. Color: Coyote 498.

3.2.6 Thread. Thread, Nylon, Bonded, Size E or Size F, A-A-59826, Type II, Class A, as required. Color: Coyote 498.

3.2.7 Buckle. Any buckle must be user reparable without tools. Color: Coyote 498. Spectral reflectance requirements shall be in accordance with paragraph. 3.4.5 (Appendix A, Table III) when tested in accordance with paragraph 4.5.10.

3.2 Design. The BASC model mounted/dismounted system is a modular vest protecting the upper torso from multiple ballistic threats which is easily configured to defeat predicted mission threat at a minimum system weight. The BASC subsystem is expected to consist of the following: (1) one base vest assembly made up of an outer shell base vest carrier with a ballistic insert set made up of removable ballistic inserts; (2) one yoke and collar assembly with non-removable ballistic inserts; (3) one throat protector which attaches to the front base vest and collar with non-removable ballistic insert; (4) one groin protector assembly made up of a groin protector carrier with non-removable ballistic insert; (5) one lower back protector assembly made up of a lower pack protector carrier with non-removable ballistic insert; (6) one cummerbund assembly (if used); (7) ESAPI plate pockets (front, back, side). The BASC provides protection from conventional fragmenting munitions and multiple hits from 9mm sub-machine gun (SMG) rounds. The SAPI subsystem consists of a set of interchangeable, sized, and contoured plates inserted into front and back pockets inside the BASC to provide vital organs protection against multi-hits of small arms rifle bullets and indirect fire flechettes. The Side SAPI subsystem consists of a set of interchangeable, contoured plates inserted into the side plate pockets and shall be worn inside the left and right cummerbund panels if a cummerbund is used in the design. The BASC load bearing capability, shall be capable of accommodating the following minimum load: six (6) M-16/M-4 magazines, two (2) 9mm magazines, and one (1) Individual First Aid Kit (IFAK). The BASC must integrate with the issued USMC hydration system. It is desired that the BASC load bearing capability will be capable of integrating with the issued USMC Chest

Rig interfaces. It is also desired that if a cummerbund is used with the BASC Plate Carrier/load bearing capability that it incorporates the interfaces used in the Improved Modular Tactical Vest (IMTV) and USMC Plate Carrier (PC) cummerbund.

3.3 Patterns. Patterns will be required deliverable items as specified in the underlying solicitation and shall be incorporated into this specification for source selection evaluation purposes. A successful offeror's patterns will be the metric against which required FAT and subsequent production lots will be compared to. Working patterns shall consist of a complete set of patterns constructed utilizing a commercially available computer aided design (CAD) format. The working patterns shall be a nested set of patterns for all sizes required in the tariff, include the size, directional lines, placement marks, notches, authorized seam allowances, all annotation labeling internal locations and an associated table of operations in sufficient detail to allow the manufacture of the BASC and its components by a third party. Files to be included in the set will be a master pattern model, grade rule table and annotation file. Baseline patterns require a 3/8 inch seam allowance ±1/16 inch unless otherwise stated on patterns. Except for the ballistic panels, all the components of the vest shall be cut with a tolerance of ± 1/16 inch in accordance with the pattern parts indicated. The ballistic panels shall be cut with a tolerance of -0/+1/8 inch to ensure that the minimum required protective area of coverage is achieved. Drill holes are not permitted.

3.4 BASC System Performance Requirements. The following requirements apply to all components and subcomponents of the BASC in any of its potential configurations in accordance with paragraph 3.3.

3.4.1 Functional Integration. All BASC components shall be integrated for functional and physical interfaces for any BASC system configuration. All components within a size shall be fully interchangeable with every other system of the same size (i.e. a ballistic panel will fit into any BASC outer shell of the same size) with no degradation to performance. Any configuration of BASC in accordance with paragraph 3.3 shall be functionally integrated with any configuration of PALS components (see paragraph 4.4).

3.4.2 Fungus Resistance. All components and parts of the BASC, including interior components, shall be resistant to fungal growth. The visual grading shall be less than 2. All components shall show only trace or no susceptibility to fungal growth nor experience damage due to the presence of fungus spores or adjacent fungus growth (see paragraph 4.5.9).

3.4.3 Use and Care Instruction. An instruction pamphlet will be furnished by the developer with each body armor system. The instruction pamphlet will be printed on a durable man made, synthetic paper capable of continued use under harsh field conditions.

3.4.4 Camouflage. Appendix A, Table II outlines the camouflage for applicable components to reduce signature to an acceptable level (see paragraph 4.5.10).

3.4.5 Infrared Reflectance. The infrared reflectance for finished components and subcomponents specified in 3.2 shall conform to the requirements specified in Appendix A, Table IV initially

and after laundering when tested as specified in 4.5.10. Acetal hardware shall conform to infrared reflectance requirements in Appendix A, Table III.

3.4.6 Matching. The cloths shall match the standard (see paragraph 4.5.14).

3.4.7 Colorfastness. The finished cloth shall show fastness to laundering (after 3 cycles), light (after 40 standard fading hours or 170 kilojoules), and perspiration equal to or better than the standard sample or 3-4 of the AATCC Gray Scale for Color Change and Color Transfer for each of the pattern areas, except fastness to light shall be equal to or better than a rating of 3 for Color Change. The finished cloth shall show fastness to crocking equal to or better than the standard sample or shall have an AATCC Chromatic Transference Scale rating of not lower than 3-4 for all the pattern areas. The finished textile components shall meet the colorfastness requirements when tested as specified in paragraph 4.5 (Appendix C, Table I).

3.5 BASC Subsystem. See paragraph 3.3 for BASC configuration. The overall minimum area of ballistic coverage for the BASC Soft Armor Vest (SAV) and its ballistic components is defined as a range between 95% (threshold) and 105% (objective) of the area of coverage of the Outer Tactical Vest (OTV). Each size will be based on the individual design submissions and the associated ballistic area of coverage values shall be incorporated as Appendix A, Table IV-A when tested as specified in 4.5.6. Finished measurements for each size will be based on the individual design submissions and the values for each component shall be incorporated as Appendix A, Table IV-B through Table IV-H when inspected as specified in 4.5.2.

3.5.1 Ballistic Protection Levels. The BASC protection levels follow (see paragraph 4.1, 4.4, & 4.6):

a) BASC provides fragmentation protection from conventional fragmenting munitions (see paragraph 3.5.2.2).

b) BASC provides multi-hit sub-machine gun bullet protection for 9mm, 124 gr., Full Metal Jacket (FMJ) Remington projectile (see paragraph 3.5.2.3).

3.5.2 Ballistic Performance. The BASC ballistic material shall accomplish the ballistic characteristics specified in paragraphs 3.5.2.2, 3.5.2.2.1, and 3.5.2.3 as tested in paragraph 4.6.

3.5.2.1 Removable Ballistic Panel Subcomponent. Ballistic panels must be able to be inserted easily into the BASC base vest carrier. The ballistic panels shall be designed to prevent raveling and soiling, and to secure proper placement within the outer shell carrier to provide required ballistic protection to the individual wearing the item. The gap/ease between the outer shell carrier and panel shall be no greater than the ease necessary to allow proper installation of the ballistic soft armor inserts (see paragraph 4.5.1).

3.5.2.1.1 Ballistic Filler. The ballistic filler weight shall not exceed 1.10 lb/ft^2 with a maximum 0.30 inch thickness when tested as specified in 4.5.6 and 4.5.7. Weight reduction of the ballistic filler that exceeds 0.10 lb/ft^2 or more is desired. Except for ancillary components such as thread, the ballistic filler shall be made entirely of ballistic material. If ballistic filler is non-contiguous,

a minimum feathered overlap of 1 inch is required when fully extended during individual movements to maintain uniform ballistic protection.

3.5.2.1.2 Flexibility. The ballistic filler stiffness shall not exceed 225 cm-g when tested as specified in 4.6.6.

3.5.2.1.3 Abrasion Resistance. All adjacent layers within the ballistics material system shall demonstrate abrasion resistance against each other for a minimum of 2000 cycles when tested as specified in paragraph 4.5.14 (Appendix C, Table I). A rating ≥ 3 is required.

3.5.2.2 BASC Fragmentation Protection. The ballistic material system (see paragraph 3.5.2) shall provide consistent ballistic performance. All BASC components and base vest (see paragraph. 3.3) shall be made from the same approved ballistic package. Appendix B, Table I lists the required minimum V50 values for base vest assembly, and collar assemblies, lower back protector, groin protector, and side plate pockets at specified obliquity when tested with the Fragment Simulating Projectile (FSP) and Right Circular Cylinder (RCC) dry and wet (sea water).

Appendix B, Table I specifies minimum ballistic performance that shall be maintained after conditioning to hot and cold temperature, accelerated aging and POL contamination. Testing is specified in 4.6.

3.5.2.2.1 Yoke Fragmentation Protection. Additional ballistic filler sandwiched in the yoke carrier of the outer shell and lining shall not exceed 0.40 lb/ft^2 (max.) and 0.10 inch thickness (max.). The minimum V50 is outlined in Appendix B, Table II.

3.5.2.3 Sub-Machine Gun Protection. The ballistic material system shall be engineered to provide sub-machine gun protection at no added weight to the fragmentation material system. Table III in Appendix B outlines the ballistic material system minimum dry V50, and V0 acceptance for the 9mm, 124 gr., FMJ Remington projectile against 3 hits at 0 degree obliquity and 2 hits at 30 degree obliquity with maximum deformation when tested as specified in 4.6. Desired 9mm performance is required at no added material weight.

3.5.3 BASC Construction. The BASC shall be constructed in accordance with best commercial practices.

3.5.3.1 Hook and Loop Fastener. Hook and loop fasteners shall not be stitched in the selvage edge to prevent associated fraying and durability problems from repeated use (see 4.5). If Class 4 is used, the hook and loop fasteners shall be stitched 1/8 inch +1/16 from the edge.

3.5.3.2 Stitching. Stitching shall conform to ASTM D-6193, 9-10 stitches per inch. End of seams and stitches (stitch type 301) that are not caught in other seams or stitching shall be securely back tacked or back stitched. Thread breaks or bobbin run-outs occurring during sewing shall be secured by stitching back of the break a minimum of 1/2 inch. Thread tension shall be maintained so that there will be no loose stitching resulting in loose bobbin or top thread, or excessively high stitching resulting in puckering of the sewn materials. Thread ends shall be

trimmed to a length of not more that 1/4 inch.

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

3.5.3.4 Bartacks. No stitch run-off is allowed and no needle cutting by bartack. Double bartacks (one on top of the other) shall be avoided to prevent needle cutting and weakening of the attachment point. Bartack requirements are specified in Appendix A, Table IV-B when tested as specified in 4.5.

3.5.3.5 Bartack Alignment for Pouch Attachment Ladder System (if used). The required spacing of vertical bartacks which is needed for physical compatibility of PALS components on BASC is specified below.

a) Distance between vertical bartacks on horizontal webbing shall be 1 1/2 inch -0 / +1/16.

b) Distance between non-consecutive horizontal webbing shall be 1 1/8 inch ±1/16.

c) Vertical bartacks on consecutive horizontal webbing rows shall be vertical aligned with an offset of 3/4 inch -0 / +1/16 bottom to top in a vertical straight line.

3.5.3.6 Buttonholes. Buttonholes shall be straight cut. Position in accordance with the marks indicated on the pattern, with the ends of the buttonholes securely tacked. The use of buttonholes in lieu of grommets for drainage considerations is desired.

3.5.3.7 Extraction Strap. The extraction strap on the back of the BASC (all sizes) shall have a peak strength not less than 400 lbf (increased strength is desired) when tested in accordance with paragraph 4.8.

3.5.3.8 Binding. All ends of binding not completely encased are to be seared.

3.5.3.12 Drainage. The BASC base vest and side plate pockets shall provide a durable means to allow water in the vest to drain out quickly and easily.

3.5.3.13 Torso Adjustment. Torso adjustment to accommodate the 5th percentile female Marine to the 95th percentile male Marine shall provide the wearer a means to easily secure the vest to the torso. Adjustability shall not unduly increase associated snag hazards.

3.6 Size, Identification, and Instruction Label. Labels will be readable under low light conditions; moonlight and red or blue filtered flashlight. All labels shall be applied so that the text faces the body when worn. The label shall be permanently affixed (e.g. sewn). The label

shall be of sufficient strength to withstand repeated abrasion during field use and cleaning. Color: Tan 499.

The Content for labels can be found in Appendix E and shall include the following:

a) The BASC base vest component and ballistic panel subcomponent shall have a combination size, identification and serial number. Chest circumference for each size can be found in Appendix A, Table V.

b) The side plate pockets shall have a combination identification, serial number and instruction label.

c) The instruction label shall include "dos and don'ts" for use, cleaning instructions, and donning/doffing instructions for the entire BASC system.

d) The instruction label shall be located on the inside of the back carrier of the base vest. The type shall be no smaller than 10 point and shall be in accordance with MIL-DTL-32075, Type VI, Class 14.

e) The modular components; throat, yoke collar assembly, side plate pockets, lower back protector assembly and groin protector assembly are also labeled. Label size shall be at the option of the contractor governed by the contents and size of the characters of the inscription, space between lines, and as applicable blank margins on the sides of the labels.

f) All components containing ballistic armor shall be labeled with lot and serial number in addition to identification and size (as appropriate).

3.7 ESAPI Pockets (front, back, side). The BASC ESAPI pockets (front, back, side) shall ensure positioning of the bottom horizontal edge according to the Government patterns for proper organ coverage, and have enough ease to allow the SAPI subsystem to be easily and quickly inserted into and removed from the vest without struggle or force. The ESAPI pockets (front, back, side) shall not allow the insert to shift during user operation or due to the added weight of PALS-compatible components when attached to the outer shell (see paragraph 4.7.1 and 4.7.2).

3.8 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 items submitted to the government for acceptance shall comply 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 below where such inspections are deemed necessary to ensure the supplies conform to prescribed requirements.

a) FAT (see paragraph 4.2)

b) LAT (see paragraph 4.3)

4.2 First Article Test. When a FAT is required, it shall be examined for design (3.3), compatibility and interchangeability of components, inspection requirements in (4.5), ballistic data for all test conditions (4.6.1.1), data, certificate, or compliance for testing requirements (4.6, 4.7), and overall workmanship (Appendix C, Table I). The procuring activity may waive any test(s) when sufficient documentation already exists to verify compliance. This is encouraged in cases when additional models, or minor changes from the currently approved model, are to be verified. In these cases, FAT may be tailored.

4.2.1 Material Qualification. At any point after a FAT has been approved, any desired material change(s) must be submitted to the government via an Engineering Change Proposal (ECP) and may be subject to testing in accordance with the appropriate paragraph(s) of this Performance Specification. Changes to any material approved through FAT must be approved in writing by the government prior to presentation for inspection and acceptance.

4.2.2 Ballistic Qualification. At any point after a FAT has been approved, any proposed raw material, or process change to the ballistic package may be required to pass all ballistic FAT requirements as specified in paragraph 4.6. A requirement to conduct all or part of the FAT requirements laid out herein is at the discretion of the Contracting Officer and will be communicated to the contractor in writing. Any change to previously approved machinery, production methods, place of performance, subcontractors etc. is considered a process change.

4.3 LAT. LAT shall be performed in accordance with Sections 3 and 4 and in conjunction with Appendices A through D. The government's acceptance of the contractor's end item product will be determined by both the ballistic and non-ballistic requirements validation.

4.3.1 Certificate of Compliance (COC). COCs shall be provided when requested by the government. The government reserves the right to inspect any item, and conduct any test contained herein, to determine the validity of the certification.

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 qualitative values exist or are difficult to measure (Appendix C, Table I).

4.5 Requirements and Verifications. Appendix C, Table I delineates performance 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 complete vests, or front and back base vest panels, or individual components (when components are purchased separately).

4.5.2 End Item Dimensional Inspection. The end items shall be inspected for finished measurements against patterns provided. The lot size shall be expressed in units of complete vests or individual components, when components are purchased separately.

4.5.3 Reserved for Future Use

4.5.4 In-Process Visual Examination of Cut Parts, Fillers and Patterns. The cut parts for all BASC ballistic filler components shall be 100 percent inspected by the vendor during the cutting process to determine that parts containing defects are removed from production. Ballistic fillers shall be 100 percent inspected by the manufacturer during the assembly of the individual ballistic components to assure that they contain the correct number of plies, that no individual plies are pieced and they are marked correctly as to the size and number of plies. In addition to the above, inspection shall be made of working patterns to assure that they conform to baseline patterns in all respects. Whenever nonconformance is noted, correction shall be made to the item or items affected. Parts that cannot be corrected shall be removed from production.

4.5.5 In-process Visual Examination of Ballistic Filler Assemblies for Size. Appendix C, Table IV provides visual examination criteria for ballistic filler. The lot shall be expressed in units of discrete ballistic fillers (e.g. base vest ballistic fillers, side plate pocket ballistic fillers, groin protectors, lower back protectors, throat protectors and collar assemblies).

4.5.6 Area of Coverage. Square inches of coverage are measured by comparison of digitized patterns with working patterns.

4.5.7 Weight. The BASC subsystem will be examined for weight by component. Weights are taken on a tared scale and measured to the nearest 0.01 pound. Areal densities for FAT and Lot Acceptance Testing may be calculated from weights and measurements taken from shoot-packs submitted for ballistic testing. Instructions for shoot-pack measurement are outlined in Appendix D Instructions for Shoot-Pack Measurement. Units shall be expressed in lb/ft^2.

4.5.8 Thickness. Thickness is measured to the nearest 0.01 inch when measured under 0.5 psi when tested according to ASTM D-1777.

4.5.9 Fungus Test. Verification of compliance with the fungus requirement may be performed through the use of certified materials and coupon sampling. A fungus test may be performed on all non-certified materials. Tests will be performed in accordance with Method 508.4 of MIL-STD-810. A sample of each non-certified material may be placed in the fungus test chamber for 28 days.

4.5.10 Infrared Reflectance. Spectral reflectance shall be evaluated initially and after laundering in accordance with Appendix A, Table III. The accelerated laundering shall be performed using AATCC 61 Opt 1 except; a 4 gram sample size shall be used. 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, will be obtained from 600 to 860 nanometers (nm), at twenty (20) nm intervals on an integrating sphere spectrophotometer or a spectroradiometer. 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. Measurements will be taken on a minimum of 2 different areas and the data averaged. 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 standard aperture size used in the color measurement device shall be 1.0 to 1.25 inches in diameter. When the measured reflectance values for any color at four or more wavelengths do not meet the limits specified in Appendix A, Table III, it shall constitute a test failure.

4.5.11 Resistance to POL, insect repellent, sweat, and sea water after one laundering. The BASC outer shell carrier cloths shall be tested after one laundering per 4.5.13, and after exposure to DEET, POLs, (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 inches by 8 inches. The specimen shall be laid flat, face-side up, on a glass plate, 8 inches by 8 inches by 1/4 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 stirrer apparatus. While stirring, heat the solution to 50 degree 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 at 35 degree C onto the center of an 8 inch by 8 inch by 1/4 inch glass plate. Place an 8 inches by 8 inches specimen face up. Dispense an additional 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. See 4.6.1.1.1 for sea water formulation; sample preparation shall be the same as for perspiration.

4.5.12 Laundering Procedure. The test specimens and ballast, if needed, shall be placed in an automatic washing machine set on permanent press cycle, high water level and warm (105 degree F ± 5 degree F) wash temperature. The test specimens shall be taken from the vicinity of the fabric as the specimens for the initial test. The duration of the laundering cycle shall be 30 ± 5 minutes using 0.5 ounce (14 grams) of 1993 AATCC Standard Reference Detergent. After laundering, the specimens and ballast shall be dried in an automatic tumble dryer set on permanent press cycle, 150 to 160 degree F for approximately 15 minutes. The laundering equipment, washer and dryer, shall be in accordance with AATCC TM 135-1992.

4.5.13 Matching. Individual BASC components, cloths and webbing shall match each other when assembled into a complete system as well as match the standard samples viewed under filtered tungsten lamps that approximate artificial daylight and that have a correlated color temperature of 7500 ± 200 K, with illumination of 100 ± 20 foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2300 ± 200K.

4.5.14 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 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 fabric structure change.

4.6 Ballistic Performance. FAT shall be conducted on 15 x 15 inch shoot packs of the proposed ballistic material system (see 6.3). LAT shall be conducted on 15 x 15 inch shoot packs constructed of the approved ballistic material system (see Appendix D). Failure to meet the requirements of any sub-test will constitute failure for the entire FAT or LAT.

4.6.1 Ballistic Testing. General procedures and requirements are provided in 4.6.2 (see 6.3 for definitions).

4.6.1.1 Conditions. Dry specimens and specimens after; wet, hot temperature, cold temperature, accelerated aging and POL conditioning will be ballistically tested as specified in 3.5.2.2. Dry condition is the standard test condition specified in 4.6.2.3.

4.6.1.1.1 Wet Condition. Sea water shall be utilized for wet test conditions. Sea water formulation is 3% sodium chloride/0.5% magnesium chloride. The wet condition is achieved by

completely submerging the BASC system in sea water at 70 ± 5 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 inch plate to distribute load to allow for maximum fluid penetration. Excessive water will be drained from the specimen by hanging vertically for 15 minutes and tested within 5 minutes with tests completed within 60 minutes.

4.6.1.1.2 Temperature Extremes Condition. For hot temperature extreme, the BASC system 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 4.6.3. 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 4.6.3 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.

4.6.1.1.3 Accelerated Aging. Accelerated aging for the BASC and/or subcomponents will be performed in general accordance with ASTM D1149, with the following modifications. The entire BASC or subcomponent under test will be subjected to treatment. A 30 lbs. weight will be applied to the test item during accelerated aging conditioning. All tested components will be conditioned for 72 hours at 40^{o}C while maintaining a minimum of 50 parts per hundred million of ozone. The BASC and/or subcomponents do not require any additional tensile strain during accelerated aging conditioning. After accelerated aging conditioning, the BASC and/or subcomponents under test must remain at ambient atmospheric conditions for 24 hours prior to ballistic testing. Verify that the conditioned specimens perform as specified in 3.5.2.2.

4.6.1.1.4 POL Contamination. The ballistic material system specimens shall be immersed in each of the following; motor oil, and gasoline at room temperature. The specimens shall be placed flat in a pan with 1/8 inch - 1/4 inch of the POL fluid. A ten pound weight shall be placed on a 15 x 15 inch 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.

4.6.2 Ballistic Test Criteria. For all Protection Ballistic Limits (BL); V50, Vs/Vr, and V0 acceptance tests the following minimum information is required 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.
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 V50 or V0 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) Angle of spall/debris ejection if applicable.
k) Name of company performing tests.
l) Type of gun barrel, caliber, and propellant used.
m) Range measurements including distances from gun barrel to velocity measurement devices and target.
n) Calculated Ballistic Limit. In a situation where the V50 BL, Vs/Vr or V0 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.

4.6.2.1 Projectile Velocity Determination. 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 minimum 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.

4.6.2.2 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 USATECOM TOP 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.

4.6.2.3 Environmental Test Conditions. All ballistic tests shall be performed at a standard atmosphere of 68 ± 10 degree Fahrenheit and 50 ± 20% relative humidity. Temperature and humidity measurements shall be recorded before the beginning of each day's test firings and every two hours thereafter.

4.6.2.4 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.

4.6.3 V50 BL Calculation. V50 will be determined in accordance with MIL-STD-662F. For LAT, three (3) Partial Penetrations (PP) and three (3) Complete Penetrations (CP) within a 125 ft/sec velocity spread or five (5) Partial Penetrations (PP) and five (5) Complete Penetrations (CP) within a 150 ft/sec velocity spread yield the V50 BL determination that will be accepted. FAT will require five (5) Partial Penetrations (PP) and five (5) Complete Penetrations (CP) within a 150 ft/sec velocity spread to determine V50 BL.

4.6.3.1 PP and CP Determination for V50. Complete and partial penetrations (see 6.4) 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. The following test conditions apply:

a) 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 (see 6.3).
b) For LAT, test samples shall be 15.0 x 15.0 inch square size panels and configured in the armor material system approved under the FAT.
c) For all size test panels a metallic (approx. 0.20 inch thick aluminum or steel) frame with minimum 1.4 inch webbing shall be employed to restrain the test material during ballistic impact.
d) The test panel will be sandwiched between 2 frames and restrained with mechanical or pneumatic clamping devices at each of the four corners of the frame.
e) 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.
f) Shot spacing shall be based on impact point.
g) All shots shall be at least 2.5 inches from any edge of the samples.
h) Test shots shall be sufficiently spaced so that sequential shots are not influenced by previous impact areas. A minimum shot spacing of 2.5 inch is required but 3.0 inch is recommended especially when testing against sub-machine gun projectiles.
i) It may be necessary to use 2-3 panels for the V50 determination.
j) Test specimens shall be reconditioned to a smooth shape after every shot.

4.6.3.2 Vs/Vr and V50 Test Sample Mounting. Restraint is required during testing so that the material is not pulled through the ballistic test window frame. Unless otherwise stated the following conditions shall be performed during V50 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 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.

4.6.4 Vs/Vr Testing. The Vs/Vr testing is for government reference only and is done by starting at the upper end of the velocity spectrum and working down to below the V50. Starting velocities are provided in Appendix D, Table III. Testing is performed at 0 degrees and 45 degrees obliquity for all RCC fragmentation projectiles. Both the striking velocity (Vs) and the residual velocity (Vr) of the projectile must be measured. Yaw of the striking projectile should be measured for all shots. Approximate starting velocities are listed below. From the starting velocity subsequent shots are taken at approximately 400 - 500 ft/sec increments down to below the V50 where there are no longer any complete penetrations. Additional shots are then taken above and below the V50, in a similar manner to standard V50 test methodology, to characterize the performance of the armor system in this area. This testing will require between 15 and 20 valid shots for each size RCC. Approximately half of the shots should be in the regime between the starting velocity and just above the V50. Shots that would not be considered valid include: excessive yaw of the striking projectile; incomplete measurement of the residual velocity of a complete penetration; impacts at incorrect obliquity; or impact closer than 1 inch to any previous impact.

4.6.5 V0 Determination for Acceptance. For V0 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.

a) 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 (see 6.3).
b) For LAT, test samples shall be 15.0 x 15.0 inch square size panels and configured in the armor material system approved under the FAT.
c) Samples will be mounted on clay block described below (see 4.6.5.2).
d) The first shot will be 2.75 ± 1/4 inch from any edge.
e) The next shot shall be located 3.5 inch -0/+1/2 from the first shot and at the weakness point in the configuration, e.g.; seamed area or non-uniform area of design.
f) The third shot location should be positioned 3.5 inch –0/+1/2 from any of the 2 previous test shots.
g) 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.
h) The transient deformation shall be measured (see 4.6.5.1) after the third and fifth test firings
i) Test shots should be staggered at least 0.25 inch off the horizontal and vertical lines of any previous shots.
j) Test specimens shall be reconditioned to a smooth shape after every shot.

4.6.5.1 Back Face Deformation (BFD) Measurement. The back of the armor test specimen will be attached to a block of non-hardening, oil-based molding clay so that no movement of the test samples occur before, during or after the ballistic impact. The test fixture containing the clay backing material shall be in the form of a single block at least 4.0 inches thick and 24 x 24 inches length and height. The clay backing material shall be conditioned in its fixture, using a heated

chamber or enclosure. Conditioning time, temperature, and corresponding drop test performance may change as a function of backing material age and usage. Actual conditioning temperature and recover time between uses will be determined by drop test results. Additional clay, conditioned to the same initial temperature as the fixture, shall be used to fill voids and restore the front surface of the backing material as needed. The clay consistency should be such that depression of 25mm (± 3 mm) in depth is obtained when a 1 kg (± 10gm) (2.2 lb ± 0.35 oz) cylindrical steel mass, 44.5mm (± 0.5 mm) (1.75 ± 0.02 inches) in diameter and having a hemispherical striking end is dropped from a height of 2 m (± 2 cm) (6.56 ft ± 0.07 ft) onto one of its square faces. 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 mm. when measured from the original undisturbed surface of the backing material to the lowest point of the depression. There are two acceptable methodologies to deriving the Back Face Deformation.

Methodology 1 - All Back Face Deformation measurements will only be conducted at 0-degree obliquity to the original undistributed surface of the backing material. Indentation measurements will utilize measurement devices (± 0.1 mm accuracy) incorporating a fixed reference "guide" that can rest solidly upon two edges of the fixture, establishing the reference plane across the diameter of the indentation. The distance between the reference "guide" and original undisturbed surface will be measured at the point of intended impact prior to impact. The distance between the reference "guide" and the lowest point of depression will be measured after impact. Back Face Deformation will be the difference between the two measurements.

Methodology 2 - Back Face Deformation measurements will be taken utilizing a certified, calibrated laser scanner measurement instrument, which provide a means to accurately measure the difference between the original undisturbed clay surface and the deepest point of BFD signature. The perpendicular distance between the original surface and the deepest point of depression, with reference to the original undisturbed surface, will be measured after the test record shot impact. The laser scanner measurement instruments shall be certified by ATEC and use a software package capable of meeting the following requirements:

- Uniform sample: 0.5mm
- Noise reduction: Data with 0.05mm limit on point movements.
- Wrap data points with polygonal surface *(w/o noise reduction).*
- Data Smoothing: Fill holes *(curvature based hole filling).*
- Removal of intersecting triangles.
- Spike removal: 10% *(run 2 times in a row).*
- 3D: Comparison to determine the deepest point.

The software package shall ensure the deepest point is not located within a crack in the clay. If a crack in the clay is determined to be the deepest point, the software smoothing function will fill-in the crack and find the actual deepest point. The software shall also ensure that the area identified as the deepest point has a minimum area of at least 0.7mm x 0.7mm in width and length.

4.6.5.2 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.

4.6.6 Flexibility. The ballistic filler fabric subcomponents of the system shall be tested in accordance with ASTM D 1388, Standard Test Method for Stiffness of Fabrics, with the following noted exceptions, to determine the flexural rigidity in units of cm-g for each component. The restriction of size of sample may be waived such that end item ballistic filler fabric subcomponents may be tested. These results are then used to calculate overall system flexibility as follows:

$$System\ Stiffness = \sum (\frac{G_{i,warp} + G_{i,fill}}{2}) \times Layers_i$$

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 225 cm-g when calculated as above.
Example Calculation:

A system is composed of 12 plies of Material "A" and 6 plies of Material "B". Component flexural rigidities are as follows:

Material "A"
$G_{A,warp}$ = 4.000 cm-g
$G_{A,fill}$ = 6.000 cm-g

Material "B"
$G_{B,warp}$ = 7.000 cm-g
$G_{B,fill}$ = 8.000 cm-g

System stiffness = $[\frac{(4.000+6.000)}{2} \times 12] + [\frac{(7.000+8.000)}{2} \times 6] = 105.000$ cm-g

The calculated system stiffness is less than 225cm-g and is therefore acceptable.

4.7 Operating Requirements Verification. Complete each verification in this paragraph.

4.7.1 Insertion Demonstration. One barehanded person shall demonstrate insertion of the ESAPI into the BASC base vest front and back pockets as well as the insertion of the E-SSAPI into both side plate pockets without tools or special aids. An insertion demonstration may be performed with actual or mock ESAPI's conforming to drawings 2-6-0588, 2-6-0589, 2-6-0590, 2-6-0591 and 2-6-0592 and the maximum thickness requirement. The respective pocket flaps shall be

closed and secured with the ESAPI or E-SSAPI. It shall be possible to insert and remove the ESAPI into and out of the pocket without effort. A defect shall be scored if any ESAPI must be forced into or removed from the pocket, or if excessive force is needed to secure the flap.

4.7.2 Insertion Test Using Protective Hand Gear. Insert ESAPI into the ESAPI pockets (front, back, side) while separately wearing standard cold weather gloves (NSNs 8415-01-319-5514, Shell and 8415-01-319-9042, Glove) and chemical protective hand wear (NSN 8415-01-033-3517). Perform insertion into government furnished carrier in a maximum of 30-seconds.

4.8 Extraction Strap Seam Strength. Testing shall be accomplished using a constant rate-of-extension test apparatus capable of accurately measuring loads up to 1,000 ± 2 lb. The sample (an actual vest or representative back carrier only) shall be firmly clamped across its full width to the base of the test apparatus using a steel bar or other device capable of completely restraining the sample during testing. The clamp shall be placed parallel to, and within 0.25 inches of the bottom of the Extraction Strap. The center of the Extraction Strap shall be directly in line with the center of the load cell and pulling head. The Extraction Strap shall be affixed to the load cell and pulling head through a loop of 1-inch webbing (A-A-55301 Type VI) having a gage length of 12 ± 1 inch. A preload of 1 lbf shall be applied prior to the start of testing. The load cell and pulling head shall be advanced at a constant rate of 2 inches/min until failure. The following minimum data shall be recorded: extension and load at first-stitch failure (if applicable), extension and peak load; mode of failure (i.e. seam failure, fabric tear-out, handle break).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the contract or order shall specify complete packaging requirements. 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

6.1 Intended Use. The BASC is a modular body armor system providing multiple levels of ballistic protection depending on the system configuration. The BASC provides protection from conventional fragmenting munitions and 9mm sub-machine gun. The area of protective coverage of the body is dictated by the number of modular components worn to extended coverage. BASC ballistic protection is increased to protect vital organs from multiple hits against specified small arms rifle threats and flechettes when the SAPI subsystem is worn.

6.2 Surrogate Shoot-Pack. A Surrogate Shoot-Pack system of BASC body armor may be used to represent the ballistic resistant materials of the BASC. The base vest surrogate shoot-pack systems shall consist of a base vest ballistic filler packet and a ballistic filler carrier with insert pocket. The yoke surrogate shoot-pack systems shall consist of a base vest surrogate shoot-pack with a yoke ballistic filler packet inserted into the insert pocket.

The ballistic filler packet for the BASC base vest will be 15 x 15 inches in size consisting of X plies of the proposed ballistic material system used in the BASC base vest (see 3.3.1.7 and 3.5.2.1.1). 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. 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.

The ballistic filler packet for the BASC yoke will be 15 x 15 inches in size consisting of Y plies of the proposed ballistic material system used in BASC yoke (see 3.3.1.11 and 3.5.2.2.1). 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. 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.

The ballistic filler carrier will have an insert pocket capable of holding the largest insert stitched on the face fabric. The pocket cover shall consist of the same front outer shell fabric used in the construction of the BASC base vest. The face fabric of the ballistic filler carrier shall consist of the same top plate pocket fabric used in the construction of the BASC base vest plate pocket. The insert pocket will be stitched on three sides to the face fabric with nylon or polyester thread. The top edge of the pocket will have a minimum of 5 inches of not less than 0.5 inch wide hook and loop fastener centered and stitched at the top. The ballistic filler carrier back cover shall consist of the same front inner shell fabric used in the construction on the BASC inner shell. The face fabric and back cover of the ballistic filler carrier will be stitched together on 3 sides with nylon or polyester thread to form a pocket to hold the ballistic filler packet(s). 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. Each ballistic filler carrier will be individually serialized and clearly labeled to indicate the strike face.

For yoke shoot-packs, insert the yoke ballistic filler packet into the insert pocket located on the back cover of the ballistic filler carrier. The base vest ballistic filler packet shall be inserted into the insert pocket adjacent to the front of the carrier.

All surrogate shoot-pack systems shall be clearly labeled to indicate the strike face of the system.

6.3 Ballistic Testing Definitions. The following definitions are provided to assist in understanding the test procedures:

Fair Impact. All three impacts will be at 0 degrees obliquity. A projectile that impacts the armor at an angle of incidence no greater than + 5 degrees from the intended angle of incidence 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 V50 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.

Residual Velocity. The velocity at which a projectile exits the rear surface of an armor sample. Used only for Vs/Vr testing.

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.

Spall. The detachment or delamination of a layer of material or the ejection of projectile/armor material in the area surrounding the location of impact, which occurs on the front of the armor surface. Spalling may be a threat mechanism even when penetration of the armor itself is not complete.

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.

V50 Ballistic Limit (BL). In general, the velocity at which the probability of penetration of an armor material is 50 percent.

APPENDIX A – MATERIAL PROPERTIES FOR BASC SUBCOMPONENTS

Table I. Cloths: Base Vest and Components Outer and Inner Shell (see 3.2.1)

Characteristic	**Outer Shell Cloth**	**Inner Shell Cloth**
Weight (oz/yd^2) (max.)	12.0	8.0
Breaking Strength; lb. (min.) Warp X Filling	500 X 300	360 X 270
Dimensional Stability; % (max.) Warp X Filling	3.0 X 2.0	3.0 X 2.0
Abrasion Resistance: (min.) Number of Cycles	1000	800
Water Repellency: Spray Rating (min) Initial After 1 Laundering	100,100,90 90,80,80	100,100,90 90,80,80
Hydrostatic Resistance: cm (min) Initial After 1 Laundering After 1 Laundering with the following separate conditions: POL Contamination Insect Repellent Contamination Sweat Contamination Sea Water Contamination	35	35
Dynamic Absorption: % (max.) Initial After 1 Laundering	20	20
Resistance to Organic Liquids (min) Initial After 1 Laundering	No wetting by n-dodecane	No wetting by n-dodecane

* All results are desired.

Table II. Camouflage Shades (see 3.4.4)

Component(s) or Part(s)	**Color**

(1) Outer and Inner Shell: Base Vest Cummerbund Assembly (if used) Yoke and Collar ESAPI Plate Pockets (front, back, side) Lower Back Protector Groin Protector	Coyote 498
(2) Ballistic Panel Cover MIL-DTL-508	Coyote 498
(3) Webbing Binding Tape Hook & Loop Fastener Thread Elastic Webbing Labels	Coyote 498
(4) Hardware Buckles Snaps	Coyote 498

Table III. Infrared Reflectance Requirements for Coyote 498 (see 3.4.5)

Wavelengths (Nanometers)	Minimum (Percent)	Maximum (Percent)
600	8	20
620	8	20
640	8	22
660	8	24
680	12	24
700	12	34
720	16	42
740	22	46
760	30	50
780	34	54
800	36	56
820	38	58
840	38	58
860	40	60

Table IV-A. Minimum Ballistic Panel Area; Inches^2 (see 3.5)

Outer Tactical Vest	X-Small	Small	Medium	Large	X-Large
Total Area of Coverage					

Note 1: Total area of coverage for the OTV provided in Table IV-A is provided for reference purposes only. Submitted designs will be required to adapt this table by taking into account the sizing convention used in designing the item and the associated ballistic area of coverage for each size.

Table IV-B. Bartack (see 3.5.3.4)

Characteristic	Stress points; All cloth	Webbing hangers; Webbing + cloth
Length	3/8 inch min.	3/4 inch ± 1/16
Holding Strength (min.)	60 lbs.	250 lbs.

Table IV-C. Base Vest Finished Measurements; Inches* (see 3.5)

Size	Center Front Length ± 1/2 inch	Front Width ± 1/2 inch	Center Back Length ± 1/2 inch	Back Width ± 1/2 inch
X-Small	17 1/4	21 1/4	18 1/2	20 3/4
Small	17 1/2	22 1/4	18 3/4	21 3/4
Medium	18 1/4	24 1/4	19 1/2	23 3/4
Large	19	26 1/4	20 1/4	25 3/4
X-Large	19 3/4	28 1/4	21	27 3/4

Table IV-D. Cummerbund Finished Measurements (if used); Inches* (see 3.5)

Size	Center Length ± 1/2 inch	Center Width ± 1/2 inch	Cummerbund Side Plate Pocket Channel ± 1/2 inch
Nine PALS Column	20 1/2	6 5/8	13
Eleven PALS Column	23 1/2	6 5/8	13
Thirteen PALS Column	26 1/2	6 5/8	13

Table IV-E. Groin Protector Finished Measurements; Inches* (see 3.5)

Size	Center Length ± 1/2 inch	Top Width ± 1/2 inch
X-Small – Medium	12	8 1/2
Large – X-Large	12	10 1/2

Table IV-F. Lower Back (Kidney) Protector Finished Measurements; Inches* (see 3.5)

Size	Center Length ± 1/2 inch	Center Width ± 1/2 inch
One Size	12 1/2	6 1/4

Table IV-G. Yoke and Collar Finished Measurements; Inches* (see 3.5)

Size	Collar Height ± 1/2 inch	Collar Length ± 1/2 inch	Center Back Yoke Width ± 1/2 inch
X-Small	2	19 7/8	4
Small	2	20 1/8	4
Medium	2	20 1/2	4
Large	2	20 7/8	4
X-Large	2	21 1/4	4

Table IV-H. Throat Protector Finished Measurements; Inches* (see 3.5)

Size	Throat Length ± 1/2 inch	Throat Height ± 1/2 inch
One Size	10 1/4	3 1/2

Table V. Chest Circumference for Base Vest Outer Shell Label; Inches (see 3.6)

Size	Chest Circumference
X-Small	29 - 33
Small	33 - 37
Medium	37 - 41
Large	41 - 45
X-Large	45 - 49

Table VI. Waist Circumference for Cummerbund Labe (if used); Inches (see 3.6)

Size	Waist Circumference
Nine PALS Column	< 31
Eleven PALS Column	31 - 35
Thirteen PALS Column	> 35

Note 2: Table IV-C through Table VI values are for reference purposes only (actual values reflect IMTV). These tables shall be adapted, as required, and populated with the applicable data associated with the design submitted for consideration.

APPENDIX B: BALLISTIC PROTECTION REQUIREMENTS

Table I: **Base Vest assembly, Side Plate Pockets, Groin, Collar and Lower Back Fragmentation Protection; Minimum V50** (see 3.5.2.2)

Fragment Projectile	V50 @ 0 degree DRY: ft/sec	V50 @ 0 degree WET: ft/sec	V50 @ 45 degree DRY: ft/sec
2 gr. RCC	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 temperatures, accelerated aging	2000	N/A	N/A
16 gr. RCC; After POL	1900	N/A	N/A
17 gr. FSP	1850	N/A	N/A

Table II. Yoke Area Ballistic Performance; Minimum V50 (see 3.5.2.2.1)

Fragment Projectile	V50 @ 0 degree DRY: ft/sec	V50 @ 0 degree WET: ft/sec	V50 @ 45 degree DRY: ft/sec
2 gr. RCC	3080	3000	3350
4 gr. RCC	2700	2550	2800
16 gr. RCC	2280	2150	2330
64 gr. RCC	1800	1700	1900
17 gr. FSP	2170	N/A	N/A

Table III: Sub-Machine Gun Ballistic Characteristics (see 3.5.2.3)

Projectile - 9mm, 124 gr., FMJ Remington	V50 @ 0 degree ft/sec (min.)	V0 @ 0 & 30 degree ft/sec	Deformation mm (max.)
Required	1525	1400 + 50/- 0	44.0
Desired	1625	1500 + 50/- 0	44.0

APPENDIX C: NON-BALLISTIC REQUIREMENTS AND VERIFICATIONS

Table I. Requirements and Verifications (see 4.5)

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT	LAT
Cloth Outer and Inner Shell	3.2.1	4.5		
Breaking Strength	3.2.1	ASTM D5034, G-E or G-T	X	COC
Dimensional Stability	3.2.1	AATCC 96 Option 1C, A	X	COC
Outer Shell and Inner Shell Cloth Abrasion Resistance	3.2.1	ASTM D 3884 (Footnote 1)	X	COC
Spray Rating Initial After 1 Laundering	3.2.1	4.5.12 & AATCC 22	X	COC
Hydrostatic Resistance: Initial After 1 Laundering After 1 Laundering With the following conditions: POL Contamination Insect Repellent Sweat Contamination Sea Water Contamination	3.2.1	AATCC 127 4.5.11 & 4.5.12	X	COC
Dynamic Absorption Initial After 1 Laundering	3.2.1	4.5.12 & AATCC 70	X	COC
Resistance to Organic Liquids: Initial After 1 Laundering	3.2.1	4.5.13 & AATCC 118	X	COC
Cloth Collar Material	3.2.2	4.3.1	COC	COC
Cloth Ballistic Panel Cover	3.2.3	4.3.1	COC	COC

Webbings and Tapes	3.2.4	4.3.1	COC	COC
Elastic	3.2.5	4.3.1	COC	COC
Fasteners, Hook and Loop	3.2.6	4.3.1	COC	COC
Foam	3.2.7	4.3.1	COC	COC
Snap Fasteners	3.2.8	4.3.1 & 4.5.1	COC	COC
Polyethylene	3.2.9	4.3.1	COC	COC
Cable	3.2.10	4.3.1	COC	COC
Cable Swage Sleeve	3.2.11	4.3.1	COC	COC
Thread	3.2.12	4.3.1	COC	COC
Aramid Thread	3.2.13	4.3.1	COC	COC
Rifle Bolster Coated Fabric	3.2.14	4.3.1	COC	COC
Male Buckle	3.2.16	4.3.1	COC	COC
Female Repairable Buckle	3.2.17	4.3.1	COC	COC
Tension Lock	3.2.18	4.3.1	COC	COC
Loop	3.2.19	4.3.1	COC	COC
Double Bar, Nonslip Buckle	3.2.20	4.3.1	COC	COC
Rounded Oval Slide	3.2.21	4.3.1	COC	COC
Grommet	3.2.22	4.3.1	COC	COC
Emergency Release Handle Cover	3.2.23	4.3.1	COC	COC
Cord	3.2.24	4.3.1	COC	COC
Design	3.3	4.4	X	X
Patterns	3.3.1	4.4	X	X
System Performance Requirements	3.4	4.4		
Functional Integration	3.4.1	4.4	X	X
Fungus Resistance	3.4.2	4.5.9	X	COC
Includes Use & Care Instruction	3.4.3	4.4		YES/NO
Camouflage	3.4.4	4.5.10	X	COC
Infrared Reflectance	3.4.5 & 3.2.4	4.5.10	X	COC
Matching	3.4.6	4.5.13 & 4.5.10	X	COC
Colorfastness to:	3.4.7	4.1		
Laundering: 3 Cycles	3.4.7	AATCC 61 OPTION IA	X	COC
Light	3.4.7	AATCC 16 OPTION 1 or 3 (Exposure shall be 40 hrs or 170 kilojoules)	X	COC

Crocking	3.4.7	AATCC 8	X	COC
Frosting	3.4.7	AATCC 119; EXCEPT IT SHALL BE 300 CYCLES	X	COC
Perspiration	3.4.7	AATCC 15 EXCEPT BOTH ACID AND ALKALINE TEST SHALL BE PERFORMED	X	COC
Area of Coverage	3.5	4.5.3, 4.5.4, 4.5.5	X	COC
Finished Dimensions	3.5	4.5.2, 4.5.3, 4.5.4	X	COC
Ballistic Filler Weight & Areal Density	3.5.2.1.1	4.5.5 & 4.5.6	X	COC
Removable Ballistic Panel	3.5.2.1	4.5.1	X	X
Ballistic Filler	3.5.2.1.1	4.5.5 & 4.5.6	X	COC
Flexibility	3.5.2.1.2	4.6.6	X	COC
Ballistic Filler Abrasion	3.5.2.1.3	ASTM D-3886 4.5.14	X	COC
BASC Construction	3.5.3	4.3.1 & 4.5.1		
Hook and Loop Fastener	3.5.3.1	4.5.1	X	X
Stitching	3.5.3.2	4.5.1	X	X
Automatic Stitching	3.5.3.3	4.5.1	X	X
Bartacks	3.5.3.4	4.5.1	X	X
Bartack Alignment for MOLLE Pocket Attachment	3.5.3.5	4.5.1 & 4.5.2	X	X
Buttonholes.	3.5.3.6	4.5.1	X	X
Snap setting	3.5.3.7	4.5.1	X	X
Extraction Strap	3.5.3.8	4.8	X	X
Emergency Release Cable Dimensions	3.5.3.9	4.5.1	X	X
Snap Reinforcement	3.5.3.10	4.5.1	X	X
Binding	3.5.3.11	4.5.1	X	X
BASC Drainage	3.5.3.12	4.5.1	X	X
Emergency Release Mechanism	3.5.3.14	4.5.1	X	X
Labels	3.6	4.5.1	X	X
SAPI Pocket	3.7	4.4	X	X

Footnotes: 1) H-18 abrasive wheel with 1000 gm load shall be used. A hole shall be defined as the wear through of one (1) warp and one (1) filling yarn at the same location.

Table II. End Item Defects (see 4.5.1)

EXAMINE	DEFECT	CLASSIFICATION*	
		Major	Minor
Cloth	Any hole, cut, or tear.	101	
	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.		201
	Abrasion mark, slub, or broken end or pick.	107	
	Ends not fused as required.		202
Cabling	Any hole, cut or tear, incomplete securing of sleeve, impairing function.	108	
	Ends not finished as required.	109	
Fastener Tape	Any hole, cut or tear, hooks flattened, broken or missing, impairing function.	110	
	Stitched in the selvage edge.		203
Snap Fasteners	Any fastener not functioning properly i.e., fails to snap closed, provide a secure closure or open freely. NOTE: The fasteners shall be snapped and unsnapped twice to determine whether parts or fasteners separate freely and also affect a secure closure.	111	
	Clinched excessively tight, cutting material.	112	
	Clinched loosely, permitting either component to rotate freely or separate. NOTE: Incomplete roll of end of button or eyelet barrel is evidence of insecure clinching.	113	
	Not specified style or type.	114	
	Splits in button or eyelet.		204
	Finish omitted or not as specified.		205
Seams and Stitching:			
Open Seams	½ inch or less.		206
	More than ½ inch NOTE: A seam shall be classified as an open seam when one or more stitched joining a seam are broken or when two or more consecutive skipped or runoff stitches occur.	115	

Raw Edges	More than ½ inch when securely caught in stitching. NOTE: Raw edges not securely caught in stitching shall be classified as open seams.		207
Seam & Stitch Type	Wrong seam or stitch type.	116	
Stitch Tension	Tension loose, resulting in loose bobbin or top thread.		208
	Excessively tight, resulting in puckering of material.		209
Bartacks	Any bartack omitted.	117	
	Any bartack not as specified or not in specified location.		210
	Loose stitching, incomplete or broken.		211
Stitching Ends	Not secured as specified.		212
Thread Breaks, Skipped Stitches, or Run-Offs.	Not over stitched as specified. NOTE: Thread breaks or two or more consecutive skipped or run-off stitches not over stitched shall be classified as open seams.		213
Component & Assembly	Any area of ballistic filler bunched (i.e. does not lie flat).	118	
	Any component part omitted or not as specified (unless otherwise classified herein).	119	
	Needle chews.	120	
	Any mend, darn, patch, holes, splice or other unauthorized repair.	121	
Location Markings	Printed marking more than 1/32 inch in width or not covered by component part.		214
Label	Missing, incorrect, illegible.	122†	
Shade	Individual components do not provide a good match to one another.	123	
Plate Pocket	Insert does not fit and cannot be secured into plate pocket.	124†	

*The presence of a number designates either major or minor. The value of the number is for internal inspection purposes only.
†Critical defect. If found during inspection, the lot shall be 100% inspected for the critical nonconformities and corrected or replaced at the direction of the government

Table III. End Item Dimensional Examination

EXAMINE	DEFECT	CLASSIFICATION*	
		Major	Minor
Dimensional (overall)	Smaller than nominal dimensions and applicable minus tolerance.	125	
	Larger than nominal dimensions and applicable plus tolerance.		215
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
Hardware	Not spaced within specified tolerance.		219

*The presence of a number designates either major or minor. The value of the number is for internal inspection purposes only.

Table IV. Visual Examination of Ballistic Filler Size (see 4.5.5)

EXAMINE	DEFECT	CLASSIFICATION*	
		Major	Minor
Size of Individual Ballistic Filler Assembly	Larger than cutting pattern and applicable plus tolerance. 1/ 2/		220
	Larger than cutting pattern and twice applicable plus tolerance. 1/ 2/	126	
	Smaller than cutting pattern. 1/ 2/	127	

*The presence of a number designates either major or minor. The value of the number is for internal inspection purposes only.

1/ To be scored when conditions exist for a length of more than 2 inches or if conditions exist in two or more areas with an accumulated distance of 4 inches.

2/ The front filler or back filler individual components, as applicable, shall be examined with the applicable cutting pattern centered on the filler components.

APPENDIX D: BALLISTIC PERFORMANCE VERIFICATION

Table I. Requirements and Verifications (see 4.5)

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT	LAT
Ballistic Protection Levels	3.5.1	4.1, 4.4 & 4.6	X	X
Ballistic Performance	3.5.2	4.6	X	X
BASC Fragmentation Protection	3.5.2.2	4.6	X	X
Yoke Frag. Protection	3.5.2.2.1	4.6	X	X
Sub-Machine Gun Protection	3.5.2.3	4.6	X	X

Instructions for Shoot-Pack Measurement:

1. Remove the ballistic filler packet from the ballistic filler carrier.

2. Weigh and record the ballistic filler packet separate from the ballistic filler carrier.

3. Place the ballistic filler packet on a flat unyielding surface having a straight backstop in which to press the ballistic filler packet against.

4. Ensure that the ballistic filler packet is completely flat and firmly against the backstop but without creating any bulges in the packet.

5. Measure the distance in *inches* from front to back in three locations; (1) one inch from right edge, (2) 7.5 inches from the right edge and (3) one inch from the left edge. Record each measurement using 1/16 inch resolution. NOTE: If applicable, do not include the ballistic filler packet *cover* in the measurement. Gently press against the seam to find the packet's linear edge and use this for measurement.

6. Rotate the ballistic filler packet 90 degrees clockwise and repeat step #4.

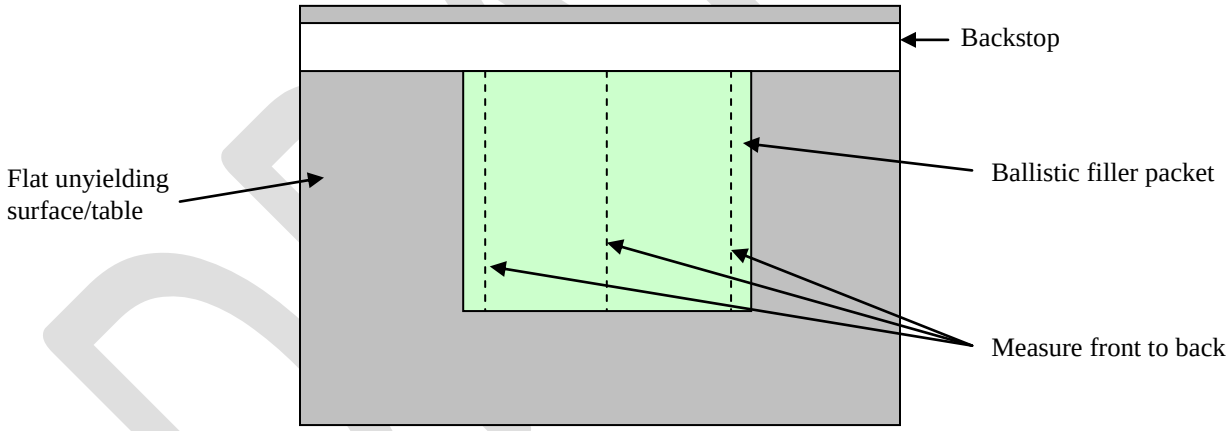


Figure 1. Shoot-Pack Measurement Set-up (not to scale)

BALLISTIC FAT PROTOCOL: BASC Ballistic FAT shall be conducted in accordance with the requirements of this purchase description and the following:

Table II. FAT Matrix

TEST	RCC, 2gr	RCC, 4gr	RCC, 16gr	RCC, 64gr	FSP, 17gr	9mm SMG	Need	Spec Paragraph
V50, dry, 0°	1 1	1 1	1 1	1 1	1 1	1	6 shoot-pack 5 yoke-pack*	3.5.2.2, 3.5.2.3 3.5.2.2.1 4.6.1
V50, wet, 0°	1 1	1 1	1 1	1 1			4 shoot-pack 4 yoke-pack*	3.5.2.2 3.5.2.2.1 4.6.1.1.1
V50, dry, 45°	2 2	2 2	2 2	2 2			8 shoot-pack 8 yoke-pack*	3.5.2.2 3.5.2.2.1
V50, high T			1				1 shoot-pack	3.5.2.2 4.6.1.1.2
V50, low T			1				1 shoot-pack	3.5.2.2 4.6.1.1.2
V50, accelerated aging			1				1 shoot-pack	3.5.2.2 4.6.1.1.3
V50, POL oil			1				1 shoot-pack	3.5.2.2 4.6.1.1.4
V50, POL gas			1				1 shoot-pack	3.5.2.2 4.6.1.1.4
V0						1	1 shoot-pack	3.5.2.3
Vs/Vr, 0°	1	1	1	1			4 shoot-pack	4.6.4
Vs/Vr, 45°	2	2	2	2			8 shoot-pack	4.6.4
Contingency							8 shoot-pack 4 yoke-pack*	3.5.2.2 3.5.2.2.1
Total							44 shoot-pack 21 yoke-pack*	3.5.2.2 3.5.2.2.1

* Yoke shoot pack: Yoke ballistic material + Base Vest ballistic material to meet ballistic requirements in paragraph 3.5.2.2.1

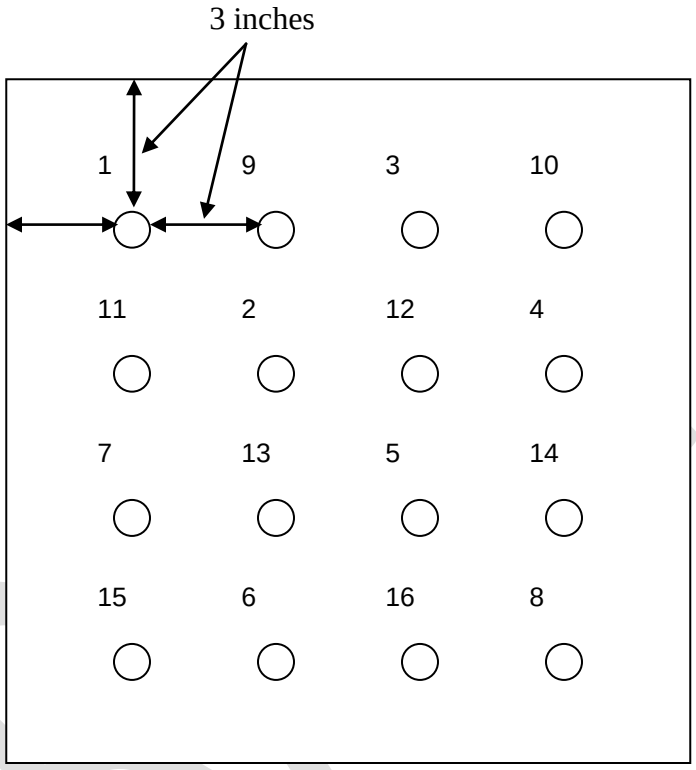
SPECIAL PROVISIONS: All production quantities submitted after approval of the FAT shall be produced using the same materials, processes, procedures, equipment and facilities that resulted in the manufacture of the acceptable FAT items. This includes all raw materials and/or sub-components. Any change to previously approved machinery, production methods, place(s) of performance, subcontractors, etc. is considered a process change. Any proposed change in the production of the approved FAT items must be reported in writing to the Contracting Officer (KO) and Project Officer (PO) for determination if a new FAT is required.

FAT Instruction:

For all V50, Vs/Vr, shot patterns as specified below. Starting velocity shall be approximately 100 fps above required minimum V50. Follow up & down procedure as specified in MIL-STD-662F.

Diagram II. First Article Test Shot Patterns

0 degree obliquity
16 shots



45 degree obliquity
12 shots

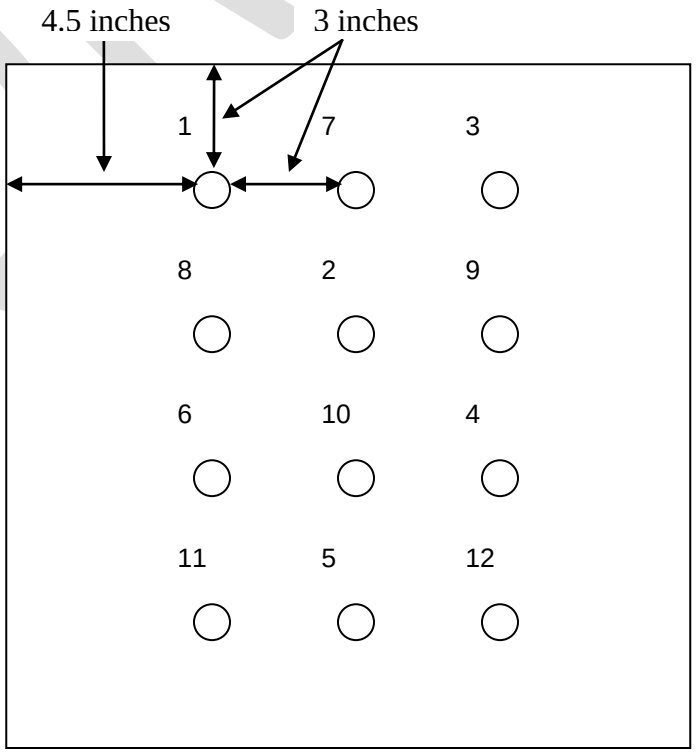


Table III. Vs/Vr Starting Velocity

Projectile	Starting Velocity
2 - grain RCC	4900 ft/s
4 - grain RCC	4900 ft/s
16 - grain RCC	4600 ft/s
64 - grain RCC	4000 ft/s

BALLISTIC LAT PROTOCOL: BASC LAT shall be conducted in accordance with the requirements of this purchase description and the following:

Table IV-A. Lot Acceptance Test Sample Selection Matrix, Base Vest

Lot Size	Number of Shoot-packs per Threat			Requirements			Total	Contingency
	V50, 17gr	V50, 9mm	V0, 9mm	V50, 17gr	V50, 9mm	V0, 9mm		
26 to 150	3	3	3	1850 fps min	1525 fps min	1400 + 50 fps	9	1/
151 to 1200	5	5	5	1850 fps min	1525 fps min	1400 + 50 fps	15	1/
1201 to 3200	8	8	8	1850 fps min	1525 fps min	1400 + 50 fps	24	1/

V0 and V50 determination tested in accordance with paragraph 4.6

Lot size is determined by the total number of base vest sets. At a minimum, one set consists of, one front and one back panel.

1/ Contingency shoot-packs are not required; however their use is encouraged in the event an invalid test occurs. Contingency shoot-packs not utilized for testing shall be retained by the DCMA QAR at the contractor's facility until contract closeout at which point the samples will be returned to the contractor.

2/ Lots presented for ballistic LAT which yield inconclusive test data (e.g. no tests, etc.) that does not satisfy the requirements of this document, may result in the lot being rejected by the government.

3/ Testing that continues after receiving a successful shot at an excess velocity shall constitute acceptance that the test is valid and that a "no test" did not take place.

LAT conducted on base vest shoot-packs shall constitute LAT for the side plate pockets, as long as those components ballistic fillers were cut within the same lot of front and back base vest shoot-packs that were subject to LAT.

Shoot-packs shall be used for ballistic LAT of yokes. Yoke shoot-packs shall be made in accordance with paragraph 6.2. The base vest filler packet shall consist of filler material cut within the same spreads as the base vest and component ballistic material and encased in ripstop. The yoke ballistic filler packet shall consist of filler material cut within the same spreads as the yoke ballistic material. If multiple spreads are used to produce the lot, the quantity of shoot-

packs dictated by Table IV-A and B shall be cut from as many different spreads possible to ensure the sample is representative of the ballistic material used throughout the lot.

Table IV-B. Lot Acceptance Test Sample Selection Matrix, Yoke

Lot Size	Number of Shoot-packs V50, 17gr	Requirement V50, 17gr	Total	Contingency
26 to 150	3	2170 fps min	3	1/
151 to 1200	5	2170 fps min	5	1/
1201 to 3200	8	2170 fps min	8	1/

V50 determination tested in accordance with paragraph 4.6
Lot size is determined by the total number of complete vests.

1/ Contingency shoot-packs are not required; however their use is encouraged in the event an invalid test occurs. Contingency shoot-packs not utilized for testing shall be retained by the DCMA QAR at the contractor's facility until contract closeout at which point the samples will be returned to the contractor.

2/ Lots presented for ballistic LAT which yield inconclusive test data (e.g. no tests, etc.) that does not satisfy the requirements of this document, may result in the lot being rejected by the government.

3/ Testing that continues after receiving a successful shot at an excess velocity shall constitute acceptance that the test is valid and that a "no test" did not take place.

When only BASC components are produced (not including yokes), no front or back panels shall be produced within the same spreads and markers, and sampling shall be in accordance with Table IV-C. If one or more base vest panels are imbedded in the spread of components, sample rates default to Table IV-A. Testing shall be performed on 15 x 15 inch shoot-packs cut from the same ballistic material spreads as the components produced. If multiple spreads are used to produce the lot, the quantity of shoot-packs dictated by Table IV-C shall be cut from as many different spreads possible to ensure the sample is representative of the ballistic material used throughout the lot.

Table IV-C. Lot Acceptance Test Sample Selection Matrix, Modular Components

Lot Size	Number of Shoot-packs per Threat			Requirements			Total	Contingency
	V50, 17gr	V50, 9mm	V0, 9mm	V50, 17gr	V50, 9mm	V0, 9mm		
51 to 500	3	3	3	1850 fps min	1525 fps min	1400 + 50 fps	9	1/
501 to 35,000	5	5	5	1850 fps min	1525 fps min	1400 + 50 fps	15	1/
35,001 to 150,000	8	8	8	1850 fps min	1525 fps min	1400 + 50 fps	24	1/

V0 and V50 determination tested in accordance with paragraph 4.6
Lot size is determined by the total number of components produced.

1/ Contingency shoot-packs are not required; however their use is encouraged in the event an invalid test occurs. Contingency shoot-packs not utilized for testing shall be retained by the DCMA QAR at the contractor's facility until contract closeout at which point the samples will be returned to the government.

2/ Lots presented for ballistic LAT which yield inconclusive test data (e.g. no tests, etc.) that does not satisfy the requirements of this document, may result in the lot being rejected by the government.

3/ Testing that continues after receiving a successful shot at an excess velocity shall constitute acceptance that the test is valid and that a "no test" did not take place.

Note that if all components are not produced in the same spreads and markers (for example, different ballistic systems are used for different lots of the same material solution) then combined testing is not authorized. For example, if front and back panels use X plies of one fabric, but throat, collar, groin and/or kidney use Y plies of another fabric, then each shall be tested separately.

SPECIAL PROVISIONS:

1) FAT approval remains in effect and production may continue unless:

a. The contractor fails LAT requirements on two (2) consecutive lots. Should this occur, the contractor will immediately cease production (Stop Work) and conduct a Failure Analysis and provide such reports as required to facilitate the completion of a Corrective Actions Report (CAR) as directed by the Defense Contract Management Agency (DCMA) Quality Assurance Representative (QAR). The CAR will then be submitted to the QAR, Contracting Officer (KO) and Project Officer (PO) for review NLT 15 days after occurrence. The Contracting Officer will determine within five (5) working days after receipt of the CAR if production of the approved FAT design configuration may resume, or if the contractor must conduct a new FAT for the issuance of a new FAT Approval Letter on a different design configuration. In cases where the Contracting Officer determines that a new FAT is required, lots representing work in progress under the prior FAT Approval Letter at the time of failure will be rejected. The failed design configuration will have its FAT Approval Letter permanently revoked and shall be permanently rejected for delivery against all Marine Corps requirements. If a new FAT is required, the contractor will submit the number of samples required to conduct a new FAT (at the contractor's expense) as directed by the Contracting Officer, for the issuance of a new FAT Approval Letter. The FAT Report remains the property of the government.

b. Maximum Lot Failures. If the number of lot failures exceeds the maximum lot failures allowed under Table V below the contractor will immediately cease production (Stop Work) and conduct a Failure Analysis and provide such reports as required to facilitate the completion of a Corrective Actions Report (CAR) as directed by the Defense Contract Management Agency (DCMA) Quality Assurance Representative (QAR). The CAR will then be submitted to the QAR, Contracting Officer (KO) and Project Officer (PO) for review NLT 15 days after occurrence. The Contracting Officer will determine within five (5) working days after receipt of

the CAR if production of the approved FAT design configuration may resume, or if the contractor must conduct a new FAT for the issuance of a new FAT Approval Letter on a different design configuration. In cases where the Contracting Officer determines that a new FAT is required, lots representing work in progress under the prior FAT Approval Letter at the time of failure will be rejected. The failed design configuration will have its FAT Approval Letter permanently revoked and shall be permanently rejected for delivery against all Marine Corps requirements. If a new FAT is required, the contractor will submit the number of samples required to conduct a new FAT (at the contractor's expense) as directed by the Contracting Officer, for the issuance of a new FAT Approval Letter. The FAT Report remains the property of the government. Maximum lot failures for all Marine Corps contracts are cumulative against the design configuration referenced in the FAT Approval Letter and are not contract specific.

Table V. Maximum Lot Failures

Total Lots Submitted	Max Lot Failures Allowed
1-100	3
101-200	3
201-300	3
Every 100 lots thereafter	3

c. Discontinued production exists if the contractor does not manufacture a specific approved FAT design within a period of 270 consecutive calendar days. Discontinued production under this stipulation may result in revocation of the FAT approval for that design. In the event of discontinued production, written authorization from the Contracting Officer must be obtained prior to resuming production. The written authorization from the Contracting Officer will identify if a new FAT is required.

Additionally, when a lot fails LAT and is subsequently rejected, that lot is rejected in its entirety and no ballistic component of that lot may be used on any other Marine Corps contract. For other government agency contracts written acknowledgement of the previous failure shall be provided to the Procuring Contracting Officer of the other government agency prior to delivery of the ballistic end items or components. Further, any lot that is withdrawn prior to the completion of the LAT procedures as required by the LAT Protocol will be considered as rejected and subject to the above conditions and restrictions. Additional Testing must be completed within 30 days of the initial LAT. All failed LATs will require a Failure Analysis per the procedures outlined in 1) a.

2) Ballistic Testing: All ballistic FAT shall be conducted at a government test facility unless agreed to in writing by the Contracting Officer. LAT for production lots shall be conducted at either a government test facility, or a mutually agreed upon NIJ certified ballistic laboratory and approved in writing by the Contracting Officer. Copies of all ballistic reports are to be submitted to the designated authority for evaluation and notification purposes.

3) Notify this office five (5) government working days prior to any testing in the event the government desires to witness testing. The government reserves the right to unilaterally reject

any lot for which testing has taken place and the government did not receive the required notification. No lot shall be released from the contractor's facility prior to receipt of notification of acceptance from the government (DCMA and the designated authority).

APPENDIX E: CONTENTS OF LABELS, AND USE AND CARE INSTRUCTIONS

Size, Identification, and Instruction Label. Label information is as listed within this appendix in accordance with MIL-STD-130. For the cummerbund assembly, items should be labeled with the relevant size nomenclature (see Table VIII). Bar code data information shall be encoded with GS1-128 and Data Matrix ECC 200 symbols. Should an item be too small to mark with the complete label, label "C" will be utilized containing the Nomenclature, National Stock Number and any size information as required. Bulk buckles, metal loops and other similar items not practically labeled shall have the appropriate label applied to the bulk packaging in accordance with MIL-STD-130. Labels applied to items so as to face the body when worn. Label for the Throat Protector will be sandwiched between the layers of textured nylon with the printed information exposed. In addition to the man readable information listed in each example, a machine readable label with similar information will be included as either example "A", "B", or "C": in the following formats:

Example "A":

NOMENCLATURE

MFR (CAGE) 54321 **Lot# 12AB3**

SER NO 12348 **DOP 05/01/2009**

NSN 8470-01-520-7373 **PART # 55B123456789-10**

CONTRACT M67854-09-D-300_ **Size: Medium**

Example "B":

NOMENCLATURE

MFR (CAGE) 54321 **Size: Medium**

DOP 05/01/2009 **NSN 8470-01-520-7373**

PART # 55B123456789-10 **CONTRACT M67854-09-D-300_**

Example "C":

NOMENCLATURE

Size: Medium **NSN 8470-01-520-7373**

PART # 55B123456789-10 **CONTRACT M67854-09-D-300_**

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