INCH POUND
AR/PD 10-04 E
30 JAN 2013
Superseding
AR/PD 10-04 D
1 SEP 2012

PURCHASE DESCRIPTION
SOLDIER PLATE CARRIER SYSTEM (SPCS)

This document is approved for use by all Departments and Agencies of the Department of Defense (DOD). Recommended improvements, simplifications, or reductions in paperwork are encouraged and should be directed to the preparing activity.

1. SCOPE

1.1 Description. This purchase description provides for a multiple threat body armor system consisting of a base vest, cummerbunds and side plate pockets for tailoring protection levels to defeat multiple ballistic hazards across the battlefield continuum and manage armor weight. The SPCS 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). SPCS is functionally integrated with Modular Lightweight Load-carrying Equipment (MOLLE).

1.2 Classification. SPCS consists of three (3) main components; base vest (front and back) with ballistic panels, side pockets (2) with ballistic panels, and cummerbund (2) with ballistic panels. The SPCS shall be used in conjunction with Enhanced Small Arms Protective Inserts (ESAPI), X Small Arms Protective Inserts (XSAPI), Enhanced Side Ballistic Insert (ESBI), and X Side Ballistic Insert (XSBI).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: Product Manager – Soldier Protective Equipment, Program Executive Office – Soldier, US Army, 10170 Beach Road, Building 328T, Fort Belvoir, Virginia

A) The SPCS subsystem; consisting of the base vest assembly, side panels, and cummerbund.

COMPONENT	SIZES
Base Vest Assembly	6 sizes: X-Small, Small, Medium, Large, X-Large, 2X-Large
Side Panels	One size
Cummerbund	3 sizes: X-Small-Small, Medium-Large, X-Large-2X-Large

B) The SAPI subsystem; consisting of a set of ESAPI or XSAPI in the same size as the SPCS.

COMPONENT	SIZES
Small Arms Protective Insert (ESAPI, XSAPI)	5 sizes: X-Small, Small, Medium, Large, X-Large

C) The Enhanced Side Ballistic Insert or X-Side Ballistic Insert subsystem; consisting of a set of ESBI/XSBI in one standard size.

COMPONENT	SIZES
Enhanced Side Ballistic Insert X-Side Ballistic Insert (ESBI/XSBI)	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

TOP 10-2-210 V4	- Ballistic Testing of Hard Body Armor Using Clay Backing
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 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)
AR/PD 10-03	- X-Side Ballistic Insert (XSBI)
GL/PD 10-07	- Cloth, Duck, Textured Nylon
A-A-59826	- Thread, Nylon
A-A-55301	- Webbing, Textile Textured or Multi-Filament
A-A-55126	- Fastener Tape, Hook and Pile, Synthetic
MIL-STD-662	- V_{50} Ballistic Test for Armor
MIL-STD-3027	- Performance Requirements and Testing of Body Armor (see 6.5)
MIL-DTL-46593	- Projectile, Calibers .22, .30, .50, and 20 mm Fragment-Simulating
MIL-W-17337	- Webbing, Textile, Woven Nylon
MIL-STD-810	- Environmental Engineering Considerations and Laboratory Tests
MIL-STD-130	- Identification Marking of U.S. Military Property
MIL-STD-1916	- DoD Preferred Method for Acceptance of Product
MIL-DTL-23053	- Detail Specification for Heat Shrinkable Tubing

(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.

ITOP 4-2-805	- Projectile Velocity and Time of Flight Measurements
TOP 10-2-210A	- Ballistic Testing of Hard Body Armor using Clay Backing

DRAWINGS

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

ENGINEERING DRAWINGS

Project Manager – Soldier Protection and Individual Equipment, Program Executive Office – Soldier, Fort Belvoir, VA

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

(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 forms a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are Department of Defense adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see paragraph 6.2).

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 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: 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 127	- Water Resistance: Hydrostatic Pressure Test
AATCC METHOD 135	- Dimensional Changes of Fabrics after Home Laundering Related to ISO 3759
AATCC Procedure 1	- Gray Scale for Color Change
AATCC Procedure 2	- Gray Scale for Staining
AATCC Procedure 8	- Step Chromatic Transference Scale
AATCC Procedure 9	- Visual Assessment of Color Difference of Textiles

(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 E29	- Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
ASTM D-204	- Sewing Threads

ASTM D-1388	- Stiffness of Fabrics
ASTM D-1683	- Failure in Sewn Seams of Woven Fabrics
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 D-6413	- Standard Test Method for Flame Resistance of Textiles (Vertical Test)

(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 Z1.4-2008 - Sampling Procedures and Tables for Inspection by Attributes

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
ISO 16022 - Information Technology Automatic Identification and Data Capture Techniques Data Matrix Bar Code Symbology Specification

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 Product Verification Testing (PVT), First Article Testing (FAT) and Lot Acceptance Testing (LAT). When specified, complete SPCS samples, representing full production quality, shall be subjected to PVT and FAT in accordance with 4.2 or LAT in accordance with 4.3. Prior to PVT submittal, the contractor shall provide data that shows all the components and materials used in the SPCS meet all stated requirements of the Technical Data Package (TDP) outlined in Appendix D. Additional TDP requirements may be required per the contract.

3.2 Materials and components. The materials and components shall conform to applicable specifications, standards, and patterns required herein.

3.2.1 Cloth Outer and Inner Shell (Body Side). The outer shell fabric shall be textured nylon duck conforming to GL-PD 10-07 Type III Class 4, and Style as specified in the contract except that flame resistance shall be in accordance with paragraph 3.2.1.1. The inner shell fabric (side worn against the body) shall be textured nylon duck conforming to GL-PD 10-07 Type III Class 3, and Style as specified in Appendix A, Table II. If additional Styles are required it will be

dictated within the contract. Type III Class 4 shall also be considered acceptable for the inner shell.

3.2.1.1 Flame Resistant Requirements: The finished cloth(s), outer shell as specified in para. 3.3.1.1, shall exhibit flame resistance. All materials tested shall be tested in both the warp and fill directions. The average melt/drip that occurs after removal of source flame shall be less than 1 droplet. The average afterflame in each direction (warp and fill) shall be no longer than 3.0 seconds, the average afterglow in each direction shall be no longer than 2.0 seconds, and the average char length in each direction shall be no longer than 4 ½ inches for samples prior to laundering (0 washes) and after laundering (5 washes). The average will be taken by combining all the subtests for their respective tests. Laundering shall be conducted according to AATCC Method 135, and the vertical flame testing shall be conducted according to ASTM D 6413.

3.2.1.2 Pattern Execution: The pattern on the printed finished cloth shall be reproducible to the standard sample in respect to design, colors and registration of the respective areas. Various areas of the pattern shall be properly registered in relation to each other and shall present definite sharp demarcations with a minimum of feathering or spew. Each pattern area shall show solid coverage; skitteriness exceeding that shown on the standard sample in any of the printed areas will not be acceptable. Solid shades shall demonstrate level dyeing uniformity. When the standard sample is not referenced for pattern execution, a pattern drawing shall be provided by the contracting or procuring activity upon request. Camouflage color will be specified in the contract. See Appendix A, Table II for individual piece colors.

3.2.2 Cloth Ballistic Panel Cover. Ballistic panel cover should be water tight over cover that is either 70 or 200 Denier Nylon ripstop that is heat sealed around the ballistic filler. The ballistic panel cover shall be water resistant and provide a shelf life/service life of 5 years. Camouflage color will be specified in the contract. See Appendix A, Table II for individual piece colors.

3.2.3 Webbing and Tapes. Webbings and tapes shall be heat cut smooth with no burrs or residual melt. When required, angles on webbings shall be 45° ±10° unless otherwise specified on the drawings or templates. Webbings and tapes shall conform to the following requirements.

a) 3/4 inch Webbing; A-A-55301, Type IV, width 0.75 inch ±1/16. Producer colored or piece/yarn dyed, textured, filament nylon are acceptable: warp ends: 69 min; binder ends: 8 min; picks/inch: 66 min. Weight: 0.48 oz/yd min; break strength: 800 lbs min; thickness: 0.039 inch min.

b) 1 inch Webbing; A-A-55301, Type III, width 1.0 inch ±1/16. Alternate construction is not acceptable. Producer colored or piece/yarn dyed, textured, filament nylon are acceptable: warp ends: 101 min; binder ends: 15 min; picks/inch: 72 min. Weight: 0.50 oz/yd min; break strength: 1000 lbs min; thickness: 0.039 inch min.

c) 1 1/2 inch Webbing; A-A-55301, Type VI, width 1.5 inch ±1/16. Producer colored or piece/yarn dyed, textured, filament nylon are acceptable: warp ends: 144 min; binder ends: 16 min; picks/inch: 80 min. Weight: 0.90 oz/yd min; break strength: 1350 lbs min; thickness: 0.039 inch min.

d) 2 inch Webbing; MIL-W-17337 Class 2, width 2.0 inch ±1/8. Producer colored, textured, filament nylon: warp ends: 160 min; binder ends: 38 min; picks/inch: 72 min. Non-textured, filament nylon: warp ends: 193 min; binder ends: 46 min; picks/inch: 72 min. Weight: 1.15 oz/yd min; break strength: 1950 lbs min; thickness: 0.039 inch min.

e) 1 inch Tape; MIL-PRF-5038, Type III, Class 2, width 1.0 inch ±1/16. Producer colored, textured, filament nylon (500 denier warp/ 210 denier fill): warp ends: 84 min; picks/inch: 65 min. Non-textured, filament nylon (210 denier warp and fill): warp ends: 200 min; picks/inch: 66 min. Weight: 0.21 oz/yd min; break strength: 300 lbs min; thickness: 0.02 inch min.

3.2.3.1 Pattern Execution, Webbing. The pattern of the finished camouflage webbing shall reproduce the standard sample with respect to design, colors, and registration of the respective areas. The pattern of the webbing shall match the pattern on the specified drawing as obtained from the contracting or procuring activity. For webbing and tape components which allow optional color patterns to be used, all pieces within a lot must be produced with the same pattern. See Appendix A, Table II for individual piece colors.

3.2.3.2 Shade Execution, Webbing. The shade of each individual color shall match the colors as specified in the standard for the camouflage pattern specified in the contract or procuring documents when tested as specified in 4.5.12.

3.2.4 Fasteners, Hook, and Loop. Hook and loop fasteners shall conform to A-A-55126, Type II, Class 1: 5/8", 1", 2", and 4 inch widths hook and loop fasteners shall be in accordance with spectral reflectance requirements in para 3.4.5 (Appendix A, Table III-B and D) when tested in accordance with para 4.5.9. Camouflage color will be specified in the contract. See Appendix A, Table II for individual piece colors.

3.2.4.1 Name Tape Loop. The name tape loop shall be placed on the top most row of webbing. This loop should be aligned to the left side and should cover four (4) sections of the MOLLE webbing system. (Note: some sizes only have four (4) sections of MOLLE on the top row so the name tape will be centered instead of aligned to the left).

3.2.5 Polyethylene. 0.030±.005 inches thick, low or high density cut to pattern and bill of material (BOM) requirements. Camouflage color will be specified in the contract. The 0.030in is located in the cummerbund; rear sections in which the rear panel lower flap attaches to loop tape, as well as the side plate pocket long attachment strap.

3.2.6 Foam. The foam shall be closed cell with a density of 3.6-7.3 lb/ft^3. Thickness shall be 1/4 inch ±1/16 when tested as specified in ASTM D-3575.

3.2.7 Emergency release assembly. The emergency release mechanism shall consist of a low profile lever based activator which is housed on an acetal base plate of 2.5 x 3.0 inches (height x width). The lever shall be activated by pulling from the vertical position downward. The lever shall be connected to four steel cables, each of which connects to a corresponding male buckle at the shoulder or waist connection points. Each steel cable shall be housed in a plastic sleeve. The male buckles at the shoulder and waist connection points shall be activated by a tensile force on

the steel cable or as conventional side squeeze buckles. The entire system shall be field repairable using only pliers and a standard Phillips or flat screwdriver. Assembly National Molding P/N 10160 or equivalent.

3.2.8 Thread. Thread, Nylon, Bonded, Size E (Tex 70-76) or Size F (Tex 90-112), A-A-59826, Type II, Class A as required. Camouflage color will be specified in the contract. See Appendix A, Table II for individual piece colors.

3.2.9 "D"-Ring. 1 ½ inch, acetal, ITW P/N 110-0150 or National Molding P/N 4775, or equivalent.

3.2.10 Ladderloc. 1 ½ inch, acetal, ITW P/N 154-0150 or National Molding P/N 7425, or equivalent.

3.2.11 Webbing hanger. 5 x 1 inch, acetal, National Molding P/N 10191, or equivalent.

3.2.12 Female buckle, non-adjustable.

a. 1 inch, acetal, ITW P/N 101-0100. National Molding P/N 5001 or equivalent.
b. 1 ½ inch, acetal, National Molding P/N 9402, or equivalent.

3.2.13 Female buckle, adjustable. 1 ½ inch, acetal, National Molding P/N 9403, or equivalent.

3.2.14 Male buckle, non-adjustable. 1 ½ inch, acetal, National Molding P/N 9406, or equivalent.

3.2.15 Male buckle, adjustable. 1 ½ inch, acetal, National Molding P/N 10213, or equivalent.

3.3 Design. The SPCS model 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 SPCS (see 3.5) consists of one (1) base vest assembly made up of a ballistic panel set (back and front), one (1) set of side ballistic panels, and (1) set of side ballistic cummerbunds. The SPCS provides protection from conventional fragmenting munitions, and 9-mm handgun ballistic protection. The ESAPI or XSAPI subsystem consists of a set of interchangeable, sized, and contoured plates used in conjunction with the SPCS to provide vital organs protection against multi-hits of small arms threats and indirect fire flechettes. The Enhanced Side Ballistic Insert (ESBI) and X –Side Ballistic Insert (XSBI) subsystem consists of a set of interchangeable, contoured plates inserted into the side plate pockets. The variants of SPCS modular system configurations follow below. Recommended enhancements are encouraged to improve its operational effectiveness and manufacturability.

Possible Configurations:

a. Plate Carrier base vest only with ballistic panels and cummerbund with ballistic panels.

b. Plate Carrier base vest with cummerbund and side ballistic panel assembly (side plate pocket and soft ballistic panel) with two ESAPI/XSAPI and with two ESBI/XSBI.

3.3.1 Patterns. The Government shall furnish patterns for the baseline design from which the contractor can use applicable parts to create cutting working patterns. Compliance with patterns is needed to meet interface requirements with fielded personnel combat equipment. The working patterns shall include the size, directional lines, placement marks, notches, and provided seam allowances. Baseline patterns require a 3/8" seam allowance +/-1/8" unless otherwise stated on patterns. Except for the ballistic panels, all the components of the vest shall be cut with a tolerance of +/- 1/8" in accordance with the pattern parts indicated except where changes or enhancement(s) to baseline are proposed. The ballistic panels shall be cut with a tolerance of -1/16"/+1/8" to ensure maximum protective area of coverage is achieved (see para 3.5, Appendix A, Table V-B). Drill holes are not permitted.

3.3.1.1 Base SPCS and Components (sizes XS, S, MD, LG, XL, 2X).

Piece Name	Piece Category	Piece Description	Fabric
PD10_04-FOS_REV_TMP	FOS REVERSE TEMP	TEMPLATE ONLY	A
PD10_04-FRT_IN_SH_UP	FRONT INNER SHELL UP	CUT 1	A
PD10_04-FRT_IN_SH_LW	FRONT IN SHELL LOW	CUT 1	A
PD10_04-FRONT_FLAP	FRONT FLAP	CUT 1	A
PD10_04-FRNT_FLAP_IN	FRONT FLAP IN	CUT 1	A
PD10_04-FOS_QR_FLAP	QUICK RELEASE FLAP	CUT 1	A
PD10_04-FOS_QR_PKT	QUICK RELEASE POCKET	CUT 1	A
PD10_04-FRNT_FLP_PKT	FR FLAP POCKET	CUT 1	A
PD10_04-FRT_IN_P_PKT	FR IN PLATE POCKET	CUT 1	A
PD10_04-FSH_CVR_NCK	FRONT SHLDER CVR NEK	CUT 2	A
PD10_04-FSH_CVR_ARM	FRONT SHLDER CVR ARM	CUT 2	A
PD10_04-BOS	BACK OUTER SHELL	CUT 1	A
PD10_04-BISU	BACK INNER SHELL UPP	CUT 1	A
PD10_04-BISL	BACK INNER SHELL LOW	CUT 1	A
PD10_04-BACK_CTR_FLP	BK CENTER FLAP OUTER	CUT 1	A
PD10_04-BK_CTRFLP_IN	BK CENTER INNER FLAP	CUT 1	A
PD10_04-BCK_CH_CVR	BACK CHANNEL COVER	CUT 2	A
PD10_04-B_CH_PL_TM	B CH PLASTIC TEMPLET	TEMP- CUT 2	P
PD10_04-BK_CTRFLP_PK	BK CENTER FLAP POCK	CUT 1	A
PD10_04-BCK_PKT_FLAP	BK POCKET PLATE FLAP	CUT 1	A
PD10_04-BCK_PLT_PKT	BACK PLATE POCKET	CUT 1	A
PD10_04-F_SHL_DR_T	FR SHL D RING TEMPLE	TEMP- CUT 2	W
PD10_04-FB_FLAP_ST	FR BK FLAP STRAP TEM	TEMP- CUT 2	W
PD10_04-FB_INPL_PS	F B IN PL PK STRAP T	TEMP- CUT 2	W
PD10_04-F_SHL_BK_ST	F SHL BK STR T	TEMP- CUT 2	W
PD10_04-QR_HNDL_T	QUICK REL WEB-TEMPLE	TEMP- CUT 1	W
PD10_04-SPC_CFSTRT	CF STRAP BUCKLE TEMP	TEMP- CUT 2	W
PD10_04-IN_SHELL	INNER SHELL	CUT 2	A
PD10_04-PLAST_BALSTC	PLAST BALLISTIC	CUT 2	B

PD10_04-OUT_SHELL	OUTER SHELL	CUT 2	A
PD10_04-REV_TMP	REVS SIDE TEMP	TEMPLATE ONLY	Z
PD10_04-SPP-BTM	SPP BOTTOM	CUT 2	A
PD10_04-SPP_IN_PKT	SPP INNER POCKET	CUT 2	A
PD10_04-SPP_OUT_SHL	SPP OUTER	CUT 2	A

3.4 SPCS Performance Requirements. The following requirements apply to all components and subcomponents of the multiple threat body armor system in any of its potential configurations in accordance with paragraph 3.3.

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

3.4.2 Fungus Resistance. All components and parts of the body armor, 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 para. 4.5.8).

3.4.3 Use and Care Instruction. An instruction pamphlet will be furnished by the manufacturer with each body armor system. The instruction pamphlet will be printed on a durable man made, synthetic paper capable of multiple time use under harsh field conditions. The pamphlet, at a minimum, shall show system and subsystem components, assembly configuration to include front, back, left, and right plate insertion instructions (with photos), cleaning instructions, repair instructions, and Preventive Maintenance Checks and Services (PMCS) instructions for the vest and soft ballistics.

3.4.4 Camouflage. Table II in Appendix A outlines the camouflage for multi terrain environment; disruptive patterns and solids, for applicable components to reduce visual and infrared (both near and far IR) signature to an acceptable level (see 4.5.9).

3.4.5 Infrared Reflectance. The infrared reflectance for finished outershell fabric, external webbing and exterior facing components only, specified in 3.4.4, shall conform to the requirements specified in Appendix A, Tables IIII-A, B, C, and D initially and after laundering when tested as specified in 4.5.9. Acetal hardware shall conform to infrared reflectance requirements in Appendix A, Table III-E.

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

3.4.7 Pattern Execution. The pattern of the finished cloth shall reproduce the standard sample with respect to design, colors, and registration of the respective areas. Solid shades shall

demonstrate level dyeing uniformity. The pattern of the cloth shall match the pattern for Operation Enduring Freedom Camouflage Pattern (OCP).

3.4.8 Colorfastness. The printed 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 para. 4.5 (Appendix C, Table I).

3.5 SPCS Subsystem. See paragraph 3.3 for SPCS subsystem configuration. The maximum finished weight of the Plate Carrier subsystem components for each size is outlined in Appendix A, Table IV-A when measured as specified in 4.5.6. The minimum area of ballistic coverage for each ballistic panel subcomponent in each size is outlined in Appendix A, Table IV-B when tested as specified in 4.5.5. Finished base vest measurements for each size are outlined in Appendix A, Table IV-C and IV-D when inspected as specified in para. 4.5.2.

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

a) SPCS provides fragmentation protection from conventional fragmenting munitions (see para. 3.5.2.2).

b) SPCS provides handgun protection for 9mm, 124 gr., Full Metal Jacketed (FMJ) projectile (see para. 3.5.2.3)

c) SPCS and ESAPI/ESBI (see para. 3.5.2.4, 3.7) together provide multi-hit small arms protection from:
    (1) Threat (E)

d) SPCS and XSAPI/XSBI (see para. 3.5.2.4, 3.7) together provide multi-hit small arms protection from:
    (1) Threat (E)
    (2) Threat (X)

3.5.2 Ballistic Performance. The SPCS ballistic material system consists of an outershell, ballistic panel, and an outershell inner lining to accomplish the ballistic characteristics specified in paragraphs 3.5.2.2/3/4 as tested in paragraph 4.6.

3.5.2.1 Removable Ballistic Panel Subcomponent. Ballistic panels must be able to be inserted easily into SPCS outershell carriers; front and back base vest, side pouches and cummerbund pouch. The ballistic panels shall provide a means to prevent raveling and soiling, and to secure placement properly within the outershell carrier. The gap/ease between outershell carrier and panel shall be no greater than the ease allowed within the baseline patterns (see para. 4.5.1).

3.5.2.1.1 Ballistic filler. The ballistic filler (without stitching and the ballistic insert cover) weight shall not exceed 0.88 lb/ft^2 with a maximum thickness (without the ballistic insert cover) of 0.30 inches when tested as specified in paragraphs 4.5.6 and 4.5.7. Not to exceed 0.92 lb/ft^2 with insert cover. Except for ancillary components such as thread, the ballistic filler shall be made entirely of ballistic material. Each ballistic filler layer shall be water repellent. Additionally, all components of the SPCS must use the same ballistic package.

Ballistic material for a specific lot will be limited to that particular lot with the following exception: in the case where a roll of significant length remains, that particular roll may be used in the next consecutive lot. Under no circumstances shall ballistic material from a particular roll be used on more than two (2) lots.

3.5.2.1.2 Flexibility. The ballistic filler shall be flexible.

3.5.2.2 SPCS Fragmentation Protection. The ballistic material system (see para. 3.5.2) shall provide consistent ballistic performance for each complete SPCS (ballistic inserts for base vest front and back, side plate pockets, and cummerbund). All SPCS components and base vest (see para. 3.3) will be made from the same approved ballistic package. Appendix B, Table I lists the required minimum V_{50} values for base vest assembly and side plate panels at specified obliquity when tested with the 17-grain Fragment Simulating Projectile (FSP).

Appendix B, Table I specifies minimum ballistic performance that shall be maintained after conditioning to hot and cold temperature extremes, accelerated aging and POL contamination. Testing is specified in section 4.5. Any change in the SPCS area of coverage must meet minimum casualty reduction potential of the approved system coverage (see section 3.5, Appendix A, Table IV-B) and V_{50} performance (see Appendix B, Table I) stated herein. Any product improvements in the ballistic performance of the SPCS base vest panels, side plate pocket panels and/or cummerbund panels shall not reduce the ballistic performance of the SPCS when tested with ESAPI/XSAPI and ESBI/XSBI as specified in the performance requirements (see 2.2).

3.5.2.3 Handgun protection. The ballistic material system shall be engineered to provide handgun protection. Appendix B, Table III outlines the ballistic material system minimum V50, and V0 acceptance for the 9-mm, 124-grain, Full Metal Jacketed (FMJ) 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.

3.5.2.4 Small Arms Protection. The ballistic material system shall be engineered to provide small arms protection when the base SPCS material system is used in conjunction with ESAPI/XSAPI and ESBI/XSBI. Appendix B, Table II outlines the ballistic material system minimum dry V_0 acceptance as specified in section 4.6. The classified threat code to specific threat round correlation chart and other details are provided in a classified enclosure separately provided to those vendors with proper security clearances and facility clearance through DSS.

3.5.3 SPCS Construction. The exterior of the system shall be edge stitched 1/8 inch from all edges EXCEPT for edges indicated with corresponding location markings on the patterns provided. All stitching shall be back-tacked to prevent raveling and demonstrate good stitching

quality with no loose ends, consistent stitches per inch, even tension with no loose needle or bobbin thread. Fabric edges shall not ravel.

3.5.3.1 Hook and Loop Fastener. Hook and loop fasteners shall not be stitched in the selvage edge to prevent associated fraying durability problems in repeated use (see para. 4.5).

3.5.3.2 Stitching. Stitching shall conform to ASTM D-6193, 9-12 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 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 materials sewn. Thread ends shall be trimmed to a length of not more than 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) will be avoided to prevent needle cutting and weakening of the attachment point. Bartack requirements are specified in Appendix A, Table V when tested as specified in 4.5.

3.5.3.5 Bartack Alignment for MOLLE Pocket Attachment. The required spacing of vertical bartacks is specified below which is needed for physical compatibility of MOLLE pocket attachment on SPCS base vest.

a) Distance between vertical bartacks on horizontal webbing shall be 1 1/2” –0, +1/16”.
b) Distance between horizontal webbing shall be 1 1/8” (±1/16).
c) Vertical bartacks on consecutive horizontal webbing rows shall be vertical aligned 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. All buttonholes will be 1 ¼” with a finished cut of 1”± 1/16”.

3.5.3.7 Drag strap. The drag strap on the back of the SPCS carrier (all sizes) shall have a peak strength not less than 400 lbs (increased strength is desirable) when tested in accordance with paragraph 4.8, and also give rise 1/4 inch -0/+1/8.

3.5.3.8 Emergency Release Mechanism. An emergency release mechanism shall be provided (para. 3.2.7). The mechanism shall be a single point activator and located on the front (chest) portion of the vest and be capable of being operated with either hand, gloved or not. Upon activation of the mechanism, the vest shall separate into two distinct pieces. The SPCS release mechanism must be compatible with the Tactical Assault Panel (TAP) and cummerbund.

3.6 Size, Identification, and Instruction Label. All markings must be visible in low light levels under .0108 lux lighting and also in blackout conditions with an L-shaped standard Army issued flashlight with a red or blue filter. The label shall be of sufficient strength to withstand repeated abrasion during field use and cleaning, and include the following:

a) The SPCS base vest component shall have a combination of size, identification, serial number, ballistic protection level, and instruction label for the base vest (Appendix E). Chest circumferences for each size in Appendix A, Table VI.

b) The side pocket and cummerbund shall have a combination of size, identification, serial number, and ballistic protection level for the side plate pocket and cummerbund (Appendix E).

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

d) The instruction label shall be located on the inside of the back of the base vest (Appendix E). The size of the label shall be 4.5 inches wide by 7.75 inches high. The type shall be no smaller than 10 point and shall be in accordance with MIL-DTL-32075, Type VI, and Class 14. Color: Tan 499. Contents of labels shall be as found in 6.6.

3.6.1 Unique Identification (UID): Front and Back ballistic panels only will require a unique identification label that conforms to the specifications below:

The manufacturer is required to comply with the current versions of Military Standard 130 and the Department of Defense Guide to Uniquely Identifying Items, and the following criteria.

1. Color: Label/Tag will be Foliage Green 504 with black Human Readable and Machine Readable Information (HRI) and (MRI).

2. HRI shall consist of: Commercial and Government Entity (CAGE) code of activity applying the tag/label, Lot Number, Serial Number, Date of Production, National Stock Number (NSN) and Design Code. HRI will meet requirements of the latest version of MIL-STD-130.
3. MRI shall consist of one ECC 200 compliant Data Matrix code containing: CAGE code of activity applying the tag/label, Lot Number, Serial Number, Date of Production, NSN, and Design Code. The tag/label shall comply with the latest version of MIL-STD-130, ANSI MH10.8.2, and Items #4 and #5 below. To prevent automated read errors, the Government will not allow other 1D or 2D codes to be printed on this label. This does not restrict contractor from using other HRI and MRI on labels not associated with the UID label/tag.

4. Data Matrix Construct: The Data Matrix shall be encoded per MIL-STD-130 using only the data identifiers (DI) and criteria shown below. The following DI sequence shall be maintained in the order listed below:

Cage=17V followed by cage code
Lot=1T followed by lot number
Serial number=S followed by serial number
Date of production = 16D followed by production date, YYYYMMDD
National stock number=N followed by the NSN.
Part number = 1P followed by design code (the design code may be up to 13 alpha-numeric characters (plus only dashes "-" as special characters))

Construct Example:
[)>RS06GS17V52969GS1TE034GSS328185GS16D20080215GSN8470-01-520-7370GS1PABC-123RSEOT

5. Data Matrix Geometry: Data Matrix codes shall be a square ECC200 matrix per ISO 16022. Individual Cell size (element size) of the code shall be between 0.020 and 0.023 inches. A quiet zone of 0.5 inches of Black label/tag material is required around the Data Matrix code.

6. Verification: Data Matrix code quality will be graded to ISO 15415 with a certified verifier and meet a minimum passing grade per the latest release of MIL-STD-130. AS9132 and AIM DPM grading platforms will not be allowed for this project. Contractor must provide the contracting officer with at least two verification reports per ballistic panel for each FAT and LAT. If using laminates or overcoats the label must be verified after placing the laminate or overcoat on the label or tag. No exceptions are allowed. Proof of Verification is subject to inspection at the time of shipment.

7. Validation: Validation checks of the UID must be performed on a routine basis. Contractor is responsible for encoding the UID per above guidelines (#4 and 5) and the latest revision of MIL-STD-130. Proof of Validation is subject to inspection at the time of shipment.

8. Placement of the UID label/tag: The data will be centered horizontally and shall be placed on the same label for size, identification, and instruction (specified in 3.6). The UID label/tag will be located directly below all the information specified in 3.6.

3.7 Hard Armor Pocket. The SPCS ESAPI/XSAPI/ESBI/XSBI pockets shall ensure positioning of the bottom horizontal edge according to the Government patterns for proper organ coverage, and have enough ease to allow the ESAPI/XSAPI/ESBI/XSBI to be easily and quickly inserted into and removed from the vest without struggle or force. The ESAPI/XSAPI pocket shall ensure that along the entire perimeter of the insert there is 1 in -0/+1/8 inch of ballistic filler that extends beyond the edge of the corresponding size insert for all sizes (see paragraph 4.7.2). The ESBI/XSBI pocket shall allow for edge to edge coverage of soft armor coverage on the ESBI/XSBI plate. The ESAPI/XSAPI/ESBI/XSBI pocket shall not allow the insert to shift during user operation or due to added weight of MOLLE components attached to the outershell. (see paragraph 4.7.1)).

3.8 Ownership and Support.

3.8.1 Service Life and Reliability. The finished SPCS shall have a service life of 365 days of continuous use in all types of typical military field environments with no operational mission failures if not impacted by ballistic projectiles.

3.8.2 Shelf Life. The minimum shelf life of all components and materials in the finished SPCS shall be 5 years. The components and materials shall suffer no degradation in performance after storage for a period of 5 years.

In addition, the contractor and its subcontractor shall ensure that the finished end item shipped, following Government LAT approval, in a timely manner to ensure that no less than 90 percent (allowing for rounding to whole months) of the shelf-life is still remaining at time of receipt by the first Government activity. Any delivery from a contractor not having at least 90 percent shelf-life remaining shall be considered nonconforming and cause for rejection.

The Contractor and its subcontractors shall not incorporate, integrate nor include in the manufacturing of any subassembly or end item, self-life expired raw materials, and or parts. If shelf-life expiration for raw materials is not defined in this specification, the recommended shelf-life expiration from the raw material source shall be honored. Any delivery or end item found to have been manufactured with expired material from a contractor shall be considered non-conforming and cause for rejection.

3.8.3 Health and Safety. The SPCS shall be safe to use and not contain any harmful materials.

3.8.4 Safety. The SPCS shall be designed so that under all conditions or normal use and under a likely fault condition, including human error, it protects against the risk of hazards. The potential for injury while assembling, donning/doffing, cleaning and maintaining the SPCS shall be eliminated or minimized to the maximum extent. There shall be no loose parts that would be susceptible to snagging.

3.8.5 Toxicity. The water repellant/frame finished on SPCS shall not present a dermal health hazard when used as intended.

3.8.6 Hazardous Materials. Hazardous materials that can be exposed to personnel or the environment during any operational (to include fabrication, transportation, and setup/tear down) or maintenance procedures, or exposed as a result of damage to the equipment, or requiring special disposal procedures, shall be kept to an absolute minimum, consistent with operational requirements. Environmentally acceptable substitutes shall be used whenever possible without degrading operational function and maintaining cost effectiveness. Hazardous material exposure to personnel shall be controlled to levels below the OSHA Permissible Exposure Limits. The SPCS shall not present any uncontrolled health hazard throughout the life-cycle of the item. The following shall be included when designing the SPCS.

- Avoid the use of materials that cause skin irritation or allergies
- Utilize materials that are resistant to fire, fungus, bacterial growth and etc.
- Allow for easy cleaning and/or replacement of parts that could present health hazards to the wearer.

3.8.7 Responsibility for compliance. All items shall meet all requirements of section 3 and 4 of this specification. The absence of any inspection requirements shall not relieve the contractor of the responsibility of ensuring that all products of supplies 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. Unless otherwise specified, the contractor is responsible for the performance of all inspection requirements specified herein. The Government reserves the right to perform any of the inspections set forth where such inspections are deemed necessary to ensure the supplies conform to prescribed requirements.

a) PVT (see 4.2)

b) FAT (see 4.2)

c) LAT (see 4.3)

4.2 Product Verification Testing and First Article Testing. Product verification testing is required prior to FAT submittal and must be tested at a Government facility. Production verification testing shall be tested in accordance with section 4.6 and Appendix C and D. Failure to meet the ballistic requirements outlined within this purchase description will prohibit the armor design from entering FAT. Additionally, the contractor shall provide data that shows all the components and materials used in SPCS meet all stated requirements of the Technical Data Package. 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 in 4.6 and 4.7, and overall workmanship (Appendix A, B, C, D & E).

4.2.1 Material Qualification. At any point after a First Article Test has been approved, any material change must be submitted to the Govt. via the ECP process. The Govt. will then communicate requirements for approval.

4.2.2 Ballistic Qualification. At any point after a First Article Test has been approved, any material change must be submitted to the Govt. via the ECP process. The ballistic package will be required to pass all ballistic First Article Test requirements as specified in paragraph 4.6.

Each ballistic package submitted for a First Article Test shall have a unique name or code to identify the package. No duplication of names or codes for different packages shall be accepted. A ballistic package includes both base vest and side panel designs.

4.3 Lot Acceptance Testing. LAT shall be performed in accordance with Section 3 and 4 in conjunction with Appendices A, B, C, D, E and F. The Government's acceptance of the contractor's end item product will be determined by the ballistic and non-ballistic requirements validation.

4.3.1 Certificate of Compliance (COC). When certificates of compliance are required, the Government reserves the right to test such items to determine the validity of the certification. All certificates shall be supported by test reports to ascertain their validity.

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 and can be found in Appendix C.

4.5 Non Ballistic 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 vests or the individual components (when component is purchased separately). The sample unit shall be one completely fabricated vest or individual component.

4.5.2 End Item Dimensional Inspection. The end items shall be inspected for finished measurements (see Appendix C, Table III). The lot size shall be expressed in units of vests or individual components (when component is purchased separately). The sample unit shall be one completely fabricated base vest or individual component.

4.5.2.1 Linear Measurements. Front and back center measurements are taken along the center line by holding the garment taut. With a metal measuring device, measurements shall be taken to the nearest 1/16 inch. Front and back width, and webbing hanger's measurements are taken in a flat, relaxed state, with a metal measuring device and measurements taken to the nearest 1/16 inch. ESBI/XSBI pocket measurements are taken along the horizontal and vertical line by holding the garment taut. With a metal measuring device, measurements shall be taken to the nearest 1/16 inch. Dimensional measurements are taken as described below:

a) Center Front and Back Lengths: The center front and back length shall be taken on a straight line from the center of the back from the top edge of the base vest neckline (center front and back) to the bottom edge of the shell.

b) Front and Back Width: The front and back width shall be taken on a straight line measuring across the panel from side to side.

c) Spacing of Webbing Hangers for MOLLE pockets: The horizontal distance between bartacks shall be taken from the center of one bartack to the center of the adjacent

bartack. The spacing between horizontal webbing shall be measured on adjacent webbings from the bottom edge of one to the top edge of the other.

d) ESBI/XSBI Side Pocket Length and Width: The side ESBI/XSBI plate pocket measurements shall be taken on a straight line along the outer edge of the pocket on both horizontal and vertical axis.

e) Cummerbund Length and Width: The cummerbund measurements shall be taken on a straight line along the outer edge of the pocket on both horizontal and vertical axis.

4.5.3 In-Process Visual Examination of Cut Parts, Fillers and Patterns. The cut parts for the vest shell assembly, and the ballistic filler components shall be 100 percent inspected by vendor during the cutting process to determine that parts containing defects such as a hole, cut, are removed from production. Ballistic fillers shall be 100 percent inspected by vendor during the assembly of the individual groups 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 government patterns in all respects.

4.5.4 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 front and back ballistic fillers and ESBI/XSBI side plate pocket ballistic fillers. The sample unit shall be one ballistic filler.

4.5.5 Area of Coverage. Square inches of coverage are measured by digitized patterns and comparison to working patterns (para 3.5).

4.5.6 Weight and Areal Density.

4.5.6.1 Weight Measurements. The SPCS will be examined for weight by component. See maximum weights in Appendix A, Table IV-A. Weights are taken on a tarred scale and measured to the nearest 0.01 pound.

4.5.6.1 Areal Density Measurements. Areal density shall be calculated on unstitched ballistic filler material in accordance with ASTM-D-3776, Standards Test Methods for Mass per Unit Area of Fabric, Option C, with exceptions. Each 15 inch x 15 inch ply of ballistic filler shall have two (2) 100 cm^2 die cut samples cut out and weighed independently to the 0.001 lbs. The weight percent difference between the first sample and the second sample shall be within two (2) percent. The areal density for a single ply shall be the total mass of the two (2) pieces divided by the total area of the two (2) pieces. The actual areal density for the entire ballistic filler shall be calculated by adding each ply's areal density together. Areal densities shall be expressed in lb/ft^2.

4.5.7 Thickness. Thickness is measured to the nearest 0.01 inch when measured under 0.5 psi when tested according to ASTM D-1777 (Appendix A Table I).

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

4.5.9 Infrared Reflectance. Spectral reflectance shall be evaluated initially and after laundering In accordance with Appendix A, Table III. The accelerated three laundering shall be performed using AATCC 61 Test No. 1A; except a 4 gram sample size shall be used unless the amount needed to provide the required five layers of the specimen for testing is larger (the specimens of webbing or tape need to be 4 inches long). When evaluating the camouflage printed cloth, webbing, or tape each color shall be tested separately. Also 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 unless the size of the item dictates a smaller aperture is required. 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.

4.5.10 Resistance to POL, insect repellent, sweat, and sea water after one laundering. SPCS outershell carrier cloths shall be tested, after one laundering per 4.5.11, and after exposure to each DEET, POLs; motor oil, JP-8 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 ¼ inch and three drops of each test liquid shall be applied to the center of the specimen. A glass plate the same dimensions shall be placed on the specimen and a four pound weight placed in the center of the glass plate assembly. After 16 hours, remove the specimen and test immediately for hydrostatic resistance. DEET test liquid shall be diethyltoluamide (O-I-503 Type II, Concentration A). The motor oil shall conform to ASTM D-4485, Grade CD-II. The weapon lubricant shall conform to MIL-PRF-63460 or commercial Break Free CLP, Santa Ana, CA or equal. The perspiration solution shall be made up in a 500 ml glass beaker by combining 3.0 grams sodium chloride, 1.0 gram of trypticase soy broth powder, 1.0 gram normal propyl propionate, and 0.5 gram liquid lecithin. Add 500 ml of distilled water, add a magnetic stirring bar, and cover the beaker. Place the beaker on a combination hot plate/magnetic 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 and sample preparation shall be the same as perspiration.

4.5.11 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 test specimens shall be laundered with 0.5 ounce (14 grams) of 1993 AATCC Standard Reference Detergent. The duration of the laundering cycle shall be 30 +/-5 minutes. After laundering, the specimens and ballast shall be dried in an automatic tumble dryer set on permanent press cycle, 150 to 160 degree F for approximately 15 minutes. The laundering equipment, washer and dryer, shall be in accordance with AATCC TM 135-1992.

4.5.12 Visual Shade Matching. The color and appearance of the cloths and components (webbing, tapes) shall match the standard sample using the AATCC Evaluation Procedure 9, Option A or C, with sources simulating artificial daylight D75 illuminant with a color temperature of 7500 (± 200) K, illumination of 100 (± 20) foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2856 (± 200) K. All matching/shade analysis must be conducted in a Government directed lab unless otherwise specified in the contract or procuring documents.

4.5.13 Flame Resistance. All materials tested shall be tested in accordance with ASTM D 6413 in both the warp and fill directions as evaluated by section 3.2.1.1.

4.6 Ballistic Performance. First Article Testing will be conducted on material end items. Lot Acceptance Testing will be conducted on the end item constructed of the approved ballistic material system as verified by FAT. 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 6.4 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. Prior to conditioning, the heat sealed ballistic cover will be carefully cut along the entire bottom edge of the ballistic panel without cutting into the ballistic filler. All testing will be conducted in the conditions specified in 4.6.2.3. All non-ballistic components of the ballistic material system (i.e.; outer shell and inner lining) shall be laundered as specified in 4.5.11 prior to assembling test panels to simulate a worn condition. All specimens will be visually inspected after conditioning for coloration, distortion, melting, cracking, or other physical defects and noted.

4.6.1.1.1 Wet Condition. Sea water shall be utilized for wet test conditions. Prior to conditioning, the heat sealed ballistic cover will be carefully cut along the bottom edge of the ballistic panel without cutting into the ballistic filler, from edge to edge. Sea water formulation is 3% sodium chloride / 0.5% magnesium chloride. The armor submersion equipment shall consist of a water bath that allows for at least one armor panel of the largest size to hang vertically, without any folds or bends, with the top edge of the armor at least 100 mm (3.9 in) below the surface of the water, and with at least 50 mm (2.0 in) clearance around the panel for a minimum of 24 hours but should not exceed 24.5 hours. The water temperature shall be 70 degree F ± 10 degree F. For armors that are buoyant, as little weight as possible shall be attached to the bottom edge of the armor with clothes pins or similar clips to allow the armor to hang vertically (cut side down) under water. After removing the specimen from the water, it shall be hung vertically and allowed to dry for 10 min (+5 min/-0 min) and tested within 5 minutes with tests completed within 60 minutes.

4.6.1.1.2 Temperature Extremes Condition. Prior to conditioning, the heat sealed ballistic cover will be carefully cut along the bottom edge of the ballistic panel without cutting into the ballistic filler, from edge to edge. For hot temperature extreme, the SPCS shall be heated in an oven operating at 155 + 10 degrees Fahrenheit for 6 +/- ¼ 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 +/- ¼ hours continuously. The test specimen shall be removed from refrigeration, mounted and ballistically tested as specified in 4.6.3, within 10 minutes with tests completed within 60 minutes. If either 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. Prior to conditioning, the heat sealed ballistic cover will be carefully cut along the bottom edge of the ballistic panel without cutting into the ballistic filler, from edge to edge. Accelerated aging for the SPCS and/or subcomponents will be performed in general accordance with ASTM D1149, with the following modifications. The entire SPCS or subcomponent under test will be subjected to treatment. 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 SPCS and/or subcomponents do not require any additional tensile strain during accelerated aging conditioning. After accelerated aging conditioning, the SPCS and/or subcomponents under test must remain at ambient atmospheric conditions for a minimum of 24 hours prior to ballistic testing, not to exceed 36 hours from completion of conditioning. Verify that the conditioned specimens perform as specified in 3.5.2.2.

4.6.1.1.4 POL Contamination. Prior to conditioning, the heat sealed ballistic cover will be carefully cut along the bottom edge of the ballistic panel without cutting into the ballistic filler, from edge to edge. POL conditioning should be done on each of the following; motor oil and JP-8. The armor submersion equipment shall consist of a POL bath that allows for at least one armor panel of the largest size to hang vertically, without any folds or bends, with the top edge of the armor at least 100 mm (3.9 in) below the surface of the POL fluid, and with at least 50 mm (2.0 in) clearance around the panel for a minimum of 4 hours but no longer than 4.5 hours at room temperature. For armors that are buoyant, as little weight as possible shall be attached to the bottom edge of the armor with clothes pins or similar clips to allow the armor to hang vertically (cut side down). After removing the specimen from the POL fluid, it shall be hung

vertically and allowed to dry for 15 minutes. Excess POL fluid shall be wiped from the surface to facilitate handling of the specimen. Before mounting in the test fixture, the sample may be contained in a reseal able plastic bag and mounted to the test fixture to limit exposure to contaminants and fumes. The specimen then shall be ballistically tested within 30 minutes from removal in the POL fluid, 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); V_{50}, and V_0 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 or threat code when required.
d. Temperature and humidity measurements.
e. Yaw angle.
f. Angles of target obliquity.
g. Velocity measurements of each test shot used to test the armor (regardless of whether that particular velocity was used in the V_{50} or V_0 determination).
h. Velocity loss and/or corrected striking velocity.
i. PP (Partial Penetration) and CP (Complete Penetration) next to each shot velocity as determined.
j. Back Face Deformation measurements recorded to the nearest tenth of a millimeter rounding following standard ASTM E29
k. Angle of spall/debris ejection if applicable.
l. Name of organization/company performing tests.
m. Type of gun barrel and serial number, caliber, and propellant type and weight, twist rate.
n. Range measurements including distances from gun barrel to velocity measurement devices and target.
o. Calculated Ballistic Limit. In a situation where the V_{50} BL, or V_0 data sheet would compromise the Security Classification Guide for Armor Materials (see 2.2), the data sheet should exclude the specific projectile used during testing.
p. Penetrated plies of soft armor for system tests.
q. Clay drop temperatures, locations, depth and clay box number.
r. Remarks or notes for all testing anomalies, unfair hits, etc.
s. All shot locations.
t. Revision number/level of all ballistic software used by test lab (i.e. FARO software including smoothing function, etc…).

4.6.2.1 Projectile Velocity Determination. Projectile velocity and time of flight measurements shall be in accordance with ITOP 4-2-805. Instrumental velocity shall be translated into strike velocity at the target and the strike velocity shall be used for ballistic requirements. Projectile velocity measurement methods shall employ either high velocity lumiline screens or electrical contact screens which either open or close an electric circuit by passage of the projectile through

the detector. Contact screens may consist of metallic foils separated by a thin insulating layer, or may consist of a circuit printed on paper with the circuit spacing such that the projectile passing through the screen will break the circuit. An electric counter type chronograph measuring to the nearest microsecond or as a 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 all projectiles, velocity correction methodology shall be used to calculate the actual striking; ATC V2 Drag curves shall be used to accomplish this.

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 ITOP 4-2-805. Spacing between triggering devices is a function of the expected velocity of the projectile being fired. In many instances, physical restriction, such as short overall distance from muzzle to test sample dictates the spacing of the triggering devices. The last pair of triggering devices shall be placed at least four (4) feet (122 cm) for fragment and 9mm tests, and at least 5 feet (152.4 cm) for system level tests 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 as closely as possible to a standard atmosphere of 68 +/- 10 degree Fahrenheit and 50 +/- 20% relative humidity. Temperature and humidity measurements shall be recorded before the beginning of days 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 for soft armor tests and 3 degrees for system tests, 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 V_{50} BL Calculation. V_{50} will be determined in accordance with MIL-STD-662F and ITOP 4-2-805. For First Article Testing (FAT) and Lot Acceptance Testing (LAT), three (3) Partial Penetration (PP's) and three (3) Complete Penetrations (CP's) within a 125 ft/sec velocity spread or five (5) Partial Penetration (PP's) and five (5) Complete Penetrations (CP's) within a 150 ft/sec velocity spread yield the V_{50} BL determination that will be accepted. For LAT the test shall conclude immediately upon obtaining a valid 3/3 and shall only use a 5/5 when a 3/3 cannot be obtained. For LAT, if neither the six nor the ten shot conditions can be satisfied and the following conditions have been met then it shall be determined to have satisfied that specific threat condition requirement (10 partial rule): (1) at least ten (10) partial penetrations at velocities in excess of the required minimum V_{50}, (2) no complete penetrations at or below the minimum required V_{50} velocity, and (3) at least 14 fair shots have been made in the vest(s). Should none of these three conditions apply, the test shall be declared inconclusive and another SPSC shall be tested.

4.6.3.1 PP and CP Determination for V_{50}. Complete and partial penetrations 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) SPCS base vest panels configured in the end item armor material system shall be used for FAT.
b) SPCS base vest panels configured in the end item armor material system approved under the First Article Test shall be used for Lot Acceptance Testing.
c) For all size test panels a metallic (approx. 0.20 inch thick aluminum or steel) frame with minimum 1.4 inch width shall be employed to restrain the test material during ballistic impact.
d) The test panel will be sandwiched between a 4 inch flat ring mount restrained with mechanical or pneumatic clamping devices on the frame.
e) Shot spacing shall be measured on center of impact point.
f) All shots shall be at least 2.5 inches from any ballistic material edge found on the samples.
g) 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. Closer shot spacing data shall be permitted in the event a complete penetration does not occur.
h) Depending on the test panel size it may be necessary to use 2-3 panels for the V_{50} determination.
i) Test specimens shall be reconditioned on a hard surface and smoothed out after every shot.

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

a) SPCS base vest panels configured in the end item armor material system shall be used for FAT. For system tests, the Government will provide hard armor inserts that have had their design certified during Government FAT and have passed Government LAT.
b) SPCS base vest panels configured in the end item armor material system approved under the FAT shall be used for LAT.
c) Test specimens shall be reconditioned to a smooth shape after every shot.
d) Samples will be mounted on clay block described below (see para. 4.6.4.2).

For 9mm V0 Testing

a) All test samples will be tested in their final design and end use configuration including all system components (e.g., carriers, straps).
b) The armor panel shall be rigidly supported across the entire rear face area, paragraph 4.6.4.2 and 4.6.4.2.1

c) The armor panel shall be positioned and maintained in intimate contact with the backing material prior to and during the ballistic impact event.
d) The first shot will be 2.75 ± 0.25" inch from any edge.
e) All subsequent shots shall be no closer than 2.75 ± 0.25" inch from any edge.
f) The next shot shall be located 3.5 inch –0/+0.5" from the first shot and at the weakness point in the configuration, e.g.; seamed area or non-uniform area of design.
g) The third shot location should be positioned 3.5 inch –0/+1/2" from any of the 2 previous test shots.
h) 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.
i) The transient deformation shall be measured (see paragraph 4.10.8) after the third and fifth valid test firings per paragraph 4.6.4.1 and 4.6.4.1.1
j) Test shots should be staggered at least 0.50 inch off the horizontal and vertical lines of any previous shots. Shot location will be measured as the impact point on the strike face of the ballistic panel, not the surface of the vest.
k) Test specimens shall be reconditioned to a smooth shape after every shot.
l) The armor panel shall be adjusted between shots as required to maintain a consistent armor panel surface, original condition, alignment of the ballistic panels/layers, and intimate contact with the backing material.

For System Testing with ESAPI

m) The first fair hit impact (0 degrees obliquity) will be between 0.75 to 1.25 inches from the edge of the Insert for threat E.
n) The second impact (0 degrees obliquity) will be 5.0 to 6.0 inches away from the first impact on the Insert for threat E and located on the crown of the plate.
o) The distance between the third shot and any subsequent shots will be 5.0 to 6.0 inches away from any previous impacts on the Insert for threat E.
p) All shots after the first shot must be at least 1.5 inches from any edge of the Insert.
q) The back face deformation shall be measured only for shots taken a 0 degrees obliquity per paragraph 4.6.4.1 and 4.6.4.1.1.
r) Test specimens shall be reconditioned on a hard surface and smoothed out after every shot.

For System Testing with ESBI

s) The first fair hit impact (0 degrees obliquity) will be between 0.75 to 1.25 inches away from any edge for shot pattern "A" and 2.0 to 2.5 inches away from any edge for shot pattern "B" with threat e.

t) The second impact (0 degrees obliquity) will be 4.0 to 5.0 inches away from the first impact location and located as per the two separate shot patterns "A" and "B" for threat e.
u) Shot pattern "A" and "B" shall be alternated after each test.
v) The back face deformation shall be measured only for shots taken a 0 degrees obliquity per paragraph 4.6.4.1 and 4.6.4.1.1.
w) Test specimens shall be reconditioned on a hard surface and smoothed out after every shot.

4.6.4.1 Clay Box and Mold Measurement. The rear of the armor test specimen will be attached to a block of non-hardening, oil-based modeling clay so that no movement of the test samples occurs before, during or after the ballistic event. The clay material fixture shall be in the form of a single block at least 5.5 inches thick and 24 x 24 inches in length and height with 0.75 inch plywood backing. The clay shall be conditioned for at least 3.0 hours and worked thoroughly to remove any voids. A new clay conditioned block shall be used for each body armor sample. The clays consistency shall be such that a depression of 25 ± 3mm in depth is obtained when a 1 kg ± 10 gm (2.2 lb ± 0.35 oz) cylindrical steel mass, 44.5 ± 0.5 mm (1.75 ± 0.02 in) in diameter and having a hemispherical striking end, is dropped from a height of 2 m ± 2 cm (6.56 ft + 0.8-in**)** onto one of its square faces. During the three drop tests for each block, the center of each impact location shall be at least 6.0 inches from any previous impact site and 4" minimum from any edge of the clay block. A guide tube or other means may be used as required to assure that the striking end of the cylindrical mass impacts the backing material squarely at the desired location. Depressions and BFDs will be measured with instruments capable of ± 0.4mm accuracy. The calibration drop indentations will be filled with temperature conditioned clay prior to conduct of the V_0 test shots. The clay boxes will be numbered so as to be recognized by an overhead camera. The specimen will be strapped or taped to the surface of the clay material. Ballistic testing will be performed at 0 degrees obliquity and 30 degree obliquity. Back-face deformations in the clay will not exceed 44.0 mm. when measured from the original undisturbed surface of the backing material to the lowest point of the depression. The specimen may be smoothed between shots.

4.6.4.1.1 Back Face Deformation (BFD) Measurement. Back face deformations in the clay are measured from the original undisturbed surface of the clay backing material to the post-impact surface with the reference direction perpendicular to the front surface (facing the line-of-fire) of the box. Indentation measurements will utilize laser scanner measurement instruments, which provide a means to accurately establish the difference between the original undisturbed clay surface and the post-impact surface. The BFD measurement is the maximum-distance-length, which is the length of the longest line segment parallel to the reference direction between the pre-impact clay surface and the post-impact (BFD) clay surface, where the reference direction is defined to be perpendicular to the front surface (facing the line-of-fire) of the box containing the clay backing material. Deformations will be recorded in mm to the nearest tenth of a millimeter following standard ASTM E29 "Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications" ("Five-even" rule)(Rounding Method) (i.e., 44.050 = 44.0, 44.051 = 44.1 and 47.950 = 48.0). Back-face deformations in the clay will not exceed 44.0 mm. Additional information can be found in TOP 10-2-210A.

The laser scanner measurement instruments and associated software must be approved for use by ATEC. Prior to changes in Geomagic software, settings, or updated software, research will be

conducted and the results will be vetted through the Testing Integrated Process Team (IPT) and Product Manager prior to implementation.

4.6.4.2 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.

4.6.4.2.1 Mounting for Soft Armor Testing. 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. The specimen shall be smoothed between shots.

4.6.4.2.2 Mounting for System Testing. Before system testing, the clay material will be contoured to the back face curvature provided by the ESAPI/XSAPI and ESBI/XSBI. This buildup will use additional clay backing material conditioned in the same manner as the clay material fixture. Both the soft fragmentation protection and ESAPI/XSAPI/ESBI/XSBI will be strapped or taped to the curved surface of the clay material. Mark intended shot locations on the actual plate. Small "windows" shall be cut in the SPCS front Cordura cover to expose the aim points marked on the actual plate. Back face deformations in the clay will not exceed 44.0 mm for system testing when measured from the original undisturbed surface of the backing material to the lowest point of the depression. The soft armor specimen shall be smoothed on a hard surface between shots.

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 SPCS base vest front and back pockets as well as the insertion of the ESBI into both side plate pockets (standalone side plate pocket and side plate pocket used with the cummerbund) without tools or special aids. An insertion demonstration shall be performed with ESAPI's (conforming to drawings 2-6-0588, 2-6-0589, 2-6-0590, 2-6-0591 and 2-6-0592), ESBI's (conforming to drawing 2-6-270), and the maximum thickness requirement. The examination shall be performed with an ESAPI or ESBI in each pocket. The pocket flaps shall be closed and secured. It must be possible to insert and remove a plate in the pocket without effort. A defect shall be scored if any Insert must be forced into or removed from the pocket, or if excessive force is needed to secure the flap.

4.7.2 Measuring Soft Armor Extension beyond ESAPI/XSAPI. Insert an ESAPI into the corresponding sized SPCS front and back base vest hard armor pocket and verify correct placement. The amount of ballistic filler extending beyond the edge of the insert will be measured by holding the garment taut. Measurements will be taken using a metal measuring device and measurements taken to the nearest 1/16 inch while the vest is flat. Measurements shall be taken at a minimum from the top edge, bottom edge and parallel left and right edges of the Insert. Measurements must be a minimum of 1.0 -0 +1/8 inch of ballistic filler extending

beyond the edge of the insert or else it is scored as a defect. Verification of required ballistic filler extension may require physical destruction of the carrier and is recommended to be used only if necessary in order to reduce the number of destroyed vests.

4.8 Drag 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 panel only, as appropriate) 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 in of the bottom of the drag strap (i.e., on the SAPI pocket flap). The center of the drag strap shall be directly in line with the center of the load cell and pulling head. The drag strap shall be affixed to the load cell and pulling head through a loop of 1-in webbing (A-A-55301 Type VI) having a gage length of 12 ± 1 in. 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 in./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).

4.9 Emergency Doffing. Each complete SPCS FAT and LAT sample shall be fitted to a standing manikin or test participant with ESAPI/XSAPI and ESBI/XSBI and activated for emergency release. Activation shall be a firm quick pull approximately at a 45 degree downward angle. If a vest doesn't doff it shall be noted as a major defect. If the vest doffs but 1 or 2 buckles do not release it shall be noted as a minor defect.

4.10 Ownership and Support.

4.10.1 Shelf Life. The contractor shall provide data that shows all the components and materials used in the SPCS meet the requirements in paragraph 3.8.2.

4.10.2 Health/Safety. A demonstration shall be conducted or documentation provided to verify the health hazard and safety requirements specified in paragraph 3.8.3 and 3.8.4. Additionally, the contractor must furnish information, which certifies that all component and subcomponent materials have been safely used commercially or provide sufficient toxicity data to show compatibility with prolonged, direct skin contact.

5. PACKAGING

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

6.1 Intended Use. The multiple threat body armor is a modular body armor providing multiple levels of ballistic protection depending on the system configuration. The SPCS provides protection from conventional fragmenting munitions and 9-mm handgun rounds. The area of protective coverage of the body is dictated by the number of modular components worn to extended coverage. SPCS protection is increased to protect vital organs from multiple hits against small arm threats and indirect fire flechettes when front, back, and side small arms protective inserts are worn.

6.2 Acquisition Requirements. Acquisition documents should specify the following:

a) Title and date of this document.
b) When First Article Test and pre-production items are required.
c) Camouflage and solid colors required.
d) Size Tariff
e) Contractually approved ballistic package(s) to include package name, complete description, and FAT acceptance letter.

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

6.4 Ballistic Testing Definitions. MIL-STD-3027 shall be used as definition references only. In the case of a conflict between MIL-STD-3027 and this document, this purchase description shall take precedence. The following definitions are provided to assist in understanding the test procedures:

Fair Impact. A projectile that impacts the armor at an angle of incidence no greater than 5 degrees for soft armor testing and 3 degrees for system testing, from the intended angle of incidence, at a velocity within specifications and impacted within location requirements will be considered a fair impact.

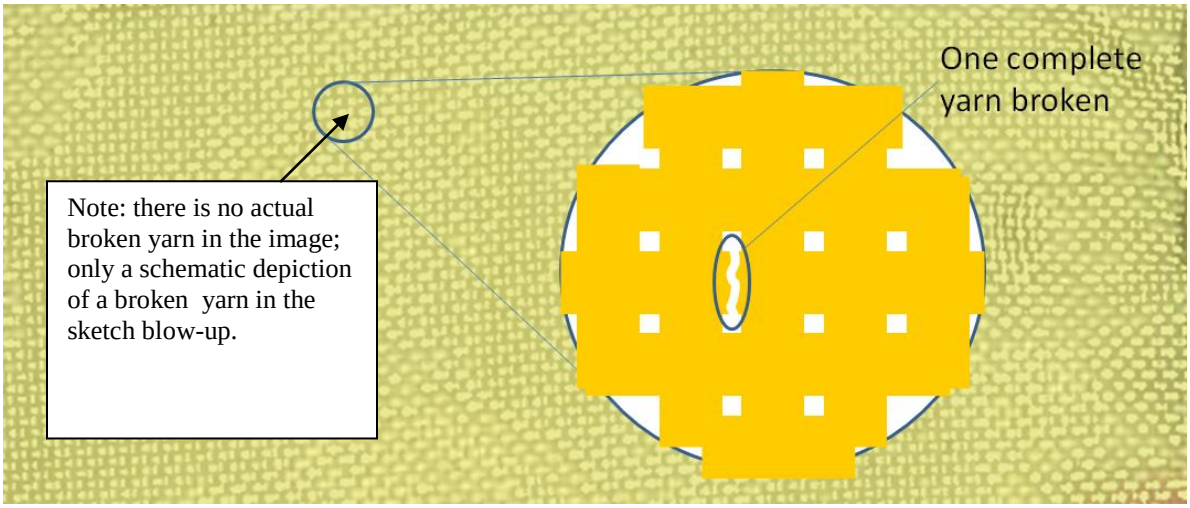
Partial Penetration (PP). Any fair impact that is not a complete penetration shall be considered a partial penetration.

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

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

1. Plate complete. Complete penetrations of the plate will have occurred when the projectile, fragment of the projectile or fragment of the armor material penetrates the

entire plate and is imbedded or passes into the soft under garment used directly behind the impact point on the ESAPI/ESBI, resulting in the penetration of the first ply of the soft armor component (minimum of one complete yarn broken of the first ply – see below schematic). Paint or fibrous material that are emitted from the back of the test specimen and rests on the outer surface of the under garment are not considered complete penetrations.



2. System complete. Complete penetrations of the system will have occurred when the projectile, any fragment of the projectile or any fragment of the test specimen penetrates the entire plate and all plies of the shoot pack and is imbedded or passes into the clay backing used directly behind the impact point on the ESAPI/ESBI and soft armor/shoot pack.

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

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

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

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

Spall. The detachment or delaminating 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.

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

6.5 Contents of Labels, and Use and Care Instructions: see Appendix E and F.

APPENDIX A – MATERIAL PROPERTIES FOR SPCS SUBCOMPONENTS

Appendix Scope: The purpose of this appendix is to provide details on the following requirements: foam characteristics, camouflage shades, infrared reflection, subsystem and subsystem weights, and area of coverage, dimensional characteristics, and chest circumference. This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

Table I. Foam Characteristics (see 3.2.7)

Characteristic	Requirement
Density	3.6 - 7.3 lb/ft^3
Thickness	0.25 inch
Compression Strength At 25% Deflection At 50% Deflection	 10 psi 20 psi
Elongation at Break	150% (min)
Tear Resistance	17 lb/inch (min)

Table II. Camouflage Shades (see 3.4.4)

COMPONENT(S) OR PART(S)	Color
Outer Shell: Base Vest (both strike side and body side), Side Plate Pouches/Cummerbund	OCP (5 color only)
Base Vest Inner Lining (inside vest)	Tan 499
Ballistic Panel Cover	Foliage Green 504
Webbing*	OCP (5 color only), Tan 499
Binding Tape*, Hook & Loop Fastener and Thread	OCP (5 color only), Tan 499**
Labels	Tan 380 or Desert Sand 503
Hardware: Buckles, Webbing hanger, Ladderloc	Tan 499

*In accordance with paragraph 3.5.3.10 all adjustment straps and straps that can be doubled back shall contain OCP on both front and back sides. All internal webbing may be Tan 499.
**OCP - Operation Enduring Freedom Camouflage Pattern
***See Table III-D for Spectral Reflectance Values for Loop only.

All Matching/shade evaluation must be conducted at a government directed lab.

Table III-A. Infrared Reflectance Requirements (percent) (see 3.4.5)

Wavelengths	OCP					
	Cream 524 Tan 525		Pale Green 526 Olive 527 Brown 529		Dark Green 528 Dark Brown 530	
Nanometers	Min	Max	Min	Max	Min	Max
600	22	44	10	30	3	12
620	24	45	11	30	3	12
640	24	45	11	32	4	12
660	25	45	12	32	4	13
680	28	48	14	35	4	18
700	28	54	19	40	6	25
720	30	58	22	43	6	27
740	32	60	25	46	10	29
760	36	61	27	48	14	33
780	38	62	28	50	18	36
800	40	62	29	50	20	37
820	44	65	30	51	20	38
840	46	66	32	51	21	39
860	48	67	33	52	21	40

Table III-B. Infrared Reflectance Requirements (percent) (see 3.4.5)

Wavelengths Nanometers (nm)	Foliage Green 504		Tan 499		Tan 380		Desert Sand 503	
	Min	Max	Min	Max	Min	Max	Min	Max
600	8	26	8	26	28	40	28	40
620	8	26	8	26	30	42	30	42
640	8	28	8	30	32	48	34	48
660	10	30	8	34	34	54	38	56
680	10	34	12	38	40	58	44	60
700	12	38	12	40	42	60	46	66
720	16	42	16	46	42	60	48	68
740	16	46	22	50	44	62	48	72
760	18	48	30	50	44	62	50	74
780	18	48	34	54	46	64	54	76
800	20	50	36	56	48	64	54	76
820	22	54	38	58	48	64	54	76
840	24	54	38	58	48	64	56	78
860	26	56	40	60	50	66	56	78

Table III-D. Infrared Reflectance Requirements – Solids Loop Only (percent) (see 3.4.5)

Wavelengths Nanometers (nm)	Tan 499	
	Min	Max
600	8	26
620	8	26
640	8	30
660	8	34
680	12	38
700	12	40
720	16	46
740	22	50
760	30	50
780	34	54
800	36	56
820	38	58
840	38	58
860	40	60

Table III-E. Infrared spectral reflectance requirements for Acetal Hardware (see 3.4.5)

Wavelengths Nanometers (nm)	Foliage Green 504		Tan 499	
	Min	Max	Min	Max
600	8	18	16	26
620	8	18	18	26
640	8	18	20	30
660	10	26	22	34
680	10	26	26	38
700	12	28	30	40
720	20	36	32	46
740	26	40	36	50
760	30	52	36	54
780	32	56	38	58
800	32	60	40	59
820	34	60	42	60
840	36	60	44	60
860	36	60	48	60

Table IV-A: Maximum SPCS Component Weights; Lbs. (see 3.5)

Finished Component (includes ballistics)	X-Small	Small	Medium	Large	X-Large	2X-Large
Side Plate Pocket (individual weight)*	0.56					
Total System (w/o side plate pockets)**	4.93	5.32	5.95	6.43	7.09	7.13

**Side Plate Pocket: Includes plate pocket, and ballistic insert.*
***Total System: Includes **Front Panel**: Front panel with ballistics, 4 quick release male buckles, 2 D-rings, and quick release mechanism. **Back Panel w/ Cummerbund**: Back panel with ballistics, shoulder straps, and 2 female buckles; 2 Cummerbunds with ballistics, polyethylene stiffener, 2 female buckles with adjustment strap, and 2 webbing hangers.*

TABLE IV-B: Minimum Ballistic Panel Area; Sq. In. (see 3.5)

Ballistic Panel	X-Small	Small	Medium	Large	X-Large	2X-Large
Base Vest Front Vest Panel	117	139	154	179	194	194
Base Vest Back Vest Panel	117	139	154	179	194	194
Side Plate Carrier* (set of 2)	110					
Cummerbund (set of 2)	102		136.5		171	171
Total Square Inches (with Cummerbund)**	336	380	444.5	494.5	559	559

*Side Plate Carrier ballistic panel area (Square Inches) is the same as the Cummerbund Side Plate Carrier.
**Does not include side plate pocket.

TABLE IV-C: SPCS Finished Measurements; Inches* (see 3.5)

Size	Center Front Length +/- ½"	Front Width +/- ½"	Center Back Length +/- ½"	Back Width +/- ½"	Side Plate Carrier Length +/- ½"	Side Plate Carrier Width +/- ½"
X-Small	13 ¾"	10 1/8"	15 ¾"	10 1/8"	9"	8"
Small	14 1/8"	11 5/8"	16 1/8"	11 5/8"	9"	8"
Medium	14 ¾"	12 ¼"	16 ¾"	12 ¼"	9"	8"
Large	15 5/8"	13 3/8"	17 5/8"	13 3/8"	9"	8"
X Large	16 ¼"	13 ¾"	18 ¼"	13 ¾"	9"	8"
2X Large	16 ¼"	13 ¾"	18 ¼"	13 ¾"	9"	8"

* See Para. 4.5.2.1 for measurement directions.

TABLE IV-D: Cummerbund Finished Measurements; Inches* (see 3.5)

Size	Cummerbund Length +/- ½"	Cummerbund Width +/- ½"
X-Small – Small	10 ½"	6 ½"
Medium – Large	13 ½"	6 ½"
X-Large-2XLarge	16 ½"	6 ½"

* See Para. 4.5.2.1 for measurement directions.

Table V. Bartack (see 3.5.3.4)

Characteristic	Stress points; All cloth	Webbing hangers; Webbing + cloth
Length; in	3/8" min	3/4 " +/- 1/16"
Holding Strength: lb. (min.)	60	250

Table VI. Chest Circumference for Base Vest (see 3.6)

Size	Chest Circumference (Inches)
X-Small	29-33”
Small	33-37”
Medium	37-41”
Large	41-45”
X-Large	45-49”
2X-Large	49-61”

Table VII. Chest Circumference for Cummerbund (see 3.6)

Size	Chest Circumference (Inches)
X-Small – Small	29-37”
Medium – Large	37-45”
X-Large-2XLarge	45-61”

APPENDIX B: BALLISTIC PROTECTION REQUIREMENTS

Appendix Scope: The purpose of this appendix is to provide details on the ballistic protection requirements. This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

Table I: **Base Vest assembly, Side Plate Pocket and Cummerbund Fragmentation Protection; Minimum V_{50} (see 3.5.2.2)**

Fragment Projectile	V_{50} @ 0 degree DRY: ft/sec	V_{50} @ 0 degree WET: ft/sec	V_{50} @ 45 degree DRY: ft/sec
17 gr. FSP	1850	1720	1880
17 gr. FSP; After hot and cold temperatures, accelerated aging	1800	N/A	N/A
17 gr. FSP; After POL	1700	N/A	N/A

Table II: Small Arms Protection Ballistic Characteristics (see 3.5.2.4)

Threat	V_0 Acceptance; @ 0 & 30 degree ft/sec	Deformation; mm (max)
e*[1]	2700 +50/-0	44.0

*System level testing will be conducted for Government Reference Only for First Article Testing and Lot Acceptance Testing.

[1]During production verification testing, system level testing with threat E will be tested at a Government facility for record and must pass testing in accordance with section 4.6, Appendix B, and Appendix D in order to proceed into FAT.

The Government will provide hard armor plate inserts (ESAPI/ESBI) that have had their design certified during FAT and have passed LAT for the system tests.

Table III. Handgun; minimum V50 & V0 acceptance (see 3.5.2.3)

Threat	V50@ 0 deg; Wet/Dry (min) ft/s	V0 Acceptance @ 0 & 30 deg, ft/s	Deformation; (max) mm
9mm, 124 gr. FMJ	1525	1400 +50/-0	44.0

For shot placement and procedure follow guidelines outlined in Section 4.6.4 (9mm V0), and Table I-A4 (9mm V50).

V_0 Ballistic Resistance for System Testing with ESAPI:

Ballistic V_0 System Testing of SPCS with ESAPI shall be conducted per paragraph 3.5.2.4 and 4.6 and procedures specified in the contract (see paragraph 6.2). For V_0, the minimum velocities as in Table II above will be the requirement. The ballistic V_0 testing of ESAPI shall have a minimum of 3 impacts (2 impacts at 0 degree obliquity and 1 impact at 30 degree obliquity). The first two shots must be fired at 0 degree obliquity and the third shot at 30 degrees obliquity for all threats. For the 30 degree obliquity shots, the direction of the obliquity depends on which side of the centerline is the intended impact point. If on the right, that side shall be rotated up-range (toward the gun barrel); if left, that side shall be rotated up-range.

An "Edge" fair hit impact (0 degree obliquity) shall be between 0.75 to 1.25 inches from any insert edge. A "Crown" impact (0 degree obliquity) will be 5.0-6.0 inches from any edge shot impact location (on the plate) and located at the ballistically weakest point of the insert (e.g. triple point or seam, if any) (see Figure B-1). The distance between second and all subsequent shots will be between 5.0–6.0 inches on the insert (see Figure B-1). All shots after the first shot must be a minimum of 1.5 inches from any edge of the insert. Back face deformation measurements, per paragraph 4.6.4.1.1, will only be taken for shots taken at 0 degrees obliquity.

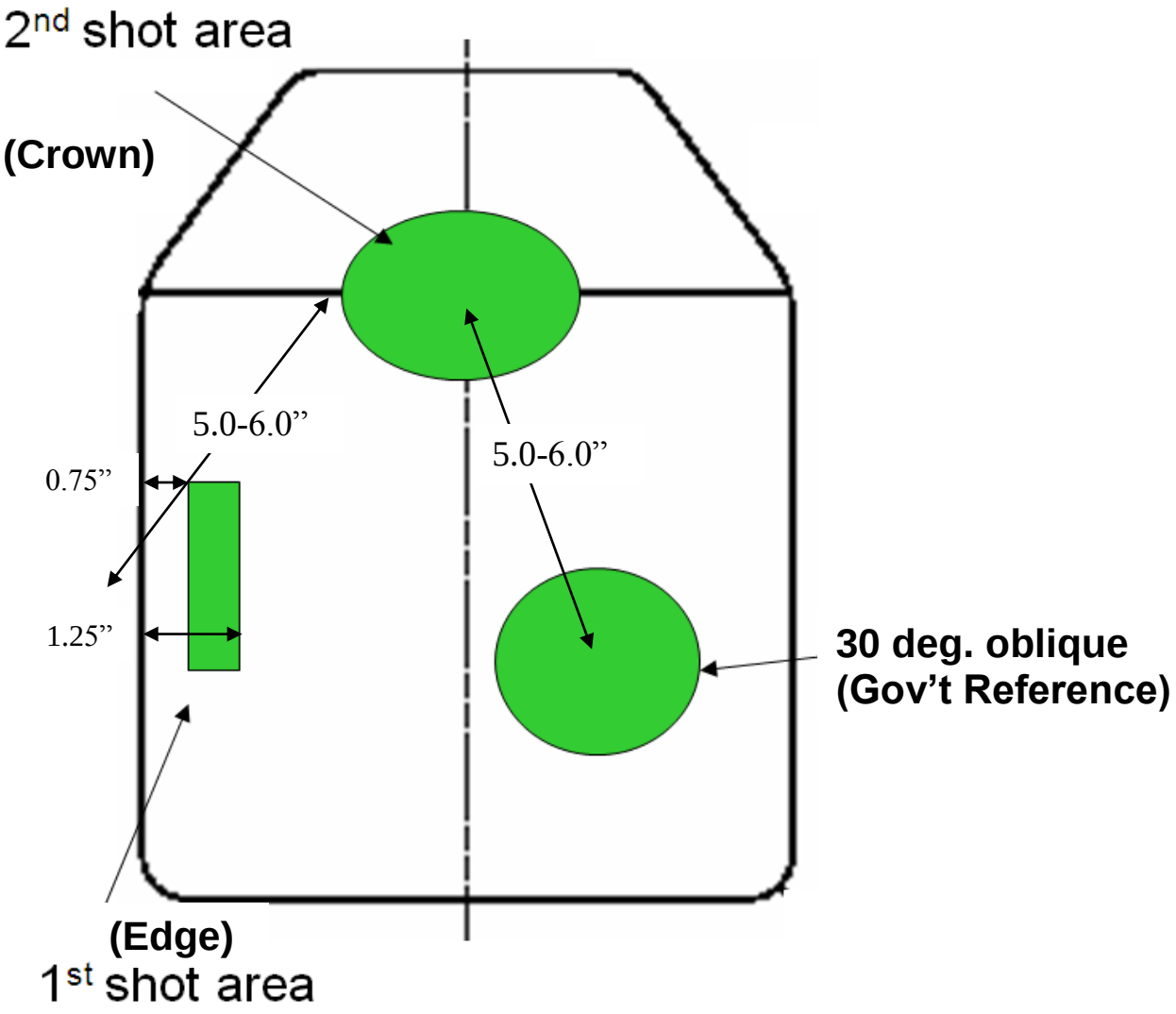


Figure B-1: General shot pattern

Figure above: General V_0 testing shot patterns for uniform material design (other patterns IAW the shot spacing requirements above are possible at the discretion of the government – i.e. mirror image opposite the vertical centerline, etc).

Complete and partial penetrations for V_0 testing – see 6.4 for complete definitions.

V_0 Ballistic Resistance for System Testing with ESBI:

Ballistic V_0 System Testing of SPCS with ESBI shall be conducted per paragraph 3.5.2.4 and 4.6 and procedures specified in the contract (see paragraph 6.2). For V_0, the minimum velocities as in Table II above will be the requirement. The ballistic V_0 testing of ESBIs shall have a minimum of 2 impacts (all impacts at 0 degree obliquity) for all threats. The 2nd V_0 impact on a plate is for government reference only.

Shot spacing shall have the first fair hit impact (0 degrees obliquity) between 0.75 to 1.25 inches from any edge for shot pattern "A" and between 2.0 and 2.5 inches from an edge for shot pattern "B." The second impact at zero degrees obliquity will be 4.0-5.0 inches from the first impact location and located as per the two separate shot patterns (Figures B-2 and B-3). Tested plates will alternate between the two shot patterns (pattern on a No Test shall be repeated on a new plate) starting with pattern A for each threat. All shots after the first shot must be a minimum of 1.5 inches from any edge. Back face deformation measurements, per paragraph 4.6.4.1.1, will only be taken for both shots.

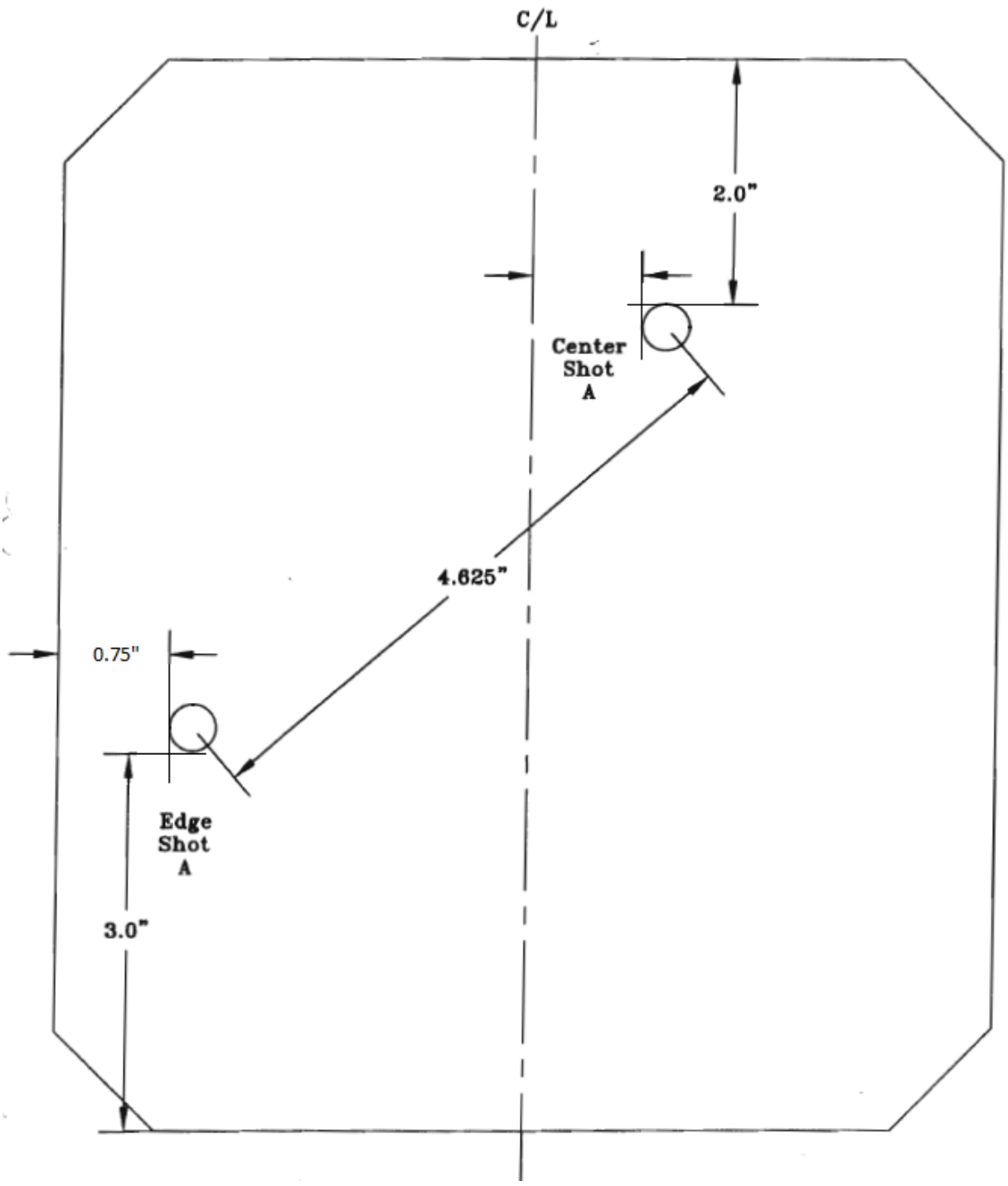


Figure B-2: Shot pattern "A" (not to scale)

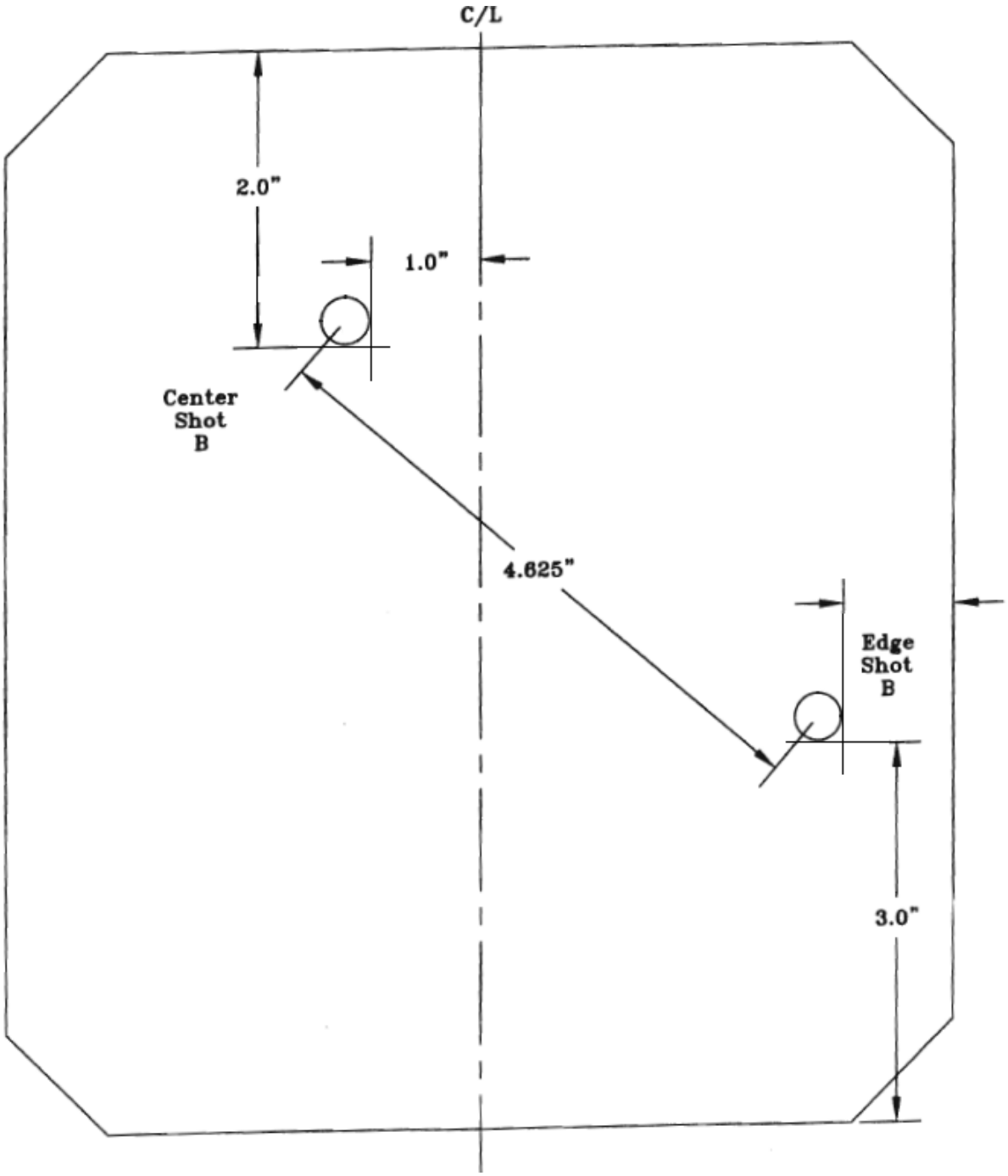


Figure B-3: Shot pattern "B" (not to scale)

Figures above: General V_0 testing shot patterns for uniform material design (other patterns IAW the shot spacing requirements above are possible at the discretion of the government – i.e. mirror image opposite the vertical centerline, etc).

Complete and partial penetrations for V_0 testing – see 6.4 for complete definitions.

APPENDIX C: NON-BALLISTIC REQUIREMENTS AND VERIFICATIONS

Appendix Scope: The purpose of this appendix is to provide details on the non-ballistic requirements and verifications. This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

Table I. Requirements and Verifications (see 4.5)

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	LAT
Cloth Outer and Inner Shell	3.2.1	4.5	X	COC
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
Outershell and Innershell Cloth Abrasion Resistance*	3.2.1	ASTM D 3884*	X	COC
Spray Rating: Initial 1 Laundering	3.2.1	AATCC 22 & 4.5.11	X	COC
Hydrostatic Resistance: Initial After 1 Laundering After 1 Laundering and POL Contamination After 1 Laundering and Insect Repellent After 1 Laundering and Sweat Contamination After 1 Laundering and Sea Water Contamination	3.2.1	AATCC 127 & 4.5.10	X	COC
Dynamic Absorption: After 1 Laundering	3.2.1	4.5.11 & AATCC 70	X	COC
Resistance to Organic Liquids: Initial After 1 Laundering	3.2.1	4.5.11 & AATCC 118	X	COC
Flame Resistant	3.2.1.1	4.5.13 & ASTM-D-6413	X	COC***
Cloth Ballistic Panel Cover.	3.2.2	4.3.1	X	COC
Webbings and Tapes	3.2.3	4.3.1	X	COC
Fasteners, Hook and	3.2.4	4.3.1	X	COC

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	LAT
Loop				
Foam	3.2.6	4.3.1	X	COC
Polyethylene	3.2.5	4.3.1	X	COC
Thread	3.2.8	4.3.1	X	COC
"D"-Ring	3.2.9	4.3.1	X	COC
Ladderloc	3.2.10	4.3.1	X	COC
Webbing Hanger	3.2.11	4.3.1	X	COC
Female Buckle Non-Adj.	3.2.12	4.3.1	X	COC
Female Buckle Adj.	3.2.13	4.3.1	X	COC
Male Buckle Non-Adj.	3.2.14	4.3.1	X	COC
Male Buckle Adj.	3.2.15	4.3.1	X	COC
Emergency Release Assembly	3.2.8	4.3.1	X	COC
Design (as described on DD-1222)	3.3	4.4	X	Y/N
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	4.5.8	X	COC
Use & Care Instruction	3.4.3	4.4		X
Camouflage	3.4.4	4.1	X	X
Infrared Reflectance	3.4.5, 3.2.3, 3.2.4	4.5.9	X	COC
Matching**	3.4.6	4.5.12	X	COC**
Colorfastness to:	3.4.8	4.1		
Laundering: 3 Cycles	3.4.8	AATCC 61 OPTION IA	X	COC
Light	3.4.8	AATCC 16 OPTION 1 or 3 (Exposure shall be 40 hrs or 170 kilojoules)	X	COC
Crocking	3.4.8	AATCC 8	X	COC
Perspiration	3.4.8	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

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	LAT
Finished Weight	3.5	4.5.6	X	X
Finished Dimensions	3.5	4.5.2, 4.5.3, 4.5.4	X	COC
Areal Density	3.5.2.1.1	4.5.5, 4.5.6	X	COC
Removable Ballistic Panel Subcomponent	3.5.2.1	4.5.1	X	X
Ballistic Filler	3.5.2.1.1	4.5.5 & 4.5.6	X	X
Hook and Loop Fastener	3.5.3.1	4.5.1	X	X
Buttonholes	3.5.3.6	4.5.1	X	X & COC
Drag Strap	3.5.3.7	4.8	X	X
Emergency Release Mechanism	3.5.3.8	4.5.1 & 4.9	X	X
SAPI Pocket	3.7	4.4, 4.5.2	X	X (visual only)

* 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.
** Matching verification shall be performed at a government directed lab.
*** COC shall include test data.

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	
Fastener Tape	Any hole, cut or tear, hooks flattened, broken or missing, impairing function.	110	
Seams and Stitching:	Incorrect Style.	115	
Open Seams	½ inch or less.		205

EXAMINE	DEFECT	CLASSIFICATION*	
		MAJOR	MINOR
	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.	116	
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.		206
Seam & Stitch Type	Wrong seam or stitch type.	117	
Stitch Tension	Tension loose, resulting in loose bobbin or top thread.		207
	Excessively tight, resulting in puckering of material.		208
Bartacks	Any bartack omitted.	118	
	Any bartack not as specified or not in specified location.		209
	Loose stitching, incomplete or broken.		210
Stitching Ends	Not secured as specified.		211
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.		212
Component & Assembly	Any area of ballistic filler bunched (i.e. does not lie flat)	119	
	Any component part omitted or not as specified (unless otherwise classified herein)	120	
	Needle Chews.	121	
	Any mend, darn, patch, holes, splice or other unauthorized repair.	122	
Location Markings	Printed marking more than 1/32 inch in width or not covered by component part.		213
Label	Missing, incorrect, illegible.	123	
Use & Care Pamphlet	Omitted, printing or figures illegible, any page missing.		215

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

Table III. END ITEM DIMENSIONAL EXAMINATION

EXAMINE	DEFECT	CLASSIFICATION*	
		Major	**Minor**
Dimensional (overall)	Smaller than nominal dimensions less applicable minus tolerance indicated but not smaller than nominal dimensions less twice the applicable minus tolerance. Larger than nominal dimensional and applicable plus tolerance.	124	216
Component and Location Dimensions	Not within specified tolerance		217
Stitch Margin or Gage	Not within specified tolerance		218
Box, Box-X and stitching	Dimensions not within specified tolerance		219
Hardware	Not spaced within specified tolerance		220

*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 4.5.4)

Examine	Defect	Classification*	
Size of Individual Ballistic Filler Assembly	A) Smaller than cutting pattern:	Major	Minor
	(1) 3/16 inch to 3/8 inch at any point around the periphery 1/ 2/		221
	(2) More than 3/8 inch at any point around the periphery 1/ 2/	125	
	(3) 1/8 inch up to 3/16 inch around entire periphery 2/		222
	(4) More than 3/16 inch around entire periphery 2/	126	
	B) larger than cutting pattern by 3/8 inch or more at any point 1/ 2/		223

*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 condition exits for a length of more than 2 inches or if condition exists in several 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.

PRODUCT VERIFICATION TESTING PROTOCOL: SPCS non-ballistic Product Verification Testing shall be conducted in accordance with section 4 and Tables I to IV above.

Accept / Reject criteria:

(1) One or more major/minor defects constitutes FAT rejection

All major and minor defects must be corrected prior to DCMA shipment of test articles. If defects are found, the armor samples shall be re-inspected and resubmitted to DCMA for another random inspection. If the armor samples fail three consecutive inspections the articles will FAIL FAT.

The government reserves the right to conduct all non-ballistic tests and reject on identification of any single nonconformance.

FIRST ARTICLE TESTING PROTOCOL: SPCS non-ballistic First Article Testing shall be conducted in accordance with section 4 and Tables I to IV above.

Accept / Reject criteria:

(2) One or more major/minor defects constitutes FAT rejection

All major and minor defects must be corrected prior to DCMA shipment of test articles. If defects are found, the armor samples shall be re-inspected and resubmitted to DCMA for another random inspection. If the armor samples fail three consecutive inspections the articles will FAIL FAT.

The Government reserves the right to conduct all non-ballistic tests and reject on identification of any single nonconformance.

LOT ACCEPTANCE TESTING PROTOCOL: SPCS non-ballistic Lot Acceptance Testing shall be conducted in accordance with section 4 and Tables I to IV above.

Accept / Reject criteria:

(1) One or more major defects constitutes LAT rejection
(2) A minor defect rate higher than allowed by Table I-A (found in Appendix D) using Acceptance Quality Limit (AQL) of 4.0 constitutes LAT rejection.

All major and minor defects must be corrected prior to DCMA shipment of test articles. If defects are found, the armor samples for that respective lot shall be re-inspected and resubmitted to DCMA for another random. If the armor samples fail three consecutive inspections the articles will FAIL LAT.

The government reserves the right to conduct all non-ballistic tests and reject on identification of any single nonconformance.

APPENDIX D: BALLISTIC PERFORMANCE VERIFICATION

Appendix Scope: The purpose of this appendix is to provide details on the ballistic performance verification. This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

Table I-A. Requirements and Verifications (see 4.5)

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	LOT ACCEPTANCE TESTING
Ballistic Protection Levels	3.5.1	4.1, 4.4, & 4.5	X
Ballistic Performance	3.5.2	4.5	X
Fragmentation Protection	3.5.2.2	4.5	X
Handgun Protection	3.5.2.3	4.5	X
Small Arms Protection	3.5.2.4	4.5	X*

*System level Small Arms Protection is for Govt. reference only during FAT and LAT.

TECHNICAL DATA PACKAGE: The contractor shall provide data that shows all the components and materials used in the SPCS meet all stated requirements of the Technical Data Package.

Prior to Product Verification Testing submittal, contractors shall provide a Technical Data Package (TDP) for each SPCS design submitted to the Government consisting of but not limited to the following items:

- Design nomenclature
- Material configuration
    - Type of materials used
        - All raw materials and components
        - Raw materials and component suppliers
        - Include all related special storage requirements
        - Include all shelf life expiration periods
    - Build sheet/Cut Patterns
    - Dry layup (unsown sample)

Additionally, a SPCS standard (size medium) represented by the design shall be submitted to the Government. The Government will treat all information provided as Proprietary Information and deem it close hold with restricted access. This information is required by the Government in order to baseline and maintains configuration management of each SPCS design submitted for PVT. The contractor shall refrain from using proprietary materials in the design. However, if the contractor does use proprietary materials, the contractor shall disclose all proprietary materials to enable the government to maintain configuration control.

PRODUCT VERIFICATION: SPCS Product Verification testing shall be conducted in accordance with paragraph 4.6 and Table I-A1 below.

Table I-A1. Product Verification Test Matrix (panels required)

TEST	System Testing Threat "e" 2700 +50/-0 ft/sec	Number of Panels
ESAPI V_0	4 XS, 4 SM, 4 MED, 4 LG, 4 XL, 4 2XL	4 XS, 4 SM, 4 MED, 4 LG, 4 XL, 4 2XL
ESBI V_0	22 Pockets*	25 Pockets*

*SPCS pockets are all one size. Pockets will be taken from full systems supplied during PVT.

Product verification testing is required prior to FAT submittal and must be tested at a Government facility. In order to proceed into FAT, system level testing must pass the requirements outlined in Table I-A1 and the requirements below. Ballistic packages that fail to meet these requirements **will not** be allowed to proceed into FAT. Products submitted during this phase of testing shall be the same materials, processes, procedures, equipment, and facilities that will be used to create vests for FAT.

Statistical Confidence in Test Results: Table I-A2 below represents the resistance to penetration and back face deformation statistical analysis required for product verification testing for both system level tests carrier and side plate pocket. For resistance to penetration, the lower confidence level for the probability of no penetration P(nP) is the statistic of interest and the result compared against a 90% probability of no penetration for first shot and a 70% probability of no penetration for the second shot. For back-face deformation (BFD), the Upper Tolerance Limit will be computed using back-face deformation as a continuous normal random variable and the result compared against the requirement.

Table I-A2. Statistical Analysis Method (system level)

1st shot	2nd shot
Resistance to Penetration	
90% Prob. of No Penetration (P(nP)) , 90% Confidence	70% Prob. of No Penetration (P(nP)), 90% Confidence
Back Face Deformation (≤44.0mm)	
90% Upper Tolerance Limit / 90% Confidence	80% Upper Tolerance Limit / 90% Confidence

Analysis Methodologies: For each valid test shot, the result is determined to have experienced either a system complete penetration or a system partial penetration (no penetration of the system). The numbers of complete penetrations and no penetrations are the basis for calculating the 90% LCL for P(nP) via the exact Clopper-Pearson method[1], with the numerical result truncated by applying the "floor function" to two-decimal place precision. The LCL for P(nP) is calculated for the 1st and 2nd shots by combining plate sizes. For system level testing with an ESAPI plate the LCL is calculated for both shots 1 and 2. For system level testing with an ESBI plate the LCL is calculated for only shot 1. The LCL must meet or exceed the requirement specified in Table II-A2. For example, if the 90% LCL for the P(nP) associated with a set of second shot data from FAT were calculated to be 0.699987, the reported result would be 0.69 and the outcome would be considered to be non-compliant with the prescribed criterion of 0.70. For back face deformation, the metric of merit is a one-sided Upper Tolerance Limit (UTL) based on the assumption of normally distributed BFD data; the UTL to be calculated is specified in Table II-A2. The BFD UTLs are calculated for the first and second shots by combining plate sizes.

Validated one-decimal place BFD measurements, for tested hard armor inserts that did not experience complete penetrations, are the basis for any UTL calculation. The UTL is defined as $Y_u = \bar{Y} + ks$, where $\bar{Y}$ is the mean of all valid BFD measurements, k is a look-up constant[2] (varying with the sample size, UTL percentage, and confidence percentage), and s is the sample standard deviation. The UTL is reported to one decimal place precision after adjusting upwards via the "ceiling function" – ensuring that a conservative UTL is reported. For example, calculated results of 38.1349 mm and 38.1999 mm are each reported as 38.2 mm. Compliance with the BFD requirement is achieved only if the associated UTL is less than or equal to 44.0mm.

When calculating the sample average (mean) and standard deviation in order to compute the UTL, calculate both the mean and standard deviation to six significant digits. This is to avoid the

rounding of these intermediate quantities affecting the reported UTL. The final result (the UTL) is then reported to one decimal place as specified above.

The UTL is defined as $Y_u = \bar{Y} + ks$, where $\bar{Y}$ is the mean of all valid BFD measurements, k [1]

$$\frac{1}{1+\frac{n-x+1}{x}F_{2(n-x+1),2x,\alpha/2}} \leq p \leq \frac{\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}}{1+\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}} \quad \frac{1}{1+\frac{n-x+1}{x}F_{2(n-x+1),2x,\alpha/2}} \leq p \leq$$

$$\frac{\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}}{1+\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}} \quad \frac{1}{1+\frac{n-x+1}{x}F_{2(n-x+1),2x,\alpha/2}} \leq p \leq \frac{\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}}{1+\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}}$$ Where

$F_{v1,v2,\alpha}F_{v1,v2,\alpha}F_{v1,v2,\alpha}$ is the upper α cutoff from an F distribution with v1 and v2 degrees of freedom. (Clopper Pearson Formula from Casella, George and Roger Berger: Statistical Inference 2002 Duxbury / Thomson Learning Inc, Pacific Grove, CA p 454.)

[2] $k=\frac{z_{utl}+\sqrt{z_{utl}^2-ab}}{a}\frac{z_{utl}+\sqrt{z_{utl}^2-ab}}{a}$ where $a=1-\frac{z_{conf}^2}{2*(N-1)}-\frac{z_{utl}+\sqrt{z_{utl}^2-ab}}{a}$ $b=z_{utl}^2-\frac{z_{conf}^2}{N}=\frac{z_{conf}^2}{2*(N-1)}-\frac{z_{conf}^2}{2*(N-1)}$ $b=z_{utl}^2-\frac{z_{conf}^2}{N}=z_{utl}^2-\frac{z_{conf}^2}{N}$ and z_{utl} is the critical value from the standard normal distribution associated with the UTL percentage. z_{conf} is the critical value from the standard normal distribution associated with the Confidence percentage and N is the total sample size for the data of interest.

For PVT impact velocity anomalies, Table I-A3 identifies the standard fair/no test criteria for this hard body armor standard. In the case of an under-velocity shot which results in either a system complete penetration (CP) or a BFD greater than 44.0mm, the shot result will be included in the analysis. If the under-velocity shot occurs on the first shot, the plate will be replaced with a contingency plate to ensure a completed test matrix.

The Government will provide hard armor plate inserts (ESAPI/ESBI) that have had their design, processes, and procedures certified during Government FAT and have also passed Government LAT for the SPCS system tests.

Table I-A3. Fair Hit/No Test Criteria for Velocity Anomalies

Impact Velocity	Test Result		Evaluator Accepts or Rejects for Inclusion in Analysis		Proceed to next data point for that plate?
	Penetration	BFD	Penetration	BFD	
Acceptable	No Penetration (PP and CP)	Measured	Include as success	Include	Yes
Acceptable	Complete System Penetration (CC)	Not measured	Include as failure	Not measured	Yes
Too High	No Penetration (PP and CP)	Measured	Not included	Not included	No
Too High	Complete System Penetration (CC)	Not Measured	Not included	Not included	No
Too Low	No Penetration (PP and CP)	Measured	Not included	Not included if ≤ 44.0mm Included if > 44.0mm	No
Too Low	Complete System Penetration (CC)	Not measured	Include as failure	Not measured	No

FIRST ARTICLE TESTING PROTOCOL: SPCS First Article testing shall be conducted in accordance with paragraph 4.6 and Table II-B1 below.

Table I-B1. First Article Test Matrix (panels required)

TEST[3]	**17-grain FSP**	**9mm, 124 gr. FMJ Remington**	**System Testing** [1]**Threat "e" 2700 +50/-0 ft/sec**	**Number of Panels**
V_0	~	2 SM, 2 MD, 2 LG, 2 XL, 2 2XL	~	2 SM, 2 MD, 2 LG, 2 XL, 2 2XL
V_{50}, wet, 0°	2 LG	4 MD	~	4 MD, 2 LG
V_{50}, dry, 45°	2 XL	~	~	2 XL
V_{50}, dry, 0°	2 SM 2 Cummerbund[2]	4 XL	~	4 XL, 2 SM 2 Cummerbunds
V_{50}, high T	2 XS	~	~	2 XS
V_{50}, low T	2 MED	~	~	2 MED
V_{50}, Accelerated Aging	2 XL	~	~	2 XL
V_{50}, POL oil	2 LG	~	~	2 LG
V_{50}, POL JP-8	1 SM, 1 LG	~	~	1 SM, 1 LG
ESAPI V_0 (system level)	~	~	4 XS, 4 SM, 4 MED, 4 LG, 4 XL, 4 2XL	4 XS, 4 SM, 4 MED, 4 LG, 4XL, 4 2XL
ESBI V_0 (system level)	~	~	22 Pockets[4]	22 Pockets[4]

[1]System level testing is for Government Reference Only.
[2]Cummerbund V_{50} testing shall be conducted on multiple samples and can be varying in sizes. All cummerbunds will be taken from the full systems supplied.
[3]Prior to conditioning, the heat sealed ballistic cover will be cut open carefully along the bottom edge of the ballistic panel without cutting into the ballistic filler.
[4]SPCS pockets are all one size. Pockets and Cummerbunds will be taken from full systems.

The Contractor shall provide a total of **68 Complete End Items SPCS (all components must be included)** samples to the Government for First Article Testing as indicated below and a minimum of two UID verification reports.

30 end item samples: First Article Testing (ballistic)
24 end item (4 each size) samples: First Article Testing (non-ballistic)
12 end item (2 each size) samples : FAT contingency / spares
1 end item sample Size M: Government record (DCMA)
1 end item sample Size M: Government record (PM SPE/TMD)
68 FAT SPCS Samples

Government samples will be retained as the manufacturing standard. Upon satisfactory completion of FAT, all FAT samples will be returned to the Contractor – except Government record vests.

Statistical Confidence in Test Results: Table II-B2 below represents the resistance to penetration and back face deformation statistical analysis for both system level tests carrier and side plate pocket. For resistance to penetration, the lower confidence level for the probability of no penetration P(nP) is the statistic of interest and the result compared against a 90% probability of no penetration for first shot and a 70% probability of no penetration for the second shot. For back-face deformation (BFD), the Upper Tolerance Limit will be computed using back-face deformation as a continuous normal random variable and the result compared against the requirement.

Table I-B2. Statistical Analysis Method

1st shot	2nd shot
Resistance to Penetration	
90% Prob. of No Penetration (P(nP)) , 90% Confidence	70% Prob. of No Penetration (P(nP)), 90% Confidence
***Back Face Deformation (≤44.0mm)**	
90% Upper Tolerance Limit / 90% Confidence	80% Upper Tolerance Limit / 90% Confidence

*90/90UTL for 9mm BFD will be across all shots taken.

Analysis Methodologies: For each valid test shot, the result is determined to have experienced either a system complete penetration or a system partial penetration (no penetration of the system). The numbers of complete penetrations and no penetrations are the basis for calculating the 90% LCL for P(nP) via the exact Clopper-Pearson method[1], with the numerical result truncated by applying the "floor function" to two-decimal place precision. The LCL for P(nP) is calculated for the 1st and 2nd shots by combining shot locations, plate sizes, and environmental conditions. The LCL must meet or exceed the requirement specified in Table 2. For example, if the 90% LCL for the P(nP) associated with a set of second shot data from FAT were calculated to be 0.699987, the reported result would be 0.69 and the outcome would be considered to be non-compliant with the prescribed criterion of 0.70.

For back face deformation, the metric of merit is a one-sided Upper Tolerance Limit (UTL) based on the assumption of normally distributed BFD data; the UTL to be calculated is specified in Table II-B2. The BFD UTLs are calculated for the first and second shots by combining plate sizes.

Validated one-decimal place BFD measurements, for tested hard armor inserts that did not experience complete penetrations, are the basis for any UTL calculation. The UTL is defined as $Y_u = \bar{Y} + ks$, where $\bar{Y}$ is the mean of all valid BFD measurements, k is a look-up constant[2] (varying with the sample size, UTL percentage, and confidence percentage), and s is the sample standard deviation. The UTL is reported to one decimal place precision after adjusting upwards via the "ceiling function" – ensuring that a conservative UTL is reported. For example, calculated results of 38.1349 mm and 38.1999 mm are each reported as 38.2 mm. Compliance with the BFD requirement is achieved only if the associated UTL is less than or equal to 44.0mm.

When calculating the sample average (mean) and standard deviation in order to compute the UTL, calculate both the mean and standard deviation to six significant digits. This is to avoid the

rounding of these intermediate quantities affecting the reported UTL. The final result (the UTL) is then reported to one decimal place as specified above.

The UTL is defined as $Y_u = \bar{Y} + ks$, where $\bar{Y}$ is the mean of all valid BFD measurements, k [1]

$$\frac{1}{1+\frac{n-x+1}{x}F_{2(n-x+1),2x,\alpha/2}} \leq p \leq \frac{\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}}{1+\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}} \quad \frac{1}{1+\frac{n-x+1}{x}F_{2(n-x+1),2x,\alpha/2}} \leq p \leq$$

$$\frac{\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}}{1+\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}} \quad \frac{1}{1+\frac{n-x+1}{x}F_{2(n-x+1),2x,\alpha/2}} \leq p \leq \frac{\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}}{1+\frac{x+1}{n-x}F_{2(x+1),2(n-x),\alpha/2}}$$

Where $F_{v1,v2,\alpha}F_{v1,v2,\alpha}F_{v1,v2,\alpha}$ is the upper α cutoff from an F distribution with v1 and v2 degrees of freedom. (Clopper Pearson Formula from Casella, George and Roger Berger: Statistical Inference 2002 Duxbury / Thomson Learning Inc, Pacific Grove, CA p 454.)

[2] $k = \frac{z_{utl}+\sqrt{z_{utl}^2-ab}}{a} \frac{z_{utl}+\sqrt{z_{utl}^2-ab}}{a}$ where $a = 1 - \frac{z_{conf}^2}{2*(N-1)} - \frac{z_{utl}+\sqrt{z_{utl}^2-ab}}{a}$ $b = z_{utl}^2 - \frac{z_{conf}^2}{N} = \frac{z_{conf}^2}{2*(N-1)} - \frac{z_{conf}^2}{2*(N-1)}$ $b = z_{utl}^2 - \frac{z_{conf}^2}{N} = z_{utl}^2 - \frac{z_{conf}^2}{N}$ and z_{utl} is the critical value from the standard normal distribution associated with the UTL percentage. z_{conf} is the critical value from the standard normal distribution associated with the Confidence percentage and N is the total sample size for the data of interest.

For impact velocity anomalies, Table II-B3 identifies the standard fair/no test criteria for this hard body armor standard. In the case of an under-velocity shot which results in either a system complete penetration (CP) or a BFD greater than 44.0mm, the shot result will be included in the analysis. If the under-velocity shot occurs on the first shot, the plate will be replaced with a contingency plate to ensure a completed test matrix.

Table I-B3. System Level Fair Hit/No Test Criteria for Velocity Anomalies

Impact Velocity	Test Result		Evaluator Accepts or Rejects for Inclusion in Analysis		Proceed to next data point?
	Penetration	BFD	Penetration	BFD	
Acceptable	No Penetration (PP and CP)	Measured	Include as success	Include	Yes
Acceptable	Complete System Penetration (CC)	Not measured	Include as failure	Not measured	Yes
Too High	No Penetration (PP and CP)	Measured	Not included	Not included	No
Too High	Complete System Penetration (CC)	Not Measured	Not included	Not included	No
Too Low	No Penetration (PP and CP)	Measured	Not included	Not included if ≤ 44.0mm Included if > 44.0mm	No
Too Low	Complete System Penetration (CC)	Not measured	Include as failure	Not measured	No

Table I-B4. 9mm V0 Fair Hit/No Test Criteria for Velocity Anomalies

Impact Velocity	Test Result		Evaluator Accepts or Rejects for Inclusion in Analysis		Proceed to next data point?
	Penetration	BFD	Penetration	BFD	
Acceptable	No Penetration	Measured	Include as success	Include	Yes
Acceptable	Complete Penetration	Not measured	Include as failure	Not measured	No
Too High	No Penetration	Measured	Include as success	Include	Yes
Too High	Complete Penetration	Not Measured	Not included	Not included	Yes
Too Low	No Penetration	Measured	Include as failure if BFD is recorded	Not included if ≤ 44.0mm Included if > 44.0mm	Yes if BFD ≤44.0mm No if BFD >44.0mm
Too Low	Complete Penetration	Not measured	Include as failure	Not measured	No

SPECIAL PROVISIONS: All production quantities submitted after approval of the First Article/Qualification shall be produced using the same materials, processes, procedures, equipment and facilities that resulted in the manufacture of the acceptable First Article/Qualification. This includes all raw materials and/or sub-components.

The Government will provide hard armor plate inserts (ESAPI/ESBI) that have had their design, processes, and procedures certified during Government FAT and have also passed Government LAT for the SPCS system tests.

Lot Acceptance Testing (LAT):

Table II. LAT Sample Selection for Base Vest, Side Plate Pocket, and Cummerbund

Lot Size	Base Vest V50 17gr	Side Plate Pocket** and/or Cummerbund** V50 17gr	Base Vest 9mm V0 Ballistic Testing	Base Vest 9mm V50 Ballistic Testing	ESAPI (Threat E) System Testing*	ESBI (Threat E) System Testing*	Non-ballistic Vests	Contingency Vests	Total vests and Pockets**
26 to 150	2	2	4	2	5 (3 Vests)	5 (5 pockets)	3	4	18 Vests
151 to 500	4	4	4	4	8 (4 vests)	8 (8 pockets)	3	5	24 Vests
501 to 3200	6	6	6	6	13 (7 vests)	13 (13 pockets)	3	6	34 vests

***System level testing is for Government Reference Only.**
****Total Vests are complete vests whereas pockets are just the pocket with soft ballistics.**

V_0 and V_{50} determination tested in accordance with paragraph 4.6

1. Multiple test panels may be necessary to calculate V_{50} in accordance with paragraph 4.6.3. If these requirements are not met using the first panel, subsequent panels may be used and combined until the number of valid data points is reached. The test will conclude once the 3CP/3PP or 5CP/5PP requirement has been obtained.

2. Sample size for system level testing is based on ANSI/ASQ Z1.4 Special Inspection Level "S-3". Defects are divided into critical defects and minor defects as below. The contractor will provide a minimum of two UID Verification reports per size for each LAT. Testers will cut small "windows" in the SPCS cover to expose the actual aim point on the Insert.

Definitions (V_0 ESAPI System Testing Govt. Ref):

Critical defects for threat e:

- Complete penetration of both hard armor (ESAPI) and soft armor (SPCS) on the 1st shot
- Back face deformation $\geq$ 48.0 mm on 1st shot

Minor defects for threat e:

- Complete penetration of hard armor (ESAPI) and partial penetration of soft armor (SPCS) on 1st shot
- Complete penetration on both hard armor (ESAPI) and soft armor (SPCS) on 2nd shot (weighted 1.5 times for each occurrence)
- Back face deformation > 44.0 mm on any shot

Definitions (V_0 ESBI System Testing Govt. Ref):

Critical defects for threat e:

- Complete penetration of both hard armor (ESBI) and soft armor (SPCS) on the 1st shot
- Back face deformation $\geq$ 48.0 mm on 1st shot

Minor defects for threat e:

- Complete penetration of hard armor (ESBI) and partial penetration of soft armor (SPCS) on 1st shot
- Back face deformation > 44.0 mm on any shot

Definitions (V_0 9mm Testing):

Critical defects:

- Complete penetration on any shot.
- Back face deformation > 44.0 mm.
- Any of the above defects will result in a FAT or LAT failure.

Definitions (V_{50} testing):

Table I-A4. Test Parameters and Requirements for V50 Ballistic Limit Testing

Parameter Description	Value	Section Ref. in MIL-STD-662F
Velocity of 1st Shot	Reference Velocity	-
Velocity step until 1st Reversal	-30.5 m/s (-100 ft/s) if 1st shot Penetration	5.3.5
	+30.5 m/s (+100 ft/s) if 1st shot Stop	Exception to 5.3.5
Velocity step until 2nd Reversal	± 22.9 m/s (± 75 ft/s) depending on result of previous shot	5.3.5
Velocity step after 2nd Reversal	± 15.2 m/s (+ 50 ft/s) depending on result of previous shot	5.3.5

One or more V_{50} subtest that results in a V_{50} that is less than the requirement will constitute LAT rejection.

SPECIAL PROVISIONS

1) Lot Failure: When a lot fails LAT and is subsequently rejected, that lot is rejected in total and no component parts may be used in the production of any other lot. Further, any lot that is withdrawn prior to completion of Additional Testing procedures as required by the Q/A Test 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 LAT's will require a Failure Analysis.

The Government will provide hard armor plate inserts (ESAPI/ESBI) that have had their design, processes, and procedures certified during Government FAT and have also passed Government LAT for the SPCS system tests.

Table II-A—Single sampling plans for normal inspection (Master table)

(See 9.4 and 9.5)

Sample size code letter	Sample size	Acceptance Quality Limits, *AQLs*, in Percent Nonconforming Items and Nonconformities per 100 Items (Normal Inspection)																										
		0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31
B	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	0 1	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45
C	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45		
D	8	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45			
E	13	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45				
F	20	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↑	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22							
G	32	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓
H	50	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓
J	80	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
K	125	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
L	200	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
M	315	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
N	500	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
P	800	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Q	1250	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
R	2000	↑	↑	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

LAT

↓ = Use the first sampling plan below the arrow. If sample size equals, or exceeds, lot size, carry out 100 percent inspection.

↑ = Use the first sampling plan above the arrow.

Ac = Acceptance number.

Re = Rejection number.

ANSI / ASQ Z1.4 - Acceptable Quality Limits

11

SINGLE NORMAL PLANS

CODE LETTERS

Table I—Sample size code letters

(See 9.2 and 9.3)

Lot or batch size	Special inspection levels				General inspection levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	A	A	A	A	A	A	B
9 to 15	A	A	A	A	A	B	C
16 to 25	A	A	B	B	B	C	D
26 to 50	A	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	E	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1200	C	C	E	F	G	J	K
1201 to 3200	C	D	E	G	H	K	L
3201 to 10000	C	D	F	G	J	L	M
10001 to 35000	C	D	F	H	K	M	N
35001 to 150000	D	E	G	J	L	N	P
150001 to 500000	D	E	G	J	M	P	Q
500001 and over	D	E	H	K	N	Q	R

ANSI / ASQ Z1.4 Inspection Levels - Sample Size Code Letters

V_0 System Test Contingency Matrix (LAT)

			Shot 1								
Velocity →			Over	Over	Over	Fair	Fair	Fair	Under	Under	Under
	↓	Result	Critical Defect	Minor Defect	No Minor Defect	Critical Defect	Minor Defect	No Minor Defect	Critical Defect	Minor Defect	No Minor Defect
Shot 2	Over	Minor Defect	1	1	1	2, 4	2, 6	2, 3	2, 4	2, 6	1
	Over	No Minor Defect	1	1	1	2, 4	2, 4	2, 4	2, 4	2, 5	1
	Fair	Minor Defect	1	1	1	2, 4	2, 4	2, 4	2, 4	2, 5	1
	Fair	No Minor Defect	1	1	1	2, 4	2, 4	2, 4	2, 4	2, 5	1
	Under	Minor Defect	1	1	1	2, 4	2, 5	2, 5	2, 4	2, 5	1
	Under	No Minor Defect	1	1	1	2, 4	2, 5	2, 5	2, 4	2, 5	1

LEGEND:

1. No second shot; re-test on new plate
2. Continue with second shot
3. Wait until end of testing and tally total points. If vendor fails, re-test. If vendor passes then no need to re-test.
4. Data valid
5. Shoot second plate and compare total penalty points with first plate. Pick plate with most minor defects or any critical defects.
6. Shoot second plate and add points. Only consider 1st shot minor defects on first plate, compare 1st plate to 2nd plate total minor defects and pick plate with most minor defects or any critical defects.

NO TESTS:

1. If the "edge strip" is impacted by the incoming projectile (indicating a shot too close to the edge), the plate will be a "No test" (rationale – the plate can only pass)
2. If the 2nd shot is not within the specified shot spacing the plate will be a "No test" (rationale – the plate can only pass)
3. If the clay sticks to the shoot pack in the BFD location as the shoot pack is removed and the BFD result is above 44.0 mm, test shall be considered a "No test". Rationale: Resulting BFD would inadvertently result in a deeper reading due to clay removal from the surface. If the testing is using statistical sampling of BFDs, all instances of clay sticking to the shoot pack and creating a deeper BFD should be noted and if the plate design fails due to high BFD, these cases need to be retested.

NOTES:

1. If silicon spray is used, remove immediately afterwards (scrape off and dispose surface clay).

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

Appendix Scope: The purpose of this appendix is to provide details on the following: contents of labels and care and use instructions. This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

SOLDIER PLATE CARRIER SYSTEM
FRONT CARRIER – AR/PD 10-04E04E
SIZE:
NSN:

THE SOLDIER PLATE CARRIER SYSTEM (SPCS) WITH ALL SOFT BALLISTIC PANELS INSTALLED PROVIDES PROTECTION FROM FRAGMENTATION & 9-mm. THIS VEST DOES NOT PROTECT AGAINST KNIVES OR SHARP OBJECTS.

DO NOT MACHINE WASH OR DRY. FAILURE TO FOLLOW THESE INSTRUCTIONS WILL DAMAGE THE VEST'S PROTECTIVE CAPABILITY.

CLEANING INSTRUCTIONS

1. Remove dirt from outer surface with a cloth or soft bristle brush.
2. Remove all ballistic panels and the Enhanced Small Arms Protective Inserts (ESAPI) and Enhanced Side Ballistic Inserts (ESBI) from the outer shell and the component carriers. Soft ballistic Panels are ONLY to be cleaned by removing loose dirt from the surface and wiping clean with a moistened cloth or a soft bristle brush. Avoid submerging the panels in water; DO NOT bleach! DO NOT machine wash! DO NOT dry clean! DO NOT apply solvents to the ballistic panels! If the ballistic panels become wet allow them to air dry flat away from heat sources and out of direct sunlight. If the ballistic panels become saturated with liquids such as bleaches, JP-8, petroleum, oils or lubricants, turn them in for replacement as soon as possible.
3. Hand wash the SPCS base vest and component outer shells only in cold water with soap or a very mild detergent. DO NOT USE CAUSTIC CLEANERS, CHLORINE BLEACH, YELLOW SOAP, CLEANING FLUIDS OR SOLVENTS, WHICH WILL DISCOLOR AND DETERIORATE THE ITEMS!
4. Rinse the outer shells very thoroughly in clean water to wash out the soap.
5. Air-dry indoors, or in the shade, AWAY FROM HEAT SOURCES.
6. DO NOT ATTEMPT TO DYE THE ITEM OR FIX DISCOLORATIONS.

TURN IN YOUR ITEM IF:

1. Frags or bullets have hit them.
2. The outer cover is torn or damaged beyond field repair.
3. The hook and loop cannot be closed completely or repaired.
4. The webbing is torn or damaged beyond repair.
5. The items cannot be adequately cleaned, or are badly discolored.
6. The items have open seams or broken components.

REFER TO USE & CARE MANUAL FOR THE PROPER USE OF THIS BALLISTIC PROTECTIVE SYSTEM, REPAIR PROCEDURES & RECORDING OF HITS.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY:

SOLDIER PLATE CARRIER SYSTEM
BACK CARRIER – AR/PD 10-04E04E
SIZE:
NSN:

THE SOLDIER PLATE CARRIER SYSTEM (SPCS) WITH ALL SOFT BALLISTIC PANELS INSTALLED PROVIDES PROTECTION FROM FRAGMENTATION & 9-mm. THIS VEST DOES NOT PROTECT AGAINST KNIVES OR SHARP OBJECTS.

DO NOT MACHINE WASH OR DRY. FAILURE TO FOLLOW THESE INSTRUCTIONS WILL DAMAGE THE VEST'S PROTECTIVE CAPABILITY.

CLEANING INSTRUCTIONS

1. Remove dirt from outer surface with a cloth or soft bristle brush.
2. Remove all ballistic panels and the Enhanced Small Arms Protective Inserts (ESAPI) and Enhanced Side Ballistic Inserts (ESBI) from the outer shell and the component carriers. Soft ballistic Panels are ONLY to be cleaned by removing loose dirt from the surface and wiping clean with a moistened cloth or a soft bristle brush. Avoid submerging the panels in water; DO NOT bleach! DO NOT machine wash! DO NOT dry clean! DO NOT apply solvents to the ballistic panels! If the ballistic panels become wet allow them to air dry flat away from heat sources and out of direct sunlight. If the ballistic panels become saturated with liquids such as bleaches, JP-8, petroleum, oils or lubricants, turn them in for replacement as soon as possible.
3. Hand wash the SPCS base vest and component outer shells only in cold water with soap or a very mild detergent. DO NOT USE CAUSTIC CLEANERS, CHLORINE BLEACH, YELLOW SOAP, CLEANING FLUIDS OR SOLVENTS, WHICH WILL DISCOLOR AND DETERIORATE THE ITEMS!
4. Rinse the outer shells very thoroughly in clean water to wash out the soap.
5. Air-dry indoors, or in the shade, AWAY FROM HEAT SOURCES.
6. DO NOT ATTEMPT TO DYE THE ITEM OR FIX DISCOLORATIONS.

TURN IN YOUR ITEM IF:

1. Frags or bullets have hit them.
2. The outer cover is torn or damaged beyond field repair.
3. The hook and loop cannot be closed completely or repaired.
4. The webbing is torn or damaged beyond repair.
5. The items cannot be adequately cleaned, or are badly discolored.
6. The items have open seams or broken components.

REFER TO USE & CARE MANUAL FOR THE PROPER USE OF THIS BALLISTIC PROTECTIVE SYSTEM, REPAIR PROCEDURES & RECORDING OF HITS.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY:

SOLDIER PLATE CARRIER SYSTEM – SIDE PANEL BALLISTIC INSERT– AR/PD 10-04E04E
SIZE:
NSN:

INSERT THIS SIDE TO BODY FAILURE TO INSERT THIS BALLISTIC INSERT IN THE SPCS OUTERSHELL WILL RESULT IN ABSENCE OF BALLISTIC PERFORMANCE FROM FRAGMENTATION & 9-mm.

DO NOT LAUNDER BALLISTIC PANELS!

Avoid submerging in wash water. DO NOT bleach! DO NOT machine wash! DO NOT dry clean! DO NOT apply solvents!

FOR CLEANING: ONLY Remove loose dirt from surface & wipe clean with a moistened cloth or soft bristle brush. If Ballistic Panels become wet allow to air dry in a flat position away from heat sources & out of direct sunlight. If Ballistic panels become saturated with liquids such as bleaches, JP-8, petroleum, oils, or lubricants, TURN IN FOR REPLACEMENT AS SOON AS POSSIBLE.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY:

SOLDIER PLATE CARRIER SYSTEM – CUMMERBUND BALLISTIC INSERT– AR/PD 10-04E04E
SIZE:
NSN:

INSERT THIS SIDE TO BODY FAILURE TO INSERT THIS BALLISTIC INSERT IN THE SPCS OUTERSHELL WILL RESULT IN ABSENCE OF BALLISTIC PERFORMANCE FROM FRAGMENTATION & 9-mm.

DO NOT LAUNDER BALLISTIC PANELS!

Avoid submerging in wash water. DO NOT bleach! DO NOT machine wash! DO NOT dry clean! DO NOT apply solvents!

FOR CLEANING: ONLY Remove loose dirt from surface & wipe clean with a moistened cloth or soft bristle brush. If Ballistic Panels become wet allow to air dry in a flat position away from heat sources & out of direct sunlight. If Ballistic panels become saturated with liquids such as bleaches, JP-8, petroleum, oils, or lubricants, TURN IN FOR REPLACEMENT AS SOON AS POSSIBLE.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY:

SOLDIER PLATE CARRIER SYSTEM
SIDE PLATE CARRIER – AR/PD 10-04E04E
SIZE:
SIDE:
NSN:

Refer to SPCS outershell label for cleaning and maintenance instructions.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY:

SOLDIER PLATE CARRIER SYSTEM
CUMMERBUND SIDE PLATE POCKET – AR/PD 10-04E04E
SIZE:
NSN:

Refer to SPCS outershell label for cleaning and maintenance instructions.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY:

SOLDIER PLATE CARRIER SYSTEM
CUMMERBUND – AR/PD 10-04E04E
SIZE:
SIDE:
NSN:

Refer to SPCS outershell Label for cleaning and maintenance instructions.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY:

APPENDIX F: CONTENTS OF LABELS, AND USE AND CARE INSTRUCTIONS FOR FRONT AND BACK BALLISTICS

Appendix Scope: The purpose of this appendix is to provide details on the following: contents of labels and care and use instructions on the front and back ballistics. This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

SOLDIER PLATE CARRIER SYSTEM - FRONT BALLISTIC INSERT– AR/PD 10-04E04E
SIZE:
NSN:

INSERT THIS SIDE TO BODY FAILURE TO INSERT THIS BALLISTIC INSERT IN THE SPCS OUTERSHELL WILL RESULT IN ABSENCE OF BALLISTIC PERFORMANCE FROM FRAGMENTATION & 9-mm.

DO NOT LAUNDER BALLISTIC PANELS!

Avoid submerging in wash water. DO NOT bleach! DO NOT machine wash! DO NOT dry clean! DO NOT apply solvents!

FOR CLEANING: ONLY Remove loose dirt from surface & wipe clean with a moistened cloth or soft bristle brush. If Ballistic Panels become wet allow to air dry in a flat position away from heat sources & out of direct sunlight. If Ballistic panels become saturated with liquids such as bleaches, JP-8, petroleum, oils, or lubricants, TURN IN FOR REPLACEMENT AS SOON AS POSSIBLE.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY:

SOLDIER PLATE CARRIER SYSTEM- BACK BALLISTIC INSERT– AR/PD 10-04E04E
SIZE:
NSN:

INSERT THIS SIDE TO BODY FAILURE TO INSERT THIS BALLISTIC INSERT IN THE SPCS OUTERSHELL WILL RESULT IN ABSENCE OF BALLISTIC PERFORMANCE FROM FRAGMENTATION & 9-mm.

DO NOT LAUNDER BALLISTIC PANELS!

Avoid submerging in wash water. DO NOT bleach! DO NOT machine wash! DO NOT dry clean! DO NOT apply solvents!

FOR CLEANING: ONLY Remove loose dirt from surface & wipe clean with a moistened cloth or soft bristle brush. If Ballistic Panels become wet allow to air dry in a flat position away from heat sources & out of direct sunlight. If Ballistic panels become saturated with liquids such as bleaches, JP-8, petroleum, oils, or lubricants, TURN IN FOR REPLACEMENT AS SOON AS POSSIBLE.

LOT NUMBER:_____
DATE OF MFG:_____
SERIAL NO:_____
CONTRACT #:
MANUFACTURED BY: