INCH-POUND
AR/PD 15-03 REV D
Amendment 2
APR 2018

Supersedes
AR/PD 15-03 REV D
Amendment 1
FEB 2018

PURCHASE DESCRIPTION

BODY ARMOR, TORSO and EXTREMITY PROTECTION (TEP) MODULAR SCALABLE VEST (MSV) GENERATION II

1. SCOPE

1.1 Description. This Purchase Description (PD) covers the requirements for the Modular Scalable Vest (MSV), which is a component of the Torso and Extremity Protection (TEP) system. This system shall provide better fragmentation and handgun protection than the current baseline Improved Outer Tactical Vest (IOTV) Generation III. The modular scalable design must allow for insertions of future technologies that support modernization and the defeat of ballistic, fragmentation, blunt impact, and flame threats seen on the battlefield. This specification delineates system-, subsystem-, component-, and subcomponent-level requirements for end item body armor performance (see paragraph 6.1). The MSV utilizes with the Modular Lightweight Load Equipment (MOLLE) system to provide the Soldier with protection and utility. The MSV has been designated a Critical Safety Item (CSI) because it provides critical ballistic protection to Soldiers.

1.2 Classification. This PD covers the MSV along with its multiple subcomponents in multiple sizes. The Government will issue the MSV system separately as three subsystems. The MSV shall be one type in the following subsystems. See Table I, II, and III for sizing by component.

a. The MSV subsystem; consisting of the base vest assembly (with a concealable vest insert, cummerbund, and two ballistic inserts), two shoulder pads, two side plate carriers, two side plate pockets, and two side plate ballistic inserts. (See Table I).

b. The Torso Ballistic Insert subsystem; consisting of a set of Enhanced Small Arms Protective Inserts (ESAPI) and X Threat Small Arms Protective Inserts (XSAPI). (See Table II).

c. The Side Ballistic Insert subsystem; consisting of a set of Enhanced Side Ballistic Inserts (ESBI) and X Threat Side Ballistic Inserts (XSBI). (See Table III).

TABLE I. Base Vest Assembly

Component	Sizes
Base Vest Assembly (Outer Carrier)	5 sizes: Extra Small (XS), Small (S), Medium (M), Large (L), Extra Large (XL)
Alternate Base Vest Assembly	3 sizes: S Long, S Short, XS Short
Concealable Vest w/ Cummerbund	5 sizes: XS, S, M, L, XL
Alternate Concealable Vest w/ Cummerbund	3 sizes: S Long, S -Short, XS-Short
Ballistic Inserts	5 sizes: XS, S, M, L, XL
Alternate Ballistic Inserts	3 sizes: S Long, S-Short, XS-Short
Side Plate Carrier (Left and Right)	3 sizes: 8 (S), 10 (M), 12 (L)
Alternate Side Plate Carrier	2 sizes: 6 (XS), 14 (XL)
Side Plate Pocket	3 sizes: S (6x6), M (6x8), and L (7x8)
Alternate Side Plate Pocket	1 size: XS (6x4)
Side Plate Pocket Ballistic Inserts	3 sizes: S (6x6), M (6x8), and L (7x8)
Alternate Side Plate Pocket Ballistic Inserts	1 size: XS (6x4)

As a modular solution the following components are required to make a full system

Base Vest Assembly	Side Plate Carrier L and R	Side Plate Pocket X 2
XS-Short	8 (S)	6X6
XS	8 (S)	6X6
S-Short	8 (S)	6X6
S	10 (M)	6X6
S-Long	10 (M)	6X6
M	10 (M)	6X8
L	10 (M)	7X8
XL	12 (L)	7X8

TABLE II. Torso Ballistic Insert Subsystem

Component	Sizes
Small Arms Protective Insert (ESAPI and XSAPI)	5 sizes: XS, S, M, L, XL
Vital Torso Plate (VTP)	8 sizes: XS-Short, XS , S-Short, S, S-Long, M, L, XL

TABLE III. Side Ballistic Insert Subsystem

Component	Sizes
Side Ballistic Insert (ESBI and XSBI)	3 sizes: 6x6, 6x8, 7x8
Vital Torso Plate (VTP)	4 sizes: 6x4, 6x6, 6x8, 7x8

2. APPLICABLE DOCUMENTS

2.1 General. The specified documents listed in this section are in Sections 3 and 4 of this PD. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. Users must meet all specified requirements listed in the documents cited in Section 3 and Section 4 of this specification, regardless of whether or not they are in Section 2.

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 Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the Solicitation (see paragraph 6.2).

SPECIFICATIONS
DEPARTMENT OF DEFENSE

MIL-DTL-10884	Fasteners, Snap
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
CO/PD 04-19	Enhanced, Small Arms Protective Inserts (ESAPI)
FQ/PD 07-03	X Small Arms Protective Inserts (XSAPI)
AR/PD 11-06	Enhanced Side Ballistic Insert (ESBI)
AR/PD 10-03	X Side Ballistic Insert (XSBI)
A-A-55301	Webbing, Textile Textured or Multi-Filament
A-A-55126	Fastener Tape, Hook and Pile, Synthetic
A-A-55217	Thread, aramid, spun staple
A-A-55220	Thread, Para-aramid, Intermediate Modulus
A-A-59826	Thread, nylon, bonded
A-A-55634	Zippers (Fasteners, Slide Interlocking)
GL/PD 07-12	Cloth, Flame Resistant
MIL-DTL-32439	Cloth, Duck, Textured Nylon
MIL-STD-662	V_{50} Ballistic Test for Armor
MIL-STD-3027	Performance Requirements and Testing of Body Armor
MIL-W-17337	Webbing, Textile, Woven Nylon
MIL-DTL-508	Cloth, Oxford, nylon, 3 Ounce
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-961	Specifications Format
ITOP 4-2-805	Projectile Velocity and Time of Flight Measurements
PED-IOP-008	Soft Armor Flexibility Test Internal Operating Procedure
10 CFR 1610	Standard for the Flammability of Clothing Textiles
TOP 10-2-210	Ballistic Testing of Hard Body Armor Using Clay Backing

(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.

DRAWINGS

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

Drawing No. 2-6-268	Enhanced Side Ballistic Insert (6X6)
Drawing No. 2-6-269	Enhanced Side Ballistic Insert (6X8)
Drawing No. 2-6-270	Enhanced Side Ballistic Insert (7X8)
Drawing No. 2-6-0588	Enhanced Small Arms Protective Insert, Extra-Small
Drawing No. 2-6-0589	Enhanced Small Arms Protective Insert, Small
Drawing No. 2-6-0590	Enhanced Small Arms Protective Insert, Medium
Drawing No. 2-6-0591	Enhanced Small Arms Protective Insert, Large
Drawing No. 2-6-0592	Enhanced Small Arms Protective Insert, Extra-Large
Drawing No. 2-6-05932	Enhanced Small Arms Protective Insert, Small-Long
Drawing No. 2-6-05933	Enhanced Small Arms Protective Insert, Small-Short
Drawing No. 2-6-05934	Enhanced Small Arms Protective Insert, Extra Small-Short

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

(Copies of drawings, patterns, 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. Unless otherwise specified, documents which are Department of Defense adopted, are those listed in the issue of the Department of Defense Index of Specifications and Standards (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 61	Colorfastness to Laundering: Accelerated
AATCC METHOD 135	Dimensional Changes of Fabrics after Home Laundering
AATCC METHOD 127	Hydrostatic Pressure Test

(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-1149	Standard Test Methods for Rubber Deterioration-Cracking in an Ozone Controlled Environment
ASTM D-1424	Standard Test Method for Tearing Strength of Fabrics by Falling-Pendulum Type (Elmendorf) Apparatus
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)
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)

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA INC.

NASM16491	Grommet, metallic
NASM27980	Fasteners, snap

* Copies of this document are available online at http://www.aia-aerospace.org or from the Aerospace Industries Association of America, Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/ASQ Z1.4-2003	Sampling Procedures and Tables for Inspection by Attributes

* Copies of this document are available online at http://www.asq.org or from the American Society for Quality Control, P.O. Box 3005 Milwaukee, WI 53201-3005.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 16022	Information Technology Automatic Identification and Data Capture Techniques Data Matrix Bar Code Symbology Specification
ISO 15415	Information Technology Automatic Identification and Data Capture Techniques, Bar code print quality test specification -- Two-dimensional symbols

* Copies of this document are available online at http://www.iso.org or from the International Organization for Standardization (ISO) 1 rue de Varembé, Case postale 56, CH-1211 Geneva 20, Switzerland

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 specification, however, supersedes applicable laws and regulations unless the Contractor obtains a specific exemption.

3. REQUIREMENTS

3.1 First Article Testing (FAT) and Lot Acceptance Testing (LAT) Conformance Inspection. Testing shall subject, when specified, complete samples, representing full production quality, to FAT or LAT In Accordance With (IAW) paragraphs 4.2 and 4.3.

3.2 Materials and Components. The materials and components shall conform to applicable specifications, standards, and patterns required herein. When part or component manufacturers are referenced herein it will be according to alphabetical order, not by preference. In accordance with paragraph 6.2, the contract will specify camouflage color.

3.2.1 Cloth, Outer Shell (Front Panel). The cloth(s) utilized to fabricate the front outer shell fabric shall be a laminated textured nylon duck material. The face material shall be Type III Class 4 (500 Denier). The synthetic cloth shall meet the characteristics outlined in Appendix B Table B-II, when tested as specified in paragraph 4.4. The pattern of this material is as specified in paragraph 3.5.1.

3.2.1.1 Cloth, Outer Shell Substrate & Concealable Shell (Flame Resistance). The finished shell substrate to the laminated outer cloth as specified in 3.2.1, shall exhibit flame resistance. The cloth utilized to fabricate the substrate shall be a lightweight, durable, synthetic cloth conforming to MIL-DTL-32439 Type IV Class 3 with flame resistance qualities meeting the characteristics outlined in Appendix B Table B-I. Test personnel shall conduct laundering according to AATCC Method 135, and modified vertical flame testing according to ASTM D 6413 with a 2 inch folded edge and a horizontal top stitch 1.5 inches from the bottom edge. The pattern of this material is as specified in paragraph 3.5.1.

3.2.2 Cloth, Inner Plate Pocket. The plate pocket fabric shall be textured nylon duck conforming to MIL-DTL-32439 Type IV Class 3 or equivalent meeting the characteristics outlined in Appendix B Table B-I, when tested as specified in paragraph 4.4. The pattern of this material is as specified in paragraph 3.5.1.

3.2.3 Cloth, Foam Pad Shells. The shell pad material shall be a plain weave cloth with four way stretch in the pattern as specified in paragraph 3.5.1 and conforming to the physical requirements listed in Appendix B Table B-II. The cloth shall be tweave 520E Durastretch®, or equivalent, when tested as specified in paragraph 4.4.

3.2.4 Cloth, Side Plate Carrier Outer Shell. The outer shell fabric shall conform to the requirements identified in paragraph 3.2.1, or equivalent, when tested as specified in paragraph 4.4.

3.2.5 Cloth, Side Plate Carrier Inner Shell. The inner shell fabric shall conform to the requirements identified in paragraph 3.2.1, or equivalent, when tested as specified in paragraph 4.4.

3.2.6 Cloth, Side Plate Pocket Outer Shell, Body Facing. The outer shell fabric shall conform to the requirements identified in paragraph 3.2.1, or equivalent, when tested as specified in paragraph 4.4.

3.2.7 Cloth, Side Plate Pocket Internal Shell, Outer Facing. The inner shell fabric shall conform to the requirements identified in paragraph 3.2.1.1, or equivalent, when tested as specified in paragraph 4.4.

3.2.8 Cloth, Ballistic Panel Cover. The ballistic panel cover shall be a lightweight, polyurethane coated, nylon, ripstop that does not exceed 210 denier and shall be heat sealed around the ballistic filler with a minimum heat seal width of 0.20 inches. The ballistic cover shall conform to the physical requirements listed in Appendix B Table B-II, when tested as specified in paragraph 4.4.

3.2.9 Cloth, Inner front & Back Flap Cover. The concealable panel cover shall be textured nylon duck conforming to a 330 Denier water repellent/flame resistant coated material, or equivalent conforming to the physical requirements listed in Appendix B Table B-I, when tested as specified in paragraph 4.4.

3.2.10 Webbing and Tapes. Webbings and tapes shall be heat cut smooth with no burrs or residual melt. Producer colored, textured, filament nylon (1000 denier warp/ 500 denier fill) and non-textured, filament nylon (840 denier warp/ 210 denier fill) construction may be used. Webbings and tapes shall conform to the following requirements when used:

a. 3/4 inch Webbing: A-A-55301, Type IV, width 0.75 ±1/16 inch. Producer colored or piece/yarn dyed, textured, filament nylon are acceptable. The webbing shall conform to the physical requirements listed in Appendix B Table B-IV when tested as specified in paragraph 4.4.

b. 1 inch Webbing: A-A-55301, Type III, width 1.0 ±1/16 inch. Alternate construction is not acceptable. Producer colored or piece/yarn dyed, textured, filament nylon are acceptable. The webbing shall conform to the physical requirements listed in Appendix B Table B-IV when tested as specified in paragraph 4.4.

c. 1 ½ inch Webbing: A-A-55301, Type VI, width 1.5 ±1/16 inch. Producer colored or piece/yarn dyed, textured, filament nylon are acceptable. The webbing shall conform to the physical requirements listed in Appendix B Table B-IV when tested as specified in paragraph 4.4.

d. 1 inch Tape: MIL-PRF-5038, Type III, Class 2, width 1.0 ±1/16 inch. Producer colored, textured, filament nylon. The tape shall conform to the physical requirements listed in Appendix B Table B-IV when tested as specified in paragraph 4.4.

3.2.11 Fasteners, Hook and Loop Low Profile. Low profile hook and loop fasteners located throughout the system shall conform to A-A-55126C Type III Class 6, or equivalent and conform to the physical requirements listed in Appendix B Table B-III when tested as specified in paragraph 4.4. Warp knit loop low profile, 100 percent (%) Nylon, without selvage, shall be a laser cut only and optional laser cut or cold cut for extruded plastic hook fastener tape low profile. Warp knit loop shall come in 1, 1 ½, 2, and 4 inch widths (Velcro® Brand Loop 3610 or equivalent). The extruded hook fastener tape shall be continuous extrusion in 1, 1 ½, 2, and 4 inch widths (Velcro® Brand Hook HTH 745 or equivalent).

3.2.12 Fasteners, Laminated Circular Engagement (LCE). A Self Engaging Fastener (SEF) constructed by mechanically bonding hook and loop tape together in a back-to-back orientation that enables the fastener to self-engage (Velcro® Brand One-Wrap or equivalent) shall conform to the physical requirements listed in Appendix B Table B-III conforming to Class 8, when tested as specified in paragraph 4.4. The construction shall use the LCE on the attachment points of the side plate carrier and cummerbund.

3.2.13 Slide Fasteners. Slide fasteners shall be A-A-55634, Continuous Element Fasteners (CEF) plastic chain with a closed top and bottom stop, fastener size 8 in Tan 499 in a reverse configuration with a cord or tab pull. The slide fastener shall have a crosswise breaking strength of 130 pounds (lbs) minimum when tested according to ASTM D2061.

3.2.14 Foam. The foam (located within the shoulder pads and the front and back inner vest) shall be closed cell or Ethylene-vinyl acetate (EVA) foam with a density of 2 ± 1 pounds per cubic foot (lb/ft^3). Thickness shall be ¼ ± 1/16 and 3/8 ± 1/16 when tested as specified in ASTM D3575.

3.2.15 Non-Ballistic Thread. The non-ballistic thread shall be nylon, bonded, Size E (Tex 70-76) or Size F (Tex 90-112), A-A-59826, Type II, or equivalent conforming to the physical requirements listed in Appendix B Table B-V. Paragraph 3.5.1 shall specify the color.

3.2.16 Ballistic Thread. The ballistic thread shall be para-aramid, spun staple, Size Tex 40-60, A-A-55220, Type I, or equivalent conforming to the physical requirements listed in Appendix B Table V.

3.2.17 Plate Pocket Internal Shell. The inner shell fabric shall be textured nylon duck conforming to paragraph 3.2.2, when tested as specified in paragraph 4.4.

3.2.18 Center flap cloth backer. The inner shell fabric shall be textured nylon duck conforming to paragraph 3.2.2, when tested as specified in paragraph 4.4.

3.2.19 Composite Laminate. The side plate carrier stiffener material shall be an 8 ply laser cut Polypropylene laminate stiffener comprised of multiple layers of self-reinforcing polypropylene plain woven composite, or equivalent. The front carrier form sheet shall be a 6 ply laser cut Polypropylene laminate stiffener comprised of multiple layers of self-reinforcing polypropylene plain woven composite, or equivalent, that conforms to Appendix B Table B-VI.

3.2.20 Grommet. The Contractor may use plain, brass, black oxide, NASM16491, size 0, Type I, Class 3, grommets, if required, for drain holes found in side plate pockets. Alternatively, the Contractor may use sewn eyelets or buttonholes in the place of grommets.

3.2.21 Washer. The Contractor may use plain, brass, black oxide, NASM16491, size 0, Type I, Class 3, washers, if required, for drainage holes if used in place of sewn eyelets or buttonholes.

3.2.22 Tensionlock. The tensionlock shall be a 1 ½ ± 1/8 inch opening, acetal, ITW P/N 154-0150 or National Molding P/N 7425, or equivalent.

3.2.23 Oval Loop. The construction of oval loop may use 1 ½ ± 1/8 inch opening, Coated Steel, ITW P/N 01041-20-22857, or equivalent.

3.2.24 Female Buckle, Non Adjustable. The non-adjustable female buckle may be constructed of 1 ½ ± 1/8 inch opening, acetal, National Molding P/N 9402, or equivalent

3.2.25 Female Buckle, Adjustable. The adjustable female buckle may be constructed of 1 ½ ± 1/8 inch opening, acetal, National Molding P/N 9403, or equivalent.

3.2.26 Male Buckle, Non Adjustable. The non-adjustable male buckle may be constructed of 1 ½ ± 1/8 inch opening, acetal, National Molding P/N 10358V, or equivalent.

3.2.27 Male Buckle, Repairable.The repairable male buckle may be constructed of 1 ½ ± 1/8 inch opening, acetal, National Molding P/N 10213V, or equivalent.

3.2.28 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 inches by 3.0 inches (height x width) and secured to the composite laminate front panel stiffener by means of rivets. The lever shall be activated by pulling from the vertical position downward to a position perpendicular to the torso. 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 either by 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. The Emergency Release Assembly shall be National Molding P/N 10431V or an equivalent that is easily interchangeable and is compatible with existing 1 ½-inch female buckles.

3.2.29 Rivet. The manufacturer shall use an aluminum blind rivet to attach the emergency release assembly to the composite laminate. The rivet diameter shall be appropriately sized to connect the composite laminate to the Emergency Release trigger without cracking or splitting the trigger.

3.3 Design. The MSV is a modular scalable vest protecting the upper torso from multiple ballistic threats, which is easily configured to defeat predicted mission threat at a minimum system weight. The MSV subsystem (see paragraph 3.3.2) consists of the base vest assembly (with concealable vest inserts, cummerbund, and two (2) ballistic inserts), two (2) shoulder pads, two (2) side plate carriers, two (2) side plate pockets, and two (2) side plate ballistic inserts. The MSV provides protection from conventional fragmenting munitions and multiple hits (with a minimum shot spacing of 2.5 inches) from 9mm, 0.357 SIG, and 0.357 MAG handgun rounds. The torso ballistic insert (ESAPI and XSAPI) subsystem consists of a set of interchangeable, sized, and contoured plates inserted into front and back pockets inside the MSV carrier to provide vital organs protection against multiple hits of small arms rifle bullets and indirect fire flechettes. The side ballistic insert (ESBI and XSBI) subsystem consists of a set of interchangeable, sized, and contoured plates inserted into left and right side pockets of the MSV carrier. The front of the MSV outer shell uses a Pouch Attachment Ladder System (PALS) to enable limited load carrying compatible with Modular Lightweight Load-carrying Equipment (MOLLE). The Pouch Attachment Ladder System (PALS) on the exterior of the outer shell carrier shall be cut by any mechanical means that accurately cuts the laminated materials in complex designs without compromising physical appearance and prevents associated fraying and durability problems along the cut edges (including, but not limited to, the laser cutting process described in US Patent No. 9,565,922, assigned to FirstSpear, LLC). The addition of the Ballistic Combat Shirt (BCS), Ballistic Battle Belt (B3), and Blast Pelvic Protector (BPP) provides full up tactical level protection. The variants of Body armor, multiple threat modular system configurations are described (see a, b, c, and d) below. Recommended enhancements are encouraged to improve the MSV's operational effectiveness and manufacturability in accordance with change procedures identified in the contract.

a. MSV low profile vest, which only includes the assembly of the front, back and two side plate carrier ballistic inserts. This configuration could include the ESAPI/XSAPI for added protection.

b. MSV plate carrier vest only; which only includes the MSV low profile vest, the plate carrier (base vest) with a minimum of two plates, ESAPI/XSAPI.

c. MSV base vest with one or more, or all of the TEP modular components; BCS, B3, BPP and/or two ESAPI/XSAPI and two ESBI/XSBI.

d. MSV base vest with none, some, or all TEP modular components and limited load carriage using MOLLE pockets.

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. The Contractor shall ensure compliance with patterns in order 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 ± 1/16 inch seam allowance unless otherwise stated on patterns. Except for the ballistic panels, Contractors shall cut all the components of the vest with a tolerance of ± 1/16 inch IAW the pattern parts indicated except where changes or enhancement(s) to baseline are proposed. The contractor shall cut the ballistic panels with a tolerance of -1/16 + 1/8 inch to ensure maximum protective area of coverage is achieved (see Appendix C, Table C-II). The Government does not permit drill holes. Refer to Appendix E for pattern pieces and nomenclatures.

3.3.2 MSV Subsystem. See paragraph 3.3 for MSV configuration. Appendix C, Table C-I gives the maximum finished weight of the MSV subsystem components for each size when measured as specified in 4.6.5. Appendix C, Table C-II gives the minimum area of ballistic coverage for each ballistic panel subcomponent in each size when tested as specified in 4.6.4. Finished base vest measurements for each size are outlined in Appendix C Table C-III to Table C-V when inspected as specified in 4.6.1. Refer to Appendix D for measurement points.

3.4 Construction. The exterior of the system shall be edge stitched 1/8 ± 1/16 inch from all edges of the front and side plate carrier. Fabric edges shall not ravel.

3.4.1 Hook and Loop Fastener. The Contractor shall not stich hook and loop fasteners in the selvage edge to prevent associated fraying durability problems in repeated use.

3.4.2 Stitching. Stitching shall conform to ASTM D-6193, 8-15 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. The Contractor shall secure thread breaks or bobbin run-outs occurring during sewing 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. The Contractor shall trim thread ends to a length of not more than 1/4 inch. Stitching through the composite laminate material, low profile hook, or Laminated Circular Engagement (LCE) shall conform to ASTM D-6193, 6-10 stitches per inch (stitch type 301), avoid needle cutting by sewing multiple stitches along the same stitch line of the material.

3.4.3 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.

3.4.4 Bartacks. No stitch run-off is allowed and no needle cutting by bartack. The Contractor shall avoid double bartacks (one on top of the other) to prevent needle cutting and weakening of the attachment point. Table IV specifies bartack requirements when tested as specified in paragraph 4.7.

TABLE IV. Bartack

Characteristic	Stress points; All cloth	Webbing hangers; Webbing and cloth
Length; inch	3/8 inch min.	3/4 ± 1/16 inch

3.4.5 Bartack Alignment for MOLLE Pocket Attachment. The following specifies the required spacing of vertical bartacks needed for physical compatibility of MOLLE pocket attachment on the MSV base vest. Testing personnel shall test the MOLLE attachment points according to 4.6.1.2 MOLLE Attachment Testing.

a. The distance between vertical bartacks on horizontal webbing shall be 1 ½ ± 1/16 inch.

b. The vertical distance between horizontal webbing shall be 1 ± 1/16 inch. This requirement is not applicable to the inside of the side plate carrier and the back carrier attachment points for the side plate carrier.

c. Vertical bartacks on consecutive horizontal webbing rows shall be vertically aligned bottom to top in a vertical straight line.

d. The width of the laser cut opening at its widest point shall be 1 1/8 ± 1/16 inch for Type 1 (Oval slit) and 1 3/16 ± 1/16 for Type 2 (Straight slit).

e. The vertical distance between laser cut Pouch Attachment Ladder System (PALS) shall be 1 ± 1/16 inch when measured from the top of one opening to the top of the next opening on the adjacent row.

f. Laser cut openings on consecutive horizontal rows shall be vertically aligned bottom to top in a vertical straight line.

3.4.6 Buttonhole. Buttonholes shall be straight cut. The Contractor shall position buttonholes IAW the marks indicated on the pattern, with the ends of the buttonholes securely tacked. All buttonholes will be 1 inch with a finished cut of 3/4 ± 1/16 inch.

3.4 7 Binding. The Contractor will sear all ends of binding that are not completely encased.

3.5 Operating Requirements. The following requirements apply to all components and subcomponents of the MSV in any of its potential configurations IAW paragraph 3.3.

3.5.1 Camouflage. Table V outlines the camouflage for multi-terrain environment; disruptive patterns and solids, for applicable components to reduce visual and infrared (IR) (both near and far IR) signature to an acceptable level.

TABLE V. Camouflage Shade

Component(s) or Part(s)	Operational Camouflage Pattern (OCP)
Cloth, outer shell, inner shell, side plate carrier outer shell, side plate pocket outer shell, side plate carrier inner shell, concealable shell	7-color pattern: Dark Cream 559 Tan 525 Light Sage 560 Olive 527 Dark Green 528 Brown 529 Bark Brown 561
Cloth, side plate pocket inner shell, side plate pocket internal shell	Tan 499 or Coyote 498
Ballistic panel cover	Foliage Green 504 or Tan 499
Binding Tape Webbing (para 3.2.10)	5-color pattern: Dark Cream 559 – Ground Shade Olive 527 Dark Green 528 Brown 529 Bark Brown 561
Hook & loop fastener, Low profile Hook & Loop fastener, Laminated Circular Engagement (LCE), Non ballistic Thread, Labels	Tan 499
Oval loop	Tan 499
Hardware Buckles	Tan 499

3.5.1.1 Pattern Execution. The pattern on the printed finished cloth and webbings 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.

3.5.1.1.1 Style H, Operational Camouflage Pattern. The raw material provider shall dye cloth(s) to a ground shade either matching or approximating Dark Cream 559 and then shall be overprinted with the camouflage pattern. When the ground shade is dyed to match Dark Cream 559, the six (6) remaining colors shall be printed as appropriate, for the Tan 525, Light Sage 560, Olive 527, Dark Green 528, Brown 529 and Bark Brown 561 areas of the pattern. When the raw material provider does not dye the ground shade to approximate Dark Cream 559 all seven (7) colors of the camouflage pattern shall be printed to match all seven (7) colors. Each area of the specific color of the pattern shall be IAW the applicable standard sample or drawing number 2-1-2592.

3.5.2 Spectral Reflectance. All exterior components and parts of the body armor system shall conform to Tables VI-A, VI-B, and VI-C unless superseded by the requirements specified in paragraph 3.2. The cloth must meet the requirement for initial and after laundering testing when tested as specified in paragraph 4.8.2. Acetal hardware shall conform to the spectral reflectance requirements, Table VI-C.

TABLE VI-A. Camouflage Colors (%)

Wavelengths Nanometers (nm)	Dark Cream 559 Tan 525		Light Sage 560 Olive 527 Brown 529		Dark Green 528 Bark Brown 561	
	Min	Max	Min	Max	Max	Min
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 VI-B. Solid Colors (%)

Wavelengths Nanometers (nm)	Foliage Green 504		Tan 499	
	Min	Max	Min	Max
600	8	26	8	26
620	8	26	8	26
640	8	28	8	30
660	10	30	8	34
680	10	34	12	38
700	12	38	12	40
720	16	42	16	46
740	16	46	22	50
760	18	48	30	50
780	18	48	34	54
800	20	50	36	56
820	22	54	38	58
840	24	54	38	58
860	26	56	40	60

TABLE VI-C. Acetal Hardware (%)

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

3.5.3 Matching. All exterior components and parts of the body armor system shall match the color and appearance of the standard sample when tested as specified in paragraph 4.8.2.

3.5.4 Fungus Resistance. The Contractor shall provide, as part of the Technical Data Package, the composition of synthetic materials used (weight of synthetic material/total weight). When the composition of material used in components and parts of the body armor, including interior components, consist of at least 80% (by weight) synthetic materials (Nylon, Para-Aramid, UHMWPE, etc.) fungus resistance shall not be tested. When fungus resistance is tested the visual grading shall be equal to or less than 3 when graded IAW Method 508 of MIL-STD-810. All components shall experience no visual damage due to the presence of fungus spores or adjacent fungus growth when tested as specified in paragraph 4.6.7.

3.5.5 Functional Integration. All body armor, multiple threat components shall be integrated for functional and physical interfaces for the SPS TEP system. 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 MSV outer shell back of same size) with no degradation of performance. Any configuration of body armor, multiple threat IAW paragraph 3.3 shall be functionally integrated with any configuration of MOLLE.

3.5.5.1 SAPI and SBI pockets. The MSV SAPI and SBI 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 ESBI, XSBI, ESAPI, or the XSAPI (see paragraph 2.2.2) to be easily and quickly inserted into and removed from the vest without struggle or force (see paragraph 4.8.5). The Government will allow open seams to accommodate for stitching interference with the front plate pocket on sizes XS to MD as long as the plate remains secure.

3.5.6 Drag Strap. The drag strap on the back of the MSV carrier (all sizes) shall have a minimum peak strength of 400 lbs and a rise of ½ inch to 2 inches (measured in the center of the handle) when tested IAW paragraph 4.8.6.

3.5.7 Emergency Doffing. The MSV shall have an emergency release mechanism. The mechanism shall be a single point activator, 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; front and back (see paragraph 4.8.7).

3.5.8 Drainage. The MSV shall provide a durable means to allow water in the vest and side plate pockets to drain out. If the Contractor uses grommets, eyelets, washers, or buttonholes as a drainage mechanism, they shall be securely attached and cinched without splitting (or other damage) in order to prevent detachment from or cutting of the adjacent material (see paragraph 4.8.8).

3.6 Ballistic Material System Operating Requirements. The ballistic package shall meet the following operating requirements.

3.6.1 Areal Density. The soft armor ballistic filler (without stitching and the ballistic insert cover) shall not exceed the requirements listed in Table VII, when tested IAW paragraph 4.9.1. Except for ancillary materials, such as thread, the ballistic filler shall be made entirely of ballistic materials. The Government allows the use of quilting and asymmetric ballistic designs. Each ballistic filler layer shall be water repellent. The ballistic filler design shall be a uniform areal density. Testing will use a shoot pack as described in paragraph 3.6.1.1, Shoot pack, for the areal density requirement.

TABLE VII. Maximum Areal Density (lb/ft^2)

Base	0.88

3.6.1.1 Areal Density Shoot Pack. Testing shall use representative shoot packs to represent the ballistic resistance materials, for the areal density calculation. The representative shoot packs (ballistic material systems) shall consist of a ballistic filler packet comprised of the ballistic filler and the ballistic cover. The ballistic material systems shall be 15 inches by 15 inches in size consisting of X plies proposed ballistic material system. The ballistic package used within the shoot pack must be unstitched. When the ballistic filler is an asymmetric system of different materials, the Contractor shall clearly label the filler packet to differentiate the strike face from the back face. The Contractor shall individually serialize and label each shoot pack to identify the strike face.

3.6.2 Thickness. The shoot pack (not including cloth ballistic panel cover) shall be IAW Table VIII for thickness, when tested IAW 4.9.2.

TABLE VIII. Maximum Thickness (inches)

Base	0.27

3.6.3 Flexibility. Testing for flexibility of the ballistic material is for Government reference only. The ballistic material system should not exceed 90 lbs at a 2 inch plunge when tested IAW paragraph 4.9.3.

3.7 Ballistic Performance Requirements. The MSV shall provide the following ballistic protection levels when tested stand-alone or as a system:

a. MSV provides fragmentation protection from conventional fragmenting munitions (see paragraph 3.7.1).

b. MSV provides multi-hit handgun bullet protection for 9mm, 124 grain (gr), .357 Sig, 125 gr, and the .357 Mag., 158 gr projectile (see paragraph 3.7.2).

c. MSV and ESAPI or XSAPI with ESBI or XSBI together provide multi-hit small arms threat protection (see paragraph 3.3) from:

(1) Threat Code A

(2) Threat Code B

(3) Threat Code C and C1

(4) Threat Code D

(5) Threat Code E

(6) Threat Code F

(7) Threat Code X

3.7.1 Fragmentation Protection. The ballistic material system shall provide consistent ballistic performance. Table IX-A to Table IX-E lists the required minimum V_{50} values for the ballistic system at specified obliquity when tested with the Fragment Simulating Projectile (FSP) and Right Circular Cylinder (RCC) for dry, wet, extreme temperature, accelerated aging, and Petroleum, Oil, & Lubricants (POL) conditions. Any product improvements in the ballistic performance of the ballistic material system shall not reduce the ballistic performance of the body armor, multiple-threat system small arms protection of base vest and SAPI when tested as specified in ESAPI and XSAPI performance requirements.

TABLE IX-A. 2 gr RCC V_{50} Testing

Threat	Condition		Obliquity (degree)	V_{50} Requirement (ft./sec.)
2 gr RCC	Dry @ 0 degree		0	2710
	Sea Water @ 0 degree		0	2575
	Dry @ 45 degrees		45	2800
	Hot		0	N/A
	Cold		0	N/A
	Accelerated Age		0	N/A
	POL (Oil & F-24)		0	N/A

TABLE IX-B. 4 gr RCC V_{50} Testing

Threat	Condition	Obliquity (degree)	V_{50} Requirement (ft./sec.)
4 gr RCC	Dry @ 0 degree	0	2400
	Sea Water @ 0 degree	0	2300
	Dry @ 45 degrees	45	2460
	Hot	0	N/A
	Cold	0	N/A
	Accelerated Age	0	N/A
	POL (Oil & F-24)	0	N/A

TABLE IX-C. 16 gr RCC V_{50} Testing

Threat	Condition	Obliquity (degree)	V_{50} Requirement (ft./sec.)
16 gr RCC	Dry @ 0 degree	0	2050
	Sea Water @ 0 degree	0	1920
	Dry @ 45 degrees	45	2080
	Hot	0	2000
	Cold	0	2000
	Accelerated Age	0	2000
	POL (Oil & F-24)	0	1900

TABLE IX-D. 64 gr RCC V_{50} Testing

Threat	Condition	Obliquity (degree)	V_{50} Requirement (ft./sec.)
64 gr RCC	Dry @ 0 degree	0	1660
	Sea Water @ 0 degree	0	1610
	Dry @ 45 degrees	45	1660
	Hot	0	N/A
	Cold	0	N/A
	Accelerated Age	0	N/A
	POL (Oil & F-24)	0	N/A

TABLE IX-E. 17 gr FSP V_{50} Testing

Threat	Condition	Obliquity (degree)	V_{50} Requirement (ft./sec.)
17 gr FSP	Dry @ 0 degree	0	1850
	Sea Water @ 0 degree	0	N/A
	Dry @ 45 degrees	45	N/A
	Hot	0	N/A
	Cold	0	N/A
	Accelerated Age	0	N/A
	POL (Oil & F-24)	0	N/A

3.7.2 Handgun Protection. The ballistic material system shall be engineered to provide handgun protection. Table X-A to Table X-C outlines the ballistic material system minimum dry V_{50}, and V_0 acceptance for the multi-hit handgun protection against the 9 mm, 124 gr Full Metal Jacketed (FMJ) Remington, .357 Sig, 125 gr Full Metal Jacketed Flat Nose (FMJFN), and the .357 Mag., 158 gr Jacketed Soft Point (JSP) against 3 hits at 0° obliquity and 2 hits at 30° obliquity, with the maximum back face deformation requirement of 44.0 mm when tested and measured IAW paragraph 4.10.9.2 and 4.10.9.3.

TABLE X-A. 9 mm Handgun V_{50} Testing

Threat	Condition	Obliquity (degree)	V_{50} Requirement (ft./sec.)
9 mm, 124 gr FMJ Remington	Dry @ 0 degree	0	1525
	Sea Water @ 0 degree	0	1525
	Dry @ 45 degrees	45	1525
	Hot	0	1525
	Cold	0	1525
	Accelerated Age	0	1525
	POL (Oil & F-24)	0	1525

TABLE X-B. .357 Sig. and .357 Mag. V_{50} Testing

Threat	Condition	Obliquity (degree)	V_{50} Requirement (ft./sec.)
.357 Sig., 125 gr FMJFN	Dry @ 0 degree	0	1565
.357 Mag., 158 gr JSP	Dry @ 0 degree	0	1525

TABLE X-C. Handgun V_0 Testing

Projectile	Condition	Torso Vest, Components, Front/Back Pelvic V_0 Requirement (ft./sec.)*	Deformation Max (mm)**
9 mm, 124 gr FMJ Remington	Dry	1400 +50/-0	44.0
.357 Mag., 158 gr JSP	Dry	1400 +50/-0	44.0
.357 Sig., 125 gr FMJFN	Dry	1450 +50/-0	44.0
**Max deformation will be calculated using a statistical protocol which separates the 0^o obliquity from the 30^o obliquity shots (paragraph 4.10.9.5).			

3.8 Support or Ownership Requirements. The MSV shall meet the following support or ownership requirements.

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

3.8.3 Health and Safety. The MSV shall be safe to use and not contain any harmful materials. Additionally, the MSV will be non-hazardous (non-explosive and have no toxicological or electromagnetic radiation effects) to the individual wearing the MSV or troops in the surrounding area.

3.8.4 Safety. The Contractor shall design the MSV system 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 Contractor shall design the MSV to eliminate or minimize to the maximum extent the potential for injury while assembling, donning/doffing, reconfiguring, cleaning, and maintaining the MSV. The design shall not have loose parts that would be susceptible to snagging.

3.8.5 Toxicity. The water repellant/flame finishes on MSV shall not present a dermal health hazard when used as intended. Testing personnel will verify this requirement using material safety data sheets.

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 eliminated, consistent with operational requirements. The design shall use environmentally acceptable substitutes without degrading operational function and maintaining cost effectiveness. Hazardous material exposure to personnel shall be controlled to levels below the Occupational Safety and Health Administration's Permissible Exposure Limits. The MSV shall not present any uncontrolled health hazard throughout the life-cycle of the item. When designing the MSV the Contractor shall:

a. Avoid the use of materials that cause skin irritation or allergies.

b. Utilize materials that are resistant to fire, fungus, bacterial growth, etc.

c. 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.

3.8.7.1 Workmanship. The finished MSV shall conform to the quality of product established by this PD. The Contractor shall verify and validate that all fabrication procedures will yield quality workmanship to meet product specification and contract requirements. All materials used in the construction shall consist of quality levels that assure conformance to all requirements unless otherwise authorized. All workmanship shall be conducted to eliminate and avoid human induced defects. Manufacturing practices shall be capable of consistently yielding product that conforms to all requirements in this PD and implied specifications for the MSV and its components. All component materials shall be properly marked, identified, and protected during storage. Materials shall be produced and integrated to extend durability and provide consistency of appearance throughout the life of the MSV. All components shall be thoroughly cleaned and free from production debris, stains, and other foreign matter prior to assembly. Material layers shall be free of contaminants (such as, but not limited to foreign object debris, any media not associated with the TDP, loose fragments of component materials, operator elements not part of component materials. Material interfaces shall be compatible and ensure ease of use. This section is applicable to all material or components of the product whether furnished by the Prime Contractor or by any of their suppliers or subcontractors. The Contractor shall obtain the written consent of the Government prior to making any changes to the material, process, or equipment used in production of the MSV.

3.8.7.2 Identification and Traceability. Reference ISO 9001:2008 Clause 7.5.3 – Identification and Traceability is a requirement under this contract. Lot numbering is applicable. The Contractor shall maintain traceability records for all component parts used to manufacture the end item product. When the Contractor purchases components as end items to the MSV, all component parts Lot identification shall be traceable via each MSV's serial number and contract number. When purchased separately, all component parts Lot identification shall be traceable via the component part lot number. Subcontractor's component part lot information shall enable traceability to the raw materials used in the component part. Each MSV Lot shall consist of only one size, mixed sized Lots must be approved by the Government prior to production. The Contractor can make a MSV Lot from multiple Lots of ballistic material, where a Lot of ballistic material is defined as an individual roll of ballistic material. However, in the case where there is remaining ballistic material, left over from the production run of an MSV Lot, that material shall only be used in the next consecutive MSV Lot. The Contractor shall provide a technical description of the design package, which shall include, but not limited to, build-sheet: design orientation, number of layers, and material identification by layer and material type by layer.

Records shall be maintained and readily available for Government inspection and audit. For End Item Products identified with individual serial numbers, the traceability requirements listed above shall be traceable via the individual serial number and contract number.

3.8.8 Technical and Operator Manual.

3.8.8.1 Contractors shall deliver a copy of the most current Technical Manual Operator's Manual Preventive Maintenance Checks and Services (PMC) for the MSV and a graphic training aid as defined in the contract, with each end item delivered. The technical manual must be the latest version, including all changes, at the time of contract award. The Graphic Training Aid shall conform to KwikPoint P/N KP18-MIL-VUG18 or an equivalent.

3.8.8.2 The Contractor shall provide a Technical and Operator Manual with materials that conform to Table XI and Figures 1.

TABLE XI. Technical Manual Dimensions

Style	Trim Size (inches)	Orientation	Maximum Printing Area (inches)
Pocket-sized Technical Manual	4 X 5½ 5½ X 4	Vertical Horizontal	3 1/8 x 5 5 x 3 1/8
Graphic Training Aid	Maximum 4 X 5.5	Folded	NA

Text Stock: White Offset (50 lbs)
Cover Stock: Buff Index (110 lbs) Prints: Head to Head
Color of Ink: Black
Trim Size: 4 x 5 ½ inches
Binding: Leave blank
Number of Staples: 2
Sides to be trimmed: 4

FIGURE 1. Technical and Operator Manual Materials

3.8.9 Spare Parts Kit. Each production Lot of MSV shall be accompanied by a spare parts kit. The parts kit shall contain the items listed in Table XII and be stored in a subdued color High Density Polyethylene container equipped with handles. Each kit shall contain a packing list. The nomenclature and quantity of each component in the kit shall be listed and printed on white paper using permanent black ink

TABLE XII. Spare Parts Kit

Quantity (Qty)/Kit	Description
20	Emergency release assembly 4 of each size (see paragraph 3.2.28)
20	Female buckle, non-adjustable (see paragraph 3.2.24) with 15 inches of webbing attached
20	Shoulder pads (10 left, 10 right)
20	Male buckle, repairable (see paragraph 3.2.27)
80	Side plate carrier pockets (Qty: 30- S (6x6), 30- M (6x8), 20- L (7x8))
20	Female buckle, adjustable (see paragraph 3.2.25)
50	Side plate carriers (Qty: 20- Small, 20- Medium, 10- Large)
50	Concealable cummerbund carriers (Qty: 20- Small, 20- Medium, 10- Large)

3.9 Size, Identification, and Instruction Label. The label shall be of sufficient strength to withstand repeated abrasion during field use and cleaning, and include the following:

a. The MSV base vest component and ballistic panel subcomponent shall have a combination of size, identification, serial number, ballistic protection level, date of manufacture, Lot number, and instruction label for the entire MSV system.

b. The instruction label shall include do's and don'ts for use and cleaning instructions, and donning/doffing instructions for the entire MSV system.

c. The instruction label shall be located on the inner side of the base vest. The size of the label shall be 4 ± 0.25 inches wide by 8 ± 0.25 inches high or any combination not to exceed 32 square inches. The type shall be no smaller than 10 point and shall be IAW MIL-DTL-32075, Type VI, Class 14.

d. The modular components; side plate carriers, ballistic panels, side plate pockets, concealable carrier, and cummerbunds shall also be labeled. Label size shall be at the option of the Contractor governed by the contents and size of the characters of the inscription, space between lines, and as applicable blank margins on the sides of the labels. The contents of the labels shall at a minimum contain the information as found in Appendix A.

3.9.1 Unique Identification (UID). Front and Back ballistic panels shall require a unique identification label that conforms to the specifications below. The Contractor shall comply with the requirements of the current version of Military Standard 130 and the Department of Defense Guide to Uniquely Identifying Items, and the following criteria:

a. Color: Label/Tag shall be black and tan Human Readable Information (HRI) and Machine Readable Information (MRI).

b. 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 shall meet requirements of the latest version of MIL-STD-130.

c. 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 d and e below. To prevent automated read errors, the Contractor shall not allow other 1D or 2D codes to be printed on this label. This does not restrict the Contractor from using other HRI and MRI on labels not associated with the UID label/tag.

d. Data Matrix Construct: The Data Matrix shall be encoded per MIL-STD-130 using only the data identifiers (DI) and criteria shown in Figure 2. 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))
Cage/Lot/Serial=25S followed by cage code, followed by Lot number, followed by serial number
Contract Number = 4Z followed by contract number
Construct Example: [)>RS06GS17V1FKY1GS1T1LGSS137479-001GS16D20130901GSN8470-01-536-7227GS1P28508-1GS25S1FKY11L137479-001GS4ZSPM1C1-13-D-1055

FIGURE 2. Data Matrix Construct

e. 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.

f. Verification: Data Matrix code quality shall 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. If using laminates or overcoats the Contractor must verify the label 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 manufacturing.

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

h. Placement of the UID label shall be printed on existing front and back ballistic insert label such that the label is extended no more than three inches in length below current size label.

4. VERIFICATION

4.1 Classification of Inspections. The inspection requirements specified herein are outlined below. The Contractor is responsible for compliance to all stated requirements, and the Government reserves the right to perform any of the tests set forth to ensure the supplies conform to prescribed requirements. All testing shall be performed at a Government directed test laboratory.

a. FAT (see paragraph 4.2)

b. LAT/conformance inspection (see paragraph 4.3).

4.2 FAT. When a FAT is required, it shall be examined for design (4.6) compatibility and interchangeability of components, inspection requirements in paragraph 4.7, and ballistic data for all test conditions, data, certificate, or compliance for testing requirements in paragraphs 4.9 and 4.10, and overall workmanship. FAT verification testing shall conform to paragraph 4.11.

4.2.1 Material Qualification. At any point after a FAT has been approved, any material change shall be tested IAW the appropriate paragraph of this PD and approved by the Government.

4.2.2 Ballistic Qualification. At any point after original FAT approval, any material or process change to the ballistic package shall be required to pass all ballistic FAT requirements.

4.3 LAT/Conformance Inspection. Conformance Lot inspection shall be performed IAW sections 3 and 4. The Government will determine its acceptance of the Contractor's end item product by the ballistic and non-ballistic requirements validation.

4.3.1 Certificate of Compliance (CoC). When CoCs are required, the Contractor shall conduct tests to determine the validity of the certifications and the Government reserves the right to inspect and test such items to determine the validity of the certification. All CoCs and supporting test data, for all components and/or material performance as stated in the product specification document, shall be provided to the Defense Contracting Management Agency (DCMA) at the time FAT and LAT samples are presented for inspection and acceptance. The Statement of Work for the contract or Delivery Order shall specify complete CoC delivery requirements. The Contractor shall ensure that all CoCs and supporting test results are submitted electronically with Department of Defense Form 1222, (DD1222), Request for and Results of Tests.

4.4 Requirements and Verifications. Table XIII delineates performance requirements verified through visual methods, including physical measurements in order to determine that no deficiencies exist. The Government may elect to perform testing at their discretion at any time during production.

TABLE XIII. Requirements and Verifications

Characteristic	Requirement Paragraph	Verification Paragraph	FAT	LAT/ Conformance Lot Inspection
Materials and Components	3.2	4.5		
Cloth, outer shell (Front Panel)	3.2.1	4.5 APPENDIX B Table II	X*	CoC
Cloth, Outer Shell Substrate & Concealable Shell	3.2.1.1	4.5 APPENDIX B Table I	X*	CoC*
Cloth, Inner Plate Pocket	3.2.2	4.5 APPENDIX B Table I	X*	CoC
Cloth, Foam Pad Shells	3.2.3	4.5 APPENDIX B Table II	X*	CoC
Cloth, Side Plate Carrier Outer Shell	3.2.4	4.5 APPENDIX B Table II	X*	CoC
Cloth, Side Plate Carrier Inner Shell	3.2.5	4.5 APPENDIX B Table II	X*	CoC
Cloth, Side Plate Pocket Outer Shell, Body Facing	3.2.6	4.5 APPENDIX B Table II	X*	CoC
Cloth, Side Plate Pocket Internal Shell, Outer Facing	3.2.7	4.5 APPENDIX B Table II	X*	CoC
Cloth, ballistic panel cover	3.2.8	4.5 APPENDIX B Table II	X*	CoC
Cloth, Inner Front and Back Flap Cover	3.2.9	4.5 APPENDIX B Table II	X*	CoC
Webbing and Tapes	3.2.10			
3/4 inch Webbing	3.2.10a	4.5 APPENDIX B Table IV	X*	CoC
1 inch Webbing	3.2.10b	4.5 APPENDIX B Table IV	X*	CoC
1 1/2 inch Webbing	3.2.10c	4.5 APPENDIX B Table IV	X*	CoC
1 inch Tape	3.2.10d	4.5 APPENDIX B Table IV	X*	CoC
Fasteners, Hook and Loop				
Fasteners, Hook and Loop Low Profile	3.2.11	4.5 APPENDIX B Table III	X*	CoC
Fasteners, Laminated Circular Engagement (LCE)	3.2.12	4.5 APPENDIX B Table III	X*	CoC
Slide Fastener	3.2.13	4.5	X*	CoC
Foam	3.2.14	4.5	X*	CoC
Non-Ballistic Thread	3.2.15	4.5 APPENDIX B Table V	X*	CoC
Ballistic Thread	3.2.16	4.5 APPENDIX B Table V	X*	CoC

TABLE XIII. Requirements and Verifications (Cont)

Characteristic	Requirement Paragraph	Verification Paragraph	FAT	LAT/ Conformance Lot Inspection
Plate Pocket Internal Shell	3.2.17	4.5 APPENDIX B Table I	X*	CoC
Composite laminate	3.2.19	4.5 APPENDIX B Table VI	X*	CoC
Grommet	3.2.20	4.3.1	X*	CoC
Washer	3.2.21	4.3.1	X*	CoC
Tensionlock	3.2.22	4.3.1	X*	CoC
Oval Loop	3.2.23	4.3.1		CoC
Female buckle, non-adjust	3.2.24	4.3.1	X*	CoC
Female buckle, adjustable	3.2.25	4.3.1	X*	CoC
Male buckle, non-adjust	3.2.26	4.3.1	X*	CoC
Male buckle, repairable	3.2.27	4.3.1	X*	CoC
Emergency release assembly	3.2.28	4.3.1	X*	COC
Design	3.3	4.6		
Patterns	3.3.1	4.6.1 – 4.6.3	X	
MSV subsystem	3.3.2	4.6.1 – 4.6.7	X	
Construction	3.4	4.7		
Hook and loop fastener	3.4.1	4.7.1	X	X
Stitching	3.4.2	4.7.1	X	X
Automatic stitching	3.4.3	4.7.1	X	X
Bartacks	3.4.4	4.7.1	X	X
Bartack alignment	3.4.5	4.7.1	X	X
Buttonhole	3.4.6	4.7.1	X	X
Binding	3.4.7	4.7.1	X	X
Operating Requirements	3.5	4.8		
Camouflage	3.5.1	4.8.1	X*	X
Spectral reflectance	3.5.2	4.8.2	X*	CoC**
Shade Matching	3.5.3	4.8.4	X*	CoC**
Fungus resistance	3.5.4	4.6.7	X*	
Functional Integration	3.5.5	4.8.3		
SAPI and SBI pocket	3.5.5.1	4.8.5	X	X
Drag strap	3.5.6	4.8.6	X	X
Emergency release	3.5.7	4.8.7	X	X
Drainage	3.5.8	4.8.8	X	
Ballistic Material System Operating Requirements	3.6	4.9		
Areal Density	3.6.1	4.9.1	X	CoC
Thickness	3.6.2	4.9.2	X	CoC
Flexibility	3.6.3	4.9.3	X	Coc
Ballistic Performance Requirements	3.7	4.10		

TABLE XIII. Requirements and Verifications (Cont)

Characteristic	Requirement Paragraph	Verification Paragraph	FAT	LAT/ Conformance Lot Inspection
Fragmentation protection	3.7.1	4.10	X	X
Handgun protection	3.7.2	4.10	X	X
Support or Ownership Requirements	3.8	4.13		
Size, identification and instruction label	3.9	4.13.1	X	X
Unique identification (UID)	3.9.1	4.13.2	X	X

NOTES:
X -Testing required
CoC -CoC in the form of a test report to include data must be presented to DCMA during LAT pull. Contractor shall provide the CoC to the Government per 4.3.1 and as outlined in the contract.
CoC* -With each new Lot of FR material introduced into production the CoC shall be presented to DCMA. Contractor shall provide the CoC to the Government per 4.3.1 and as outlined in the contract.
* -Individual subcomponent test reports from an approved test lab (Aberdeen Test Center(ATC), Natick Soldier Research Development Engineering Command (NSRDEC), Defense Logistics Agency Troop Support (DLA TS)) may be used for FAT submission if the same supplier is used in production. Test reports shall not be more than 180 days old at time of FAT commencement; test reports older than 180 days will be evaluated on a case-by-case base and may require a FAT re-submission.
** - Cloth, outer shell shall have shade verification conducted at a Government lab

4.5 Materials and Components Verification. The materials and components shall conform to applicable specifications, standards, and patterns required herein as stated in paragraph 3.2. Where manufacturer part numbers are called out, those parts or components shall be determined to be equivalent solely by the Government. During determination of equivalency, the Government reserves the right to perform any of the inspections or testing set forth in this document where the Government deems such inspections necessary to ensure the supplies conform to the prescribed requirements. Table IX delineates performance requirements verified through visual methods, including physical measurements in order to determine that no deficiencies exist.

4.6 Design verification.

4.6.1 Finished measurements. Testing Personnel shall inspect the end items for finished measurements, Table IX. The Lot size shall be expressed in units of vests or individual components.

TABLE IX. 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.		215
Dimensional (overall)	Larger than nominal dimensional and applicable plus tolerance.	124	
Component and Location Dimensions	Not within specified tolerance		216
Stitch Margin or Gage	Not within specified tolerance		217
Box, Box-X and stitching	Dimensions not within specified tolerance		218
Hardware	Not spaced within specified tolerance		219

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

4.6.1.1 Linear Measurements. Front and back center measurements shall be taken along the center line by holding the garment taut with a metal measuring device and measurements taken to the nearest 1/8 inch. Front and back width measurements shall be taken along the center line by holding the garment taut with a metal measuring device and measurements taken to the nearest 1/8 inch. The webbing hanger's measurements are taken to the nearest 1/16 inch in a flat, relaxed state, with a metal measuring device. 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. Note: Front flap and/or back center flap may be raised while taking measurement.

b. Front and Back Width: The front and back width shall be taken on a straight line measuring the widest point below the lower armhole opening, edge to edge.

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. Spacing of Laser PALS for MOLLE Pockets: The horizontal distance between laser cut PALS shall be taken from the beginning of one laser opening to the beginning of the adjacent opening. The measurement of the horizontal laser cut PALS opening shall be taken at the maximum width of the opening. The spacing between horizontal laser cut PALS shall be measured on adjacent openings from the bottom edge of one to the top edge of the other.

4.6.1.2 MOLLE Attachment Testing. Prior to testing, testing personnel shall condition the MOLLE attachment opening samples to either ambient conditions or both extreme hot and cold. Testing shall use a constant rate-of-extension test apparatus capable of accurately measuring loads up to 1,000 lbs ± 2 lb Testing personnel shall firmly clamp the sample across its full width by a clamp or device capable of completely restraining the sample during testing. They shall place the clamp or device parallel to, and 3 inches below the bottom MOLLE attachment opening being tested. The center of the MOLLE attachment opening being tested shall be directly in line with the center of the load cell and pulling head. The MOLLE attachment openings shall be affixed to the load cell and pulling head through a loop of 1-in webbing (A-A-55301 or MIL-W-17337) that is perpendicular to the MOLLE attachment opening and shall have a gage length of 5 ± 1 inch. Testing shall apply a preload of 1 pound per foot (lbf) prior to the start of testing.

4.6.1.2.1 On each 15 inches by 24 inches sample which should be constructed in the same manner as an actual end item, which consists of the outer cover material and MOLLE attachment openings, there shall be;

a. Four rows of attachment openings.

b. All attachment opening rows shall start/end 1 1/8 ± 1/16 inch away from any edge.

c. All attachment opening rows shall be compatible with current MOLLE gear.

4.6.1.2.2 Each sample shall have the four tests conducted in the following positions:

a. Position 1: Located on the first MOLLE attachment opening on a row.

b. Position 2: Located on the MOLLE attachment opening directly left or right to position 1.

c. Position 3: Located on the MOLLE attachment opening directly above/below position 1.

d. Position 4: Randomly located MOLLE attachment opening but is located at least 2 inches from the nearest edge in any direction from positions 1 through 3.

4.6.1.3 Three (3) samples are required to complete testing totaling 12 tests for each condition (ambient, extreme hot, and extreme cold). The first three (3) tests (positions 1 through 3) on a sample shall have the load cell and pulling head advance at a constant rate of 2 inches per minute (in/min). Once 85 +5/-0 lbs has been reached, the load on the MOLLE attachment opening will be held in place for a minimum of 5 minutes but no more than 6 minutes. Testing personnel shall record the following minimum data: Extension and Load at first-stitch failure (if applicable), Extension and Peak Load; Mode of Failure (i.e., seam failure, fabric tear-out; material failure). Additionally, after loading on each position, testing personnel will make a visual inspection and compared that to a standard sample in order to determine if there has been a noticeable dimensional change. The fourth test (position 4) on each sample shall have the load cell and pulling head advance at a constant rate of 2 inch/minute until failure. Testing personnel shall record the following minimum data: Extension and Load at first-stitch failure (if applicable), Extension and Peak Load; Mode of Failure (i.e., seam failure, fabric tear-out; material failure, or webbing failure). Each MOLLE attachment opening must meet the requirements in paragraph 3.4.5.

4.6.2 In-process Visual Examination of Cut Parts, Fillers and Patterns. The cut parts for the vest shell assembly, the ballistic filler components, and collars shall be 100% inspected by the Contractor during the cutting process to determine that parts containing defects such as a hole or cut, are removed from production. Ballistic fillers shall be 100% inspected by the Contractor 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. Whenever nonconformance is noted, the Contractor shall make corrections to the item or items affected. Parts that cannot be corrected shall be removed from the production.

4.6.3 In-process Visual Examination of Ballistic Filler Assemblies for Size. Table XIII provides visual examination criteria for ballistic filler. The Lot shall be expressed in units of front or back ballistic fillers. The sample unit shall be expressed in terms of single ballistic plies or ballistic assembles. Ballistic fillers shall be 100% inspected by Contractor during the assembly of the individual groups to assure that they contain the correct number of plies, that no individual plies are pieced, for the quality of each individual plies (free from defect holes, cuts, tears, smash floats, slubs, thin places, mend patches, creases, wrinkles, excessively soiled or stained), and that 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.

TABLE X. Ballistic Filler and Assembly Defects

Examine	Defect	Classification*	
		Major	Minor
Size of Individual Ballistic Filler Assembly	A) Smaller than cutting pattern:		
	(1) 3/16 inch to 3/8 inch at any point around the periphery 1/ 2/		217
	(2) More than 3/8 inch at any point around the periphery 1/ 2/	127	
	(3) 1/8 inch up to 3/16 inch around entire periphery 2/		218
	(4) More than 3/16 inch around entire periphery 2/	128	
	B) larger than cutting pattern by 3/8 inch or more at any point 1/ 2/		219
Number of Plies	Less than specified number of plies in the approved design	129	
	More than specified number of plies in approved design	130	
	Any deviation from the approved ballistic Design	131	
Assembly Dimension	(1) By 1/8 inch up to 1/4 inch for a distance of 2 inches or more or in several areas with an accumulated distance of 5 inches or more		220
	(2) By more than 1/4 inch for a distance of 2 inches or more in several areas with an Accumulated distance of 5 inches or more	132	
Ballistic Panel Cover	Any hole, cut, or tear in the heat sealed cover	133	
	Gaps or bubbles in heat seal around the ballistic filler		222
	Heat seal width under 0.20 inches		223

NOTES:
*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.

4.6.4 Area of coverage. Square inches of coverage are measured by digitized patterns and comparison to working patterns. For FAT, one non-sewn mockup of each size ballistic insert assembly shall be provided for examination.

4.6.5 Weight. Testing personnel shall examine the MSV for weight by component. See maximum weights in Appendix C Table I. Weights are taken on a tarred scale and measured to the nearest 0.01 lb.

4.6.6 Thickness. Thickness shall be measured to the nearest 0.01 inch when measured under 0.5 pounds per square inch (psi) when tested according to ASTM D-1777.

4.6.7 Fungus Test. Testing personnel will verify compliance with the fungus requirement through the use of certified materials and coupon sampling. Testing personnel will perform a fungus test on all non-certified materials. Tests will be performed IAW Method 508.4 of MIL-STD-810. Testing personnel will place a sample of each non-certified material in the fungus test chamber for 28 days.

4.7 Construction Verification.

4.7.1 End Item Visual Inspection. Testing personnel shall inspect the end items for the defects listed in Table XI. 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.

TABLE XI. End Item Defects

Examine	Defect	Classification*	
		Major	Minor
Cloth	Any hole, cut, or tear greater than 1/16 inch	101	
	Any hole less than 1/16 inch or abrasion mark less than ½ inch		200
	Any abrasion marks greater than ½ inch, broken or missing yarns or multiple floats.	102	
	Any mend, darn or patch.	103	
	Needle Chews.	104	
Webbing or Tape	Any hole, cuts, tears, or smash.	105	
	Not firmly and tightly woven, edges frayed or scalloped.	106	
	Multiple floats.		201
	Abrasion mark, slub, or broken end or pick.	107	
	Ends not fused as required.		202
Cabling	Any hole, cut or tear, incomplete securing of sleeve, impairing function.	108	
	Ends not finished as required.	109	
Fastener Tape	Any hole, cut or tear, hooks flattened, broken or missing, impairing function.	110	
Seams and Stitching:	Incorrect style	115	
Open Seams	½ inch or less.		205
	More than ½ inch NOTE: A seam shall be classified as an open seam when one or more stitches joining a seam are broken or when two or more consecutive skipped or runoff stitches occur.	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

TABLE XI. End Item Defects (Cont)

Examine	Defect	Classification*	
		Major	Minor
Seam & Stitch Type	Wrong seam or stitch type.	117	
	Needle cutting	118	
	Any seam not as specified or not in specified location.	119	
Stitch Tension	Tension loose, resulting in loose bobbin or top thread.		207
	Excessively tight, resulting in puckering of material.		208
Stitches Per Inch	One to two stitches less than minimum specified		209
	Three or more stitches less than minimum specified	120	
Bartacks	Any bartack omitted.	121	
	Any bartack not as specified or not in specified location.		210
	Loose stitching, incomplete or broken.		211
	Bartack miss alignment	122	
Stitching Ends	Not secured as specified.		212
Thread Breaks, Skipped Stitches, or Run-Offs.	Not over stitched as specified. NOTE: Thread breaks or two or more consecutive skipped or run-off stitches not over stitched shall be classified as open seams.		213
Emergency Release	Not functioning properly and vest does not doff, not assembled correctly in MSV.	123	
	Not functioning properly, but vest does doff, two or less buckles fail to properly release.		214
Component & Assembly	Any area of ballistic filler bunched (i.e. does not lie flat)	124	
	Any component part omitted or not as specified (unless otherwise classified herein)	125	
	Needle Chews.	126	
	Any mend, darn, patch, holes, splice or other unauthorized repair.	127	
Fit of Ballistic inserts within carrier	Carrier smaller than ballistic insert(s), i.e., not permitting assembly to lie smooth and flat within.	128	
	Carrier larger than ballistic inserts, i.e., more than ¼ inch clearance around periphery when insert is centered within carrier.		215
Fit of ESAPI within carrier	Carrier pocket smaller than ballistic plate(s), i.e., not permitting ballistic plate to insert into carrier pocket.	129	
Location Markings	Printed marking more than 1/32 inch in width or not covered by component part.		216
Label	Missing, incorrect, illegible.	130	
Use & Care Pamphlet	Must be present with each MSV		217
Graphic Training Aid	Must be present with each MSV		218

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

4.8 Operating Requirements Verification.

4.8.1 Camouflage. As specified by the contract, the camouflage pattern shall be IAW their respective drawings.

4.8.2 Spectral reflectance. Testing personnel shall evaluate spectral reflectance initially and after laundering IAW paragraph 4.8.10. The three launderings shall be performed using AATCC 61 Test No. 1A; except a 4 gram (gm) 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. Testing shall use AATCC Standard Reference Detergent without optical brightener. Spectral reflectance, initially and after laundering, will be obtained from 600 nanometers (nm) to 860 nm, at 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. Testing will take measurements on a minimum of two different areas and the data averaged. Testing personnel shall view the specimen at an angle no greater than 10^{o} from normal, with the specula component included. Photometric accuracy of the spectrophotometer shall be within 1%, and wavelength accuracy within 2 nm. The standard aperture size used in the color measurement device shall be 1 inch 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 Table XI, it shall constitute a test failure.

4.8.3 Functional Integration Verification. Testing personnel verify this performance requirement by observation and operation that the properties, characteristics, and parameters of the item meet the functional requirements specified in paragraph 3.5.5. Verification is indicated by a pass or fail criteria, which is a simple accept or reject indications of functional performance since no qualitative values exist or are difficult to measure.

4.8.4 Visual Shade Matching. The cloths shall match the standard samples viewed under filtered tungsten lamps that approximate artificial daylight and that have a correlated color temperature of 7500 Kelvin (K) ± 200K, with illumination of 100 ± 20 foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2856K ± 200K.

4.8.5 Insertion demonstration. One barehanded person shall demonstrate insertion of the ESAPI into both front and rear MSV pockets without tools or special aids using an ESAPI Plate or a mock ESAPI conforming to drawings 2-6-0588, 2-6-0589, 2-6-0590, 2-6-0591 and 2-6-0592 and the maximum thickness requirement (see paragraph 2.2.2). Testing shall perform the examination with an ESAPI in each pocket. The pocket flaps shall be closed and secured. Testing shall conduct the same demonstration procedure for side plate pockets using an ESBI Plate or a mock ESBI conforming to drawing 2-6-270. Failure of ESAPI/ESBI to fit properly within the pockets/pouches without force or the inability to secure closure without applying excessive force shall be noted as a major defect according to Table XI.

4.8.6 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 lbs ± 2 lbs Testing personnel shall firmly clamp the sample (an actual vest or representative back panel only, as appropriate) 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. Testing shall place the clamp parallel to, and within 0.25 inch of the bottom of the drag strap (i.e., on the SAPI back 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 2 inch webbing (MIL-W-17337/A-A-55301 or a small clevis clamp). Testing personnel shall apply a preload of 1 lbf prior to the start of testing. The load cell and pulling head shall be advanced at a constant rate of 2 inch/minute until failure. Testing personnel shall record the following minimum data: 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).

4.8.7 Emergency Doffing. Testing personnel shall fit each complete MSV FAT or LAT sample to a standing manikin or test participant with ESAPIs or XSAPIs and ESBIs or XSBIs and activate emergency release. Activation shall be a firm, quick, pull at approximately 45° downward. If the vest does not doff, testing personnel shall note it as a major defect. If the vest doffs but one or two buckles do not release, testing personnel shall note it as a minor defect per Table XI (See paragraph 3.5.7).

4.8.8 Drainage. Testing personnel shall visually inspect the MSV side plate pockets for drain holes to ensure grommets, if used, are fastened securely and that holes are not obstructed. Testing shall note any missing or loose grommets/eyelets as a minor defect.

4.8.9 Resistance to POL, Sweat, and Sea Water after One Laundering. Testing personnel shall test the MSV outer shell carrier cloths after one laundering per paragraph 4.8.10 and after exposure to each POLs; motor oil, gasoline and weapon lubricant, sweat, and sea water for hydrostatic resistance IAW AATCC TM 127. A specimen for each test liquid (e.g., 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 testing shall apply three (3) drops of each test liquid 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, testing personnel will remove the specimen and test immediately for hydrostatic resistance. 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 milliliter (ml) glass beaker by combining 3.0 gms sodium chloride, 1.0 gm of trypticase soy broth powder, 1.0 gm normal propyl propionate, and 0.5 gm 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, testing personnel will heat the solution to 50 degrees Celsius (50° C) until all ingredients dissolve. While stirring, they will cool the solution to 35° C, remove cover, and dispense immediately with pipette or other suitable measuring device. Dispense 2 ml of perspiration solution at 35° 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 resistance. See paragraph 4.10.1.1 for seawater formulation and sample preparation shall be the same as perspiration.

4.8.10 Laundering Procedure. Testing personnel shall place test specimens and ballast, if needed, in an automatic washing machine set on permanent press cycle, high water level and warm (105° F ± 5° F) wash temperature. The test specimens shall be taken from the vicinity of the fabric as the specimens for the initial test. Testing will use 0.5 ounce (oz) (14 gms) of 1993 AATCC Standard Reference Detergent. The duration of the laundering cycle shall be 30 minutes ± 5 minutes. After laundering, testing personnel shall dry the specimens and ballast in an automatic tumble dryer set on permanent press cycle, 150° Fahrenheit (F) to 160° F for approximately 15 minutes. The laundering equipment, washer and dryer, shall be IAW AATCC TM 135-1992.

4.8.11 Flame Resistance. The finished outer shell cloth substrate, as specified in 3.2.1.1, shall exhibit flame resistance. All materials tested shall be tested in both the warp and fill directions. Testing personnel shall conduct laundering according to paragraph 4.8.10 and vertical flame testing according to ASTM D 6413.

4.9 Ballistic Material System Operating Requirements Verification.

4.9.1 Areal Density. Testing personnel shall calculate areal density on unstitched ballistic filler material (no ballistic cover) for the base IAW ASTM-D-3776, Standards Test Methods for Mass per Unit Area of Fabric, Option C, with exceptions. The Contractor shall build shoot packs used for the areal density calculation IAW paragraph 3.6.1.1. Each 15 inches by 15 inches ply of ballistic filler shall have two (2) 100 centimeter squared (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 2%. The areal density for a single ply shall be the total mass of the two pieces divided by the total area of the two pieces. Testing personnel shall calculate the actual areal density for the entire ballistic filler by adding each ply's areal density together. Testing will conduct areal density calculations on five (5) shoot packs. The average of the areal densities measurements is determined and compared against the requirement in paragraph 3.6.1.

4.9.2 Thickness. Testing shall measure thickness to the nearest 0.01 inch when tested according to ASTM D-1777 (Table 1 testing option 1), for five randomly selected ballistic shoot packs submitted for FAT. Testing personnel will remove the ripstop cover prior to measurement. The average of the five shoot packs will determine if the requirement is met. LAT will be conducted on one end item constructed of the approved ballistic material systems as verified by FAT.

4.9.3 Flexibility(For Government Reference only). For the base vest only, the ballistic material system shall be tested IAW Aberdeen Test Center Soft Armor Flexibility Test Internal Operating Procedure, PED-IOP-008. The test shall be conducted on five (5) torso vest shoot packs (ballistic filler only). Each shoot pack will be tested for flexibility and the result recorded.

4.10 Ballistic performance. Paragraph 4.10.2 provides general procedures and requirements (see paragraph 6.4 for Definitions). FAT shall be conducted on shoot packs that represent the end items. LAT shall be conducted on end items constructed of the approved ballistic material systems as verified by FAT. Failure to meet the requirements of any sub-test shall constitute failure for the entire FAT or LAT.

4.10.1 Conditions. Ballistic testing shall be conducted on dry specimens and conditioned specimens after conditioning for; water submersion (sea water), hot temperature, cold temperature, accelerated aging, and POL. Prior to conditioning, the heat sealed ballistic cover

and the outer carrier shall be carefully cut 4 inches along the top and bottom edges without cutting into the ballistic filler allowing the ballistic filler to be completely exposed to the environmental conditions. All testing shall be conducted in the conditions specified in paragraph 4.10.5.

4.10.1.1 Sea Water (Wet Conditioning). Sea water shall be utilized for wet test conditions. Prior to conditioning, the heat sealed ballistic cover and outer carrier will be carefully cut 4-inches along the top and bottom edges without cutting into the ballistic filler allowing the ballistic filler to be completely exposed. The 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 lay horizontally, without any folds or bends. The specimens are submerged such that the fluid is in contact with all exterior surfaces to allow maximum fluid penetration. Testing personnel shall place a 10 lb weight on a 15 inches by 15 inches plate to distribute load and allow for maximum fluid penetration for a minimum of 24 hours, but should not exceed 24.5 hours. The water temperature shall be 70° F ± 10° F. After removing the specimen from the water, testing personnel shall hang the specimen vertically and allow it to dry for 10 minutes -0 minutes / +5 minutes and test it within 5 minutes with tests completed within 60 minutes.

4.10.1.2 Temperature Extreme Conditions. Prior to conditioning, the heat sealed ballistic cover and outer carrier will be carefully cut 4 inches along the top and bottom edges without cutting into the ballistic filler allowing the ballistic filler to be completely exposed. For hot temperature extreme, the armor sample shall be heated in an oven operating at 155° F + 10° F for 6 hours ± ¼ hours continuously. Testing personnel shall remove the test specimen from the oven, mount it, and ballistically test it. For cold temperature extreme, the armor sample shall be cold temperature exposed to -60° F ± 10° F for 6 hours ± ¼ hours continuously. Testing personnel shall remove the test specimen from refrigeration, mount it, and ballistically test it 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.

4.10.1.3 Accelerated Aging. Prior to conditioning, the heat sealed ballistic cover and outer carrier shall be carefully cut 4 inches along the top and bottom edges without cutting into the ballistic filler allowing the ballistic filler to be completely exposed. Testing personnel shall perform accelerated aging for the armor sample in general accordance with ASTM D1149, with the following modifications. Testing personnel will subject the entire armor sample under test to treatment. Testing personnel shall condition all tested components for 72 hours at 40° C while maintaining a minimum of 50 parts per hundred million of ozone. Armor samples do not require any additional tensile strain during accelerated aging conditioning. After accelerated aging conditioning, the armor sample 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.

4.10.1.4 POL Contamination. Prior to conditioning, the heat sealed ballistic cover and outer carrier shall be carefully cut 4 inches along the top and bottom edges without cutting into the ballistic filler allowing the ballistic filler to be completely exposed. POL conditioning shall be done on each of the following; motor oil and F-24. Testing personnel shall place the specimens flat in an adequately sized pan for the largest size vest to lay flat with enough POL fluid in the bin to cover the test item. A 10 lb weight shall be placed on a 15 inch by 15 inch plate to distribute load and allow maximum fluid penetration. The loaded specimen shall remain immersed for 4 hours -0 minutes / +15 minutes at room condition. After removing the specimen

from the POL fluid, testing personnel shall hang it vertically and allow it 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 resealable plastic bag and mounted to the test fixture to limit exposure to contaminants and fumes. Testing personnel shall ballistically test the specimen 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 specimen.

4.10.2 Ballistic Test Criteria. For all protection Ballistic Limits (BL); V_{50}, V_s/V_r, and V_0 Conformance tests; the following minimum information shall be required to validate performance:

a. Armor specimen description, including exact materials, thickness, areal density of armor system or ballistic system nomenclature, sizes, and weights of all components.

b. Conditioning of armor specimen.

c. Test projectile with exact nomenclature.

d. Temperature and humidity measurements.

e. Yaw angle.

f. Angles of target obliquity.

g. Velocity measurements of each test shot used to test the armor (regardless of whether that particular velocity was used in the V_{50} or V_0 determination).

h. Velocity loss and/or corrected striking/residual velocity. Strike velocity shall be used for ballistic requirements.

i. Partial Penetration (PP) and Complete Penetration (CP) next to each shot velocity as determined.

j. Name of company performing tests.

k. Type of gun barrel, caliber, and propellant used.

l. Range measurements including distances from gun barrel to velocity measurement devices and target.

m. Calculated Ballistic Limit. In a situation where the V_{50} BL, V_s/V_r or V_0 data sheet would compromise the Security Classification Guide for Armor Materials (see paragraph 2.2), the data sheet should exclude the specific projectile used during testing.

4.10.3 Projectile Velocity Determination. Projectile velocity and time of flight measurements shall be IAW ITOP 4-2-805. Testing personnel shall translate instrumental velocity 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. Testing will use an electric counter type chronograph measuring to the nearest microsecond or as a minimum to the nearest 10 microseconds with these measuring devices. As an alternative, testing can use Doppler radar or radiographic equipment calibrated to capture the projectile at various time intervals of flight. For all projectiles, velocity correction methodology shall be used to calculate the actual striking velocity and, where appropriate, actual residual velocity.

4.10.4 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 are 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. Testing personnel shall place the last pair of triggering devices at least four feet (122 cm) in front of the test sample and should be protected from possible damage resulting from fragments.

4.10.5 Environmental Test Conditions. All ballistic tests shall be performed in a standard atmosphere of 68° F ±10° F and 50% ± 20% relatively humidity. Testing personnel shall record temperature and humidity measurements before the beginning of each test.

4.10.6 Projectile Yaw Determination. Testing personnel shall measure projectile yaw for each firing by yaw cards, flash radiograph, or photography. Any round for which yaw is determined to be greater than 5° 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°.

4.10.7 V_{50} Ballistic Limit Calculation. The V_{50} is the average velocity of an equal number each of CP and PP within a specified spread. V_{50} shall be determined IAW MIL-STD-662 and ITOP 4-2-805. The V_{50} will be calculated using a 3 by 3 (3 lowest velocity CP's and 3 highest velocity PP's) within a 125 foot per second (ft/s) spread or a 5 by 5 within a 150 ft/s spread. Testing personnel calculate the spread by subtracting the highest velocity used for the calculation from the lowest velocity used. If the 5 by 5 criteria cannot be met, then a logistic regression may be used to determine the V_{50} only if you have at least 5 CP's and 5 PP's. In addition, all shots must be used to calculate the V_{50} using logistic regression (for example, total 14 shots, 5 CP, 9 PP, and you cannot get a 5 by 5 within 150 fps all 14 shots must be used for the regression). For LAT only, when neither a 3 by 3, a 5 by 5, nor a logistic regression can be used then a "7 Partial Rule" may be applied. The application of the "7 Partial Rule" requires 7 or more PPs above the V_{50} requirement and no CPs below the V_{50} requirement. The test item is said to have met the requirement, although a specific V_{50} velocity has not been determined.

4.10.7.1 CP and PP Determination for V_{50}. CPs and PPs shall 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) shall be placed 6 inches + 1/2 inch (152 mm + 12.7 mm) behind and parallel to the target. The aluminum witness sheet will be at least 15 inches by 15 inches in size and be of sufficient size to capture all fragments resulting from the ballistic event, mounted rigidly around its parameter and placed so that the target impact location is approximately at the center of the aluminum sheet. The following test conditions apply:

a. Test samples shall be 15 inch by 15 inch square size panels and configured in the proposed final armor material system for the FAT only (see paragraph 4.11.3).

b. MSV vest panels configured in the armor material system approved under FAT shall be used for LAT.

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 shall be sandwiched between two frames and restrained with mechanical or pneumatic clamping devices at each of the four corners of the frame.

e. The restraining frames shall be cut so that a ballistic window with minimum sizing of 12.0 inches by 12.0 inches square will be used for FAT.

f. Shot spacing shall be measured on center of impact point on the strike face of the ballistic panel, not the surface of the vest.

g. All shots shall be at least 2.5 inches from any edge of the samples. When the size of a piece (plate pocket) is too small to allow edge requirement to be met, testing personnel will place shots within 0.25 inches of the centerline of the piece to maximize the impacted area. Testing personnel must still maintain spacing between shots on small pieces.

h. Test shots shall be sufficiently spaced so that sequential shots are not influenced by previously impacted areas. A minimum shot spacing of 2.5 inches is required. Testing shall permit closer shot spacing data in the event a failure does not occur.

i. Depending on the test panel size, it may be necessary to use two to three panels for the V_{50} determination.

j. Test specimens shall be reconditioned to a smooth shape on a firm flat surface after every shot.

4.10.8 V_s/V_r. V_s/V_r testing is for Government reference only. Testing personnel shall conduct V_s/V_r testing in a similar manner as stated in paragraph 4.10.7, V_{50} Ballistic Limit Calculation, with the exception that no aluminum witness panel shall be used. Testing shall start at the velocities prescribed in Table XII. Testing shall drop velocities by approximately 400 ft/s to 500 ft/s increments down to below the V_{50} where there are no longer any complete penetrations. Testing will then take additional shots above and below the V_{50}, in a similar manner to standard V_{50} test methodology, to characterize the performance of the armor system. This testing will require between 15 and 20 valid shots for each size RCC. Approximately half of the shots should be in the region between the starting velocity and just above the V_{50}. Shots that would not be considered valid will include excessive yaw of the striking projectile; incomplete measurement of the residual velocity of a complete penetration; impacts at incorrect obliquity; or impact closer than 2.5 inch to any previous impact.

TABLE XII. V_s/V_r Starting Velocities

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

4.10.9 V_0 Determination for Acceptance. Testing personnel shall translate Instrumental velocity into strike velocity at the target and the strike velocity shall be used for ballistic requirements. For V_0 or full protection (no CPs), a minimum velocity (muzzle plus 50 ft/s) shall be the requirement. The following conditions apply; The minimum requirement is no CP at the maximum specified shot pattern. Closer positioning of shots without CP is a desired requirement. For FAT, samples should be 15 inches by 15 inches square size panels and configured in the proposed final armor material system for FAT only (see paragraph 4.11.3). For LAT, MSV vest panels configured in the armor material system approved under FAT shall be used for LAT.

4.10.9.1 Shot Spacing. Testing personnel shall test all samples with five shots in the approximate pattern described below.

a. Samples will be mounted on clay block (see paragraph 4.10.9.2).

b. The first shot will be 2.75 ± 1/4 inches from any edge.

c. The next shot shall be located 3.5 inches –0 inch / +1/2 inch from the first shot and at the weakness point in the configuration, i.e. the seamed area or non-uniform area of design.

d. The third shot location should be positioned 3.5 inches –0 inch / +1/2 inch from any of the two previous test shots.

e. The fourth and fifth shots shall be located 3.5 inches –0 inch / +1/2 inch from any previous test shots and tested at 30° obliquity.

f. The transient deformation shall be measured (see paragraph 4.10.9.3) after the third and fifth valid test firings.

g. Testing personnel should stagger test shots at least 0.50 inch off the horizontal and vertical lines of any previous shots. Testing will measure shot location as the impact point on the strike face of the sample.

h. Test specimens shall be reconditioned to a smooth shape after every shot.

4.10.9.2 Clay Box and Mold Measurement. Testing personnel shall attach the back of the armor test specimen 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 inches by 24 inches in length and height with 0.75 inch plywood backing. Testing personnel shall condition the clay for at least 3.0 hours and work it thoroughly to remove any voids. Testing shall use a new clay conditioned block for each body armor sample. The clays consistency shall be such that a depression of 25mm ± 3mm in depth is obtained when a 1 kilogram (kg) ± 10 gm (2.2 lb ± 0.35 oz) cylindrical steel mass, 44.5mm ± 0.5 mm (1.75 in ± 0.02 in) in diameter and having a hemispherical striking end, is dropped from a height of 2 meters (m) ± 2 cm (6.56 ft. + 0.8 in) onto one of its square faces. During the three (3) 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 inches 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. Testing personnel shall measure depressions and Back Face Deformation (BFD) with instruments capable of ± 0.4mm accuracy. Testing personnel shall fill the calibration

drop indentations with temperature conditioned clay prior to conducting the V_0 test shots. The clay boxes shall be numbered so as to be recognized by an overhead camera. The specimen shall be strapped or taped to the surface of the clay material. Ballistic testing shall be performed at 0° and 30° obliquity. BFD in the clay for each threat shall not exceed 44.0 mm (after the data is placed within the correct Upper Tolerance Limit (UTL)) when measured from the original undisturbed surface of the backing material to the lowest point of the depression. Testing personnel may smooth the specimen between armor samples; the specimen must still meet above requirements if reused.

4.10.9.3 BFD Measurement. BFD in the clay shall be 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 shall be recorded in mm to the nearest tenth digit following standard ASTM E29 "Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications" ("Five-even" rule)(Rounding Method) (i.e., 44.050 = 44.0, 44.051 = 44.1 and 47.950 = 48.0). TOP 10-2-210 contains additional information.

4.10.9.3.1 Scanner. 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, a Government Lab will conduct research and the results will be vetted through the Testing Integrated Process Team and Product Manager prior to implementation.

4.10.9.4 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 testing personnel shall secured it 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° obliquity impacts can be achieved.

4.10.9.5 Statistical Confidence in Test Results. For BFD, the UTL shall be computed using BFD as a continuous normal random variable and the result compared against the requirement. For all armor samples of that ballistic design and test threat, BFD shall be 44.0 mm (1.73 in) or less when using the statistical numbers in Table XIII (with the exception of the 30° obliquity).

TABLE XIII. Statistical Analysis

FAT		
0 Degree Obliquity		**30 Degrees Obliquity**
UTL	**Confidence**	All BFDs < 44.0 mm
90%	90%	
LAT		
0 Degree Obliquity		**30 Degrees Obliquity**
UTL	**Confidence**	All BFDs < 44.0 mm
80%	90%	

4.10.9.5.1 Analysis Methodologies. For BFD, the metric of merit is a one-sided UTL based on the assumption of normally distributed BFD data; the UTL to be calculated is specified in paragraph 4.10.9.5. Testing personnel calculate the BFD UTLs for the 0° obliquity for a specific ballistic package against a specific threat combing all sizes.

4.10.9.5.1.1 Validated one-decimal place BFD measurements 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 44.0 mm.

4.10.9.5.1.2 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.

4.10.9.5.1.3 This calculation, (2 k= $\frac{z_{utl}+\sqrt{z_{utl}^2-ab}}{a}$ where a=1- $\frac{z_{conf}^2}{2*(N-1)}$ b=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.

4.10.9.6 Test Continuation. Testing personnel will consider any shot for V_0 testing with a velocity over or under the velocity specified on Table X-C (Handgun V_0 Testing) invalid. Testing will continue and testing personnel will consider subsequent shots valid as long as no striking velocity exceeds a maximum velocity of 1475 ft/s 9 mm, 1475 ft/s .357 MAG, and 1525 ft/s .357 Sig. If a shot exceeds the maximum velocity as stated above, the test will be considered a "no test".

4.11 FAT. Prior to FAT, the Contractor must submit their technical data package to the Government for approval in order to gain approval to conduct FAT.

a. The technical data package shall include, but is not limited to, the items in Figure 3.

- One (1) of both an XS and an XL MSV for DCMA/PM Standard Samples
- One (1) MSV soft armor dry lay-up shoot pack*.
    - The MSV soft armor dry lay-up shall not be sewn together and shall be placed inside the cloth ballistic cover that shall be heat sealed on only three sides allowing for the ballistics to be taken out/put in. Additionally the Contractor shall supply a soft armor in order for the Government to perform a design check.
    - MSV soft armor technical documentation shall contain the following information:
        - Build Sheet
        - Design Nomenclature
        - Material Types, Model/Part Numbers, Nomenclatures, etc.
        - Number of plies, Orientation, Weave, Denier, Weight, etc.
        - Areal Density
        - Stitch Pattern

NOTE:
*Refer to 4.11.3 for shoot pack construction instruction.

Any priority data or intellectual property provided by Contractors, to include dry-layups, technical information, and sample inserts, will be properly protected and will not be disclosed outside of the Government, in accordance with DFARS clause 252.227-7013.

FIGURE 3. Technical Data Package

b. When a full FAT is required, the items in Figure 4 shall be submitted.

- One Hundred -Three (103) Base Shoot Packs (section 4.11.3)
- Eight (8) Base Shoot Packs Un-sewn (section 3.6.1.1)
- Two (2) Complete MSVs of each size
- One (1) Cut and unsewn components per size (ALL END ITEM PIECES)
- Twenty (20) feet of all raw materials (cloth, mesh, etc.)
- Sixty (60) feet of all raw materials (hook/loop, tape, webbing, etc.)
- Ten (10) of each type of hardware (buckles, quick release systems, etc.)
- Five (5) minimum 12 inch by 12 inch sheets of composite laminate
- One (1) Spool of each type of Thread (ballistic, non-ballistic, etc.)

Note: If multiple sub-contractors are to be utilized on the MSV construction then complete samples must be sent per contractor and be clearly labeled.

FIGURE 4. FAT REQUIREMENTS

c. All FAT samples shall be accompanied with a DD1222 signed by DCMA. In addition, the Contractor shall submit a 3-ring binder containing final test reports for all materials and components called out in paragraph 3.2 of the PD. All test reports shall be no older than 180 days at the time of submission. If testing has not been completed on any components called out in paragraph 3.2, then it will be evaluated during FAT.

4.11.1 Non-Ballistic Testing. All samples, representing full production quality, shall meet testing requirements defined within Section 3, Requirements, and Section 4, Verification. Additionally, the MSV must meet the inspection verifications listed in Tables IX through XII. At any point after FAT approval, any material change must be tested IAW the appropriate paragraph of this PD and approved by the Government.

4.11.1.1 Accept/Reject Criteria: One or more Major/Minor defects can constitute a FAT rejection.

4.11.1.2 All major and minor defects shall be corrected prior to DCMA shipment of test articles. If testing personnel find defects, the armor samples shall be reconstructed, re-inspected, and resubmitted to DCMA for another random inspection.

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

4.11.2 Ballistic Testing. All testing requirements and verifications shall be met IAW Section 3 and Section 4 using the test matrix in Table XIV. Testing personnel shall measure all shoot packs for thickness and weight prior to testing. For areal density measurements during FAT, testing shall measure the un-sewn shoot packs only. NOTE: Testing personnel perform 17 gr V_{50} testing for the plate pocket with and without a base vest. At any point after FAT approval, any material or process change to the ballistic package requires Government approval and must pass all ballistic FAT requirements.

4.11.3 Surrogate Shoot Pack. A surrogate shoot pack system of MSV body armor shall be used to represent the ballistic resistant materials of the MSV. All surrogate shoot pack systems will consist of (1) a base vest ballistic filler packet and (2) a ballistic filler carrier with insert pocket. The ballistic filler packet for MSV base vest will be 15 inches by 15 inches in size consisting of X plies proposed ballistic material system used in the MSV base vest. The ballistic packet shall be heat sealed in the same manner as the end item. If no stitching pattern is used, the shoot pack shall be stitched diagonally across the 4 corners with a 5 inch line of 50 TEX Aramid thread at 5 to 10 stitches per inch (not to include the heat seal outer cover). When the ballistic filler is an asymmetric system of different materials, the Contractor will label the filler packet to indicate the strike face from the back face. The ballistic filler carrier will have an insert pocket capable of holding the largest insert stitched on the face fabric. The face fabric and the pocket cover will consist of 500 Denier Cordura Type III, Class 3 IAW MIL-DTL-32439. The Contractor will stitch the insert pocket on three sides to the face fabric with nylon or polyester thread. The top edge of the pocket will have a minimum of 5 inches of not less than 0.5 inch wide hook and loop fastener centered and stitched at the top. The ballistic filler carrier back cover will consist of 500 Denier Cordura Type III, Class 3 IAW MIL-DTL-32439. The front and back filler carrier covers will be stitched together on three sides with nylon or polyester thread to form a pocket to hold the ballistic filler packet(s). The fourth side will remain unstitched but will have a minimum of 5 inches of not less than 0.5 inch hook and loop fastener centered and stitched to the top. The Contractor will individually serialize each ballistic filler carrier and clearly label it to indicate the strike face.

TABLE XIV. Ballistic First Article Test (FAT) Matrix

TEST	Frag 2 gr	Frag 4 gr	Frag 16 gr	Frag 64 gr	Frag 17 gr	9 mm Handgun	.357 Sig	.357 Mag	Sub-Total
V_{50}, Dry, 0°	1 Shoot pack	1 Shoot pack	1 Shoot pack	1 Shoot pack	1 Shoot pack	1 Shoot pack	1 Shoot pack	1 Shoot pack	8 Shoot pack
V_{50}, Wet, 0°	1 Shoot pack	1 Shoot pack	1 Shoot pack	1 Shoot pack		1 Shoot pack			5 Shoot pack
V_{50}, Hot, 0°			1 Shoot pack			1 Shoot pack			2 Shoot pack
V_{50}, Cold, 0°			1 Shoot pack			1 Shoot pack			2 shoot pack
V_{50}, Age, 0°			1 Shoot pack			1 Shoot pack			2 shoot pack
V_{50}, POL/Oil 0°			1 Shoot pack			1 Shoot pack			2 shoot pack
V_{50}, POL/F-24, 0°			1 Shoot pack			1 Shoot pack			2 shoot pack
V_{50}, Dry, 45°	1 Shoot pack	1 Shoot pack	1 Shoot pack	1 Shoot pack		1 Shoot pack			5 shoot pack
V_0, Dry, 0° and 30°						8 Shoot pack	8 Shoot pack	8 Shoot pack	24 shoot pack
V_s/V_r 0°	1 Shoot pack	1 Shoot pack	1 Shoot pack	1 Shoot pack					4 Shoot pack
V_s/V_r, 45°	2 Shoot pack	2 Shoot pack	2 Shoot pack	2 Shoot pack					8 Shoot pack
Non Ballistic Testing									15 Shoot pack
Contingency	**25 Shoot pack**								
Total	**103 Shoot pack**								

4.12 LAT. Testing personnel shall only perform LAT on valid approved FAT designs. Figure 5 and Figure 6 provide instructions and criteria for all LATs. All ballistic and non-ballistic requirements and verifications shall be met IAW Section 3 and Section 4.

SUBMISSION, REVIEW, ACCEPTANCE/REJECTION OF LATs

The follow instructions are supplemental for guidance purposes only, detailed verbiage regarding review, submission, acceptance/rejection of LAT will be provided in the solicitation and the contract.

- All Lot test samples selected by the DCMA QAR will be inspected in accordance to the Quality Acceptance Letter of Instruction (QALI) and upon completion of inspections the items will be sent to the contract mandated testing facility using DD Form 1222 (Request For and Results Of Tests).
- Upon completion of the required ballistic and non-ballistic testing, the results will be provided to the Contractor and to COR and their designated representatives for review and acceptance/rejection. No production Lot will be released for shipment by the Contractor until approval by the COR or their representative.
- The acceptance, additional testing requirement, or rejection of each Lot will be provided to the DCMA QAR, who will take the appropriate action.

FIGURE 5. Submission, Review, Acceptance/Rejection of LAT

4.12.1 Non-Ballistic Testing. All samples, representing full production quality, shall meet testing requirements defined within Section 3 and Section 4. Additionally, the MSV must meet the inspection verifications listed in Tables IX through XII.

Accept/Reject Criteria:

a. One or more major defects can constitutes LAT rejection
b. A minor defect rate higher than allowed by Table X and Table XI using Acceptance Quality Limit (AQL) of 4.0 constitutes LAT rejection, unless otherwise stated within the contract according to MIL-STD 961.

FIGURE 6. Accept/Reject Criteria

a. All major and minor defects must be corrected prior to DCMA shipment of test articles. If testing personnel find defects, the armor samples for that respective Lot shall be re-inspected and resubmitted to DCMA for another random sample selection. If the armor samples fail three (3) consecutive inspections, the articles will FAIL LAT.

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

4.12.2 Ballistic Testing. DCMA shall randomly selected complete MSVs from a finished production Lot for testing. The quantities required for complete MSVs and modular components depending on Lot size are listed in Table XV-A. Testing personnel will measure areal density on un-sewn shoot packs only. Testing shall inspect all ballistic samples for ballistic configuration (ply count). NOTE: Each MSV consists of one front panel and one back panel. Testing personnel will alternate between the front and back panels while performing tests for different levels of threat. For example, first MSV sample, front panel should be tested for 17 gr V_{50}, and the back panel shall be tested for 9mm V_0; the second MSV sample, front panel shall be tested for 9mm V_{50}, the back panel shall be tested for 17 gr V_{50}, and so on. For Lots that include complete MSVs, one V_{50} per component shall be required. For Lots that are pure components (ex. 100% Deltoid), then the test matrix in Table XV-B shall be used.

4.12.2.1 All LATs shall be conducted on actual end items. All testing requirements and verifications shall be met IAW Section 3 and Section 4 using the test matrix in Table XV-A and Table XV-B.

TABLE XV-A. LAT Sample Selection Matrix (complete MSV)

Lot size	Number of tests per threat			Number of vests needed for testing	Contingency Vests	Total Vests
	V_{50}, 17 gr	V_{50}, 9mm	V_0, 9mm			
26 to 150	2	2	2	3	2	5
151 to 1200	4	4	4	6	3	9
1201 to 3200	6	6	6	9	4	13

TABLE XV-B. LAT Sample Selection Matrix (per modular components)

Lot size	Number of Test Samples Required for 17 gr V_{50}[3]				V_{50} Tests per component[2]
	Side Plate Carrier		Side Plate Pocket[1]		
26 to 150	4		8		1
151 to 1200	8		16		2
1201 to 3200	12		24		3

Notes:

1. Side Plate Pocket shall be tested in conjunction with the side plate carrier. Side plate carrier will be the strike face and will be placed in front of the side plate pocket during testing. When no side plate carrier is present (a pure side plate pocket Lot) then the side plate pocket will be tested standalone with 17 gr V_{50} requirement of 1850 feet per second.

2. Multiple test panels may be necessary to calculate V_{50}. 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.

3. Number of test panels listed above is the total quantity of end items needed per Lot. If complete vests are shipped for LAT, these components may be removed from complete vest and used for the modular component testing. Only one V_{50} will be required for separate components for LAT when included with base vest in the test report.

4.13 Support or Ownership Requirements Verification. Appendix A contains sample labels.

4.13.1 Size, Identification, and Instruction Label. The labels shall be verified IAW paragraph 3.9 and MIL-DTL-32075 type IV, Class 14.

4.13.2 Unique Identification (UID). UID shall be verified IAW paragraph 3.9.1 and MIL-STD-130

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

6.1 Scope. This section is not a mandatory part of the PD. This information is for guidance only.

6.2 Intended Use. The multiple threat body armor is a modular body armor providing multiple levels of ballistic protection depending on the system configuration. The MSV provides protection from conventional fragmenting munitions and 9mm handguns. The area of protective coverage of the body is dictated by the number of modular components worn to extend coverage. MSV protection increases to protect vital organs from multiple hits against small arm rifles and indirect fire flechette when the configuration includes the front and back small arms protective inserts.

6.3 Acquisition Requirements. Acquisition documents should specify the following:

a. Title and date of this document.

b. When first article, and pre-production items are required.

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.

f. Shipping instructions.

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

6.5 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 PD shall take precedence. The following definitions are provided to assist in understanding the test procedures:

a. **Fair Impact.** A projectile that impacts the armor at an angle of incidence no greater than $+5^{o}$ from the intended angle of incidence will be considered a fair impact.

b. **Complete Penetration (CP)** for V_{50} Testing. A CP 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.

c. **Complete Penetration (CP)** for Acceptance Testing. A CP 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 CP.

d. **Partial Penetration (PP).** Any fair impact that is not a CP shall be considered a PP.

e. **Residual Velocity.** The velocity at which a projectile exits the rear surface of an armor sample. Used only for V_s/V_r testing.

f. **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

g. **Obliquity.** The angle, in degrees, between the line-of-flight of the bullet and a line perpendicular to the front surface (facing the line-of-fire) of the clay box. A projectile's line-of-flight which is perpendicular to the surface of the clay box strikes at zero (0) degrees of obliquity.

h. **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.

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

APPENDIX A:

Contents of Labels & Care and Use Instructions

A 1. Scope: This Appendix is a mandatory part of the specification. The information contained herein is for compliance with the Labels and Care and Use Instructions requirements.

MODULAR SCALABLE VEST ARMY
FRONT CARRIER – AR/PD 15-03

SIZE:
NSN:

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

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

FIGURE A-1. Use and Care Instructions Label for the MSV Front Carrier

MODULAR SCALABLE VEST ARMY
BACK CARRIER – AR/PD 15-03

SIZE:
NSN:

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

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

FIGURE A-2. Use and Care Instructions Label for the MSV Back Carrier

MODULAR SCALABLE VEST ARMY
FRONT CARRIER – AR/PD 15-03

THE MODULAR SCALABLE VEST ARMY (MSV) WITH ALL SOFT BALLISTIC PANELS INSTALLED PROVIDES PROTECTION FROM FRAGMENTATION AND 9MM SUBMACHINE GUN OR LESSER THREATS. THIS VEST DOES NOT PROTECT AGAINST KNIVES OR SHARP OBJECTS.

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, gasoline, petroleum, oils or lubricants, turn them in for replacement as soon as possible.
3. Hand wash the MSV 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.

FIGURE A-3. Cleaning Instruction Label for MSV Front Carrier, to be placed inside of the Front Carrier

MODULAR SCALABLE VEST ARMY
BACK CARRIER – AR/PD 15-03

THE MODULAR SCALABLE VEST ARMY (MSV) WITH ALL SOFT BALLISTIC PANELS INSTALLED PROVIDES PROTECTION FROM FRAGMENTATION AND 9MM SUBMACHINE GUN OR LESSER THREATS. THIS VEST DOES NOT PROTECT AGAINST KNIVES OR SHARP OBJECTS.

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, gasoline, petroleum, oils or lubricants, turn them in for replacement as soon as possible.
3. Hand wash the MSV 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:

7. Frags or bullets have hit them.
8. The outer cover is torn or damaged beyond field repair.
9. The hook and loop cannot be closed completely or repaired.
10. The webbing is torn or damaged beyond repair.
11. The items cannot be adequately cleaned, or are badly discolored.
12. 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.

FIGURE A-4. Cleaning Instruction Label for MSV Back Carrier, to be placed inside the Back Carrier

MODULAR SCALABLE VEST ARMY - FRONT BALLISTIC INSERT– AR/PD 15-03
SIZE:
NSN:

INSERT THIS SIDE TO BODY FAILURE TO INSERT THIS BALLISTIC INSERT IN THE MSV OUTER SHELL WILL RESULT IN ABSENCE OF BALLISTIC PERFORMANCE FROM FRAGMENTATION & 9MM SUB-MACHINE GUN OR LESSER THREATS.

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, gasoline, petroleum, oils, or lubricants, TURN IN FOR REPLACEMENT AS SOON AS POSSIBLE.

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

FIGURE A-5. Sample Use and Care Instruction Label for MSV Front Ballistic Insert

MODULAR SCALABLE VEST ARMY - BACK BALLISTIC INSERT– AR/PD 15-03
SIZE:
NSN:

INSERT THIS SIDE TO BODY FAILURE TO INSERT THIS BALLISTIC INSERT IN THE MSV OUTER SHELL WILL RESULT IN ABSENCE OF BALLISTIC PERFORMANCE FROM FRAGMENTATION & 9MM SUB-MACHINE GUN OR LESSER THREATS.

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, gasoline, petroleum, oils, or lubricants, TURN IN FOR REPLACEMENT AS SOON AS POSSIBLE.

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

FIGURE A-6. Sample Use and Care Instruction Label for MSV Back Ballistic Insert

MODULAR SCALABLE VEST ARMY
LEFT/RIGHT SIDE PLATE CARRIER – AR/PD 15-03
SIZE:
NSN:

Refer to MSV outer shell label for cleaning and maintenance instructions.

LOT NUMBER:
DATE OF MFG:
CONTRACT #:
MANUFACTURED BY:

FIGURE A-7. Sample Use and Care Instruction Label for MSV Left / Right Side Plate Carrier

MODULAR SCALABLE VEST ARMY
LEFT/RIGHT SIDE PLATE CARRIER – AR/PD 15-03
SIZE:
NSN:

Refer to MSV outer shell label for cleaning and maintenance instructions.

LOT NUMBER:
DATE OF MFG:
CONTRACT #:
MANUFACTURED BY:

FIGURE A-8. Sample Use and Care Instruction Label for MSV Right Side Plate Carrier

MODULAR SCALABLE VEST ARMY
SIDE PLATE POCKET – AR/PD 15-03
SIZE:
NSN:

Refer to MSV outer shell label for cleaning and maintenance instructions.

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

FIGURE A-9. Sample Use and Care Instruction Label for MSV SBI Side Plate Pocket

MODULAR SCALABLE VEST ARMY
SIDE PLATE POCKET BALLISTIC INSERT – AR/PD 15-03
SIZE:
NSN:

Refer to MSV outer shell label for cleaning and maintenance instructions.

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

FIGURE A-10. Sample Use and Care Instruction Label for MSV Side Plate Pocket Ballistic Insert

MODULAR SCALABLE VEST ARMY
SHOULDER PADS – AR/PD 15-03
SIZE:
NSN:

Refer to MSV outer shell label for cleaning and maintenance instructions.

LOT NUMBER:
DATE OF MFG:
CONTRACT #:
MANUFACTURED BY:

FIGURE A-11. Sample Use and Care Instruction Label for MSV Shoulder Pads

APPENDIX B

Material Characteristics

B 1. Scope: This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

TABLE B-I. Cloth Materials

Characteristic	Type III Class 4	Type IV Class 3	Type IV Class 4	Specification
Section	3.2.1.1	3.2.2 3.2.7 3.2.17 3.2.18	3.2.1.1	
Weight, (minimum) (maximum)	8.0 9.5	N/A 6.0	N/A 7.5	oz/ sq yd
Break Strength, (minimum) Warp Fill	350 260	200 155	400 155	lbs.
Tearing Strength, (minimum) Warp Fill	16 15	12 11	9 6	lbs.
Flame Resistance (FR) Initial, (Maximum) After-flame Warp Fill After-glow Warp Fill Char length (Max) Melt drip	 3 3 2.0 2.0 4.5 >1 drop	N/A	 3 3 2.0 2.0 4.5 >1 drop	(Average) sec. sec. sec. sec. in. Pass / Fail
Spray Rating Initial One Laundering	100, 100, 90 90, 90, 80	100, 100, 90 90, 90, 80	95, 95, 90 75, 75, 75	Pass / Fail
Abrasion Resistance (minimum)	600	500	500	Pass / Fail
Colorfastness laundered (3 cycles)[1] Light (after 40 hrs.) Crocking	3 3 3	3 3 3	3 3 3	Pass / Fail

1/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCCEvaluation Procedure 2, Gray Scale for Staining.

TABLE B-II. Specialty Cloth Materials

Characteristic	Laminate	Heat Seal Ripstop	520E Stretch	Specification
Section	3.2.1 3.2.4 3.2.5 3.2.6 3.2.9	3.2.8	3.2.3	
Weight, Minimum maximum	15 23	N/A 6.0	6.0 7.0	oz/ sq yd
Break Strength, (minimum) Warp Fill	500 500	150 100	150 100	lbs.
Tearing Strength, (min.) Warp Fill	35 30	2.5 2.0	7 5	lbs.
Stretch, % Warp Fill	N/A	N/A	20-30 20-30	%
Spray Rating Initial One Laundering	100, 100, 90 90, 90, 80	100, 100, 90 90, 90, 80	N/A	Pass / Fail
Abrasion Resistance (minimum)	700	N/A	N/A	Pass / Fail
Colorfastness laundered (3 cycles)[1] Light (after 40 hrs.) Crocking	3 3 3	N/A	N/A	Pass / Fail
1/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCC Evaluation Procedure 2, Gray Scale for Staining.				

TABLE B-III. Fasteners, Hook and Loop

Characteristic	Type IV	Class 6	Class 6	Class 6	Class 6	Class 8	
Width,		1	1 ½	2	4	4	±1/16 in.
Thickness, (min.)	0.04	0.11 (max)	0.11 (max)	0.11 (max)	0.11 (max)	N/A	in.
Weight, (min.)	N/A	5.0	8.0	10.8	21.6	50.8	gm./ lin. yd.
Break Strength, (min.)	N/A	N/A	N/A	N/A	N/A	156	lbs.
Shear Strength, pounds (min.) Type IV hook unlaundered	N/A	11	11	11	11	7	lbs./ sq. in.
Colorfastness laundered (3 cycles)[1]	N/A	3	3	3	3	N/A	Pass / Fail

1/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCC Evaluation Procedure 2, Gray Scale for Staining.

TABLE B-IV. Webbing and Tape

Characteristic	¾ inch	1 inch	1 ½ inch	1 inch Tape	Specification
Section	3.2.10a	3.2.10b	3.2.10c	3.2.10d	
Width	3/4	1	1 1/2	1	±1/16 in.
Thickness Minimum maximum	0.055 0.700	0.046 0.053	0.046 0.053	0.015 0.025	in.
Weight, (min.)	0.46	0.49	1.08	0.28	oz/ sq yd
Break Strength, (min.)	600	700	1000	500	lbs.

TABLE B-V. Threads

Characteristic	Tex 70-76	Tex 90-112	Tex 40-60	Specification
Section	3.2.15	3.2.15	3.2.16	
Break Strength (min)	8	8	13	lbs.

TABLE B-VI. Composite Requirements

Type	AD (psf)	Thickness (in)	Tensile Strength (MPa)
6 Layer	0.118 +/- 0.008	0.028 +/- 0.004	>190
8 Layer	0.161 +/- 0.008	0.035 +/- 0.006	>190

APPENDIX C

Finished Measurements

C 1. Scope: This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

TABLE C-I. Maximum MSV Component Weights (lbs)

Finished Component	XS	S	M	L	XL
Base Vest Assembly: Tier 1 Carrier, Tier 3 Carrier, Side Plate Carriers, Side Plate Pockets, & 4 Ballistic Panels	TBD	TBD	TBD	TBD	TBD
Side Plate Pocket (Qty. 2)	1.11 (6x6)	1.11 (6x6)	1.33 (6x8)	1.33 (6x8)	1.53 (7x8)
Total System	8.51	9.29	10.06	10.81	11.76

TABLE C-II. Minimum Ballistic Panel Area (square inch)

Ballistic Panel	Front Panel	Back Panel	6X4 Pocket	6X6 Pocket	6X8 Pocket	7X8 Pocket
XS-Short	92	92	TBD	48	61	70
XS	103	103				
S-Short	108.4	108.4				
S	123.7	123.7				
S-Long	127.4	127.4				
M	140.6	140.6				
L	158.5	158.5				
XL	181	181				

TABLE C-III. MSV Finished Measurements (inch)

Size	Center Front Length* ± ½ inch	Front Width* ± ½ inch	Center Back Length* ± ½ inch	Back Width* ± ½ inch
XS -Short	12.5	9.5	12.5	9.5
XS	14	9.5	14	9.5
S-Short	13.25	10	13.25	10
S	14	11	14	11
S-Long	15	10	15	10
M	14.5	11.5	14.5	11.5
L	15.5	12	15.5	12
XL	16	14	16	14
*Finished measurements may be adjusted ± 1" with initial lots till which time the patterns can be adjusted for full rate production.				

TABLE C-IV. Side Plate Carrier Finished Measurements (inch)

Size	Side Plate Carrier Length* ± ½ inch	Side Plate Carrier Width* ± ½ inch
Core Sizes		
S	20	5.0
M	23	5.0
L	26	5.0
Alternate Sizes		
XS	17	5.0
XL	29	5.0
*Finished measurements may be adjusted ± 1" with initial lots till which time the patterns can be adjusted for full rate production.		

TABLE C-V. Side Plate Pocket Finished Measurements (inch)

Size	Side Plate Pocket Length ± ½ inch	Side Plate Pocket Width ± ½ inch	Slider Length ± ½ inch
6 X 6 Pocket	8.15	7.45	14.00
6 X 8 Pocket	8.15	8.60	14.00
7 X 8 Pocket	10.00	8.60	14.00

TABLE C-VI. Chest Circumference for Base Vest

Size	Chest Circumference (Inches)
XS Short, Alternative Base Vest	29-33
XS	29-33
S	33-37
S–Short, Alternate Base Vest	33-37
S–Long, Alternate Base Vest	33-37
M	37-41
L	41-45
XL	45-61

APPENDIX D

Measurement Points

D 1. Scope: This Appendix is not a mandatory part of the specification. The information contained herein is intended for guidance only.

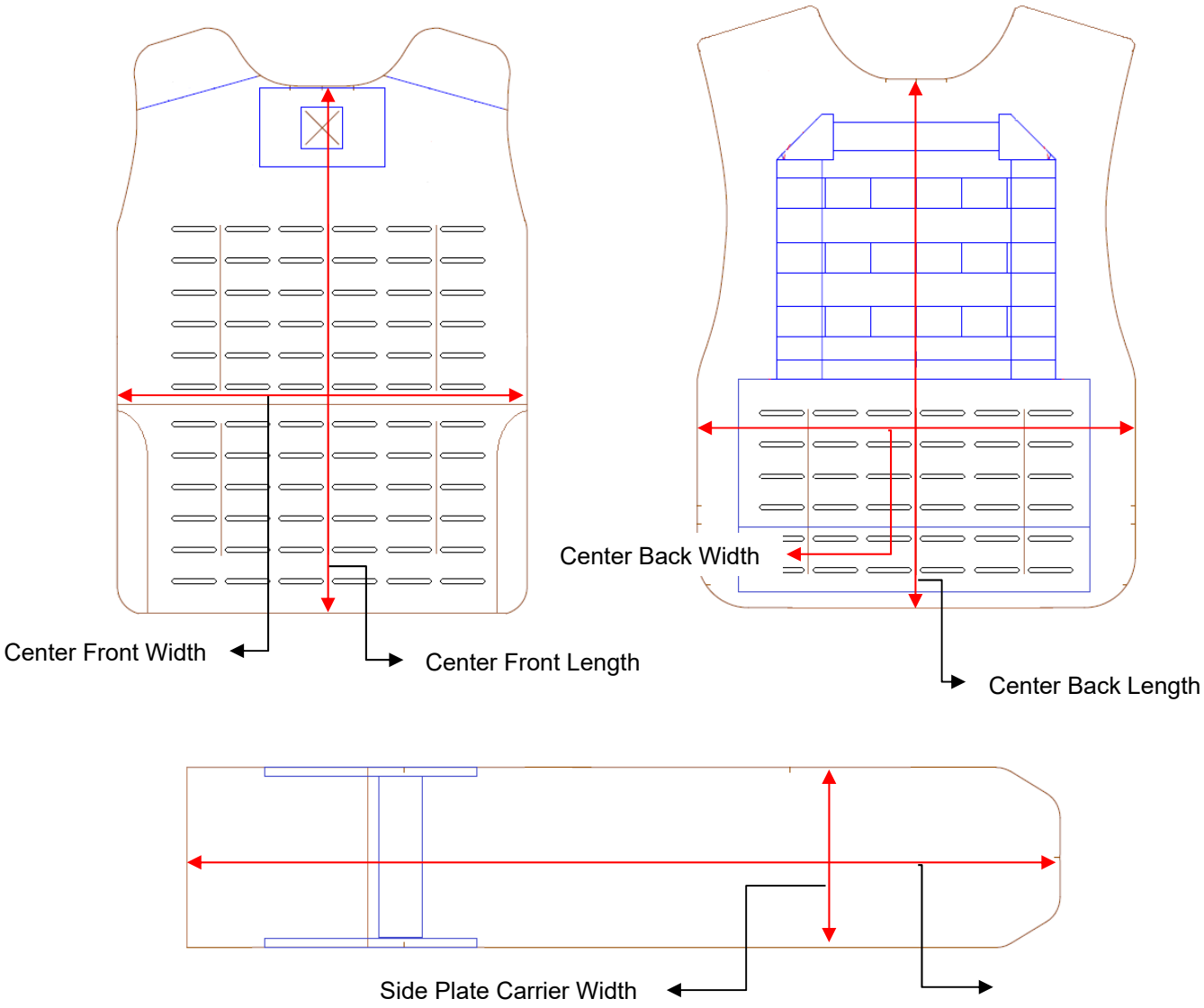

FIGURE D-1. Measurement Points

APPENDIX E

Pattern Nomenclatures

E 1. Scope: This Appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

TABLE E-I. Fabric Key

Identifier	Material Type
A	330D FR, Type IV Class 4
B	520E Stretch
C	330D, Type IV Class 3
D	330D, Type IV Class 3
E	FOAM 3/8" 2#
F	FOAM 1/4" 6#
G	FOAM 1/4" 2#
H	Fasteners, Hook Low Profile
K	Ballistic material
L	Fasteners, Loop Low Profile
M	500D, Type III Class 3
N	500D FR, Type III Class 4
O	Fasteners, Laminated Circular Engagement (LCE)
P	Heat seal, Ballistic Panel Cover
S	500D/1000D LAMINATE
T	TEMPLATE
U	Composite TEGRIS 8 PLY

TABLE E-II. Tier 1 Concealable Vest, Back Panel

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_BKCN SHCOR R0	2 BKCON OUT SHLD TBI	CUT 2	D
2	MSV2_BKCN-INR-CT	2 BKCON INNER CENTER	CUT 1	A
3	MSV2_BKCN-INR-LW-SD	2 BKCON INR LOW SIDE	CUT 2	B
4	MSV2_BKCN-INSD-PLPK	2 BKCON INSD BLST PK	CUT 1	C
5	MSV2_BKCN-INSD-SHD-F	2 BKCON INSD SHLD FM	CUT 2	F
6	MSV2_BKCN-OT-CBD-TBH	2 BKCON OUT CBD TB H	CUT 2	H
7	MSV2_BKCN-OT-FL	2 BKCON OUT CBD FLP	CUT 1	A
8	MSV2_BKCN-OT-LW	2 BKCON OUTER LOWER	CUT 1	A
9	MSV2_BKCN-OT-LWSD-L	2 BKCON OUT LWSD LP	CUT 2	L
10	MSV2_BKCN-OT-MID	2 BKCON OUT MIDDLE	CUT 1	A
11	MSV2_BKCN-OT-SHD	2 BKCON OUT SHLD	CUT 2	A
12	MSV2_BKCN-OT-SHD-CH	2 BKCON OUT SHLD CHN	CUT 2	B
13	MSV2_BKCN-OT-SHD-H	2 BKCON OUT SHLD HK	CUT 2	H
14	MSV2_BKCN-OT-SHTBINH	2 BKCON OT SHD TB IH	CUT 2	H
15	MSV2_BKCN-OT-UP	2 BKCON OUTER UPPER	CUT 1	A
16	MSV2_BKCN-OT-UP-LIN	2 BKCON UPPER LINING	CUT 1	D
17	MSV2_BKCN-OTSHD-TBO	2 BKCON OUT SHLD TBO	CUT 2	A

TABLE E-III. Tier 1 Concealable Vest, Front Panel

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_FTCN-INR-MID	2 FTCN INNER MIDDLE	CUT 1	B
2	MSV2_FTCN-INR-SD	2 FTCN INNER SIDE	CUT 2	A
3	MSV2_FTCN-INR-SHD-L	2 FTCN INR SHLD LOOP	CUT 2	L
4	MSV2_FTCN-INSD-PLPK	2 FTCN INSD PLT PKT	CUT 1	C
5	MSV2_FTCN-INSD-SHD	2 FTCN INSIDE SHLDR	CUT 2	F
6	MSV2_FTCN-OT-FL-H	2 FTCN OUT FLAP HOOK	CUT 1	H
7	MSV2_FTCN-OT-LW	2 FTCN OUTER LOWER	CUT 1	A
8	MSV2_FTCN-OT-LW-FL	2 FTCN OUT LWR FLAP	CUT 1	A
9	MSV2_FTCN-OT-LW-L	2 FTCN OUT LWR LOOP	CUT 1	L
10	MSV2_FTCN-OT-LWFL-L	2 FTCN OUT LWR FLP L	CUT 1	L
11	MSV2_FTCN-OT-LWFLUNL	2 FTCN OUT LWR FLP L	CUT 1	L
12	MSV2_FTCN-OT-MID-FL	2 FTCN OUTER FLAP	CUT 1	A
13	MSV2_FTCN-OT-SH-L	2 FTCN OUT SHLD LOOP	CUT 2	L
14	MSV2_FTCN-OT-UN-FL	2 FTCN OUT UNDER FLP	CUT 1	D
15	MSV2_FTCN-OT-UN-FL-H	2 FTCN OUT UND FLP H	CUT 1	H
16	MSV2_FTCN-OT-UP	2 FTCN OUTER UPPER	CUT 1	A
17	MSV2_FTCN-OT-UP-FG-L	2 FTCN OUT UP FLG LP	CUT 1	L

TABLE E-IV. Tier 3 Plate Carrier Vest, Front Panel

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_FRTC-INR-LW-CT	2 FRTC INR LWR CNTR	CUT 1	M
2	MSV2_FRTC-INR-MID	2 FRTC INNER MIDDLE	CUT 1	M
3	MSV2_FRTC-INR-SHD	2 FRTC INR SHOULDER	CUT 2	M
4	MSV2_FRTC-INR-UP-CT	2 FRTC INR UPR CNTR	CUT 1	M
5	MSV2_FRTC-INSD-LBLFL	2 FRTC INSD LABEL FL	CUT 1	A
6	MSV2_FRTC-INSD-PLST	2 FRTC INSD PLSTC FR	CUT 1	U
7	MSV2_FRTC-INSDPLPKLG	2 FRTC INS PLPK LNG	CUT 1	C
8	MSV2_FRTC-INSPLPKLGH	2 FRTC INS PLPKLG HK	CUT 2	H
9	MSV2_FRTC-INSPLPKST	2 FRTC INS PLPK SHRT	CUT 1	C
10	MSV2_FRTC-INSPLPKSTL	2 FRTC INS PLPKSH LP	CUT 1	L
11	MSV2_FRTC-LWSD-F	2 FRTC INR LWR SD FM	CUT 2	F
12	MSV2_FRTC-LWSDCR	2 FRTC INR LWR SD CR	CUT 2	M
13	MSV2_FRTC-LWSDIN	2 FRTC INR LWR SD IN	CUT 2	M
14	MSV2_FRTC-LWSDOT	2 FRTC INR LWR SD OT	CUT 2	B
15	MSV2_FRTC-OT	2 FRTC OUTER BASE	CUT 1	N
16	MSV2_FRTC-OT-FG-L	2 FRTC OUT FLAG LOOP	CUT 1	L
17	MSV2_FRTC-OT-FL-H	2 FRTC OUT FLP HOOK	CUT 1	H
18	MSV2_FRTC-OT-FLP	2 FRTC OUTER FLAP	CUT 1	S
19	MSV2_FRTC-OT-INR-FL	2FRTC OUT INNER FLAP	CUT 1	C
20	MSV2_FRTC-OT-INRFL-H	2 FRTC OUT INRFLP HK	CUT 1	H
21	MSV2_FRTC-OT-LW-FL	2 FRTC OUT LWR FLAP	CUT 1	S
22	MSV2_FRTC-OT-LW-L	2 FRTC OUT LOWER LP	CUT 1	L
23	MSV2_FRTC-OT-PLSPK-H	2 FRTC OT PLST PK HK	CUT 1	H
24	MSV2_FRTC-OT-PLSPK-L	2 FRTC OT PLST PK LP	CUT 1	L
25	MSV2_FRTC-OT-PLST-PK	2 FRTC OUT PLST PKT	CUT 1	C
26	MSV2_FRTC-OT-QR-CVR	2 FRTC OT QKRL CVR	CUT 1	B
27	MSV2_FRTC-OT-UP-L	2 FRTC OUT UPPER LP	CUT 2	L
28	MSV2_FRTC-OTSHDWBCVR	2 FRTC OT SHD WB CVR	CUT 2	S
29	MSV2_FRTC-UPSD-F	2 FRTC INR UP SD FM	CUT 2	F
30	MSV2_FRTC-UPSDIN	2 FRTC INR UP SD IN	CUT 2	M
31	MSV2_FRTC-UPSDOT	2 FRTC IN UP SD OT	CUT 2	B

TABLE E-V. Tier 3 Plate Carrier Vest, Back Panel

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_BTC-INR-LW-F	2 BKTC INR LWR FOAM	CUT 1	E
2	MSV2_BTC-INR-LW-SD	2 BKTC INNER LW SIDE	CUT 2	M
3	MSV2_BTC-INR-MID	2 BKTC INNER MIDDLE	CUT 1	M
4	MSV2_BTC-INRLWCT-OT	2 BKTC IN LWR CNTR C	CUT 1	B
5	MSV2_BTC-INRLWCTINSD	2 BKTC IN LWR CNTR B	CUT 1	M
6	MSV2_BTC-INRUP-CT	2 BKTC INR UPR CNTR	CUT 1	M
7	MSV2_BTC-INRUP-SHD-F	2 BKTC INR UPR FOAM	CUT 2	F
8	MSV2_BTC-INRUP-SHDOT	2 BKTC INR UPR SHD C	CUT 2	B
9	MSV2_BTC-INRUPSHDINS	2 BKTC INR UPR SHD B	CUT 2	M
10	MSV2_BTC-INSD-LBL-FL	2 BKTC INSD LABEL FL	CUT 1	A
11	MSV2_BTC-INSDPLPK-IN	2 BKTC INSD PLPK INR	CUT 1	C
12	MSV2_BTC-INSDPLPK-OT	2 BKTC INSD PLPK OUT	CUT 1	C
13	MSV2_BTC-INSDPLPKINL	2 BKTC INSD PLPK INL	CUT 1	L
14	MSV2_BTC-INSDPLPKOTH	2 BKTC INSD PLPK OTH	CUT 2	H
15	MSV2_BTC-OT	2 BKTC OUTER	CUT 1	N
16	MSV2_BTC-OT-CBD-CH	2 BKTC OT CMRBND CH	CUT 2	S
17	MSV2_BTC-OT-CBDCHL	2 BKTC OUT CBD CH LP	CUT 2	L
18	MSV2_BTC-OT-L	2 BKTC OUTER LOOP	CUT 1	L
19	MSV2_BTC-OT-LWFLIN	2 BKTC OT LWR FLP IN	CUT 1	C
20	MSV2_BTC-OT-LWFLOT	2 BKTC OUT LWR FLP O	CUT 1	S
21	MSV2_BTC-OT-NMTP-L	2 BKTC OT NM TP LOOP	CUT 1	L
22	MSV2_BTC-OT-SHD-WB-H	2 BKTC OT SHLD WB HK	CUT 4	H
23	MSV2_BTC-OT-SHD-WB-L	2 BKTC OT SHLD WB LP	CUT 4	L
24	MSV2_BTC-OTLW-FLIN-H	2 BKTC OT LWFL INHK	CUT 1	H
25	MSV2_BTC-OTLW-FLOT-L	2 BKTC OT LWFL OTLP	CUT 1	L
26	MSV2_BTC-OTSHDWB-H-B	2 BKTC OT SHLD WB HK	CUT 2	H
27	MSV2_BTC-OTUP-FLINLG	2 BKTC OT UPFLP IN	CUT 1	C
28	MSV2_BTC-OTUP-FLINST	2 BKTC OT UPFL INNER	CUT 1	C
29	MSV2_BTC-OTUP-FLOLGL	2 BKTC OT UPFL OT LP	CUT 1	L
30	MSV2_BTC-OTUP-FLOTLG	2 BKTC OT UPR FLP OT	CUT 1	M
31	MSV2_BTC-OTUP-FLOTST	2 BKTC OT UPFL OUTER	CUT 1	S
32	MSV2_BTC-OTUPFLINLGH	2 BKTC OT UPFL INHK	CUT 1	H
33	MSV2_BTC-OTUPFLINSTH	2 BKTC OT UPFL IN HK	CUT 1	H
34	MSV2_BTC-SHD-STRP-T	2 BKTC SHD STRP TMPL	CUT 2 - TEMPLATE	T
35	MSV2_BTC-ZIP-GAR	2 BKTC ZIPPER GARAGE	CUT 2	M
36	MSV2_BTC-ZIP-STOP	2 BKTC ZIPPER STOP	CUT 12	M

TABLE E-VI. Tier 1 Concealable Vest, Cummerbund

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_CC-CMRBND	2 CON CUMMERBUND	CUT 2	S
2	MSV2_CC-CMRBND-EXT	2 CON CMRBND EXTEN	CUT 4	O
3	MSV2_CC-EXT-TAB	2 CON CMRBND EXT TAB	CUT 4	T

TABLE E-VII. Tier 3 Plate Carrier Vest, Side Plate Carrier

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_CBD-CMRBND	2 CMRBND BODY	CUT 2	S
2	MSV2_CBD-ONWP-EXT	2 CMRBND HKLP TAB EX	CUT 2	O
3	MSV2_CBD-OT-L	2 CMRBND OUTER LOOP	CUT 2	L
4	MSV2_CBD-PLST	2 CMRBND PLSTC FRAME	CUT 2	U

TABLE E-VIII. Front/Back Ballistic Insert

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_FTBK-BLSTC	2 FTBK BALLISTICS	CUT	K
2	MSV2_FTBK-BLSTC CVR	2 FTBK BLSTCS COVER	CUT 2	P

TABLE E-IX. Side Plate Pocket, Ballistic Insert

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_SPP-BLSTC	2 SPP BALLISTICS	CUT	K
2	MSV2_SPP-BLSTC-CVR	2 SPP BALLISTICS CVR	CUT 2	P

TABLE E-X. Side Plate Pocket, Outer Carrier

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_SPP-BLSTC-PKT	2 SPP BLSTIC POCKET	CUT 1	C
2	MSV2_SPP-INR	2 SPP INNER	CUT 1	M
3	MSV2_SPP-OT	2 SPP OUTER	CUT 1	S
4	MSV2_SPP-OT-LIN	2 SPP OUTER LINING	CUT 1	A
5	MSV2_SPP-ZIP-GAR	2 SPP ZIPPER GARAGE	CUT 1	M

TABLE E-XI. Shoulder Pad, Outer Carrier

Item	Pattern Nomenclature	Pattern Name	Cut	Material Type
1	MSV2_SHDPD-CORD-KEEP	2 SHLD CORD KEEP	CUT 12	O
2	MSV2_SHDPD-F	2 SHOULDER PAD FOAM	CUT 2	G
3	MSV2_SHDPD-INR	2 SHLD PD INNER BODY	CUT 2	B
4	MSV2_SHDPD-KPR	2 SHLD PAD KEEPER	CUT 2	S
5	MSV2_SHDPD-KPR-L	2 SHLD PD KPR LOOP	CUT 2	L
6	MSV2_SHDPD-LGFL-L	2 SHLD PD LNG FLP LP	CUT 2	L
7	MSV2_SHDPD-OT	2 SHLD PD OUTER BODY	CUT 2	A
8	MSV2_SHDPD-STFL-H	2 SHLD PD SHRT FLP H	CUT 2	H