

INCH POUND

FQ/PD 07-05E**23 APR 2010****SUPERSEDES****FQ/PD 07-05D****2 SEP 2009**

**PURCHASE DESCRIPTION
BODY ARMOR, MULTIPLE THREAT / INTERCEPTOR
IMPROVED OUTER TACTICAL VEST**

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

1. SCOPE

1.1 Description. This purchase description provides for a multiple threat body armor system consisting of a base vest and modular components for tailoring protection levels to defeat multiple ballistic hazards across the battlefield continuum and manage armor weight. The Improved Outer Tactical Vest (IOTV) is a critical safety item. This specification delineates system, subsystem, component, and subcomponent level performance requirements to accomplish the end item body armor performance (see paragraph 6.1). Body armor, multiple threat is functionally integrated with Modular Lightweight Load Equipment (MOLLE).

1.2 Classification. Body armor, multiple threat components; base vest assembly, front and back yoke and collar assembly, lower back protector assembly, groin protector assembly, deltoid protector, small arms protective inserts (SAPI, ISAPI, ESAPI, XSAPI) shall be one type in the following sizes. Body armor, multiple threat will be issued separately as three subsystems, as follows.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: Project Manager – Soldier Protection and Individual Equipment, Program Executive Office – Soldier, US Army, 10170 Beach Road, Building 325, Fort Belvoir, Virginia
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- A) The Improved Outer Tactical Vest (IOTV) subsystem; consisting of the base vest assembly, front yoke and collar assembly, back yoke and collar assembly, lower back protector assembly, groin protector assembly, and deltoid protector components.

COMPONENT	SIZES
Base Vest Assembly	11 sizes: X-Small, Small, Medium, Medium-Long, Large, Large-Long, X-Large, X-Large-Long, 2X-Large, 3X-Large, 4X-Large
Back Yoke and Collar	8 sizes: X-Small, Small, Medium / Medium-Long, Large / Large-Long, X-Large / X-Large-Long, 2X-Large, 3X-Large, 4X-Large
Front Yoke and Collar	8 sizes: X-Small, Small, Medium / Medium-Long, Large / Large-Long, X-Large / X-Large-Long, 2X-Large, 3X-Large, 4X-Large
Lower Back Protector Assembly	One size
Groin Protector Assembly	2 sizes: X-Small to Medium-Long, and Large to 4X-Large
Deltoid Protector	Three sizes: X-Small to Small, Medium to Large-Long, and X-Large to 4X-Large

- B) The SAPI subsystem; consisting of a set of SAPI, ISAPI, ESAPI and XSAPI in the same size as the IOTV.

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

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

COMPONENT	SIZES
Enhanced Side Ballistic Insert (ESBI)	One size

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise

specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the Solicitation (see paragraph 6.2).

**SPECIFICATIONS
DEPARTMENT OF DEFENSE**

MIL-DTL-32075	- Label: For Clothing, Equipage, and Tentage (General Use).
MIL-PRF-5038	- Tape, Textile and Webbing, Textile, Reinforcing Nylon
MIL-PRF-63460	- Lubricant, Cleaner and Preservative for Weapons and Weapons Systems (Metric)
CO/PD 00-03	- Small Arms Protective Inserts (SAPI)
CO/PD 05-02	- Improved, Small Arms Protective Inserts (ISAPI)
CO/PD 04-19	- Enhanced, Small Arms Protective Inserts (ESAPI)
FQ/PD 07-03	- X Small Arms Protective Inserts (XSAPI)
CO/PD 06-20	- Enhanced Side Ballistic Insert (ESBI)
GL/PD 10-07	- Cloth, Duck, Textured Nylon
A-A-59826	- Thread, Nylon
A-A-55301	- Webbing, Textile Textured or Multi-Filament
A-A-55126	- Fastener Tape, Hook and Pile, Synthetic
MIL-W-4088	- Webbing, Textile Woven Nylon
MIL-STD-662	-V50 Ballistic Test for Armor
MIL-STD-3027	-Performance Requirements and Testing of Body Armor (see 6.5)
MIL-DTL-46593	- PROJECTILE, CALIBERS .22, .30, .50, AND 20 mm FRAGMENT-SIMULATING
MIL-W-17337	- Webbing, Textile, Woven Nylon
MIL-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-1916	- DoD Preferred Method for Acceptance of Product

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

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

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

DRAWINGS

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

Drawing No. 2-1-2519 Universal Camouflage Pattern 60 inches

Drawing No. 2-1-2519-1 Universal Camouflage Desert Sand 500

Drawing No. 2-1-2519-2 Universal Camouflage Urban Gray 501

Drawing No. 2-1-2519-3 Universal Camouflage Foliage Green 502

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

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

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

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

- AATCC METHOD 8 - Colorfastness to Crocking; AATCC Crockmeter Method
- AATCC METHOD 15 - Colorfastness to Perspiration
- AATCC METHOD 16 - Colorfastness to Light
- AATCC METHOD 22 - Water Repellency; Spray Test
- AATCC METHOD 61 - Colorfastness to Laundering: Accelerated
- AATCC METHOD 70 - Water Repellency: Tumble Jar Dynamic Absorption Test
- AATCC METHOD 96 - Dimensional Changes in Commercial Laundering of Woven and Knitted Fabrics Except Wool
- AATCC METHOD 118 - Oil Repellency: Hydrocarbon Resistance Test
- AATCC METHOD 127 - Water Resistance: Hydrostatic Pressure Test
- AATCC METHOD 135 - Dimensional Changes of Fabrics after Home Laundering Related to ISO 3759
- AATCC Procedure 1 - Gray Scale for Color Change
- AATCC Procedure 2 - Gray Scale for Staining
- AATCC Procedure 8 - Step Chromatic Transference Scale
- AATCC Procedure 9 - Visual Assessment of Color Difference of Textiles

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM E29 - Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- ASTM D-204 - Sewing Threads
- ASTM D-1388 - Stiffness of Fabrics
- ASTM D-1683 - Failure in Sewn Seams of Woven Fabrics
- ASTM D-1777 - Standard Method for Testing Thickness of Textile Materials
- ASTM D-3575 - Materials, Flexible Cellular, Made From Olefin Polymers
- ASTM D-3776 - Mass Per Unit Area (Weight) of Woven Fabric
- ASTM D-3884 - Abrasion Resistance of Textile Fabrics, (Rotary Platform, Double Head Method)

ASTM D-3886	- Abrasion Resistance of Textile Fabrics, (Inflated Diaphragm)
ASTM D-4485	- Standard Specification for Performance of Engine Oils
ASTM D-5034	- Breaking Force and Elongation of Textile Fabrics (Grab Test)
ASTM D-6193	- Standard Practice for Stitches & Seam
ASTM D-6413	- Standard Test Method for Flame Resistance of Textiles (Vertical Test)

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

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

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 16022 - Information Technology Automatic Identification and Data Capture Techniques
Data Matrix Bar Code Symbology Specification

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

3. REQUIREMENTS

3.1 First Article and Conformance Inspection. When specified, complete Body armor, multiple threat samples, representing full production quality, shall be subjected to first article inspection in accordance with 4.2 or conformance inspection in accordance with 4.3.

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

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

3.2.1.1 Flame Retardant Requirements: The finished cloth(s), outer shell and inner shell as specified in 3.3.1.1 and 3.3.1.2, shall exhibit flame resistance. All materials tested shall be tested in both the warp and fill directions. The average melt/drip that occurs after removal of source flame shall be less than 1 droplet. The average afterflame in each direction (warp and fill) shall be no longer than 3.0 seconds, the average afterglow in each direction shall be no longer than 2.0 seconds, and the average char length in each direction shall be no longer than 4 ½ inches for samples prior to laundering (0 washes) and after laundering (5 washes). Laundering shall be conducted according to AATCC Method 135, and the vertical flame testing shall be conducted according to ASTM D 6413.

3.2.1.2 Weight of Finished Fabric: The weight of the finished fabric (with FR coating) shall be no greater than 9.0 oz/sqyd. See 4.15.14.

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

3.2.2 Cloth Collar Material. The collar material next to the skin shall be highly abrasion resistant, non-abrasive to skin, pliable to enable collar to roll down, resistant to oil penetration and dry rot and able to remove oils when cleaned. Collar material next to the skin shall be Mil-DTL-508, Oxford, Nylon, 3 oz Type I, Class 3. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.3 Cloth Ballistic Panel Cover. Ballistic panel cover should be 70 Denier 1.9 oz. Nylon Ripstop. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.4 Cloth Spacer Mesh. Spacer Mesh with tricot laminate. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.5 Webbing and Tapes. Webbing and tapes shall be heat cut smooth with no burrs or residual melt. When required, angles on webbings shall be $45^{\circ} \pm 10^{\circ}$ unless otherwise specified on the drawings or templates. Webbing and tapes shall conform to the following requirements.

- a) 1.0 inch Webbing; A-A-55301, Type III, except that the spectral reflectance requirements shall be in accordance with para. 3.4.6 (Appendix A, Tables V-A and V-B) when tested in accordance with Para 4.5.9. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.
- b) 2.0 inch Webbing; 100% Nylon, width 2 inches ± 0.063 , weight 1.30 ozs/yd minimum, Tensile strength 2000 lbs minimum, thickness 0.046 ± 0.0007 , ground yarns number of ends - 191 minimum, ground yarns ply/denier/twist - 1/840/0, binder yarns number of ends - 44 minimum, binder yarns ply/denier/twist - 1/840/0, Filling, picks/inch - 40 (double) minimum, filling, ply/denier/twist - 1/1000/0, lockstitch, ply/denier/twist - 1/210/0 minimum, weave, double plain w/binders weaving 2 up, 2 down, the spectral reflectance requirements shall be in accordance with para. 3.4.6 (Appendix A, Table V-B) when tested in accordance with Para 4.5.9. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.
- c) 1.0 inch Webbing; MIL-W-17337 Class 2, continuous filament textured nylon shall be used. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

- d) 1.5 inch Webbing; MIL-W-17337 Class 2, continuous filament textured nylon shall be used. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.
- e) 2.0 inch Webbing; MIL-W-17337 Class 2, continuous filament textured nylon shall be. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.
- f) 3.0 inch Webbing; MIL-W-17337 Class 2, continuous filament textured nylon shall be used. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.
- g) 1.0 inch Tape; MIL-PRF-5038, Type III, class 2, continuous filament textured yarns shall be used except that the spectral reflectance requirements shall be in accordance with para. 3.4.6 (Appendix A, Table V-A) when tested in accordance with Para 4.5.9. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.5.1 Pattern Execution, Webbing. The pattern of the finished camouflage pattern webbing shall reproduce the standard sample with respect to design, colors, and registration of the respective areas. The pattern of the webbing shall match the pattern on the specified drawing as obtained from the contracting or procuring activity.

3.2.5.2 Shade Execution, Webbing. The shade of each individual color shall match the colors as specified in the standard for the camouflage pattern specified in the contract or procuring documents from GL/PD 10-07 Style G Type III when tested as specified in 4.5.13.

3.2.6 Elastic. Elastic shall be heat cut smooth with no burrs or residual melt. Elastic shall conform to the following requirements.

- a) 1 inch; width – 1 inch \pm .0625, warp – textured polyester 150/2, filler – textured polyester 150/1, rubber – natural rubber, thickness - .060-.095, stretch – 100% \pm 10%. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.
- b) 1 1/2 inch; width – 1 1/2 inch \pm .125, warp – textured polyester 150/2, filler – textured polyester 150/1, rubber – natural rubber, thickness - .055-.085, stretch – 100% \pm 10%. Color: Optional.
- c) 4 inch; width – 4 inch \pm .060, construction – knitted, warp – textured polyester 150/1, filler – textured polyester, 150/1, 750d total, rubber – natural or equivalent, rubber strands – 60, thickness - .040-.045, picks per inch – 50 \pm 4, stretch – 110% \pm 15%. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.7 Fasteners, Hook, and Loop. Hook and loop fasteners shall conform to A-A-55126, Type II, Class I, in 5/8", 1.0", 1.5", 2.0", and 4.0" widths. 1.0" and 2.0" hook and loop fasteners shall be in accordance with spectral reflectance requirements in para. 3.4.6 (Appendix A, Table V-B) when tested in accordance with para 4.5.9. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.8 Foam. The foam (located within the yoke) shall be closed cell with the properties specified in Appendix A, Table II when tested as specified in ASTM D-3575. The foam shall be sandwiched between the ballistic filler.

3.2.9 Snap Fasteners. Snap fasteners shall conform to MS27980, style 2, hard action. The snap fasteners shall have a black chemical finish, except that the button cap shell shall have an enamel finish. The enamel shall be uniformly coated over the top surface of the shell including the visible portion of the edge. The enamel shall be capable of withstanding attachment operations without removal of any enamel. The enamel coating shall be smooth and free of sags, runs, and streaks (see 4.5). Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.10 Polyethylene. 0.045 ±.005 inches thick, high density.

3.2.11 Cable. 3/32 Galvanized 7x7 aircraft cable coated to .163 +/- .008 with natural nylon. Ends of cable shall have no exposed metal.

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

3.2.13 Coated Fabric. Hypalon Coated Nylon, 16 oz/sq yd, Reeves Air Safety Products, or equal. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.14 Ladderloc. Trovato, 1" TLL, ITW P/N 154-0100-5676, or equal. This component will be used for all original manufactured items. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.15 Ladderloc. Splitloop, LL 1, ITW P/N 104-3100, or equal. This component will be used in the spares kit (Appendix A, Table III). Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.16 "D"-Ring. 1", (ITW P/N: 01047-20 or equivalent) Steel, Zinc, Welded. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors. Spectral reflectance requirements shall be in accordance with para. 3.4.6 (Appendix A, Table V-B) when tested in accordance with para 4.5.9.

3.2.17 Shoulder Buckle. Shoulder buckle, 2" to 1" webbing reducer shall not exceed 2.5" width, 1" height, and 0.1" thickness. Average break strength shall be at least 400 lbf.

3.2.18 Ring. Rectangular, 1" X 1/2" X .150, Steel, Zinc, Welded. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.19 Loop. 1 1/8" X 3/16" X .120, Steel, Zinc, Welded. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.20 Slide. 25mm, Steel, Zinc, ITW P/N 08090-22-21884, or equal. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors.

3.2.21 Slide. Tri/Glide, Bowed, 2", Steel, ITW P/N 09148-22-21884, or equal.

3.2.22 Grommet. Plain, brass, black oxide, NASM16491, size 0, type I, class 3

3.2.23 Washer. Plain, brass, black oxide, NASM16491, size 0, type I, class 3

3.2.24 Outer Shell Field Repair Patch, Type I. One field repair patch, type I, will be furnished with each complete IOTV. 3" 3/4 x 6" 1/4 pressure-sensitive adhesive patch with Abrasion resistant Resin. Patch must be capable of being directly applied to outer shell cloth specified in para. 3.2.1 using mild pressure for 2 minutes or less. Patch must demonstrate an improvement in durability compared to outer shell material. Patch meets pattern size and is the specified camouflage pattern.

3.2.25 Outer Shell Field Repair Patch, Type II. One field repair patch, type II, will be furnished with each complete IOTV. 3" 3/4 x 6" 1/4 pressure-sensitive adhesive patch, Universal Camouflage. Patch must be capable of being directly applied to outer shell cloth specified in para. 3.2.1 using mild pressure for 2 minutes or less. Patch must demonstrate equal durability compared to outer shell material. Patch meets color, pattern size and Near Infra Red values as the specified camouflage pattern.

3.2.26 Outer Shell Cleaning Foam System. Manual foam dispensing system with cleaning surfactant and water/inert agents that removes stains, dirt, blood and odor. Foam shall not affect visual or Near Infra Red signature as per the specified camouflage pattern requirements. The plastic container must be a 5 oz non-aerosol device that is capable of foaming cleaning solution. The plastic container cap shall be capable of working as a brush. Product shall not contain components designated to be possible or suspected human carcinogens. pH of solution shall be no less than 7.0 and no more than 7.5. Major components of the foam shall not flash.

3.3 Design. The Body armor, multiple threat model dismantled system is a modular vest protecting the upper torso from multiple ballistic threats which is easily configured to defeat predicted mission threat at a minimum system weight. The IOTV subsystem (see 3.5) consists of (1) One base vest assembly made up of a camouflage outershell base vest carrier with a ballistic insert set made up of removable ballistic (back and front) inserts, (2) One yoke and collar assembly made up of one each front and back yoke and collar carrier assemblies with a ballistic insert set made up of ballistic inserts, (3) One groin protector assembly made up of a groin protector carrier with a removable ballistic insert, (4) One lower back protector assembly made up of a lower pack protector carrier with a removable ballistic insert, and (5) One deltoid protector. Components are all attached to the IOTV. The IOTV provides protection from

conventional fragmenting munitions and multiple hits from 9mm handgun rounds. The SAPI, ISAPI, ESAPI or XSAPI subsystem consists of a set of interchangeable, sized, and contoured plates inserted into front and back pockets inside the IOTV carrier to provide vital organs protection against multi-hits of small arms rifle bullets and indirect fire flechettes. The ESBI subsystem consists of a set of interchangeable, contoured plates inserted into left and right side pockets of the IOTV carrier. Webbing hanger attachments on the front of the IOTV outershell carrier accommodate limited load carrying compatible with MOLLE modular load bearing vest pockets. The variants of Body armor, multiple threat modular system configurations follow below. Recommended enhancements are encouraged to improve its operational effectiveness and manufacturability.

- a) IOTV base vest only; which does not include any of the front and back yoke and collar, groin protector, lower back protector, deltoid protector or SAPI, ISAPI, ESAPI or XSAPI modular components.
- b) IOTV base vest with one or more, or all of the modular components; front and back yoke and collar, groin protector, lower back protector, deltoid protector and/or one or two SAPI, ISAPI, ESAPI, or XSAPI
- c) IOTV base vest with none, some, or all 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. Compliance with patterns is needed to meet interface requirements with fielded personnel combat equipment. The working patterns shall include the size, directional lines, placement marks, notches, and provided seam allowances. Baseline patterns require a 3/8” seam allowance +/-1/16” unless otherwise stated on patterns. Except for the ballistic panels, all the components of the vest shall be cut with a tolerance of +/- 1/16” in accordance with the pattern parts indicated except where changes or enhancement(s) to baseline are proposed. The ballistic panels shall be cut with a tolerance of -1/16”/+1/8” to ensure maximum protective area of coverage is achieved (see para. 3.5, Appendix A, Table VI-B). Drill holes are not permitted.

3.3.1.1 Base Vest and Components Carrier Outer Shell, Camouflage (as specified).

Item	Nomenclature	Computer Nomenclature	Cut
1.	Front Outer Shell	F OUT SH	1 Face Up
2.	Front Flap	F FL	1 Face Up
3.	Front Channel Cover	F CH CVR	1 Pair
4.	Front Right Shoulder Cover	F R SHD CVR	1 Face Up
5.	Front Left Shoulder Cover Top	F L SHD CVR TP	1 Face Up
6.	Front Left Shoulder Cover Bottom	F L SHD CVR BT	1 Face Up
7.	Front Release Handle Cover	F RL HN CVR	1 Face Up
8.	Back Outer Shell	B OUT SH	1 Face Up
9.	Back Upper Flap	B UP FL	1 Face Up
10.	Back Center Flap	B CTR FL	1 Face Up
11.	Back Shoulder Cover	B SHD CVR	1 Pair

12.	Back Channel Cover	B CH CVR	1 Pair
13.	Side Plate Carrier Outer Shell	SPC OUT SH	1 Pair
14.	Side Plate Carrier Inner Shell	SPC IN SH	1 Pair
15.	Side Plate Carrier Plate Pocket	SPC P PK	1 Pair
16.	Side Plate Carrier Pocket Bottom Overlay	SPC P PK BTM OVLY	1 Pair
17.	Side Plate Carrier Label Underlay	SPC LBL UNLY	1 Pair
18.	Side Plate Carrier Plate Pocket Inner Cap	SPC P PK IN CAP	1 Pair
19.	Side Plate Carrier Plate Pocket Cap Top	SPC P PK CAP TP	1 Pair
20.	Side Plate Carrier Plate Pocket Outer Cap	SPC P PK OUT CAP	1 Pair
21.	Collar Front Outer Shell	CLR F OUT SH	1 Face Up
22.	Collar Back Outer Shell	CLR B OUT SH	1 Pair
23.	Lower Back Protector Outer Shell	LBP OUT SH	1 Face Up
24.	Groin Protector Outer Shell	GP OUT SH	1 Face Up
23.	Groin Protector Inner Shell	GP IN SH	1 Face Up
24.	Deltoid Outer Shell, Upper Inner	DLT UP IN	2 Face Up
25.	Deltoid Outer Shell, Lower Inner	DLT LW IN	2 Face Up
26.	Deltoid Outer Shell	DLT OUT SH	2 Face Up
27.	Deltoid Arm Strap Channel	DLT CHNL	2 Face Up

3.3.1.2 Base Vest and Components Carrier Inner Shell, see Appendix A Table IV for color.

Item	Nomenclature	Computer Nomenclature	Cut
1.	Front Flap Pocket	F FL PK	1 Face Up
2.	Front Inside Plate Pocket	F IN P PK	1 Face Up
3.	Back Inside Plate Pocket	B IN P PK	1 Face Up
4.	Back Center Flap Inside Pocket	B CTR FL IN PK	1 Face Up
5.	Back Center Flap Pocket	B CTR FL PK	1 Face Up
6.	Internal Elastic Band Outer Cover	IEB OUT CVR	1 Pair
7.	Internal Elastic Band Inner Cover	IEB IN CVR	1 Pair
8.	Yoke Front Outer Shell	YK F OUT SH	1 Face Up
9.	Yoke Front Inner Shell	YK F IN SH	1 Face Up
10.	Yoke Back Outer Shell	YK B OUT SH	1 Face Up
11.	Front Inner Shell Upper	F IN SH UP	1 Face Up
12.	Front Inner Shell Lower	F IN SH LWR	1 Face Up
13.	Front Inner Shell Side	F IN SH S	1 Pair
14.	Back Inner Shell Upper	B IN SH UP	1 Face Up
15.	Back Inner Shell Lower	B IN SH LWR	1 Face Up
16.	Back Inner Shell Side	B IN SH S	1 Pair
17.	Lower Back Protector Inner Shell Upper	LBP IN SH UP	1 Face Up
18.	Lower Back Protector Inner Shell Lower	LBP IN SH LWR	1 Face Up

3.3.1.3 Collar Material.

Item	Nomenclature	Computer Nomenclature	Cut
1.	Collar Front Inner Shell	CLR F IN SH	1 Face Up
2.	Collar Back Inner Shell	CLR B IN SH	1 Pair

3.3.1.4 Spacer mesh.

Item	Nomenclature	Computer Nomenclature	Cut
1.	Yoke Back Inner Shell	YK B IN SH	1 Face Up

3.3.1.5 Ballistic Panel Cover.

Item	Nomenclature	Computer Nomenclature	Cut
1.	Front Ballistic Cover Outer	F BL CVR OUT	1 Face Up
2.	Front Ballistic Cover Inner	F BL CVR IN	1 Face Up
3.	Back Ballistic Cover Outer	B BL CVR OUT	1 Face Up
4.	Back Ballistic Cover Inner	B BL CVR IN	1 Face Up
5.	Lower Back Protector Ballistic Cover Outer	LBP BL CVR OUT	1 Face Up
6.	Lower Back Protector Ballistic Cover Inner	LBP BL CVR IN	1 Face Up
7.	Groin Protector Ballistic Cover Outer	GP BL CVR OUT	1 Face Up
8.	Groin Protector Ballistic Cover Inner	GP BL CVR IN	1 Face Up
9.	Deltoid Protector Ballistic Cover Outer	DLT BL CVR OUT	2 Face Up
10.	Deltoid Protector Ballistic Cover Inner	DLT BL CVR IN	2 Face Up

3.3.1.6 Ballistic Panel. (Number of Ply Dependent on Proposed Material System)

Item	Nomenclature	Computer Nomenclature	Cut
1.	Front Ballistic	F BL	1
2.	Back Ballistic	B BL	1
3.	Collar Front Ballistic Narrow	CLR F BL NR	1
4.	Collar Front Ballistic Wide	CLR F BL WD	1
5.	Collar Back Ballistic Narrow	CLR B BL NR	1 Pair
6.	Collar Back Ballistic Wide	CLR B BL WD	1 Pair
7.	Yoke Front Ballistic	YK F BL	1
8.	Yoke Back Ballistic	YK B BL	1
9.	Lower Back Protector Ballistic	LBP BL	1
10.	Groin Protector Ballistic	GP BL	1
11.	Deltoid Protector Ballistic	DLT BL	2

3.3.1.7 Foam.

Item	Nomenclature	Computer Nomenclature	Cut
1.	Yoke Front Foam	YK F FM	1

3.3.1.8 Polyethylene.

Item	Nomenclature	Computer Nomenclature	Cut
1.	Side Plate Carrier Stiffener	SPC STF	1Pair
2.	Side Plate Carrier Pocket Strap Stiff.	SPC PL PK STRAP STF	4

3.3.1.9 Coated Fabric.

Item	Nomenclature	Computer Nomenclature	Cut
1.	Cable Handle Overlay	CBL HN OVLY	1 Face Up

3.3.1.10 Templates.

Item	Nomenclature
1.	Front and Back Center Flap Strap
2.	Front and Back Inner Plate Pocket Strap
3.	Front Left Shoulder Strap, Narrow
4.	Front Left Shoulder Hook, Long Strap
5.	Front Left Shoulder Hook, Short Strap
6.	Front Right Shoulder Cover Cable Guide
7.	Front Bartacks
8.	Front Flap Bartacks
9.	Back Drag Strap
10.	Back Upper Release Loop
11.	Back Flap Bartacks
12.	Side Plate Carrier Bartacks
13.	Internal Elastic Band Metal Loop and Slide Assembly
14.	Yoke Front and Back Strap, Narrow
15.	Yoke Front Strap, Wide
16.	Lower Back Protector Strap
17.	Lower Back Protector Overlay Bartacks
18.	Groin Protector Strap
19.	Cable Assembly Handle
20.	Shoulder Attachment Assembly

3.3.1.11 Fastener Tape, Hook and Loop, A-A-55126.

Item	Nomenclature	Cut
1.	5/8" Hook	Pieces are per pattern marking
2.	1" Hook	Pieces are per pattern marking
3.	1 1/2" Hook	Pieces are per pattern marking
4.	2" Hook	Pieces are per pattern marking
5.	4" Hook	Pieces are per pattern marking
6.	5/8" Loop	Pieces are per pattern marking
7.	1" Loop	Pieces are per pattern marking
8.	1 1/2" Loop	Pieces are per pattern marking
9.	2" Loop	Pieces are per pattern marking
10.	4" Loop	Pieces are per pattern marking

3.3.1.12 Tape, 1" Binding, MIL-PRF-5038

Item	Nomenclature	Usage as Required
1.	Front Right and Left Channel Cover Bottom Edge	

2. Front Right Shoulder Cover Top Edge
3. Front Top Left Shoulder Cover Top Edge
4. Front Bottom Left Shoulder Cover Top Edge
5. Front Flap Edge
6. Front Flap Pocket Bottom Edge
7. Front Plate Pocket Top and Bottom Edge
8. Front Right and Left Side Pocket Top Edge
9. Back Right and Left Shoulder Cover Top and Bottom Edge
10. Back Upper Flap Edge
11. Back Center Flap Edge
12. Back Right and Left Channel Cover Inside Edge
13. Back Flap Pocket Bottom Edge
14. Back Inside Plate Pocket Top and Bottom Edge
15. Side Plate Carrier Edge
16. Side Plate Carrier Right and Left Plate Pocket Flap Outer Edge
17. Side Plate Carrier Right and Left Plate Pocket Top and Bottom Edge
18. Side Plate Carrier Right and Left Inner Cap Bottom Edge
19. Yoke Back Outside and Inside Edge
20. Yoke Front Outside and Inside Edge
21. Lower Back Protector Edge
22. Lower Back Protector Overlay Ends

3.3.1.13 Webbing 1.0", MIL-W-17337.

Item	Nomenclature	Cut	Qty
1.	Back Upper Release Loops	5	2
2.	Back Lower Release Loops	5	2
3.	Back Middle Release Loop	5	1
4.	Back Cable Channel	3	1
5.	Back Cable Channels	4	2

3.3.1.14 Webbing 1.0", A-A-55301, Camouflage (as specified in contract).

Item	Nomenclature	Cut
1.	Front	Pieces are per pattern marking
2.	Front Flap	Pieces are per pattern marking
3.	Back Center Flap	Pieces are per pattern marking
4.	Side Plate Carrier	Pieces are per pattern marking
5.	Lower Back Protector Overlay	Pieces are per pattern marking
6.	Deltoid Protector Outershell	Pieces are per pattern marking

3.3.1.15 Webbing 1.0", A-A-55301, see Appendix A Table IV for color

Item	Nomenclature	Cut	Qty
1.	Front Inner Yoke Attachment	3	4
2.	Front Inner Yoke Attachment	3 ½	2
3.	Front Inner Groin Attachment	3	2

4.	Front Left Shoulder Snap Closure	2	1
5.	Front Left Shoulder Snap Strap	7 1/2	1
6.	Front and Back Center Flap Closures	8	2
7.	Back Inner Yoke Attachment	3	4
8.	Back Inner Lower Back Attachment	3	2
9.	Back Drag Strap	19 1/4	1
10.	Back Retention Handle	3 1/4	1
11.	Back Upper Loop With Ring	4 1/4	2
12.	Side Plate Carrier Right and Left	25 1/2 w/Angle	4
13.	Side Plate Carrier Flap Closure	5	2
14.	Side Plate Carrier Pocket Closure	8 w/Angle	2
15.	Internal Elastic Band Strap	12 w/Angle	2
16.	Internal Elastic Band Keeper	2 1/2	2
17.	Yoke/Collar Assembly Front and Back Attachment	3	4
18.	Yoke/Collar Assembly Front and Back Strap	7 1/4 w/Angle	4
19.	Lower Back Protector Strap	9 3/4	2
20.	Groin Protector Strap	9	2
21.	Cable Assembly Handle	13	1
22.	Side Plate Carrier Handles	8 1/2	2

3.3.1.16 Webbing 1.5", MIL-W-17337.

I Item	Nomenclature	Cut	Qty
1.	Front Right Shoulder Cover Cable Cover Guide	see 3.5.3.16	2

3.3.1.17 Webbing 2.0", 100% Nylon

Item	Nomenclature	Cut	Qty
1.	Front Right Shoulder Strap	16 w/Angle	1
2.	Front Left Shoulder Strap, Long	15	1

3.3.1.18 Webbing 2.0", MIL-W-17337.

Item	Nomenclature	Cut	Qty
1.	Front and Back Inside Plate Pockets	12	2
2.	Back Inside Drag Strap Reinforcement	8 1/2	1
3.	Yoke/Collar Assembly Front Inner	4 1/2	2
4.	Front Left Shoulder Strap, Short	5	1

3.3.1.19 Webbing 3.0", MIL-W-17337.

Item	Nomenclature	Cut	Qty
1.	Internal Elastic Band Channel Covers	6	2

3.3.1.20 Elastic 1.0".

Item	Nomenclature	Cut	Qty
1.	Side Plate Carrier Elastic Keepers	3	4

3.3.1.21 Elastic 4".

Item	Nomenclature	Cut	Qty
1.	Internal Elastic Bands		
	X-Small to Small	10	2
	Medium to Large long	13	2
	X-Large to 2 X-Large	16	2
	3 X-Large to 4 X-Large	19	2
2.	Side Plate Pocket Inner Cap Elastic	per pattern	2

3.3.1.22 Elastic 1 1/2".

Item	Nomenclature	Cut	Qty
1.	Back Channel Cover	7	2

3.3.1.23 Cable.

Item	Nomenclature	Cut	Qty
	Cable, total length		
	X-Small to Small	60	1
	Medium to Large long	62	1
	X-Large to X-Large Long	64	1
	2 X-Large to 4 X-Large	67	1

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

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

3.4.2 Fungus Resistance. All components and parts of the body armor, including interior components, shall be resistant to fungal growth. The visual grading shall be less than 2. All components shall show only trace or no susceptibility to fungal growth nor experience damage due to the presence of fungus spores or adjacent fungus growth. (see paragraph 4.5.8)

3.4.3 Individual Repairs. The Table III in Appendix A depicts spares requirements, based on a Company of 150 soldiers. Individual repair kits will be supplied when specified in acquisition documents (paragraph 6.2).

3.4.4 Use and Care Instruction. An instruction pamphlet will be furnished by the manufacturer with each body armor system. The instruction pamphlet will be printed on a durable man made, synthetic paper capable of multiple time use under harsh field conditions. MCN: 7610-01-F00-77223 or equivalent.

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

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

3.4.7 Matching. The webbing and cloths shall match the color and appearance of the standard sample when tested as specified in 4.5.13.

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

3.5 Improved Outer Tactical Vest (IOTV) subsystem. See paragraph 3.3 for IOTV configuration. The maximum finished weight of the IOTV subsystem components for each size is outlined in Appendix A, Table VI-A when measured as specified in 4.5.6. The minimum area of ballistic coverage for each ballistic panel subcomponent in each size is outlined in Appendix A, Table VI-B when tested as specified in 4.5.5. Finished base vest measurements for each size are outlined in Appendix A, Table VI-C when inspected as specified in 4.5.2.

3.5.1 Ballistic Protection Levels. The Body armor, multiple threat protection levels follow (see 4.1, 4.4, & 4.6):

- a) IOTV provides fragmentation protection from conventional fragmenting munitions (see paragraph 3.5.2.2).
- b) IOTV provides multi-hit handgun bullet protection for 9mm, 124 gr., Full Metal Jacket (FMJ) Remington projectile (see paragraph 3.5.2.3).
- c) IOTV and SAPI (see 2.2) together provide multi-hit small arms bullet protection from:
 - (1) NATO 7.62 x 51 mm M-80 Ball.
 - (2) Soviet 7.62 mm x 54 R Ball Type LPS

- (3) U.S. 5.56 mm M855 Ball.
- d) IOTV and ISAPI (2.2) together provide multi-hit small arms bullet protection from
 - (1) NATO 7.62 x 51 mm M-80 Ball.
 - (2) Soviet 7.62 mm x 54 R Ball Type LPS
 - (3) U.S. 5.56 mm M855 Ball.
 - (4) 7.62 x 39 mm API (Russian BZ and Chinese Type 56)
- e) IOTV and ESAPI (2.2) together provide multi-hit small arms bullet protection from
 - (1) NATO 7.62 x 51 mm M-80 Ball.
 - (2) Soviet 7.62 mm x 54 R Ball Type LPS
 - (3) U.S. 5.56 mm M855 Ball.
 - (4) 7.62mm x 63 APM 2
- f) IOTV and XSAPI - classified

3.5.2 Ballistic Performance. The IOTV ballistic material system consists of an outershell, ballistic panel, and an outershell inner lining to accomplish the ballistic characteristics specified in paragraphs 3.5.2.2, 3.5.2.2.1, and 3.5.2.3 as tested in paragraph 4.6.

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

3.5.2.1.1 Ballistic filler. The ballistic filler weight shall not exceed 1.10 lb sq/ft with a maximum 0.30 inch thickness when tested as specified in 4.5.6 and 4.5.7. Except for ancillary components such as thread, the ballistic filler shall be made entirely of ballistic material. If ballistic filler is non-contiguous, it is required a minimum 1", feathered overlap is achieved when fully extended during individual movements to maintain uniform ballistic protection.

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

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

3.5.2.1.3 Abrasion Resistance. All adjacent layers within the ballistics material system shall demonstrate abrasion resistance against each other for a minimum of 2000 cycles when tested as specified in paragraph 4.5 (Appendix C, Table I-B). A rating ≥ 3 is required.

3.5.2.2 IOTV Fragmentation Protection. The ballistic material system (see 3.5.2) shall provide consistent ballistic performance. For each complete IOTV all ballistic inserts for base vest, collar, groin, deltoid, and lower back protectors. All IOTV components and base vest (see para.

3.3) will be made from the same approved ballistic package. Appendix B, Table I lists the required minimum V50 values for base vest assembly, and collar assemblies, lower back protector, groin protector, and deltoid protector at specified obliquity when tested with the Fragment Simulating Projectile (FSP) and Right Circular Cylinder (RCC) dry and wet (sea water).

Appendix B, Table I specifies minimum ballistic performance that shall be maintained after conditioning to hot and cold temperature, accelerated aging and POL contamination. Testing is specified in 4.5. Any change in the IOTV area of coverage must meet minimum casualty reduction potential of the approved system coverage (see 3.5, Appendix A, Table VI-B) and V50 performance (see Appendix B, Table I) stated herein. Any product improvements in the ballistic performance of the IOTV base vest panels 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 SAPI/ISAPI/ESAPI/XSAPI performance requirements (see 2.2).

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

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

3.5.3 IOTV Construction. The exterior of the system shall be edge stitched approximately 1/8 inch from all edges EXCEPT front edge contacting the neck area of the individual and the back starting at the beginning of the shoulder flap continuing around the neck line to the other shoulder flap end. All stitching shall be back-tacked to prevent raveling and demonstrate good stitching quality with no loose ends, consistent stitches per inch, even tension with no loose needle or bobbin thread. Fabric edges shall not ravel.

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

3.5.3.2 Stitching. Stitching shall conform to ASTM D-6193, 9-10 stitches per inch. End of seams and stitches (stitch type 301) that are not caught in other seams or stitching shall be securely back tacked or back stitched. Thread breaks or bobbin run-outs occurring during sewing shall be secured by stitching back of the break minimum of 1/2 inch. Thread tension shall be maintained so that there will be no loose stitching resulting in loose bobbin or top thread, or excessively high stitching resulting in puckering of the materials sewn. Thread ends shall be trimmed to a length of not more than 1/4 inch.

3.5.3.3 Automatic Stitching. Automatic stitching machines may be used to perform any of the stitching patterns provided the requirements for the stitch pattern, stitches per inch, size and type

of thread are met, and at least three or more tying, overlapping, or back stitches are used to secure the ends of the stitching.

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

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

- a) Distance between vertical bartacks on horizontal webbing shall be $1\frac{1}{2}'' - 0/+1/16''$.
- b) Distance between horizontal webbing shall be $1\frac{1}{8}'' (\pm 1/16)$.
- c) Vertical bartacks on consecutive horizontal webbing rows shall be vertical aligned bottom to top in a vertical straight line.

3.5.3.6 Buttonholes. Buttonholes shall be straight cut. Position in accordance with the marks indicated on the pattern, with the ends of the buttonholes securely tacked. All buttonholes will be $1\frac{1}{4}''$ with a finished cut of $1'' \pm 1/16''$, except for the buttonholes in the back upper flap. The two buttonholes in the back upper flap will be $1\frac{3}{8}''$ with a cut of $1\frac{1}{8}'' \pm 1/16''$.

3.5.3.7 Snap setting. A hole shall be prepunched to receive the button and eyelet components of the snap fastener. The hole shall be smaller than the outside diameter of the button and eyelet barrels. The fastener shall be securely clinched without cutting the adjacent materials, and no splits shall occur in the button or eyelet barrels.

3.5.3.8 Drag Strap. The drag strap on the back of the IOTV carrier (all sizes) shall have a peak strength not less than 400 lbf (increased strength is desirable) when tested in accordance with para 4.8.

3.5.3.9 Release Cable. Ends of cable to be free of burrs, sharp edges and shall have no exposed metal. Cable handle shall be constructed with webbing such that a bartack separates two unequal lengths of cable and holds the cable firmly in place. Pull strength of the cable handle shall be at least 100 lbf. The lengths of the unequal sections is provided in Appendix A, Table VIII. The lengths shall be measured from the end of the webbing handle where the cable is exposed.

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

3.5.3.11 IOTV Drainage. The IOTV shall provide a durable means to allow water in the vest to drain out quickly and easily. Grommets/Eyelets/Washers will be securely cinched without splitting in a manner that will prevent detachment from or cutting of the adjacent material.

3.5.3.12 Torso Adjustment. Torso adjustment shall be accomplished using both internal and external means to provide the wearer a means to easily secure the vest to the torso. The internal adjustment, located in front of the wearer, shall be a hook and loop type closure. The external adjustment, located behind the wearer, shall utilize a friction adjustment.

3.5.3.13 Emergency Release Mechanism. An emergency release mechanism shall be provided. The activator shall be 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); the front yoke and collar shall remain attached to the front piece.

3.5.3.14 Inner Elastic Waistband. When the emergency release mechanism is activated both left and right pieces of the inner elastic waistband shall separate from the vest. Neither side shall be permanently attached to the base vest.

3.5.3.15 Emergency Release Anchor Webbing. The 1" webbing components used to attach the side plate carriers and internal elastic waistband to the base vest shall be no more than 1.25" +0"/-.25" in height.

3.5.3.16 Emergency Release Cable Channel. A channel for routing the quick release cable from the handle pocket on the front of the vest to the rear shoulder attachment points shall be constructed from two pieces of 1.5" webbing. The pieces shall be sewn together to provide a continuous channel for the quick release cable. The channel shall be attached on the line where the Front Release Handle Cover meets the Front Right Channel Cover to allow only the cable to be inserted while preventing the cable handle from being pulled into the channel. The channel shall extend 4" ± 1/8" beyond the edge of the Front Right Channel Cover.

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

- a) The IOTV base vest component and ballistic panel subcomponent shall have a combination of size, identification, serial number, and ballistic protection level and instruction label for the entire IOTV system.
- b) The instruction label shall include do's and don'ts for use and cleaning instructions, and donning/doffing instructions for the entire IOTV system.
- c) The instruction label shall be located on the inside of the back of the base vest. The size of the label shall be 4.5 inches wide by 7.75 inches high. The type shall be no smaller than 10 point and shall be in accordance with MIL-DTL-32075, Type VI, Class 14. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors. Contents of labels shall be as found in 6.6.
- d) The modular components; front yoke/collar assembly, back yoke/collar assembly, right and left side plate carriers, right and left internal elastic band, cable assembly, lower back

protector assembly, groin protector assembly, deltoid protector assembly and ballistic panels are also to 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. Camouflage color will be specified in the contract. See Appendix A, Table IV for individual piece colors. The contents of the labels shall be as found in 6.6.

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

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

1. Color: Label/Tag will be black with white Human Readable and Machine Readable Information (HRI) and (MRI).
2. HRI shall consist of: Commercial and Government Entity (CAGE) code of activity applying the tag/label, Lot Number, Serial Number, Date of Production, National Stock Number (NSN) and Design Code. HRI will meet requirements of the latest version of MIL-STD-130.
3. MRI shall consist of one ECC 200 compliant Data Matrix code containing: CAGE code of activity applying the tag/label, Lot Number, Serial Number, Date of Production, NSN, and Design Code. The tag/label shall comply with the latest version of MIL-STD-130, ANSI MH10.8.2, and Items #4 and #5 below. To prevent automated read errors, the Government will not allow other 1D or 2D codes to be printed on this label. This does not restrict contractor from using other HRI and MRI on labels not associated with the UID label/tag.
4. Data Matrix Construct: The Data Matrix shall be encoded per MIL-STD-130 using only the data identifiers (DI) and criteria shown below. The following DI sequence shall be maintained in the order listed below:

Cage=17V followed by cage code

Lot=1T followed by lot number

Serial number=S followed by serial number

Date of production = 16D followed by production date, YYYYMMDD

National stock number=N followed by the NSN.

Part number = 1P followed by design code (the design code may be up to 13 alphanumeric characters (plus only dashes “-” as special characters))

Construct Example:

[>RS06GS17V52969GS1TE034GSS328185GS16D20080215GSN8470-01-520-7370GS1PABC-123RSEOT

5. Data Matrix Geometry: Data Matrix codes shall be a square ECC200 matrix per ISO 16022. Individual Cell size (element size) of the code shall be between 0.020 and 0.023

inches. A quiet zone of 0.5 inches of Black label/tag material is required around the Data Matrix code.

6. Verification: Data Matrix code quality will be graded to ISO 15415 with a certified verifier and meet a minimum passing grade per the latest release of MIL-STD-130. AS9132 and AIM DPM grading platforms will not be allowed for this project. Contractor must provide the contracting officer with at least two verification reports per ballistic panel for each FAT and LAT. If using laminates or overcoats the label must be verified after placing the laminate or overcoat on the label or tag. No exceptions are allowed. Proof of Verification is subject to inspection at the time of shipment.
7. Validation: Validation checks of the UID must be performed on a routine basis. Contractor is responsible for encoding the UID per above guidelines (#4 and 5) and the latest revision of MIL-STD-130. Proof of Validation is subject to inspection at the time of shipment.
8. Placement of the UID label/tag: The data label shall be centered horizontally and placed immediately below the loop material in the lower center section of the vest on the side opposite the strike face.

3.7 SAPI Pocket. The IOTV SAPI 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 SAPI, ISAPI, ESAPI, or the XSAPI (see paragraph 2.2) to be easily and quickly inserted into and removed from the vest without struggle or force (see paragraph 4.7.1, End Item Fit Examination).

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

4. VERIFICATION

4.1 Classification of Inspections. The inspection requirements specified herein are classified as outlined below. Unless otherwise specified, the contractor is responsible for the performance of all inspection requirements specified herein. The Government reserves the right to perform any of the inspections set forth where such inspections are deemed necessary to ensure the supplies conform to prescribed requirements.

- a) First article inspection (see 4.2)
- b) Conformance inspection (see 4.3)

4.2 First Article Inspection. When a first article is required, it shall be examined for design (3.3), compatibility and interchangeability of components, inspection requirements in 4.5, ballistic data for all test conditions 4.6.1.1, data, certificate, or compliance for testing requirements in 4.6 and 4.7, and overall workmanship (see Appendix C, Tables I-A and I-B).

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

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

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

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

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

4.4. Demonstration Verification. The performance requirement is verified by observation and operation that the properties, characteristics and parameters of the item meet the functional requirements specified in applicable paragraphs of Section 3. Pass or fail criteria are simple accept or reject indications of functional performance since no qualitative values exist or are difficult to measure (see Appendix C, Table I-B), therefore, conformance testing will be limited to verification of components-subcomponents locations, and finished dimensions.

4.5 Requirements and Verifications. Appendix C, Tables I-A and I-B delineate performance requirements verified through visual methods, including physical measurements in order to determine that no deficiencies exist.

4.5.1 End Item Visual Inspection. The end items shall be inspected for the defects listed in Appendix C, Table II. The lot size shall be expressed in units of vests or the individual components (when component is purchased separately). The sample unit shall be one completely fabricated vest or individual component.

4.5.2 End Item Dimensional Inspection. The end items shall be inspected for finished measurements (see Appendix C, Table III). The lot size shall be expressed in units of vests or individual components.

4.5.2.1 Linear Measurements. Front and back center measurements are taken along the center line by holding the garment taut with a metal measuring device and measurements taken to the nearest 1/16 inch. Front and back width, and webbing hanger's measurements are taken in a flat, relaxed state, with a metal measuring device and measurements taken to the nearest 1/16 inch. 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.

4.5.3 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 percent inspected by vendor during the cutting process to determine that parts containing defects such as a hole, cut, are removed from production. Ballistic fillers shall be 100 percent inspected by vendor during the assembly of the individual groups to assure that they contain the correct number of plies, that no individual plies are pieced and they are marked correctly as to the size and number of plies. In addition to the above, inspection shall be made of working patterns to assure that they conform to government patterns in all respects. Whenever nonconformance's is noted, correction shall be made to the item or items affected. Parts that cannot be corrected shall be removed from the production.

4.5.4 In-process Visual Examination of Ballistic Filler Assemblies for Size. Appendix C, Table IV provides visual examination criteria for ballistic filler. The lot shall be expressed in units of front or back ballistic fillers, groin protectors, lower back protectors, and collar assemblies. The sample unit shall be one ballistic filler.

4.5.5 Area of Coverage. Square inches of coverage are measured by digitized patterns and comparison to working patterns. For First Article Testing one non-sewn mock up of each size yoke and collar assembly shall be provided for examination.

4.5.6 Weight. The IOTVs will be examined for weight by component. See max weights in Appendix A, Table VI-A. Weights are taken on a tared scale and measured to the nearest 0.01 pound. Areal densities are measured in accordance with ASTM D-3776 except units shall be expressed in lb./sq.ft.

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

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

4.5.9 Infrared Reflectance. Spectral reflectance shall be evaluated initially and after laundering in accordance with Appendix A, Table IV-A. The accelerated three laundering shall be performed using AATCC 61 Test No. 1A; except a 4 gram sample size shall be used unless the amount needed to provide the required five layers of the specimen for testing is larger (the specimens of webbing or tape need to be 4 inches long). When evaluating the camouflage printed cloth, webbing, or tape each color shall be tested separately. Also AATCC Standard Reference Detergent without optical brightener shall be used. Spectral reflectance, initially and after laundering, will be obtained from 600 to 860 nanometers (nm), at twenty (20) nm intervals on an integrating sphere spectrophotometer or a spectroradiometer. The calibration of the instrument shall be traceable to the National Institute of Standards and Technology Perfect Reflecting Diffuser Calibration as stated in a Certificate of Traceability supplied by the instrument calibration standards. The spectral bandwidth shall be less than 26 nm at 860 nm. Reflectance measurements may be made by either the monochromatic or polychromatic mode of operation. When the polychromatic mode is used, the spectrophotometer shall operate with the specimen diffusely illuminated with the full emission of a source that simulates either CIE Source A or CIE Source D65. Measurements will be taken on a minimum of 2 different areas and the data averaged. The specimen shall be viewed at an angle no greater than 10 degree from normal, with the specula component included. Photometric accuracy of the spectrophotometer shall be within 1 percent, and wavelength accuracy within 2 nm. The standard aperture size used in the color measurement device shall be 1.0 to 1.25 inches in diameter unless the size of the item dictates a smaller aperture is required. When the measured reflectance values for any color at four or more wavelengths do not meet the limits specified in Appendix A, Table V, it shall constitute a test failure.

4.5.10 Accelerated Laundering Test. The test procedure shall be as follows using the equipment cited in AATCC 61 Test No. 3A. Add 50 ml of type II P-D-245 detergent solution (0.5 percent by weight detergent solution) along with the 100 stainless steel spheres to the steel canister and close tightly. Place the stainless steel cylinder in a preheated Launder-Ometer set at a water bath temperature of 160 +/- 5 degree F. Agitate the cylinder for 45 minutes maintaining a constant temperature. At the end of the laundering cycle, remove the specimen from the cylinder and rinse thoroughly in a beaker or in running tap water at 100 +/- 5 degree F for one minute with occasional stirring or hand squeezing. Remove excess water by squeezing in hand (not extracting) and then dry the specimen in an automatic dryer set on permanent press cycle, 150 – 160 degree F for fifteen minutes. The specimen shall be compared to the original sample (unlaundered) in accordance with AATCC evaluation procedure 1 and 2 for evaluation of Gray Scale for Color Change and Staining.

4.5.11 Resistance to POL, insect repellent, sweat, and sea water after one laundering. IOTV outershell carrier cloths shall be tested, after one laundering per 4.5.12, and after exposure to each DEET, POLs; motor oil, gasoline and weapon lubricant, sweat, and sea water for hydrostatic resistance in accordance with AATCC TM 127. A specimen for each test liquid (i.e.,

DEET, motor oil, etc) shall be 8 inches by 8 inches. The specimen shall be laid flat, face side up, on a glass plate, 8 inches by 8 inches by 1/4 inch and three drops of each test liquid shall be applied to the center of the specimen. A glass plate the same dimensions shall be placed on the specimen and a four pound weight placed in the center of the glass plate assembly. After 16 hours, remove the specimen and test immediately for hydrostatic resistance. DEET test liquid shall be diethyltoluamide (O-I-503 Type II, Concentration A). The motor oil shall conform to ASTM D-4485, Grade CD-II. The weapon lubricant shall conform to MIL-PRF-63460 or commercial Break Free CLP, Santa Ana, CA or equal. The perspiration solution shall be made up in a 500 ml glass beaker by combining 3.0 grams sodium chloride, 1.0 gram of trypticase soy broth powder, 1.0 gram normal propyl propionate, and 0.5 gram liquid lecithin. Add 500 ml of distilled water, add a magnetic stirring bar, and cover the beaker. Place the beaker on a combination hot plate/magnetic stirrer apparatus. While stirring, heat the solution to 50 degree C until all ingredients are dissolved. While stirring, cool the solution to 35 degree C, remove cover, and dispense immediately with pipette or other suitable measuring device. Dispense 2 ml of perspiration solution at 35 degree C onto the center of an 8 inch by 8 inch by 1/4 inch glass plate. Place an 8 inches by 8 inches specimen face up. Dispense an additional 2 ml of perspiration solution onto the center of the specimen. A glass plate (do not rinse) of the same dimensions shall be placed on the specimen and a four pound weight placed in the center of the glass plate assembly. After 16 hours, remove and air dry specimen before testing for hydrostatic distance. See 4.6.1.1.1 for sea water formulation and sample preparation shall be the same as perspiration.

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

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

4.5.14 Flame Resistance. All materials tested shall be tested in accordance with ASTM D 6413 in both the warp and fill directions.

4.5.15 Ballistic Filler Abrasion Resistance. Testing shall be performed in accordance with ASTM D-3886 with the following exceptions: When a woven material is part of the ballistic layer system, it shall be used as the abradant mounted on the surface abrasion head; both the face and back of the test specimen shall be evaluated; the diaphragm shall be inflated to 4.0 psi with a

5.0 lb load. The abraded specimen shall be visually examined and rated according to the following criteria.

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

4.6 Ballistic Performance. First Article Testing will be conducted on 15 x 15 inch shoot packs of the proposed ballistic material system. Lot Acceptance Testing will be conducted on the end item constructed of the approved ballistic material system (see 6.4). Failure to meet the requirements of any sub-test will constitute failure for the entire First Article Test or Lot Acceptance Test.

4.6.1 Ballistic Testing. General procedures and requirements are provided in 4.6.2 (see 6.5 for definitions).

4.6.1.1 Conditions. Dry specimens and specimens after; wet, hot temperature, cold temperature, accelerated aging and POL conditioning will be ballistically tested as specified in 3.5.2.2. Dry condition is the standard test condition specified in 4.6.2.3. All non-ballistic components of the ballistic material system (i.e.; outer shell and inner lining) shall be laundered as specified in 4.5.10 prior to assembling test panels to simulate a worn condition. All specimens will be visually inspected after conditioning for coloration, distortion, melting, cracking, or other physical defects and noted.

4.6.1.1.1 Wet Condition. Sea water shall be utilized for wet test conditions. Sea water formulation is 3% sodium chloride/0.5% magnesium chloride. The wet condition is achieved by completely submerging the IOTV system in sea water at 70 +/- 10 degree F for 24 hours. The specimens are submerged such that the fluid is in contact with all exterior surfaces to allow maximum fluid penetration. A ten pound weight shall be placed on a 15" x 15" plate to distribute load to allow for maximum fluid penetration. Excessive water will be drained from the specimen by hanging vertically for 15 minutes and tested within 5 minutes with tests completed within 60 minutes.

4.6.1.1.2 Temperature Extremes Condition. For hot temperature extreme, the IOTV system shall be heated in an oven operating at 155 + 10 degrees Fahrenheit for 6 +/- ¼ hours continuously. The test specimen shall be removed from the oven, mounted and ballistically tested as specified in 4.6.3. For cold temperature extreme, the test specimen shall be cold temperature exposed to -60 +/-10 degree F for 6 +/- ¼ hours continuously. The test specimen shall be removed from refrigeration, mounted and ballistically tested as specified in 4.6.3, within 10 minutes with tests completed within 60 minutes. If the test is not completed within 60 minutes the specimen shall be reconditioned for at least 1 hour at the temperature specified above.

4.6.1.1.3 Accelerated Aging. Accelerated aging for the IOTV and/or subcomponents will be performed in general accordance with ASTM D1149, with the following modifications. The entire IOTV or subcomponent under test will be subjected to treatment. All tested components

will be conditioned for 72 hours at 40°C while maintaining a minimum of 50 parts per hundred million of ozone. The IOTV and/or subcomponents do not require any additional tensile strain during accelerated aging conditioning. After accelerated aging conditioning, the IOTV and/or subcomponents under test must remain at ambient atmospheric conditions for a minimum of 24 hours prior to ballistic testing, not to exceed 36 hours from completion of conditioning. Verify that the conditioned specimens perform as specified in 3.5.2.2.

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

4.6.2 Ballistic Test Criteria. For all Protection Ballistic Limits (BL); V50, Vs/Vr, and V0 acceptance tests the following minimum information is required by the government to validate performance;

- a) Armor specimen description including exact materials, thickness, and areal density of armor system or ballistic system nomenclature, and sizes and weights of all components.
- b) Conditioning of armor specimen.
- c) Test projectile with exact nomenclature.
- d) Temperature and humidity measurements.
- e) Yaw angle.
- f) Angles of target obliquity.
- g) Velocity measurements of each test shot used to test the armor (regardless of whether that particular velocity was used in the V50 or V0 determination).
- h) Velocity loss and/or corrected striking/residual velocity. Strike velocity shall be used for ballistic requirements
- i) PP (Partial Penetration) and CP (Complete Penetration) next to each shot velocity as determined.
- j) Angle of spall/debris ejection if applicable.
- k) Name of company performing tests.
- l) Type of gun barrel, caliber, and propellant used
- m) Range measurements including distances from gun barrel to velocity measurement devices and target.
- m) Calculated Ballistic Limit. In a situation where the V50 BL, Vs/Vr or V0 data sheet would compromise the Security Classification Guide for Armor Materials (see 2.2), the data sheet should exclude the specific projectile used during testing.

4.6.2.1 Projectile Velocity Determination. Projectile velocity and time of flight measurements shall be in accordance with ITOP 4-2-805. Instrumental velocity shall be translated into strike velocity at the target and the strike velocity shall be used for ballistic requirements. Projectile

velocity measurement methods shall employ either high velocity lumiline screens or electrical contact screens which either open or close an electric circuit by passage of the projectile through the detector. Contact screens may consist of metallic foils separated by a thin insulating layer, or may consist of a circuit printed on paper with the circuit spacing such that the projectile passing through the screen will break the circuit. An electric counter type chronograph measuring to the nearest microsecond or as a minimum to the nearest 10 microseconds will be used with these measuring devices. As an alternative radiographic equipment calibrated to capture the projectile at various time intervals of flight can be used. For all projectiles, velocity correction methodology shall be used to calculate the actual striking velocity and, where appropriate, actual residual velocity.

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

4.6.2.3 Environmental Test Conditions. All ballistic tests shall be performed as closely as possible to a standard atmosphere of 68 +/- 10 degree Fahrenheit and 50 +/- 20% relative humidity. Temperature and humidity measurements shall be recorded before the beginning of days test firings and every two hours thereafter.

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

4.6.3 V50 BL Calculation. V50 will be determined in accordance with MIL-STD-662F and ITOP 4-2-805. For First Article Testing (FAT) and Lot Acceptance Testing (LAT), three (3) Partial Penetration (PP's) and three (3) Complete Penetrations (CP's) within a 125 ft/sec velocity spread or five (5) Partial Penetration (PP's) and five (5) Complete Penetrations (CP's) within a 150 ft/sec velocity spread yield the V50 BL determination that will be accepted. For LAT the test shall conclude immediately upon obtaining a valid 3/3 and shall only use a 5/5 when a 3/3 cannot be obtained. If a 5/5 V50 cannot be obtained with available samples then logistic regression may be used to determine V50 for FAT.

4.6.3.1 PP and CP Determination for V50. Complete and partial penetrations will be determined based on the impressions left on an aluminum witness sheet. A 0.020 in. (0.051 mm thick 2024 T3 sheet of aluminum) will be placed 6 + 1/2 in. (152 + 12.7 mm) behind and parallel to the target. The aluminum witness sheet will be at least 15 x 15 in. size and be of sufficient size to capture all fragments resulting from the ballistic event, mounted rigidly around its perimeter and placed so that the target impact location is approximately at the center of the aluminum sheet. The following test conditions apply:

- a) Test samples should be 15.0 x 15.0 inch square size panels and configured in the proposed final armor material system for the First Article Testing Only (see 6.4).
- b) IOTV Vest panels configured in the armor material system approved under the First Article shall be used for Lot Acceptance Testing.
- c) For all size test panels a metallic (approx. 0.20 inch thick aluminum or steel) frame with minimum 1.4 inch width shall be employed to restrain the test material during ballistic impact.
- d) The test panel will be sandwiched between 2 frames and restrained with mechanical or pneumatic clamping devices at each of the four corners of the frame.
- e) The restraining frames will be cut so that a ballistic window with minimum sizing of 12.0 x 12.0 inch square will be used for FAT.
- f) Shot spacing shall be measured on center of impact point.
- g) All shots shall be at least 2.5 inches from any edge of the samples. When the size of a piece (yoke, collar, lower back protector) is too small to allow edge requirement to be met shots will be placed within .25" of the centerline of the piece to maximize impacted area. Spacing between shots must still be maintained for small pieces.
- h) Test shots shall be sufficiently spaced so that sequential shots are not influenced by previous impact areas. A minimum shot spacing of 2.5 inch is required. Closer shot spacing data shall be permitted in the event a failure does not occur, but 3.0 inch is recommended when testing against handgun projectiles
- i) Depending on the test panel size it may be necessary to use 2-3 panels for the V50 determination.
- j) Test specimens shall be reconditioned to a smooth shape after every shot.

4.6.3.2 Vs/Vr and V50 Test Sample Mounting. Restraint is required during testing so that the material is not pulled through the ballistic test window frame. Unrestrained or improperly restrained materials tend to be pulled down the projectile line of flight. Restraint provides for more accurate and reproducible data if applied consistently. Unless otherwise stated the following conditions shall be performed during V50 testing. The armor test sample shall be secured on the test target mount with the impact side at the appropriate angle to the line-of-flight of the projectile. The frame supports, clamps or mounting fixtures must be capable of retaining the sample and withstanding shock resulting from ballistic impact by the test projectiles. The test sample mount shall be capable of adjustment of moving the sample in the vertical and horizontal directions so that the point of impact can be located anywhere on the sample and so that appropriate degree obliquity impacts can be achieved anywhere on the sample. The test sample mount shall be capable of rotating on the vertical or horizontal axis so that various obliquity attack angles can be achieved.

4.6.4 Vs/Vr Testing. The Vs/Vr testing is for Government reference only and is done by starting at the upper end of the velocity spectrum and working down to below the V50. Starting velocities are provided in Appendix D, Table III. Testing is performed at 0 degrees and 45 degrees obliquity for all RCC fragmentation projectiles. Both the striking velocity (Vs) and the residual velocity (Vr) of the projectile must be measured. Yaw of the striking projectile should be measured for all shots. Approximate starting velocities are listed below. From the starting velocity subsequent shots are taken at approximately 400 - 500 ft/sec increments down to below the V50 where there are no longer any complete penetrations. Additional shots are then taken above and below the V50, in a similar manner to standard V50 test methodology, to characterize

the performance of the armor system in this area. This testing will require between 15 and 20 valid shots for each size RCC. Approximately half of the shots should be in the regime between the starting velocity and just above the V50. Shots that would not be considered valid include: excessive yaw of the striking projectile; incomplete measurement of the residual velocity of a complete penetration; impacts at incorrect obliquity; or impact closer than 2.5 inch to any previous impact.

4.6.5 V0 Determination for Acceptance. Instrumental velocity shall be translated into strike velocity at the target and the strike velocity shall be used for ballistic requirements. For V0 or full protection (no complete penetrations), a minimum velocity (muzzle plus 50 ft/sec) will be the requirement. The following conditions apply; No complete penetration at the maximum specified shot pattern specified is the minimum requirement. Closer positioning of shots without complete penetration is a desired requirement.

- a) Test samples should be 15.0 x 15.0 inch square size panels and configured in the proposed final armor material system for the First Article Testing Only (see 6.4).
- b) IOTV Vest panels configured in the armor material system approved under the First Article shall be used for production lot testing.
- c) Samples will be mounted on clay block described below (see 4.6.5.2).
- d) The first shot will be $2.75 \pm 1/4$ " inch from any edge.
- e) The next shot shall be located 3.5 inch $-0/+1/2$ " from the first shot and at the weakness point in the configuration, e.g.; seamed area or non-uniform area of design.
- f) The third shot location should be positioned 3.5 inch $-0/+1/2$ " from any of the 2 previous test shots.
- g) The fourth and fifth shots shall be located 3.5 inch $-0/+1/2$ " from any previous test shots and tested at 30 degrees obliquity.
- h) The transient deformation shall be measured (see 4.6.5.1) after the third and fifth valid test firings.
- i) Test shots should be staggered at least 0.50 inch off the horizontal and vertical lines of any previous shots. Shot location will be measured as the impact point on the strike face of the sample.
- j) Test specimens shall be reconditioned to a smooth shape after every shot.

4.6.5.1 Transient Deformation Measurement. The back of the armor test specimen will be attached to a block of non-hardening, oil-based molding clay so that no movement of the test samples occurs before, during or after the ballistic impact. The test fixture containing the clay backing material shall be in the form of a single block at least 4.0 in. thick and 24 x 24 in. length and height. The clay backing material shall be conditioned in its fixture, using a heated chamber or enclosure. Conditioning time, temperature, and corresponding drop test performance may change as a function of backing material age and usage. Actual conditioning temperature and recover time between uses will be determined by drop test results. Additional clay, conditioned to the same initial temperature as the fixture, shall be used to fill voids and restore the front surface of the backing material as needed. The clay consistency should be such that depression of 25mm (± 3 mm) in depth is obtained when a 1 kg (± 10 gm) (2.2 lb ± 0.35 oz) cylindrical steel mass, 44.5mm (± 0.5 mm) (1.75 ± 0.02 in) in. diameter and having a hemispherical striking end is dropped from a height of 2 m (± 2 cm) (6.56 ft ± 0.07 ft) onto one of its square faces. The specimen will be strapped or taped to the surface of the clay material. Ballistic testing will be

performed at 0 degrees obliquity and 30 degree obliquity. Back-face deformations in the clay will not exceed 44.0 mm. when measured from the original undisturbed surface of the backing material to the lowest point of the depression. The specimen may be smoothed between shots. BFD measurements will be taken utilizing a certified, calibrated laser scanner measurement instrument, which provide a means to accurately measure the difference between the original undisturbed clay surface and the deepest point of BFD signature. The perpendicular distance between the original surface and the deepest point of depression, with reference to the original undisturbed surface, will be measured after the test record shot impact. The laser scanner measurement instruments shall be certified by ATEC and use a software package capable of meeting the following requirements:

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

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

Deformations will be recorded in mm to the nearest tenth digit following standard ASTM E29 “Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications” (“Fiveeven” rule)(Rounding Method) (i.e. 43.050 = 43.0, 43.051 = 43.1 and 47.950 = 48.0).

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

4.6.5.3 Test Continuation. For V0 testing any shot with a velocity over 1450 ft/s will be considered invalid. Testing will continue and subsequent shots will be considered valid as long as no striking velocity exceeds 1475 ft/s. If a shot exceeds 1475 ft/s the test will be continued on a new panel.

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

fabric subcomponents may be tested. These results are then used to calculate an overall system flexibility as follows:

$$\text{System Stiffness} = \sum \left[\frac{G_{i, \text{warp}} + G_{i, \text{fill}}}{2} \right] \times \text{Layers}_i$$

Where:

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

The System stiffness shall be less than 225 cm-g when calculated as above.

Example Calculation:

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

Material A:	Material B
$G_{A, \text{warp}} = 4.000 \text{ cm-g}$	$G_{B, \text{warp}} = 7.000 \text{ cm-g}$
$G_{A, \text{fill}} = 6.000 \text{ cm-g}$	$G_{B, \text{fill}} = 8.000 \text{ cm-g}$

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

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

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

4.7.1 Insertion Demonstration. One barehanded person shall demonstrate insertion of the ESAPI into both IOTV pockets without tools or special aids. An insertion demonstration shall be performed with Mock ESAPI's conforming to drawings 2-6-0588, 2-6-0589, 2-6-0590, 2-6-0591 and 2-6-0592 and the maximum thickness requirement. The examination shall be performed with an ESAPI in each pocket. The pocket flaps shall be closed and secured. It shall be possible to insert and remove in the pocket without effort. A defect shall be scored if any Insert must be forced into or removed from the pocket, or if excessive force is needed to secured the flap.

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

4.8 Drag Strap Seam Strength. Testing shall be accomplished using a constant rate-of-extension test apparatus capable of accurately measuring loads up to $1,000 \pm 2 \text{ lb}$. The sample (an actual vest or representative back panel only, as appropriate) shall be firmly clamped across its full width to the base of the test apparatus using a steel bar or other device capable of completely restraining the sample during testing. The clamp shall be placed parallel to, and within 0.25 in of the bottom of the drag strap (i.e., on the SAPI pocket flap). The center of the drag strap shall be

directly in line with the center of the load cell and pulling head. The drag strap shall be affixed to the load cell and pulling head through a loop of 1-in webbing (A-A-55301 Type VI) having a gage length of 12 ± 1 in. A preload of 1 lbf shall be applied prior to the start of testing. The load cell and pulling head shall be advanced at a constant rate of 2 in./min until failure. The following minimum data shall be recorded: Extension and Load at first-stitch failure (if applicable), Extension and Peak Load; Mode of Failure (i.e., seam failure, fabric tear-out; handle break).

5. PACKAGING

5.1 Packing. For acquisition purposes, the contract or order shall specify complete packaging requirements. When DOD personnel perform material packaging, those personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. The Inventory Control Point packaging activity within the Military Department of defense Agency, or within the Military Department's Systems Command, maintains packaging requirements. Packaging data retrieval is available from the managing Military Department's or defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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

6.1 Intended Use. The multiple threat body armor is a modular body armor providing multiple levels of ballistic protection depending on the system configuration. The Outer Tactical Vest (IOTV) provides protection from conventional fragmenting munitions and 9mm handgun. The area of protective coverage of the body is dictated by the number of modular components worn to extended coverage. IOTV protection is increased to protect vital organs from multiple hits against small arm rifles and indirect fire flechette when front and back small arms protective inserts are worn.

6.2 Acquisition Requirements. Acquisition documents should specify the following:

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

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

6.4 Simulant/Surrogate Shoot-Pack. A Simulant/Surrogate Shoot-Pack system of IOTV body armor may be used to represent the ballistic resistant materials of the IOTV. All surrogate shoot pack systems will consist of (1) a base vest ballistic filler packet and (2) a ballistic filler carrier with insert pocket. A yoke shoot pack shall additionally include (3) a yoke ballistic filler packet.

The ballistic filler packet for IOTV base vest will be 15 x 15 inches in size consisting of X plies proposed ballistic material system used in IOTV base vest (see 3.3.1.7 and 3.5.2.1.2). The

ballistic packet will be stitched diagonally across the 4 corners with a 5-inch line of 50 TEX Aramid thread at 5 to 10 stitches per inch. When the ballistic filler is an asymmetric system of different materials, the filler packet will be labeled to clearly indicate the strike face from the back face.

The ballistic filler packet for IOTV yoke will be 15 x 15 inches in size consisting of X plies proposed ballistic material system used in IOTV yoke (see 3.3.1.7 and 3.5.2.2.1). The ballistic packet will be stitched diagonally across the 4 corners with a 5-inch line of 50 TEX Aramid thread at 5 to 10 stitches per inch. When the ballistic filler is an asymmetric system of different materials, the filler packet will be labeled to clearly indicate the strike face from the back face.

The ballistic filler carrier will have an insert pocket capable of holding the largest insert stitched on the face fabric. The face fabric and the pocket cover will consist of 500 denier 7.5 oz. / Sq. Yd., urethane back coated, textured nylon, in accordance with GL/PD 10-07 Style G. The insert pocket will be stitched on three sides to the face fabric with nylon or polyester thread. The top edge of the pocket will have a minimum of 5 inches of not less than 0.5 inch wide hook and loop fastener centered and stitched at the top. The ballistic filler carrier back cover will consist of 500 denier, solid green or black colored, 7.5 oz. / Sq. Yd. urethane back coated, textured nylon, in accordance with GL/PD 10-07 Style G. The front and back filler carrier covers will be stitched together on 3 sides with nylon or polyester thread to form a pocket to hold the ballistic filler packet(s). The fourth side will remain unstitched but will have a minimum of 5 inches of not less than 0.5 inch hook and loop fastener centered and stitched to the top. Each ballistic filler carrier will be individually serialized and clearly labeled to indicate the strike face.

For yoke shoot-packs, insert the yoke ballistic filler packet to the back cover of the ballistic filler carrier and have the base vest ballistic filler packet adjacent to the front of the carrier.

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

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

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

Complete Penetration (CP) for V50 Testing. A complete penetration occurs when the impacting projectile or any fragment thereof, or any fragment of the test specimen perforates the witness plate resulting in a crack or hole which permits light passage when a 60-watt, 110-volt bulb is placed behind the witness plate.

Complete Penetration (CP) for Acceptance Testing. A complete penetration will have occurred when the projectile, fragment of the projectile or fragment of the armor material is imbedded or passes into the clay backing material used to measure transient deformation. Paint or fibrous

materials that are emitted from the back of the test specimen and rests on the outer surface of the clay impression are not considered a complete penetration.

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

Areal Density (AD). A measure of the weight of the armor per unit area, usually expressed in pounds per square foot (lb. /ft²) or kilograms per square meter (kg/m²) of surface area.

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

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

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

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

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

APPENDIX A – MATERIAL PROPERTIES FOR IOTV SUBCOMPONENTS

Table I. Cloths: Outer and Inner Shell Carrier (see 3.2.1)

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

Table II. Foam Characteristics (see 3.2.8)

Characteristic	Requirement
Density	3.6 – 7.3 lb/cu.ft
Thickness	0.125 inch
Compression Strength @ 25% deflection @ 50% deflection	10 psi 20 psi
Elongation at Break	150% (min)
Tear Resistance	17 lb/inch (min)

Table III. Individual Repairs (see 3.4.3)

Qty/kit	Description
25	Ladderloc: Buckles used on back panel (para. 3.2.15)
25	Shoulder Buckle (para. 3.2.17)
10	Cable Assembly - X-Small to Small
10	Cable Assembly – Medium to Large Long
10	Cable Assembly – X-Large to X-Large Long
10	Cable Assembly – 2X-Large to 4X-Large
25	Loop, 1 1/8" X 3/16" X .120 (para. 3.2.19)
25	Slide, 25MM (para. 3.2.20)
25	Slide, Tri/Glide, Bowed, 2" (para. 3.2.21)
50	Outer Shell Field Repair Patch – Type I (para. 3.2.24)
50	Outer Shell Field Repair Patch – Type II (para. 3.2.25)
50	Outer Shell Cleaning Foam System (para. 3.2.26)

Table IV. Camouflage Shades (see 3.4.5)*

COMPONENT(S) OR PART(S)	UNIVERSAL	MultiCam
(1) Outer Shell: Base Vest Collar Lower Back Protector Groin Protector Deltoid Protector Side Plate Carrier Side Plate Pocket	3 Color Pattern: Desert Sand 500 – Ground Shade Foliage Green 502 Urban Gray 501	Cream 524 Tan 525 Pale Green 526 Olive 527 Dark Green 528, Brown 529 Dark Brown 530
(2) Inner Shell: Base Vest Inner Lining Cloth Collar Material Cloth Spacer Mesh	Foliage Green 504	Tan 499
(3) Ballistic Panel Cover	Foliage Green 504	Foliage Green 504
(4) Binding Tape Webbing (para 3.3.1.15)	Universal Camouflage Pattern	MultiCam
(5) Hook & Loop Fastener Webbing (para 3.3.1.16-20) Elastic Thread Labels	Foliage Green 504	Tan 499
(6) Webbing (para 3.3.1.14)	Tan 380 or Desert Sand 503	Foliage Green
(7) Hardware Buckles Snaps	Foliage Green 504	Tan 499

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

Table V-A. Infrared Reflectance Requirements (percent) (see 3.4.6)

Wavelengths	Universal Camouflage						MultiCam					
	Desert Sand 500		Urban Gray 501		Foliage Green 502		Cream 524 Tan 525		Pale Green 526 Olive 527 Brown 529		Dark Green 528 Dark Brown 530	
Nanometers	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
600	28	40	12	26	8	18	22	44	10	30	3	12
620	30	42	14	26	8	18	24	45	11	30	3	12
640	34	48	14	28	8	20	24	45	11	32	4	12
660	38	56	14	30	10	26	25	45	12	32	4	13
680	44	60	18	34	10	26	28	48	14	35	4	18
700	46	66	24	38	12	28	28	54	19	40	6	25
720	48	68	26	42	16	30	30	58	22	43	6	27
740	48	72	30	46	16	30	32	60	25	46	10	29
760	50	74	32	48	18	32	36	61	27	48	14	33
780	54	76	34	48	18	34	38	62	28	50	18	36
800	54	76	34	50	20	36	40	62	29	50	20	37
820	54	76	36	54	22	38	44	65	30	51	20	38
840	56	78	38	54	24	40	46	66	32	51	21	39
860	56	78	40	56	26	42	48	67	33	52	21	40

Table V-B. Infrared Reflectance Requirements (percent) (see 3.4.6)

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

Table V-C. Infrared Reflectance Requirements (percent) Tan 380 and Desert Sand 503 (see 3.4.6)

Wavelengths Nanometers (nm)	Tan 380		Desert Sand 503	
	Min	Max	Min	Max
600	28	40	28	40
620	30	42	30	42
640	32	48	34	48
660	34	54	38	56
680	40	58	44	60
700	42	60	46	66
720	42	60	48	68
740	44	62	48	72
760	44	62	50	74
780	46	64	54	76
800	48	64	54	76
820	48	64	54	76
840	48	64	56	78
860	50	66	56	78

Table V-D. Infrared spectral reflectance requirements for Acetal Hardware (see 3.4.6)

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

Table VI-A: Maximum IOTV Component Weights; Lbs. (see 3.5)

Finished Component	X-Small	Small	Medium	Medium-Long	Large	Large-Long	X-Large	X-Large-Long	2X-Large	3X-Large	4X-Large
Base Vest Assembly: Outer Base Vest Carrier & 2 Ballistic Panels	9.61	9.93	10.56	11.30	11.72	11.99	12.78	13.31	14.32	16.60	16.97
Front Yoke and Collar Assembly: Carrier and 2 Panels	0.84	0.85	0.87	0.87	0.89	0.89	0.91	0.91	0.92	0.94	0.96
Back Yoke and Collar Assembly: One Size Carrier and 2 Panels	0.60	0.62	0.65	0.65	0.68	0.68	0.71	0.71	0.74	0.77	0.80
Groin Protector Assembly: 2 Sizes; Carrier and 1 Panel	0.72	0.72	0.72	0.72	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Lower Back (Kidney) Assembly; One Size Carrier and 1 Panel	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Deltoid Protectors (2 each): Three Sizes	2.00	2.00	2.40	2.40	2.40	2.40	2.90	2.90	2.90	2.90	2.90
Total System	14.44	14.79	15.87	16.61	17.23	17.50	18.84	19.37	20.42	22.75	23.17

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

Ballistic Panel	X-Small	Small	Medium	Medium-Long	Large	Large-Long	X-Large	X-Large-Long	2X Large	3X Large	4X Large
Front Panel	305	325	354	379	401	428	444	479	543	610	680
Back Panel	310	333	370	395	415	442	458	495	555	621	689
Back Collar Wide	24	25	26	26	28	28	30	30	31	33	35
Back Collar Narrow.	15	15	16	16	18	18	19	19	20	21	22
Back Yoke	82	86	90	90	94	94	101	101	106	109	111
Front Collar Wide	27	27	27	27	27	27	27	27	27	27	27
Front Collar Narrow	17	17	17	17	17	17	17	17	17	17	17
Front Yoke	57	57	57	57	57	57	57	57	57	57	57
Groin Panel	69	69	69	69	85	85	85	85	85	85	85
Lower Back Panel	52	52	52	52	52	52	52	52	52	52	52
Deltoid Protector	85	85	106	106	106	106	130	130	130	130	130

TABLE VI-C: IOTV Finished Measurements; Inches* (see 3.5)

Size	Center Front Length +/- 1/2"	Front Width +/- 1/2"	Center Back Length +/- 1/2"	Back Width +/- 1/2"
X-Small	17 1/4	25 1/8	18 3/4	24 3/8
Small Regular	17 1/2	26 1/8	19	25 1/4
Medium Regular	18	27 1/8	19 1/2	27 1/4
Medium-Long	19	27 1/4	20 1/2	27 1/4
Large Regular	18 3/4	29 1/8	20 1/4	29 1/4
Large-Long	19 3/4	29 1/8	21 1/4	29 3/8
X-Large Regular	19 1/2	31 1/8	21	31 1/4
X-Large-Long	20 1/2	31 1/8	22	31 3/8
2X-Large	21 1/2	33	23	33 3/8
3X-Large	22 1/2	34 7/8	24	35 3/8
4X-Large	23 1/2	36 7/8	25	37 1/2

* See Para. 4.5.2.1 for measurement directions.

Table VII. Bartack (see 3.5.3.4)

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

Table VIII. Release Cable (see 3.5.3.9)

Vest Size	Short section	Long section
X-Small to Small	25" ± 1/4"	32" ± 1/4"
Medium to Large long	26" ± 1/4"	33" ± 1/4"
X-Large to X-Large Long	27" ± 1/4"	34" ± 1/4"
2 X-Large to 4 X-Large	28" ± 1/4"	35" ± 1/4"

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

Size	Chest Circumference (Inches)
X-Small	29-33
Small	33-37
Medium-Regular and Medium-Long	37-41
Large-Regular and Large-Long	41-45
X-Large-Regular and X-Large-Long	45-49
2-XLarge	49-53
3X-Large	53-57
4X-Large	57-61

APPENDIX B: BALLISTIC PROTECTION REQUIREMENTS

Table I: Base Vest assembly, Groin, Collar, Lower Back, Deltoid Fragmentation Protection; Minimum V50 (see 3.5.2.2)

Fragment Projectile	V50 @ 0 degree DRY: ft/sec	V50 @ 0 degree WET: ft/sec	V50 @ 45 degree DRY: ft/sec
2 gr. RCC	2710	2575	2800
4 gr. RCC	2400	2300	2460
16 gr. RCC	2050	1920	2080
64 gr. RCC	1660	1610	1660
16 gr. RCC; After hot and cold temperatures, accelerated aging	2000	N/A	N/A
16 gr. RCC; After POL	1900	N/A	N/A
17 gr. FSP	1850	N/A	N/A
17 gr. FSP – Collar*	1650	N/A	N/A

* For end items only the collar requirement shall be 1650 in order to compensate for the reduction of the edge spacing requirement in paragraph 4.6.3.1.

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

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

Table III: Handgun Ballistic Characteristics (see 3.5.2.3)

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

APPENDIX C: NON-BALLISTIC REQUIREMENTS AND VERIFICATIONS

Table I-A. Manufacturing Site Conformance Inspection, DCMA (see 4.5)

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	CONFORMANCE Lot Inspection
<i>IOTV Construction</i>	3.5.3	4.3.1 & 4.5.1	X	COC
Stitching	3.5.3.2	4.5.1	X	COC
Automatic Stitching	3.5.3.3	4.5.1	X	COC
Bartacks	3.5.3.4	4.5.1	X	COC
Bartack Alignment for MOLLE Pocket Attachment	3.5.3.5	4.5.1 & 4.5.2	X	X
Buttonholes	3.5.3.6	4.5.1	X	X & COC
Snap setting	3.5.3.7	4.5.1	X	COC
Binding	3.5.3.10	4.5.1	X	COC
Labels	3.6	4.5.1	X	COC

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

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	CONFORMANCE Lot Inspection
<i>Cloth Outer and Inner Shell</i>	3.2.1	4.5	X	COC
Breaking Strength	3.2.1	ASTM D5034, G-E or G-T	X	COC
Dimensional Stability	3.2.1	AATCC 96 Option 1C, A	X	COC
Outershell and Innershell Cloth Abrasion Resistance*	3.2.1	ASTM D 3884*	X	COC
Spray Rating: Initial 1 Laundering	3.2.1	AATCC 22 4.5.12 & AATCC 22	X	COC
Hydrostatic Resistance: Initial After 1 Laundering After 1 Laundering and POL Contamination After 1 Laundering and Insect Repellent After 1 Laundering and Sweat Contamination After 1 Laundering	3.2.1	AATCC 127 4.5.11 & AATCC 127	X	COC

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	CONFORMANCE Lot Inspection
and Sea Water Contamination				
Dynamic Absorption: After 1 Laundering	3.2.1	4.5.12 & AATCC 70	X	COC
Resistance to Organic Liquids: Initial After 1 Laundering	3.2.1	AATCC 118 4.5.12 & AATCC 118	X	COC
Flame Resistant	3.2.1.1	ASTM-D-6413	X	COC
Cloth Collar Material	3.2.2	4.3.1	X	COC
Cloth Ballistic Panel Cover.	3.2.3	4.3.1	X	COC
Cloth Spacer Mesh	3.2.4	4.3.1	X	COC
Webbings and Tapes	3.2.5	4.3.1	X	COC
Elastic	3.2.6	4.3.1	X	COC
Fasteners, Hook and Loop	3.2.7	4.3.1	X	COC
Foam	3.2.8	4.3.1	X	COC
Snap Fasteners	3.2.9	4.3.1 & 4.5.1	X	COC
Polyethylene	3.2.10	4.3.1	X	COC
Cable	3.2.11	4.3.1	X	COC
Cable Sleeves	3.2.12	4.3.1	X	COC
Thread.	3.2.13	4.3.1	X	COC
Fabric Coated	3.2.14	4.3.1	X	COC
Ladderloc	3.2.15	4.3.1	X	COC
Ring	3.2.16	4.3.1	X	COC
Loop	3.2.17	4.3.1	X	COC
Slide	3.2.18, 3.2.19, 3.2.20	4.3.1	X	COC
Design (as described on DD-1222)	3.3	4.4	X	Y/N
Patterns	3.3.1	4.4	X	X
System Performance Requirements	3.4	4.4		
Functional Integration	3.4.1	4.4	X	X
Fungus Resistance	3.4.2	4.5.8	X	COC
Includes Individual Repair Kit (yes/no)	3.4.3	4.4		X
Includes Use & Care Instruction (yes/no)	3.4.4	4.4		X

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	CONFORMANCE Lot Inspection
Camouflage	3.4.5	4.1	X	X
Infrared Reflectance	3.4.6, 3.2.5	4.5.9	X	COC
Matching**	3.4.7	4.5.13	X	COC**
Colorfastness to:	3.4.8	4.1		
Laundering: 3 Cycles	3.4.8	AATCC 61 OPTION IA	X	COC
Accelerated Laundering	3.4.8	4.5.10	X	COC
Light	3.4.8	AATCC 16 OPTION 1 or 3 (Exposure shall be 40 hrs or 170 kilojoules)	X	COC
Crocking	3.4.8	AATCC 8	X	COC
Perspiration	3.4.8	AATCC 15; EXCEPT BOTH ACID AND ALKALINE TEST SHALL BE PERFORMED	X	COC
Area of Coverage	3.5	4.5.3, 4.5.4, 4.5.5	X	COC
Finished Weight	3.5	4.5.6	X	X
Finished Dimensions	3.5	4.5.2, 4.5.3, 4.5.4	X	COC
Areal Density	3.5.2.1.1	4.5.5, 4.5.6	X	COC
Removable Ballistic Panel Subcomponent	3.5.2.1	4.5.1	X	X
Ballistic Filler	3.5.2.1.1	4.5.5 & 4.5.6	X	X
Flexibility	3.5.2.1.2	4.6.6	X	COC
Ballistic Filler Abrasion Resistance	3.5.2.1.3	ASTM D-3886 4.5.15	X	COC
Hook and Loop Fastener	3.5.31	4.5.1	X	X
Buttonholes	3.5.3.6	4.5.1	X	X & COC
Drag Strap	3.5.3.8	4.8	X	X
Release Cable Dimensions	3.5.3.9	4.5.1	X	X
IOTV Drainage	3.5.3.11	4.5.1	X	X (visual only)
Torso Adjustment	3.5.3.12	4.3.1 & 4.5.1	X	X (visual only)
Emergency Release	3.5.3.13	4.5.1	X	X

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	CONFORMANCE Lot Inspection
Mechanism				
SAPI Pocket	3.7	4.4, 4.5.2	X	X (visual only)

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

** Matching verification shall be performed at a government directed lab

Table II. END ITEM DEFECTS (see 4.5.1)

EXAMINE	DEFECT	CLASSIFICATION*	
		MAJOR	MINOR
Cloth	Any hole, cut, or tear.	101	
	Any abrasion marks, broken or missing yarns or multiple floats	102	
	Any mend, darn or patch.	103	
	Needle Chews.	104	
Webbing or Tape	Any hole, cuts, tears, or smash.	105	
	Not firmly and tightly woven, edges frayed or scalloped.	106	
	Multiple floats.		201
	Abrasion mark, slub, or broken end or pick.	107	
	Ends not fused as required.		202
Cabbling	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	
Snap Fasteners	Any fastener not functioning properly i.e., fails to snap closed, provide a secure closure or open freely. NOTE: The fasteners shall be snapped and unsnapped twice to determine whether parts or fasteners separate freely and also affect a secure closure.	111	
	Clinched excessively tight, cutting material.	112	
	Clinched loosely, permitting either component to rotate freely or separate. NOTE: Incomplete roll of end of button or eyelet barrel is evidence of insecure clinching.	113	
	Not specified style or type.	114	
	Splits is button or eyelet		203
	Finish omitted or not as specified.		204
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 stitched joining a seam are broken or when two or more consecutive skipped or runoff stitches occur.	116	
Raw Edges	More than ½ inch when securely caught in stitching. NOTE: Raw edges not securely caught in stitching shall be classified as open seams.		206
Seam & Stitch Type	Wrong seam or stitch type.	117	
Stitch Tension	Tension loose, resulting in loose bobbin or top thread.		207
	Excessively tight, resulting in puckering of material.		208
Bartacks	Any bartack omitted.	118	
	Any bartack not as specified or not in specified location.		209
	Loose stitching, incomplete or broken.		210
Stitching Ends	Not secured as specified.		211
Thread Breaks, Skipped Stitches, or Run-Offs.	Not over stitched as specified. NOTE: Thread breaks or two or more consecutive skipped or run-off stitches not over stitched shall be classified as open seams.		212
Component & Assembly	Any area of ballistic filler bunched (i.e. does not lie flat)	119	
	Any component part omitted or not as specified (unless otherwise classified herein)	120	
	Needle Chews.	121	
	Any mend, darn, patch, holes, splice or other unauthorized repair.	122	
Location Markings	Printed marking more than 1/32 inch in width or not covered by component part.		213
Flexibility	Exceeds specified threshold		214
Label	Missing, incorrect, illegible.	123	
Use & Care Pamphlet	Omitted, printing or figures illegible, any page missing.		215

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

Table III. END ITEM DIMENSIONAL EXAMINATION

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

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

Table IV. Visual Examination of ballistic Filler Size (see 4.5.4)

Examine	Defect	Classification*	
		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/		221
	(2) More than 3/8 inch at any point around the periphery 1/ 2/	125	
	(3) 1/8 inch up to 3/16 inch around entire periphery 2/		222
	(4) More than 3/16 inch around entire periphery 2/	126	
	B) larger than cutting pattern by 3/8 inch or more at any point 1/ 2/		223

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

1/ to be scored when condition exists 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.

APPENDIX D: BALLISTIC PERFORMANCE VERIFICATION

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

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	FAT For Initial Production	EVALUATED BY:
<i>Ballistic Protection Levels</i>	3.5.1	4.1, 4.4, & 4.6	X	
Ballistic Performance	3.5.2	4.6	X	
<i>IOTV Fragmentation Protection</i>	3.5.2.2	4.6	X	
Yoke Frag. Protection	3.5.2.2.1	4.6	X	
Handgun Protection	3.5.2.3	4.6	X	

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

CHARACTERISTIC	REQUIREMENT PARAGRAPH	VERIFICATION PARAGRAPH	LOT ACCEPTANCE TESTING	EVALUATED BY:
<i>Ballistic Protection Levels</i>	3.5.1	4.1, 4.4, & 4.6	X	
Ballistic Performance	3.5.2	4.6	X	
<i>IOTV Fragmentation Protection</i>	3.5.2.2	4.6	X	
Yoke Frag. Protection	3.5.2.2.1	4.6	X	
Handgun Protection	3.5.2.3	4.6	X	

FIRST ARTICLE TESTING PROTOCOL: IOTV First Article testing shall be conducted in accordance with paragraph 4.6 and the following:

Table II. First Article Test Matrix

TEST	Frag, 2gr	Frag, 4gr	Frag, 16gr	Frag, 64gr	Frag, 17gr	9mm Handgun	Need	Spec Para
V50, dry, 0°	X	X	X	X	X		5 shoot pack 5 yoke pack*	3.5.2.2, 3.5.2.2.1 4.6.1
V50, wet, 0°	X	X	X	X			4 shoot pack 4 yoke pack*	3.5.2.2 3.5.2.2.1 4.6.1.1.1
V50, dry, 45°	X	X	X	X			8 shoot pack 8 yoke pack*	3.5.2.2 3.5.2.2.1
V50, high T			X				1 shoot pack	3.5.2.2 4.6.1.1.2
V50, low T			X				1 shoot pack	3.5.2.2 4.6.1.1.2
V50, Accelerated aging			X				1 shoot pack	3.5.2.2 4.6.1.1.3
V50, POL oil			X				1 shoot pack	3.5.2.2 4.6.1.1.4
V50, POL gas			X				1 shoot pack	3.5.2.2 4.6.1.1.4
V50						X	1 shoot pack	3.5.2.3
V0						X	1 shoot pack	3.5.2.3
Vs/Vr, 0°	X	X	X	X			4 shoot pack 4 yoke pack*	4.6.4
Vs/Vr, 45°	X	X	X	X			8 shoot pack 8 yoke pack*	4.6.4
Contingency							8 shoot pack 4 yoke pack*	3.5.2.2 3.5.2.2.1
Total							44 shoot pack 32 yoke pack*	3.5.2.2 3.5.2.2.1

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

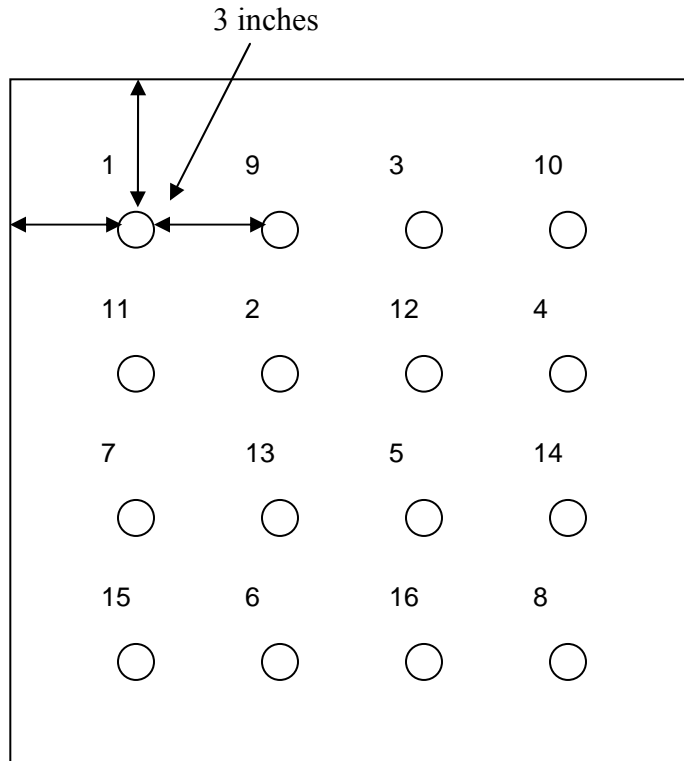
SPECIAL PROVISIONS: All production quantities submitted after approval of the First Article/Qualification shall be produced using the same materials, processes, procedures, equipment and facilities that resulted in the manufacture of the acceptable First Article/Qualification. This includes all raw materials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

FAT Testing Instruction:

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

Diagram I. First Article Test Shot Patterns

0 degree obliquity
16 shots



45 degree obliquity
12 shots

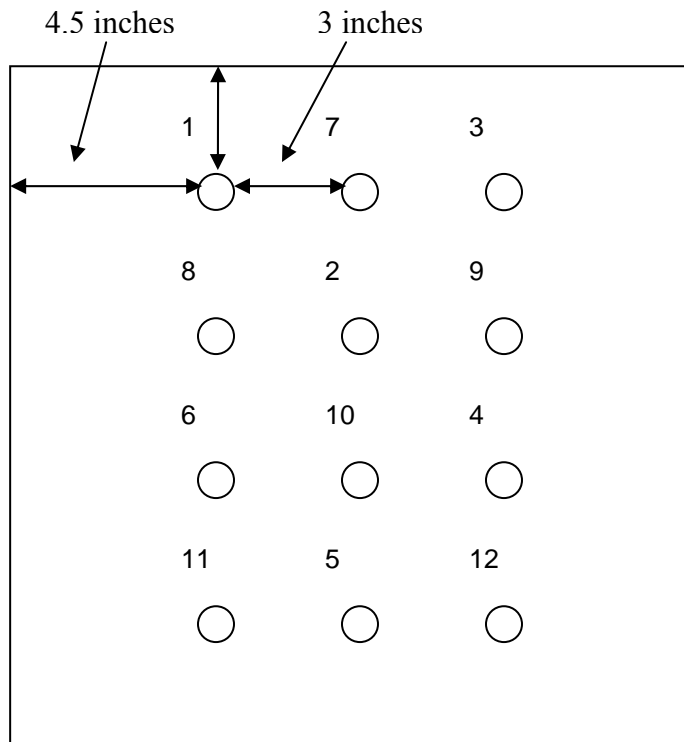


Table III. Vs/Vr starting velocity

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

Conformance Lot Inspection:

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

Lot Size	Number of test panels per threat			Requirements			Ballistic Samples	Non-ballistic vests	Total vests
	V50, 17gr	V50, 9mm	V0, 9mm	V50, 17gr	V50, 9mm	V0, 9mm			
26 to 150	2	2	2	1850 fps, min	1525 fps, min	1400 fps, min	6 (3 vests)	3	6
151 to 1200	4	4	4				12 (6 vests)	3	9
1201 to 3200	6	6	6				18 (9 vests)	3	12

V0 and V50 determination tested in accordance with paragraph 4.6

Each IOTV consists of one front panel and one back panel. The panels should be rotated for different threats. For example, first IOTV sample, front panel should be tested for 17gr. V50, and the back panel should be tested for 9mm V0; the second IOTV sample, front panel should be tested for 9mm V50, the back panel should be tested for 17 gr. V50, and so on.

For lots which include base vest only 1 V50 per component shall be required. For lots without base vests included the following table shall apply:

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

Lot Size	Number of Test Samples Required for 17gr. V50 ³					V50 Tests per Component ²	Requirements		
	Deltoid	Groin	Lower Back	Yoke ¹	Collar		V50, Deltoid, Groin, Back	V50, Collar ⁴	V50, Yoke ¹
26 to 150	3	3	3	6	6	1	1850 fps, min	1650 fps, min	2170 fps, min
151 to 1200	6	6	6	12	12	2	1850 fps, min	1650 fps, min	2170 fps, min
1201 to 3200	9	9	9	18	18	3	1850 fps, min	1650 fps, min	2170 fps, min

1. Yoke will be tested in conjunction with the base vest. Base vest will be the strike face and will be placed in front of the yoke during testing. Shots shall be spaced at least 2.5” between shots at least 2” from any edge.

2. Multiple test panels may be necessary to calculate V50 in accordance with paragraph 4.6.3. If these requirements are not met using the first panel, subsequent panels may be used and

combined until the number of valid data points is reached. The test will conclude once the 3CP/3PP or 5CP/5PP requirement has been obtained.

3. Number of test panels listed above is the total quantity of end items needed per lot. If complete vests are shipped for Lot Acceptance Testing, these components may be removed from complete vest and used for the modular component testing. Only one V50 will be required for separate components for LAT when included with base vest in the test report.

4. For end items only the collar requirement shall be 1650 in order to compensate for the reduction of the edge spacing requirement in paragraph 4.6.3.1.

SPECIAL PROVISIONS

1) Lot Failure: When a lot fails LAT and is subsequently rejected, that lot is rejected in total and no component parts may be used in the production of any other lot. Further, any lot that is withdrawn prior to completion of Additional Testing procedures as required by the Q/A Test Protocol will be considered as rejected and subject to the above conditions and restrictions. Additional Testing must be completed within 30 days of the initial LAT. All failed LAT's will require a Failure Analysis.

2) Ballistic Testing: All ballistic testing for LAT shall be conducted under the direction of Army Test and Evaluation Command (ATEC).

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

**IMPROVED OUTER TACTICAL VEST
FRONT CARRIER – FQ/PD 07-05 E**

SIZE:

NSN:

THE IMPROVED OUTER TACTICAL VEST (IOTV) 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.

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

CLEANING INSTRUCTIONS

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

TURN IN YOUR ITEM IF:

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

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

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

**IMPROVED OUTER TACTICAL VEST
BACK CARRIER – FQ/PD 07-05 E**

SIZE:

NSN:

THE IMPROVED OUTER TACTICAL VEST (IOTV) 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.

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

CLEANING INSTRUCTIONS

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

TURN IN YOUR ITEM IF:

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

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

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

IMPROVED OUTER TACTICAL VEST - FRONT BALLISTIC INSERT- FQ/PD 07-05 E

SIZE:

NSN:

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

DO NOT LAUNDRER 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:

IMPROVED OUTER TACTICAL VEST- BACK BALLISTIC INSERT- FQ/PD 07-05 E

SIZE:

NSN:

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

DO NOT LAUNDRER 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:

**IMPROVED OUTER TACTICAL VEST
SIDE PLATE CARRIER – FQ/PD 07-05 E
SIZE:
NSN:**

Refer to IOTV outershell label for cleaning and maintenance instructions.

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

**IMPROVED OUTER TACTICAL VEST
SIDE PLATE POCKET – FQ/PD 07-05 E
SIZE:
NSN:**

Refer to IOTV outershell label for cleaning and maintenance instructions.

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

**IMPROVED OUTER TACTICAL VEST
RIGHT INTERNAL ELASTIC BAND – FQ/PD 07-05 E
SIZE:
NSN:**

Refer to the IOTV outershell Label for cleaning and maintenance instructions.

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

**IMPROVED OUTER TACTICAL VEST
LEFT INTERNAL ELASTIC BAND – FQ/PD 07-05 E**

**SIZE:
NSN:**

Refer to the IOTV outershell Label for cleaning and maintenance instructions.

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

**IMPROVED OUTER TACTICAL VEST
CABLE ASSEMBLY – FQ/PD 07-05 E**

**SIZE:
NSN:**

Refer to IOTV outershell Label for cleaning and maintenance instructions.

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

**IMPROVED OUTER TACTICAL VEST
YOKE/COLLAR FRONT ASSEMBLY – FQ/PD 07-05 E**

NSN:

Refer to IOTV outershell label for cleaning and maintenance instructions.

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

**IMPROVED OUTER TACTICAL VEST
YOKE/COLLAR BACK ASSEMBLY – FQ/PD 07-05 E**

SIZE:

NSN:

Check to insure the correct side of the Ballistic Panel will be against the Body before attaching to the IOTV. Refer to IOTV outershell Label for cleaning and maintenance instructions.

LOT NO: _____

DATE OF MFG: _____

SERIAL NO: _____

CONTRACT #:

MANUFACTURED BY:

**IMPROVED OUTER TACTICAL VEST
LOWER BACK PROTECTOR OUTERSHELL – FQ/PD 07-05 E**

NSN:

Check to insure the correct side of the Ballistic Panel will be against the Body before attaching to the IOTV. Refer to IOTV outershell Label for cleaning and maintenance instructions.

LOT NUMBER: _____

DATE OF MFG: _____

SERIAL NO: _____

CONTRACT #:

MANUFACTURED BY:

**IMPROVED OUTER TACTICAL VEST
LOWER BACK PROTECTOR INSERT – FQ/PD 07-05 E**

NSN:

INSERT THIS SIDE TO BODY

DO NOT LAUNDRER. Remove loose dirt from cover with a cloth or soft brush. Avoid submerging panels in wash water. DO NOT bleach. DO NOT machine wash. DO NOT dry clean. DO NOT apply solvents. Refer to the IOTV outershell Label for cleaning and maintenance instructions.

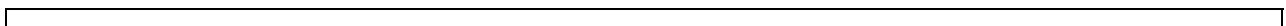
LOT NUMBER: _____

DATE OF MFG: _____

SERIAL NO: _____

CONTRACT #:

MANUFACTURED BY:



**IMPROVED OUTER TACTICAL VEST
GROIN PROTECTOR OUTERSHELL – FQ/PD 07-05 E**

SIZE:

NSN:

Check to insure the correct side of the Ballistic Panel will be against the Body before attaching to the IOTV. Refer to IOTV outershell Label for cleaning and maintenance instructions.

LOT NUMBER: _____

DATE OF MFG: _____

SERIAL NO: _____

CONTRACT #:

MANUFACTURED BY:

**IMPROVED OUTER TACTICAL VEST
GROIN PROTECTOR INSERT – FQ/PD 07-05 E**

SIZE:

NSN:

INSERT THIS SIDE TO BODY

DO NOT LAUNDRER. Remove loose dirt from cover with a cloth or soft brush. Avoid submerging panels in wash water. DO NOT bleach. DO NOT machine wash. DO NOT dry clean. DO NOT apply solvents. Refer to the IOTV outershell Label for cleaning and maintenance instructions.

LOT NUMBER: _____

DATE OF MFG: _____

SERIAL NO: _____

CONTRACT #:

MANUFACTURED BY:

**IMPROVED OUTER TACTICAL VEST
DELTOID PROTECTOR OUTERSHELL – FQ/PD 07-05 D**

SIZE:

NSN XXXX-XX-XXX-XXXX

Refer to the IOTV outershell Label for cleaning and maintenance instructions.

LOT NUMBER: _____

DATE OF MFG: _____

SERIAL NO: _____

CONTRACT #:

MANUFACTURED BY:

**IMPROVED OUTER TACTICAL VEST
DELTOID PROTECTOR BALLISTIC INSERT- FQ/PD 07-05 E**

SIZE:

NSN:XXXX-XX-XXX-XXXX

INSERT THIS SIDE TO BODY

DO NOT LAUNDER. Remove loose dirt from cover with a cloth or soft brush.

Avoid submerging panels in wash water. DO NOT bleach. DO NOT machine

Wash. DO NOT dry clean. DO NOT apply solvents.

Refer to IOTV Outershell Label for cleaning and maintenance instructions.

Check to insure the correct side of the Ballistic Panel will be against the
Body before attaching to the IOTV

Refer to the IOTV outershell Label for cleaning and maintenance instructions.

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