

INCH POUND
CO/PD 00-02G
23 February 2006
SUPERSEDES
CO/PD 00-02F
21 March 2005

PURCHASE DESCRIPTION
BODY ARMOR, MULTIPLE THREAT / INTERCEPTOR

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 **Scope.** 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. 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, yoke and collar assembly, throat protector assembly, groin protector assembly, deltoid & axillary protector assembly, small arms protective inserts (SAPI), and mock-up SAPI shall be one type in the following sizes. Body armor, multiple threat will be issued separately as three subsystems, as follows (see paragraph 6.2).

- 1) The Outer Tactical Vest (OTV) subsystem; consisting of the base vest assembly, yoke and collar assembly, throat protector assembly, and groin protector assembly components.
- 2) The SAPI subsystem; consisting of a set of SAPI, ISAPI or ESAPI in the same size as the OTV.
- 3) The Mock-Up SAPI subsystem; consisting of a set of plates corresponding to OTV size which simulate SAPI dimensions and weights for training purposes only.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which May be used in improving this document should be addressed to: Defense Supply Center Philadelphia, ATTN: DSCP-COET- BLDG 6, 700 Robbins Avenue, Philadelphia, PA 19111 by using the Standardization Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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| <u>COMPONENT</u> | <u>SIZES</u> |
|---------------------------------------|--|
| Base Vest Assembly | 8 sizes; X-Small, Small, Medium, Large, X-Large, XX-Large, XXX-Large, XXXX-Large |
| Yoke and Collar Assembly | 8 sizes; X-Small, Small, Medium, Large, X-Large, XX-Large, XXX-Large, XXXX-Large |
| Throat Protector Assembly | One size |
| Groin Protector Assembly | 2 sizes; X-Small to Medium, and Large to XXXX-Large |
| Deltoid & Axillary Protector Assembly | One size |
| Small Arms Protective Plate | 5 sizes; X-Small, Small, Medium, Large, X-Large |

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-L-63460 | - Lubricant, Cleaner And Preservative For Weapons And Weapons Systems (Metric) |
| CO/PD 00-03 | - Small Arms Protective Inserts (SAPI) |
| CO/PD 04-19 | - Enhanced, Small Arms Protective Inserts (ESAPI) |
| CO/PD 05-02 | - Improved, Small Arms Protective Inserts (ISAPI) |
| A-A-55301 | - Webbing, Textile Textured or Multi-Filament |
| A-A-55126 | - Fastener Tape, Hook and Pile, Synthetic |
| MIL-W-4088 | - Webbing, Textile Woven Nylon |
| MIL-C-43734 | - Cloth, Duck, Textured Nylon |
| MIL-STD-810 | - Environmental Engineering Considerations And Laboratory Tests |

(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).

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

DRAWINGS

US Army Natick Research, Development and Engineering Center

Drawing No. 2-1-1516 Woodland Pattern-48 inches

Drawing No. 2-1-1516B Woodland Pattern-60 inches

Drawing No. 2-1-2240 3 Color Desert Pattern 48 inches and 60 inches

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

MANUALS

TM 10-8400-203-23 General Repair Procedures for Individual Equipment;

Chapter 25, Maintenance of Interceptor Body Armor System

(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, Home and Commercial: Accelerated

AATCC METHOD 70 - Water Repellency: Tumble Jar Dynamic Absorption Test

AATCC METHOD 96 - Dimensional Changes in Commercial Laundering of Woven and Knitted Fabrics Except Wool

AATCC METHOD 118 - Oil Repellency: Hydrocarbon Resistance Test

AATCC METHOD 119 - Color Change Due to Flat Abrasion (Frosting): Screen Wire Method

AATCC METHOD 127 - Water Resistance: Hydrostatic Pressure Test

AATCC Procedure 1 - Gray Scale For Color Change

AATCC Procedure 2 - Gray Scale For Staining

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|----------------|---|
| ASTM D-204 | - Sewing Threads |
| ASTM D-1388 | - Stiffness of Fabrics |
| ASTM D-1683 | - Failure in Sewn Seams of Woven Fabrics |
| ASTM D-1693-97 | - Standard Practice for Stitches and Seams |
| ASTM D-1777 | - Standard Method for Testing Thickness of Textile Materials |
| ASTM D-3575 | - Materials, Flexible Cellular, Made From Olefin Polymers |
| ASTM D-3776 | - Mass Per Unit Area (Weight) of Woven Fabric |
| ASTM D-3884 | - Abrasion Resistance of Textile Fabrics, (Rotary Platform, Double Head Method) |
| ASTM D-3886 | - Abrasion Resistance of Textile Fabrics, (Inflated Diaphragm) |
| ASTM D-4485-99 | - Standard Specification for Performance of Engine Oils |
| ASTM D-5034 | - Breaking Force and Elongation of Textile Fabrics (Grab Test) |
| ASTM G21-90 | - Test Methods for Evaluation of Effect of Fungi on Synthetic Polymeric Materials |

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

International Standard 110902- Measurement of thermal and water vapor resistance
Under steady state conditions

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. When specified (see paragraph 6.2), complete Body armor, multiple threat samples, representing full production quality, shall be subjected to first article inspection in accordance with 4.2.

3.2 Materials and components. The materials and components shall conform to applicable specifications, standards, and patterns required herein. Use of recycled material is encouraged when practical, provided the requirements of this specification are met.

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 OTV 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, right front and left front) inserts, 2. One yoke and collar assembly made up of a yoke and collar carrier with a ballistic insert set made up of removable ballistic (right and left) inserts, 3. One throat protector assembly made up of a throat protector carrier with a removable ballistic insert, and 4. One groin protector assembly made up of a groin protector carrier with a removable ballistic insert. 5. One deltoid & axillary protector assembly made up of a deltoid & axillary protector carrier with a ballistic insert set made up of removable ballistic inserts. Components are all attached to the OTV. The OTV provides protection from conventional fragmenting munitions and

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multiple hits from 9mm handgun rounds. The SAPI, ISAPI or ESAPI subsystem consists of a set of interchangeable, sized, and contoured plates inserted into front and back pockets on the OTV outershell carrier to provide vital organs protection against multi-hits of small arms rifle bullets and indirect fire flechettes. The Mock-up SAPI subsystem in accordance with CO/PD 00-03 consists of a set of plates which simulate SAPI dimensions and weight and are used in place of actual SAPI for training purposes only. Webbing hanger attachments on the front of the OTV 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 (see 6.11). A Government baseline vest design is available. Recommended enhancements are encouraged to improve its operational effectiveness and manufacturability (see 4.4).

- a) OTV base vest only; which does not include any of the yoke and collar, throat protector, groin protector, or SAPI, ISAPI or ESAPI modular components.
- b) OTV base vest with one or more, or all of the modular components; yoke and collar, groin protector, throat protector, and/or one or two SAPI, ISAPI or ESAPI.
- c) OTV 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 4.4).

3.3.1.1 Base Vest and Components Carrier Outer Shell.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|-------------------------------|-----------------------|-----------|
| 1. | Back Outer Shell | BCK_OUT_SHL | 1 Face Up |
| 2. | Front Outer Shell, Left | FR_OUT_SHL_LF | 1 Face Up |
| 3. | Front Outer Shell, Right | FR_OUT_SHL_RF | 1 Face Up |
| 4. | Flap, Front Closure, Outer | FL_FR_CL_OU | 1 |
| 5. | Groin Back Shell | GRN_BCK_SHL | 1 |
| 6. | Groin Front Shell | GRN_FR_SHL | 1 |
| 7. | Under Collar Outer Shell | UN_CL_OU-SH | 2 |
| 8. | Throat Protector, Front | THR_PRT_FRT | 1 |
| 9. | Back Plate, Pocket, Flap | BK_PL_PK_FL | 1 |
| 10. | Top Inner DAPS Underarm | OTV-TPINR | 1 |
| 11. | Bottom Inner DAPS Underarm | OTV-BTIN | 1 |
| 12. | Outer Piece DAPS Underarm | OTV-OS | 1 |
| 13. | Outer Piece DAPS Bicep | OTV-OS-BI | 1 |
| 14. | Top Inner Piece DAPS Bicep | OTV-INRBIC | 1 |
| 15. | Bottom Liner Piece DAPS Bicep | LOW_IN_SHELL | 1 |
| 16. | Tunnel Piece for DAPS Bicep | DAPES-TUN | 1 |

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3.3.1.2 Base Vest Carrier Inner Lining.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|--------------------------------|-----------------------|-----------|
| 1. | Back Inner Shell, Upper | BK_IN_SH_UP | 1 Face Up |
| 2. | Back Inner Shell, Lower | BK_IN_SH_LW | 1 Face Up |
| 3. | Front Inner Shell, Upper Left | F_I_SH_UP_L | 1 Face Up |
| 4. | Front Inner Shell, Upper Right | F_I_SH_UP_R | 1 Face Up |
| 5. | Front Inner Shell, Lower Left | F_I_SH_LW_L | 1 Face Up |
| 6. | Front Inner Shell, Lower Right | F_I_SH_LW_R | 1 Face Up |
| 7. | Collar, Yoke Outer | COLLAR_YOKE OU | 1 Face Up |
| 8. | Collar, Yoke Inner | COLLAR_YOKE IN | 1 Face up |
| 9. | Front Flap Pocket | FRT_PKT_FLP | 1 |

3.3.1.3 Base Vest Carrier SAPI Pockets.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|----------------------------|-----------------------|-----|
| 1. | Back Pocket (Plate) | BK_PKT_PLT | 1 |
| 2. | Front Pocket Outer(Plate) | FRT_PKT_PLT OU | 1 |
| 3. | Front Pocket Inner (Plate) | FRT_PKT_PLT IN | 1 |
| 4. | Front Pocket Flap | FLAP_POCKET | 1 |

3.3.1.4 Top Collar.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|------------------------------|-----------------------|-----|
| 1. | Top Collar Outer Shell Front | TP_CL_OS_FR | 2 |
| 2. | Top Collar Outer Shell Back | TP_CL_OS-BK | 2 |
| 3. | Throat Protector Back | THR_PRT_BCK | 2 |

3.3.1.5 Ballistic Panel Cover.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|-----------------------------|-----------------------|-----|
| 1. | Back Ballistic Cover Outer | BCK_BLL_CVR OU | 1 |
| 2. | Back Ballistic Cover Inner | BCK_BLL_CVR IN | 1 |
| 3. | Front Ballistic Cover Outer | FRT_BLL_CVR OU | 2 |
| 4. | Front Ballistic Cover Inner | FRT_BLL_CVR IN | 2 |
| 3. | Groin Ballistic Cover | GR_BLL_CVR | 2 |
| 4. | Throat Ballistic Cover | THR_BLL_CVR | 2 |
| 5. | Collar Ballistic Cover | CLR_BLL_CVR | 4 |

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

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|--------------------------------|-----------------------|-----|
| 1. | Back Ballistic, Wide | BCK_BLL_WID | |
| 2. | Back Ballistic, Narrow | BCK_BLL_NRW | |
| 3. | Front Ballistic, Wide | FRT_BLL_WID | |
| 4. | Front Ballistic, Narrow | FRT_BLL_NRW | |
| 5. | Inner Ballistic Collar, Narrow | I_B_CLR_NRW | |
| 6. | Inner Ballistic Collar, Wide | I_B_CLR_WID | |
| 7. | Groin Insert | GROIN_INSERT | |

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|-----|----------------------------|-------------|
| 8. | Collar Yoke Ballistic | CLR_YOK_BLL |
| 9. | Throat Protector Ballistic | THR_PRT_BLL |
| 10. | DAPS Underarm | OTVBAL |
| 11. | DAPS Bicep | BICEPT-BAL |

3.3.1.7 Collar Yoke Foam.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|-------------------|-----------------------|-----|
| 1. | Collar, Yoke Foam | CLR_YK_FOAM | 1 |

Tempales

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|------------------------------|-----------------------|-----|
| 1 | Front Closure Snaps Template | SNAPS_TEMPLATE | |

3.3.1.8 Fastener Tape, Hook and Pile pieces are per pattern marking.

3.3.1.9 Webbing, 1”

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|--|-----------------------|----------------------|
| 1. | Shoulder Strap, Upper Arm | SH_ST_UP-ARM | 2 |
| 2. | Shoulder Strap, Upper Neck | SH_ST_UP_NK | 2 |
| 3. | Throat Protector, Upper Strap | THR_PR_UP_ST | 2 |
| 4. | Throat Protector, Lower Strap | THR_PR_LWR_ST | 1 |
| 5. | Groin Holder | GROIN_HOLDR | 2 |
| 6. | Front Yoke, Strap | FRT_YOK_STR | 2 |
| 7. | Back Yoke, Strap | BCK_YOK_STR | 2 |
| 8. | Collar & Groin Lacing Webbing Loops | | Per pattern markings |
| 9. | MOLLE pocket webbing loops on Front of OTV * | | Per pattern markings |
| 10. | MOLLE pocket webbing loops on Back of OTV * | | Per pattern markings |
| 11. | Webbing loop/Side Adjustment straps (see note) | | 8 (4 front, 4 back) |

***MOLLE POCKET WEBBING**

| Length, inches | X-SMALL | SMALL | MEDIUM | LARGE | X-LARGE |
|------------------|---------|-------|--------|-------|---------|
| Adjustable Front | 18.0 | 18.0 | 19.0 | 19.0 | 19.0 |
| Fixed Back | 6.5 | 6.5 | 8.0 | 8.0 | 8.0 |

Note: Front webbing ends inserted through the adjustment buckles shall be folded over two times, finishing 3/4 of an inch and bar tacked through all three plies to form a pull tab for ease of adjustment.

3.3.1.10 Webbing, 1 ½”.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|-------------------------------------|-----------------------|-----|
| 1. | Shoulder Ballistic Panel Attachment | SHOULDR_WEB | 2 |

3.3.1.11 Tape, 3/4” Binding

| Item | Nomenclature | Cut |
|------|--------------|---------------------|
| 1. | Front Flap | Per pattern marking |

3.3.1.12 Tape, 1” Binding.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|------------------------------|-----------------------|-----|
| 1. | Inside Side Retention Strap | INS_RET_TAP | 2 |
| 2. | Collar Yoke Assembly Binding | Per pattern marking | |

3.3.1.13 Webbing 2.0”.

| Item | Nomenclature | Computer Nomenclature | Cut |
|------|----------------------------------|-----------------------|-----|
| 1. | Back Handle | BACK_HANDLE | 1 |
| 2. | Front plate ejection strap | FR_PL_EJ-ST | 1 |
| 3. | Front plate ejection strap guide | FR_PL-EJ-ST-GU | 1 |

3.3.1.14 Name/Rank Velcro Loop

Placement and size of velcro are as indicated in Figure 6.

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 (see 6.11) 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 OTV 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 shall not support fungus growth. The visual grade rating shall be 0. All components shall neither support fungus growth nor experience damage due to the presence of fungus spores or adjacent fungus growth (see paragraph 4.5.6)

3.4.3 Individual Repairs. An overage of one (1) 1.0” self threading side friction adapters shall be included for each new vest to enable individual repair of broken hardware.

3.4.4 Use and Care Instruction. An instruction pamphlet will be furnished with each body armor system (see 6.10). The instruction pamphlet will be printed on a durable man made, synthetic paper capable of multiple time use under harsh field conditions. The pamphlet will be in black and white, 4 X 5 ½ inches, 27 Pages in length.

3.4.5 Camouflage. Table II 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 4.1).

TABLE II. Camouflage Shades

| COMPONENT(S) OR PART(S) | WOODLAND | DESERT | UNIVERSAL |
|--|--|--|---|
| (1) Outer Shell: Base Vest Collar Throat Protector Groin Protector Deltoid & Axillary Protector | 4 Color Pattern: Light Green 354 - ground shade Dark Green 355 Brown 356 Black 357 | 3 Color Pattern: Light Tan 492 - ground shade Light Brown 493 Light Khaki 494 | 3 Color Pattern: Desert Sand 503 – Ground Shade Foliage Green 502 Urban Gray 504 |
| (2) Base Vest Inner Lining | Camouflage Green 483 | 3 Color Pattern or Brown 356 or Tan 380 or Light Tan 492 Light Khaki 494 | Foliage Green 504 |
| (3) Ballistic Panel Cover MiL-C-508 | Camouflage Green 483 | Brown 356 or Black 357 or Light Khaki 494 | Foliage Green 504 |
| (4) Webbing Binding Tape Hook & Loop Fastener Thread Labels | Camouflage Green 483 Light Green Olive 106 | Light Khaki 494 Light Tan 492 | Foliage Green 504 |
| (5) Hardware Buckles Snaps Eyelets/Grommets Side Opening Adjustment | Black* | Black* | Foliage Green* 504** |

*Hardware with surface coloring that is not permanent and can rub or chip off must be covered to prevent unacceptable signature; e.g.; painted metal snaps.

**The snap fasteners shall have a black chemical finish, except that the button cap shell shall have a Foliage Green 504 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.

3.4.6 Infrared Reflectance. The infrared reflectance for finished components and subcomponents specified in 3.4.5 shall conform to the requirements specified in Tables III-A, B, C D& E initially and after laundering when tested as specified in 4.5.7. Acetal Hardware shall conform to infrared reflectance requirements in Table F.

TABLE III-A. Infrared Reflectance Requirements (percent) Woodland Camouflage

| Wavelengths | Black 357 | Lt Green 354 | | Dark Green 355 & Brown 356 | |
|--------------------|------------------|---------------------|------------|---------------------------------------|------------|
| Nanometers | Max | Min | Max | Min | Max |
| 600 | - | 8 | 20 | 3 | 9 |
| 620 | - | 8 | 20 | 3 | 9 |
| 640 | - | 8 | 20 | 3 | 9 |
| 660 | - | 8 | 20 | 3 | 12 |
| 680 | - | 10 | 30 | 3 | 14 |
| 700 | 20 | 18 | 50 | 5 | 28 |
| 720 | 30 | 22 | 54 | 7 | 44 |
| 740 | 33 | 30 | 56 | 12 | 52 |
| 760 | 33 | 35 | 58 | 18 | 56 |
| 780 | 34 | 40 | 62 | 26 | 56 |
| 800 | 34 | 55 | 80 | 34 | 56 |
| 820 | 35 | 55 | 80 | 42 | 60 |
| 840 | 35 | 55 | 82 | 44 | 60 |
| 860 | 35 | 60 | 82 | 44 | 60 |

TABLE III-B. Infrared Reflectance Requirements (percent) Desert Camouflage

| Wavelengths | LT Tan 492 | | Lt Brown 493 | | Lt Khaki 494 | |
|--------------------|-------------------|------------|---------------------|------------|---------------------|------------|
| Nanometers | Min | Max | Min | Max | Min | Max |
| 700 | 38 | 52 | 30 | 50 | 28 | 42 |
| 720 | 38 | 54 | 30 | 50 | 30 | 46 |
| 740 | 39 | 54 | 34 | 54 | 32 | 50 |
| 760 | 40 | 54 | 36 | 54 | 34 | 54 |
| 780 | 42 | 56 | 36 | 54 | 38 | 56 |
| 800 | 42 | 58 | 38 | 56 | 40 | 58 |
| 820 | 42 | 58 | 38 | 56 | 40 | 58 |
| 840 | 42 | 58 | 38 | 56 | 42 | 58 |
| 860 | 44 | 58 | 38 | 56 | 42 | 58 |

TABLE III-C. Infrared Reflectance Requirements (percent) CG 483 and Tan 380

| Wavelength Nanometer | Camo Green 483 | | Tan 380 | |
|-------------------------|----------------|-----|---------|-----|
| | Min | Max | Min | Max |
| 600 | 3 | 10 | 28 | 40 |
| 620 | 3 | 10 | 30 | 42 |
| 640 | 3 | 10 | 32 | 48 |
| 660 | 3 | 12 | 34 | 54 |
| 680 | 3 | 14 | 40 | 58 |
| 700 | 4 | 28 | 42 | 60 |
| 720 | 5 | 40 | 42 | 60 |
| 740 | 10 | 52 | 44 | 62 |
| 760 | 18 | 56 | 44 | 62 |
| 780 | 20 | 56 | 46 | 64 |
| 800 | 24 | 58 | 48 | 64 |
| 820 | 30 | 60 | 48 | 64 |
| 840 | 38 | 60 | 48 | 64 |
| 860 | 40 | 60 | 50 | 66 |

TABLE III-D. Infrared Reflectance Requirements (percent) Universal Camouflage

| Wavelengths Nanometers | Desert Sand 500 | | Urban Gray 501 | | Foliage Green 502 | |
|---------------------------|-----------------|-----|----------------|-----|-------------------|-----|
| | Min | Max | Min | Max | Min | Max |
| 600 | 28 | 40 | 12 | 26 | 8 | 18 |
| 620 | 30 | 42 | 14 | 26 | 8 | 18 |
| 640 | 34 | 48 | 14 | 28 | 8 | 20 |
| 660 | 38 | 56 | 14 | 30 | 10 | 26 |
| 680 | 44 | 60 | 18 | 34 | 10 | 26 |
| 700 | 46 | 66 | 24 | 38 | 12 | 28 |
| 720 | 48 | 68 | 26 | 42 | 16 | 30 |
| 740 | 48 | 72 | 30 | 46 | 16 | 30 |
| 760 | 50 | 74 | 32 | 48 | 18 | 32 |
| 780 | 54 | 76 | 34 | 48 | 18 | 34 |
| 800 | 54 | 76 | 34 | 50 | 20 | 36 |
| 820 | 54 | 76 | 36 | 54 | 22 | 38 |
| 840 | 56 | 78 | 38 | 54 | 24 | 40 |
| 860 | 56 | 78 | 40 | 56 | 26 | 42 |

Table III-E. Infrared Reflectance Requirements (percent) Foliage Green 504

| Wavelengths Nanometers (nm) | Min | Max |
|--------------------------------|-----|-----|
| 600 | 8 | 18 |
| 620 | 8 | 18 |
| 640 | 8 | 20 |
| 660 | 10 | 26 |
| 680 | 10 | 26 |
| 700 | 12 | 28 |
| 720 | 16 | 30 |
| 740 | 16 | 30 |
| 760 | 18 | 32 |
| 780 | 18 | 34 |
| 800 | 20 | 36 |
| 820 | 22 | 38 |
| 840 | 24 | 40 |
| 860 | 26 | 42 |

Table III-F Infrared spectral reflectance requirements for Foliage Green 504 Acetal Hardware

| Wavelengths Nanometers (nm) | Min | Max |
|--------------------------------|-----|-----|
| 600 | 8 | 18 |
| 620 | 8 | 18 |
| 640 | 8 | 18 |
| 660 | 10 | 26 |
| 680 | 10 | 26 |
| 700 | 12 | 28 |
| 720 | 20 | 36 |
| 740 | 26 | 40 |
| 760 | 30 | 52 |
| 780 | 32 | 56 |
| 800 | 32 | 60 |
| 820 | 34 | 60 |
| 840 | 36 | 60 |
| 860 | 36 | 60 |

3.4.7 Matching. The cloths shall match the standard (see 4.5.11).

3.4.8 Pattern Execution. The pattern of the finished Woodland, Desert Camouflage, or Universal Camouflage pattern cloth shall reproduce the standard sample with respect to design, colors, and registration of the respective areas. The pattern repeat of the woodland pattern and universal pattern shall be 27.25” +1.25/-2.50”, the pattern repeat of the desert pattern shall be 16.75” +1.25/-2.25” when tested as specified in 4.1. Solid shades shall demonstrate level dyeing uniformity. The pattern of the cloth shall match the pattern on the specified drawing for that camouflage, 2-1-1516, 2-1-2240, and 2-1-2519

3.4.9 Colorfastness. The finished textile components shall meet the colorfastness requirements outlined in Table IV when tested as specified in 4.5 Table XII.

TABLE IV: Colorfastness Requirements - Woodland Camouflage

| CHARACTERISTIC | REQUIREMENT |
|--|---|
| Fastness to Laundering (3 Cycles) | Equal to or better than “3-4” rating on the AATCC Gray Scale for Color Change and Staining when compared to the unlaundered sample. |
| Fastness to Accelerated Laundering Black print only | Equal to or better than “3-4” rating on AATCC Gray Scale for Color Change when compared to the unlaundered sample. |
| Fastness to Light (After 40 hours) | Equal to or better than “3-4” rating on the AATCC Gray Scale for Color Change. |
| Fastness to Crocking | Equal to or better than “3-4” rating on the AATCC Gray Scale for Staining. |
| Frosting Rating | Equal to or better than “3-4” rating on the AATCC Gray Scale for Color Change. |
| Fastness to Perspiration | Equal to or better than “3-4” rating on the AATCC Gray Scale for Color Change and Staining |

3.4.9.1 Colorfastness Desert Camouflage The finished camouflage printed cloth shall show fastness to: light (after 40 AATCC standard fading hours or 170 Kilojoules); laundering (after 3 cycles); and perspiration (acid and alkaline). The colorfastness of the cloth shall be equal to or better than the standard sample, or equal to or better than a rating of “4” using the AATCC Gray Scale for Color Change and a rating of “3-4” using the AATCC Gray Scale for Staining for each of the colors. 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 not lower than 4.0 for all the colors.

3.4.9.2 Colorfastness Universal Camouflage 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 equal to or better than a rating of “good” 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 3.5 for all the pattern areas.

3.5 Outer Tactical Vest (OTV) subsystem. See paragraph 3.3 for OTV configuration. The maximum finished weight of the OTV subsystem components for each size is outlined in Table V-A when tested as specified in 4.5.4. The minimum area of ballistic coverage for each ballistic panel subcomponent in each size is outlined in Table V-B when tested as specified in 4.5.3. Finished base vest measurements for each size are outlined in Table V-C when tested as specified in 4.5.2.

TABLE V-A: Maximum Finished OTV Weights; Lbs.

| Finished Component | X-Small | Small | Medium | Large | X-Large | 2X Large | 3X Large | 4X Large |
|---|----------------|--------------|---------------|--------------|----------------|-----------------|-----------------|-----------------|
| Base Vest Assembly: Outer Base Vest Carrier & 3 Ballistic Panels | 6.64 | 6.95 | 7.66 | 8.38 | 9.51 | 9.84 | 10.81 | 11.79 |
| Yoke & Collar Assembly: Carrier and 2 Panels | 0.90 | 0.95 | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 | 1.50 |
| Throat Protector Assembly: One Size Carrier and 1 Panel | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Groin Protector Assembly: 2 Sizes; Carrier and 1 Panel | 0.70 | 0.70 | 0.70 | 0.85 | 0.85 | 0.85 | 0.95 | 0.85 |
| DAPS | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 |
| Total System | 13.99 | 14.35 | 15.11 | 16.08 | 17.31 | 17.74 | 18.91 | 19.89 |

TABLE V-B: Minimum Ballistic Panel Area; Sq. In.

| Ballistic Panel | X-Small | Small | Medium | Large | X-Large | 2X Large | 3X Large | 4X Large |
|----------------------------|----------------|--------------|---------------|--------------|----------------|-----------------|-----------------|-----------------|
| Wide Front Panel; Ea. | 170 | 180 | 196 | 221 | 246 | 268 | 288 | 325 |
| Narrow Front Panel: Ea. | 167 | 176 | 191 | 215 | 241 | 264 | 284 | 320 |
| Wide Back Panel | 261 | 278 | 314 | 356 | 400 | 448 | 492 | 525 |
| Narrow Back Panel | 253 | 269 | 303 | 345 | 388 | 440 | 484 | 518 |
| Wide Collar; Ea. | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 |
| Narrow Collar; Ea. | 15 | 16 | 17 | 18 | 19 | 19 | 20 | 21 |
| Yoke | 101 | 104 | 110 | 115 | 121 | 100 | 111 | 119 |
| Throat Panel | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Groin Panel | 69 | 69 | 69 | 85 | 85 | 85 | 85 | 85 |
| DAP - underarm | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| DAP – upper arm | 129 | 129 | 129 | 129 | 129 | 129 | 129 | 129 |

TABLE V-C: OTV Finished Measurements; Inches*

| SIZE | CHEST +/- 1/2" | CENTER FRONT LENGTH +/- 1/2" | BACKWAIST LENGTH +/- 1/2" | FRONT POCKET Opening -0/+ 1/4" | BACK POCKET ^{1/} Opening -0/+ 1/4" | COLLAR HEIGHT - 1/16" + 1/8" |
|-----------------|-------------------|------------------------------------|---------------------------------|--------------------------------------|--|---------------------------------------|
| X-Small | 22 1/4 | 17 | 17 | 13 | 9.0 | 2 1/8 |
| Small | 23 1/4 | 17 1/4 | 17 1/4 | 13 1/2 | 10 1/2 | 2 1/8 |
| Medium | 24 1/4 | 17 3/4 | 17 3/4 | 14 | 11 1/4 | 2 1/8 |
| Large | 26 1/4 | 18 1/2 | 18 1/2 | 15 | 12 | 2 1/8 |
| X-Large | 28 1/4 | 19 1/4 | 19 1/4 | 15 1/2 | 12 3/4 | 2 1/8 |
| 2X-Large | 30 1/4 | 20 | 20 | 15 1/2 | 12 3/4 | 2 1/8 |
| 3X-Large | 32 1/4 | 20 3/4 | 20 3/4 | 15 1/2 | 12 3/4 | 2 1/8 |
| 4X-Large | 34 1/4 | 21 1/2 | 21 1/2 | 21 1/2 | 12 3/4 | 2 1/8 |

* See Para. 4.5.2 for measurement directions.

1/ The buttonhole opening pass through centered on the back of the pocket flap shall be a minimum of 1 1/4" wide.

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

- a) OTV provides fragmentation protection from conventional fragmenting munitions (see paragraph 3.5.2.2).
- b) OTV provides multi-hit handgun bullet protection for 9mm, 124 gr., Full Metal Jacket (FMJ) Remington projectile (see paragraph 3.5.2.3).
- c) OTV and SAPI (see 3.7) 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) OTV and ISAPI (3.7) 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) OTV and ESAPI (3.7) 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

3.5.2 Ballistic Performance. The OTV 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. After first article testing, an alternative simulat/shoot pack may be used for testing purposes (see 6.8).

3.5.2.1 Removable Ballistic Panel Subcomponent. Ballistic panels must be able to be inserted easily into OTV outershell carriers; collar assembly, throat 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 1.1 lb sq/ft with a maximum 0.30 inch thickness when tested as specified in 4.5.4 and 4.5.5. 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 be achieved when fully extended during individual movements to maintain uniform ballistic protection.

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

3.5.2.1.3 Abrasion Resistance. Any adjacent layers within the ballistic material system shall demonstrate abrasion resistance against each other for a minimum of 2,000 cycles with no broken surface characteristic or delamination of abraded area when tested as specified in 4.5 Table XII. This requirement applies to interfacing layers of a homogenous filler, any two adjacent layers of different materials if a hybrid filler is used and filler layer in contact with panel cover, etc.

3.5.2.2 OTV Fragmentation Protection. The ballistic material system (see 3.5.2) shall provide consistent ballistic performance. Table VI requires the minimum V50 values for base vest assembly and yoke and collar assembly at specified obliquity when tested with the Right Circular Cylinder (RCC) dry and wet (sea water).

Table VI 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 OTV area of coverage must meet minimum casualty reduction potential of the approved system coverage (see 3.5, Table V-B) and V50 performance (see Table VI) stated herein. Any product improvements in the ballistic performance of the OTV 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 performance requirements (see 2.2).

TABLE VI: Base Vest assembly, Groin and Throat Protector Assembly, Collar, Deltoid & Axillary Protector assembly Fragmentation Protection; Minimum V50

| 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 After POL | 2000 1900 | N/A | N/A |

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 Table VII.

TABLE VII. Yoke Area Ballistic Performance; Minimum V50

| 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 |

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 VIII 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.

TABLE VIII: Handgun Ballistic Characteristics

| Projectile - 9mm, 124 gr., FMJ Remington | V50 @ 0 degree; ft/sec (min.) | V0 Acceptance; @ 0 & 30 degree ft/sec | Deformation; in (max.) |
|---|--|--|-----------------------------------|
| Required | 1525 | 1400 +50/-0 | 1.73 |
| Desired | 1625 | 1500 +50/-0 | 1.73 |

3.5.3 OTV Outershell Subcomponents

3.5.3.1 Cloth. 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 Table IX when tested as specified in 4.5 Table XII. 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-C-508, Oxford, Nylon, 3 oz Type I, Class 3. Ballistic panel cover should be 70 Denier 1.9 oz. Nylon Ripstop.

TABLE IX. Cloths: Outer Shell and Inner Lining Carrier

| Characteristic | Outershell Cloth | Inner Shell Cloth |
|--|--------------------------|--------------------------|
| Breaking Strength; lb. (min.) Warp X Filling | 360 X 270 | 300 X 225 |
| Dimensional Stability; % (max.) Warp X Filling | 3.0 X 2.0 | 3.0 X 2.0 |
| Abrasion Resistance: (min.) Number of Cycles | 1000 | 1000 |
| Water Repellency: Spray Rating (min) Initially After 1 Launderings | 100,100,90 90,80,80 | 100,100,90 90,80,80 |
| Hydrostatic Resistance: cm (min) Initially and After 1 Launderings After 1 Laundering and POL Contamination After 1 Laundering and Insect Repellent Contamination After 1 Laundering and Sweat Contamination After Laundering and Sea Water Contamination | 35 | 35 |
| Dynamic Absorption: % (max.) After 1 Laundering | 20 | 20 |
| Resistance to Organic Liquids (min) After 1 Laundering | No wetting of n-dodecane | No wetting of n-dodecane |

3.5.3.2 Webbing and Tapes. Webbing and tapes shall conform to the following requirements. Webbing and tapes shall be heat cut smooth with no burrs or residual melt (see 4.3.1). Webbing and tapes must be producer dyed.

- a) 1.0 inch; A-A-55301, Type III, textured yarn only except that the spectral reflectance requirements shall be in accordance with para. 3.5.3.2.1 when tested in accordance with Para 4.5.7

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- b) 1.5 inch; A-A-55301, Type VI except that Producer dyed, textured yarns shall be used. The thickness shall be .045 -.059; weight shall be .90 oz/yd min and breaking strength shall be 1,300 min.
- c) 2.0 inch; MIL-W-4088, Type VIII B, or MIL-W-17337 alternative, except that producer colored yarns continuous filament textured nylon shall be used. Yarn denier shall be 1000 warp and 500 fill; thickness shall be .042 - .054; breaking strength 1,450 Lbs (Min); yarns per inch be 400; full warps ends shall be 160 and width binder ends shall be .38.
- d) 1.0 inch Tape; MIL-PRF-5038, Type III, class 2, except that Producer dyed, continuous filament textured yarns shall be used. The thickness shall be .020 “- .030”; breaking strength shall be 300 lbs (min); warps yarns per inch shall be 84 and fill yarns shall be 33; warp and fill yarns shall be 500d and 210d respectively.
- e) 0.75 inch Tape; MIL-PRF-5038, Type III, class 2 except that Producer dyed, continuous filament textured yarns shall be used. The thickness shall be .020 “- .030”; breaking strength shall be 200 lbs (min); warps yarns per inch shall be 63 and fill yarns shall be 33; warp and fill yarns shall be 500d and 210d respectively.

3.2.3.2..1 Spectral reflectance. The webbing shall meet the following spectral reflectance requirements:

Spectral Reflectance Requirements for Camouflage Green 483

| Wavelength (nm) | Reflectance (%) | | Wavelength (nm) | Reflectance (%) | |
|--------------------|-----------------|-----|--------------------|-----------------|-----|
| | Min | Max | | Min | Max |
| 600 | 3 | 10 | 740 | 10 | 52 |
| 620 | 3 | 10 | 760 | 18 | 56 |
| 640 | 3 | 10 | 780 | 20 | 56 |
| 660 | 3 | 12 | 800 | 24 | 58 |
| 680 | 3 | 14 | 820 | 30 | 60 |
| 700 | 4 | 28 | 840 | 38 | 60 |
| 720 | 5 | 40 | 860 | 40 | 60 |

Spectral reflectance requirements reflectance values (percent) for Foliage Green 504

| Wavelengths Nanometers (nm) | Min | Max |
|--------------------------------|-----|-----|
| 600 | 8 | 18 |
| 620 | 8 | 18 |
| 640 | 8 | 20 |
| 660 | 10 | 26 |
| 680 | 10 | 26 |
| 700 | 12 | 28 |
| 720 | 16 | 30 |
| 740 | 16 | 30 |
| 760 | 18 | 32 |
| 780 | 18 | 34 |
| 800 | 20 | 36 |
| 820 | 22 | 38 |
| 840 | 24 | 40 |
| 860 | 26 | 42 |

3.5.3.3 Fasteners, Hook, and Loop. Hook and loop fasteners utilized on the OTV outershell carrier shall conform to A-A-55126, Type I, class 1, in 5/8", 1.0", 1 1/2", and 2.0" widths (see 4.3.1).

3.5.3.4 Foam. The foam (located within the yoke) shall be closed cell with the properties specified in Table X when tested as specified in ASTM D-3575 (see 4.3.1). The foam shall be sandwiched between the ballistic filler.

TABLE X. Foam Characteristics

| 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 Tear Resistance Water Absorption of Surface | 150% (min) 17 lb/inch (min) 0.04 lb/sq ft (max.) |

3.5.3.5 Hardware.

3.5.3.5.1 Snap Fasteners. The snap fasteners shall be equal to or better than style 2, finish 2, hard action. The barrel size of the button and eyelet components shall be determined by the contractor. The size selected shall effect a secure clinch of the assembled materials. As an option, an eyelet-socket combination for the female snap fastener is permitted. The snaps shall have a uniform finish with a gloss which does not exceed 40. The color shall not degrade during repeated operation. The surface shall be smooth and free of sags, runs, and streaks (see 4.5).

3.5.3.5.2 Snap Fastener Reinforcement. Snap reinforcement that will not ravel is required on any single fabric layer application (see 4.5).

3.5.3.5.3 OTV Drainage. The OTV shall provide a durable means to allow water in the vest to drain out quickly and easily. Grommets/Eyelets/Washers will be securely clinched without splitting in a manner that will prevent detachment from or cutting of the adjacent material (see 4.5).

3.5.3.5.4 Side Opening Adjustment Hardware. The outer shell side exterior adjustment shall be friction adjustment that stays secure once positioned by the wearer yet easily adjustable by the wearer to open or close. The stitch in place friction adjustment shall be 1 inch and may be National Molding, part #5700 or equivalent. For individual field repair, one self-threading tension lock buckle, National Molding 1 inch, part #5564 or equivalent will be packaged and included for each vest (see 4.5).

3.5.3.6 OTV Construction. The exterior of the system shall be edge stitched approximately 1/8 inch from all edges EXCEPT any edge contacting the neck area of the individual (see 6.4). 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 ends shall be trimmed to 0.25 inch max. Fabric edges shall not ravel. All thread shall have a minimum thread strength of 9.0 lb. (min.) when tested as specified in 4.7 Table XII except where noted differently. Hook and loop fasteners shall not be stitched in the selvage edge to prevent associated fraying durability problems in repeated use (see 4.5).

3.5.3.6.1 Seams. Outershell carrier perimeter outer seams shall provide a double peak seam strength, first at 165 lb/inch (min.) followed by 205 lb/inch (min.). All other seams shall provide minimum 100 lb. breaking strength. (see 6.4). Testing specified in 4.5 Table XII.

3.5.3.6.2 Bartacks. Bartacks shall be placed within 1/8" +/- 1/16" of heat cut edge. No stitch run-off is allowed and no needle cutting of bartack. Double bartacks (one on top of the other) will be avoided to prevent needle cutting and weakening of the attachment point. Bartack requirements are specified in Table XI when tested as specified in 4.5 Table XII (see 6.5).

TABLE XI. Bartack

| Characteristic | Stress Points; All Cloth | Webbing Hangers: Webbing and Cloth |
|------------------------------|-------------------------------------|---|
| Length; in | 3/8" min | 3/4 " +/- 1/16" |
| Holding Strength: lb. (min.) | 60 | 250 |

3.5.3.6.2.1 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 OTV base vest.

- a) Distance between vertical bartacks on horizontal webbing shall be 1 1/2" -0/+1/16".
- b) Distance between horizontal webbing shall be 1" -0/+1/8".
- c) Vertical bartacks on consecutive horizontal webbing rows shall be vertical aligned bottom to top in a vertical straight line.

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3.5.3.6.3 Box X. Box X reinforcement, in accordance with the pattern sizes, shall utilize a thread with minimum 12 lb. breaking strength, and provide a minimum holding strength of 250 when tested as specified in 4.5 Table XII (see 6.6).

3.5.3.6.3.1 Drag Strap. The drag strap on the back of the OTV carrier (all sizes) shall have a peak strength not less than 400 lbf (increased strength is desirable) when tested in accordance with para 4.8.8

3.6 Size, Identification, and Instruction Label. Labels will be readable under low light conditions; moonlight and red or blue filtered flashlight. The label shall be of sufficient strength to withstand repeated abrasion during field use and cleaning, and remain intact for a maximum of 15 years and include the following:

(a) The OTV base vest component and ballistic panel subcomponent shall have a combination size, identification, serial number, ballistic protection level and instruction label for the entire OTV system.

Chest Circumference for Base Vest Outershell Label

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

(b) The instruction label shall include do's and don'ts for use and cleaning instructions, and Donning/doffing instructions for the entire OTV 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. Color of Label shall be as specified in Table II, of Para 3.4.5. Contents of labels shall be as found in 6.10.

(d) The modular components; yoke and collar assembly, throat, groin protectors 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. The contents of the labels shall be as found in 6.10. .

3.7 Small Arms Protective Inserts Subsystem. Shall conform to all performance specifications outlined in Personnel Armor, Small Arms, Ballistic Insert performance requirements (see paragraph 2.2).

3.7.1 SAPI Pocket. The OTV 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 SAPI mock-ups to be easily and quickly inserted into and removed from the vest without struggle or force. The front pocket shall have a quick emergency ejection strap for the SAPI.

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)

4.1.1 **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.

4.2 **First Article Inspection**. When a first article is required (see 6.2 & 6.7), it shall be examined for design (3.3), compatibility and interchangeability of components, inspection requirements in 4.5, ballistic data for all test conditions 4.6.1.2, data, certificate, or compliance for testing requirements in 4.6 and 4.7, and overall workmanship (see Table XII)..

4.3 **Conformance Inspection**. Conformance inspection shall be in accordance the Government's acceptance of the contractor's in-process and end item test plan and contract requirements for ballistic validation. Samples for conformance testing shall be selected in accordance with ANSI Z1.4. Presence of any defect or failure of any test shall be cause for rejection of the lot. Quality assurance requirements are divided in four categories; testing, demonstration, inspection and analysis, as defined below.

4.3.1 **Certificate of Compliance**. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

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

4.5 **Requirements and Verifications**. Table XII delineates performance requirements verified through visual methods, including physical measurements in order to determine that no deficiencies exist.

TABLE XII. Requirements and Verifications

| CHARACTERISTIC | REQUIREMENT PARAGRAPH | VERIFICATION PARAGRAPH | FAT For Initial Production | CONFORMANCE Lot Inspection |
|---|------------------------------|--|-----------------------------------|-----------------------------------|
| Design | 3.3 | 4.4 | X | X |
| Patterns | 3.3.1 | 4.4 | X | X |
| System Performance Requirements | 3.4 | 4.4 | | |
| Functional Integration | 3.4.1 | 4.4 | X | X |
| Fungus Resistance | 3.4.2 | 4.5.6 | X | COC |
| Individual Repair Kit | 3.4.3 | 4.4 | X | X |
| Use & Care Instruction | 3.4.4 | 4.4 | X | X |
| Camouflage | 3.4.5 | 4.1 | X | X |
| Infrared Reflectance | 3.4.6, 3.5.3.2 | 4.5.7 | X | COC |
| Matching | 3.4.7 | 4.5.11 | X | COC |
| Pattern Execution | 3.4.8 | 4.1 | X | COC |
| Colorfastness to: | 3.4.9 | 4.1 | | |
| Laundrying: 3 Cycles | 3.4.9 | AATCC 61 OPTION IA | X | COC |
| Accelerated Laundrying | 3.4.9 | 4.5.8 | X | COC |
| Light | 3.4.9 | AATCC 16 OPTION A or E (Exposure shall be 40 hrs or 170 kilojoules) | X | COC |
| Crocking | 3.4.9 | AATCC 8 | X | COC |
| Frosting | 3.4.9 | AATCC 119; EXCEPT IT SHALL BE 300 CYCLES | X | COC |
| Perspiration | 3.4.9 | AATCC 16; EXCEPT BOTH ACID AND ALKALINE TEST SHALL BE PERFORMED | X | COC |
| OTV Area of Coverage Weight, and Finished Dimensions | 3.5 | 4.5.2, 4.5.3, and 4.5.4 | X | COC |
| Ballistic Protection Levels | 3.5.1 | 4.1, 4.4, & 4.6 | X | X |
| Ballistic Performance | 3.5.2 | 4.6 | X | X |
| Removable Ballistic Panel Subcomponent | 3.5.2.1 | 4.5.1 | X | X |
| Ballistic Filler | 3.5.2.1.1 | 4.5.4 & 4.5.5 | 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 (Footnote 1) | X | COC |
| OTV Fragmentation Protection | 3.5.2.2 | 4.6 | X | COC |
| Yoke Frag. Protection | 3.5.2.2.1 | 4.6 | X | COC |
| Handgun Protection | 3.5.2.3 | 4.6 | X | COC |
| OTV Outershell Subcomponents | 3.5.3 | 4.1 | X | COC |
| Cloth | 3.5.3.1 | 4.5 | X | COC |
| Breaking Strength | 3.5.3.1 | ASTM TM 5034, G-E or G-T | X | COC |

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|--|-------------|--|-----|-----|
| Dimensional Stability | 3.5.3.1 | AATCC 96 Option 1C, A | X | COC |
| Outershell Cloth Abrasion Resistance | 3.5.3.1 | ASTM TMD 3884 (Footnote 2) | X | COC |
| Spray Rating: Initial 1 Laundering | 3.5.3.1 | AATCC 22 4.5.10 & 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 and Sea Water Contamination | 3.5.3.1 | AATCC 127 4.5.9 & AATCC 22 4.5.10 & AATCC 22 | X | COC |
| Dynamic Absorption: After 1 Laundering | 3.5.3.1 | 4.5.10 & AATCC 70 | X | COC |
| Resistance to Organic Liquids: Initial After 1 Laundering | 3.5.3.1 | AATCC 118 4.5.10 & AATCC 118 | X | COC |
| Webbings and Tapes | 3.5.3.2 | 4.3.1 | COC | COC |
| Fasteners, Hook and Loop | 3.5.3.3 | 4.3.1 | COC | COC |
| Foam | 3.5.3.4 | 4.3.1 | COC | COC |
| Hardware | 3.5.3.5 | 4.5 | X | COC |
| Snap Fasteners | 3.5.3.5.1 | 4.3.1 & 4.5.1 | X | COC |
| Snap Reinforcement | 3.5.3.5.2 | 4.5.1 | X | COC |
| OTV Drainage | 3.5.3.5.3 | 4.5.1 | X | X |
| Side Opening Adjustment Hardware | 3.5.3.5.4 | 4.3.1 & 4.5.1 | X | COC |
| OTV Construction | 3.5.3.6 | 4.3.1 & 4.5.1 | X | X |
| Thread Strength | 3.5.3.6 | ASTM D 204 | X | COC |
| Seam Strength | 3.5.3.6.1 | ASTM D 1683 (Footnote 3) | X | COC |
| Seams | 3.5.3.6.1 | 4.4 | X | COC |
| Bartacks | 3.5.3.6.2 | 4.5.1 | X | X |
| Dragstrap | 3.5.3.6.3.1 | 4.8.8 | X | CO |
| Bartack Alignment for MOLLE Pocket Attachment | 3.5.3.6.2.1 | 4.5.1 & 4.5.2 | X | X |
| Box X | 3.5.3.6.3 | 4.5.1 | X | X |
| Labels | 3.6 | 4.5.1 | X | X |
| SAPI Subsystem | 3.7 | 4.4 | X | COC |
| SAPI Pocket | 3.7.1 | 4.4, 4.5.2.2 | X | X |

Footnotes:

1) Inflate diaphragm to 4.0 psi with a 5 lb. load in a multi-directional setting. Material with most surface texture will be mounted on upper flat surfaced mount. Materials face or back surface orientation will be the same as in ballistic filler layering. A failure shall be any break in the abraded surface compared to initial.

2) 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.

3) Test Specimen from manufactured item except the specimen shall be 4” x 6” at 3” gage length with seam or Box X centered between the jaw.

4.5.1 End Item visual examination. The end items shall be examined for the defects listed below. 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.

END ITEM VISUAL DEFECTS

| EXAMINE | DEFECT | CLASSIFICATION | |
|------------------------|--|----------------|-------|
| | | MAJOR | MINOR |
| Cloth | Any hole (except drill hole), cut or tear. | 101 | |
| | Any exposed drill hole. | | 201 |
| | Any abrasion marks, broken or missing yarns or multiple floats | 102 | |
| | Any mend, darn or patch. | 103 | |
| | Needle Chews | 104 | |
| Webbing or Tape | Any hole, cuts tears or smash. | 105 | |
| | Not firmly and tightly woven, edges frayed or scalloped. | 106 | |
| | Multiple floats. | | 202 |
| | Abrasion mark, slub, or broken end or pick. | 107 | |
| | Ends not fused as required | | 203 |
| Fastener Tape | Any hole, cut or tear, hooks flattened, broken or missing, impairing function. | 108 | |
| 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. | 109 | |
| | Clinched excessively tight, cutting material | 110 | |
| | Clinched loosely, permitting either component to rotate freely or separate | 111 | |
| | Not specified style or type | 112 | |

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| | | | |
|--|---|-----|-----|
| | Finish omitted or not as specified NOTE: Incomplete roll of end of button or eyelet barrel is evidence of insecure clinching. | | 204 |
| Seams and Stitching: | Incorrect Style | 113 | |
| 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. | 114 | |
| 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 | 115 | |
| Stitch Tension | Tension loose, resulting in loose bobbin or top thread | | 207 |
| | Excessively tight, resulting in puckering of material | | 208 |
| Bartacks | Any bartack omitted | 116 | |
| | 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. Over stitched shall be classified as open seams. | | 212 |
| Component & Assembly | Any area of ballistic filler bunched (i.e. does not lie flat) | 117 | |
| | Any component part omitted or not as specified (unless otherwise classified herein) | 118 | |
| | Needle Chews | 119 | |
| | Any mend, darn, patch, holes, splice or other unauthorized repair | 120 | |
| Location Markings | Drilled | 121 | |
| | Printed marking more than 1/32 inch in width or not covered by component part. | | 213 |
| Label | Missing, incorrect, illegible. | 122 | |
| Use & Care Pamphlet | Omitted, printing or figures illegible, any page missing. | | 214 |

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4.5.2 End Item Dimensional Examination. The end item shall be examined for finished measurements in Table V-C. The lot size shall be expressed in units of 10 finished components of the same system. The lot inspection level shall be II and the AQL expressed in terms of defects per hundred units shall be 4.0.

END ITEM DIMENSIONAL EXAMINATION

| Examine | Defect | Classification | |
|-----------------------------------|--|----------------|-------|
| | | Major | Minor |
| Dimensional (overall) | Smaller than nominal dimensions less applicable minus tolerance indicated but not smaller than nominal dimensions less twice the applicable minus tolerance. | | 215 |
| | Larger than nominal dimensional and applicable plus tolerance. | 124 | |
| Component and Location Dimensions | Not within specified tolerance | | 216 |
| Stitch Margin or Gage | Not within specified tolerance | | 217 |
| Box, Box-X and stitching | Dimensions not within specified tolerance | | 218 |
| Hardware | Not spaced within specified tolerance | | 219 |

4.5.2.1 Linear Measurements. Linear 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) Chest: With the vest properly fastened and turned inside out, measure the combined width at the widest point below the lower armhole opening, edge to edge.
- b) Center Front and Back Lengths: The center front length shall be taken on a straight line along the front snap closure. The back waist length shall be taken on a straight line from the center of the back from the top edge of the base vest neckline (center back) to the bottom edge of the shell.
- c) Spacing of Webbing Hangers for MOLLE pockets: The horizontal distance between bartacks shall be taken from the center of one bartack to the center of the adjacent bartack. The spacing between horizontal webbing shall be measured on adjacent webbings from the bottom edge of one to the top edge of the other.
- d) Collar Height: At the center of the 2 snaps on the collar, measure the length from the top edge of the collar to neckline stitch edge on the binding tape.

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4.5.2.1.1 In Process Inspection:

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 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 during the assembly of the individual groups to assure that they contain the correct number of plies, that no individual plies is 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.

In-process Visual Examination of Ballistic Filler Assemblies for Size. The lot shall be expressed in units of left fronts, right fronts, or back ballistic fillers, groin protectors, throat protector assemblies. The sample unit shall be one left front, one right front, and one back ballistic filler. The inspection level shall be II and the acceptable quality level (AQL), expressed in terms of defects per hundred units shall be as follows:

| | |
|---|--------------------------------------|
| For Front Ballistic Filler, Left or Right | 1.0 major |
| Groin Protector, Throat Protector | 4.0 total (major and minor combined) |
| For Back Ballistic Filler | 2.5 major |
| | 10.0 major minor combined |

| 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 <u>1/</u> <u>2/</u> | | X |
| | (2) More than 3/8 inch at any point around the periphery <u>1/</u> <u>2/</u> | X | |
| | (3) 1/8 inch up to 3/16 inch around entire periphery <u>2/</u> | | X |
| | (4) More than 3/16 inch around entire periphery <u>2/</u> | X | |
| | B) larger than cutting pattern by 3/8 inch or more at any point <u>1/</u> <u>2/</u> | | X |

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.

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4.5.2.2 End Item Fit Examination: A fit examination shall be performed with Mock SAPI's conforming to drawings 2-6-265, 2-6-266, 2-6-267, 2-6-268, and 2-6-269. The examination shall be performed with a SAPI 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.

NOTE: With the SAPI in the Pocket(s) it shall be possible to secure the flap without having excessive force on the flap to the degree that the flap is under tension after being secured.

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

4.5.4 Weight. The OTVs will be examined for weight. See max weights in para 3.5. Inspection level shall be II and the AQL shall be 1.0. Weights are taken on a tarred scale and measured to the nearest 0.01 pound. For finished OTV components, the unit weight shall be the average of 10 finished components of the same size. Areal densities are measured in accordance with ASTM D-3776 except units shall be expressed in lb./sq.ft.

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

4.5.6 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.

4.5.7 Infrared Reflectance. Spectral reflectance shall be evaluated initially and after laundering as described in paragraph 4.5.1 of MIL-C-43734. The accelerated three laundering shall be performed using AATCC 61 Opt #A except; a 4 gram sample size shall be used. When evaluating the camouflage printed cloth, each color shall be tested separately. (note: A sample size large enough to evaluate spectral reflectance shall be used. Ten (10) stainless spheres and 1993 AATCC Standard Reference Detergent without optical brightener shall be used. Spectral reflectance, initially and after laundering, shall be obtained from 600 to 860 nanometers (nm), at 20 nm intervals on an integrating sphere spectrophotometer. 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. The specimen shall be measured as a single layer, backed with 8 layers for Light Green 354, 4 layers for Dark Green 355 and Brown 356, and 2 layers for Black 357 of the same fabric and shade. When measuring Desert pattern shades, 8 backing layers shall be used for Light Tan 492 and Light Khaki 494, and 4 layers for Light Brown 493. Measurements will be taken on a minimum of 2 different areas and the data averaged. The specimen shall be viewed at an angle no greater than 10 degree from normal, with the specula component included. Photometric accuracy of the spectrophotometer shall be within 1 percent, and wavelength accuracy within 2 nm. The standard aperture size used in the color measurement device shall be 1.0 to 1.25 inches in diameter. When the

measured reflectance values for any color at four or more wavelengths do not meet the limits specified in Table III, it shall constitute a test failure.

4.5.8 Accelerated Laundering Test. The test procedure shall be as follows using the equipment cited in AATCC 61. Cut five specimens containing predominantly black print, each 4.5" by 3.0 inches, from the basic material and then fold in half, with the face side out, to form a 2.25" x 3.0" dimension. Machine stitch the open edges together (seam allowance of no more than 0.25") to form a bag leaving an opening approximately 1.0" in length. Through the opening, add 35 stainless steel spheres. Close the bag by stapling or stitching. Place the bag in a stainless steel cylinder (one bag per cylinder) without the color transfer cloth; add 50 ml of type II P-D-245 detergent solution (0.5 percent by weight detergent solution) and 100 stainless steel spheres 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 one (1) hour maintaining a constant temperature. At the end of the laundering cycle, remove the bag from the cylinder and rinse thoroughly in a beaker or in running tap water at 100 +/- 5 degree F for five (5) minutes with occasional stirring or hand squeezing. Remove excess water by squeezing in hand (not extracting) and then dry bag in automatic dryer set on permanent press cycle, 150 – 160 degree F for fifteen minutes (more than one bag can be dried together). If the bag breaks open to release the contained spheres at any time during the test, the test shall be considered invalid and another bag specimen shall be prepared and tested. Remove all spheres from the bag and evaluate each face of the bag without pressing or ironing the bag. Each face of the laundered bag shall be compared to the original sample (unlaundered) in accordance with AATCC evaluation procedure 1 for evaluation of Gray Scale for color change, and the rating shall be based on the portion of the black print exhibiting the most color loss. The lower of the two ratings of each bag shall be recorded as the result for the bag. Failure of any of the five bags to meet required rating shall be considered a test failure.

4.5.9 Resistance to POL, insect repellent, sweat, and sea water after one laundering. OTV outershell carrier cloths shall be tested, after one laundering per 4.5.10, 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 4.7.6.2.1 for sea water formulation and sample preparation shall be the same as perspiration.

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4.5.10 Laundrying 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 laundrying cycle shall be 30 +/- 5 minutes. After laundrying, 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 laundrying equipment, washer and dryer, shall be in accordance with AATCC TM 135-1992.

4.5.11 Matching. The cloths shall match the standard samples viewed under filtered tungsten lamps that approximate artificial daylight and that have a correlated color temperature of 7500 +/- 200 K, with illumination of 100 +/- 20 foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2300 +/- 200K.

4.6 Ballistic Performance. Testing will be conducted on the end item, or on 15 x 15 inch shoot packs constructed of the approved ballistic material system. (see 6.8).

4.6.1 Ballistic Testing. General procedures and requirements are provided in 4.6.2 (see 6.9 for definitions).

4.6.1.2. 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 laundryed 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.

4.6.1.2.1 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 OTV system in sea water at 70 +/- 5 degree F for 24 hours. The specimens are submerged such that the fluid is in contact with all exterior surfaces to allow maximum fluid penetration. Excessive water will be drained from the specimen by hanging vertically for 15 minutes and tested within 5 minutes with tests completed within 45 minutes.

4.6.1.2.2 Temperature Extremes Condition. For hot temperature extreme, the OTV system shall be heated in an oven operating at 155 + 10 degrees Fahrenheit for 6 +/- ¼ hours. The test specimen shall be removed from the oven, mounted and ballistically tested as specified in 4.6.3. Thermo-couples or other temperature measuring device will be used to monitor specimens during testing. Testing must occur at a surface temperature no less than 140 degree F and the mid-point of the material system at 155 + 10 degrees degree F. If test temperature falls below specified surface and mid-point temperatures, then reheat until surface and mid-point temperatures are 155 +/- 10 degree F. For cold temperature extreme, the test specimen shall be cold temperature exposed to -60 +/- 10 degree F for 6 +/- ¼ hours. The test specimen shall be removed from refrigeration, mounted and ballistically tested as specified in 4.6.3. Thermo-couples or another temperature measuring device will be used to monitor specimens during testing. Testing must occur at a surface temperature no less than -10 degree F and the mid-point of the material system at -60 +/- 10 degree F. If test temperature rise about the specified surface and mid-point temperatures, then refrigerate specimen until surface and mid-point temperatures are -60 +/- 10 degree F.

4.6.1.2.3 Accelerated Aging. Set up an oxygen pressure aging chamber consisting of a metal vessel large enough to accommodate the specimen. Maintain the chamber at 300 +/- 10 psi, 100% oxygen atmosphere controlled by a temperature of 158 +/- 2 degree F. The test specimen shall be placed in the chamber with the strike side of specimen face up. Place a representative 30 pound weighted object on top of the specimen for uniform loading. Expose specimens in the aging chamber for a minimum of 7 days. At the end of the test, depressurize the chamber over a period of at least 5 minutes. Place samples in ambient conditions for 16 to 96 hours with weighted object on top. Visually verify that the conditioned specimens do not show appreciable change to original state. Verify that the conditioned specimens performs as specified in 3.5.2.2.

4.6.1.2.4 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" platen to distribute load to allow for maximum fluid penetration. The loaded specimen shall remain immersed for 4 hours at room condition. The specimen shall be hung vertically to drip dry for 15 minutes, excess oil shall be wiped from the surface to facilitate handling of the specimen. The specimen shall be ballistically tested within 30 minutes.

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;

- 1) Armor specimen description including exact materials, thickness, sizes, weights of all components and areal density of armor system.
- 2) Conditioning of armor specimen.
- 3) Test projectile with exact nomenclature.
- 4) Temperature and humidity measurements.
- 5) Yaw angle.
- 6) Angles of target obliquity.
- 7) 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).
- 8) Velocity loss and/or corrected striking/residual velocity for fragment simulating projectiles.
- 9) PP (Partial Penetration) and CP (Complete Penetration) next to each shot velocity as determined.
- 10) Angle of spall/debris ejection if applicable.
- 11) Name of company performing tests.
- 12) Type of gun barrel, caliber, and propellant used
- 13) Range measurements including distances from gun barrel to velocity measurement devices and target.
- 14) Calculated Ballistic Limit. In a situation where the V50 BL, Vs/Vr or V0 data sheet would compromise the Security Classification Guide for Armor Materials (see 2.2), the data sheet should exclude the specific projectile used during testing.

4.6.2.1 Projectile Velocity Determination. Projectile velocity measurement methods shall employ either high velocity lumiline screens or electrical contact screens which either open or close an electric circuit by passage of the projectile through the detector. Contact screens may consist of metallic foils separated by a thin insulating layer, or may consist of a circuit printed on paper with the circuit spacing such that the projectile passing through the screen will break the circuit. An electric counter type chronograph measuring to the nearest microsecond or as a minimum to the nearest 10 microseconds will be used with these measuring devices. As an alternative radiographic equipment calibrated to

capture the projectile at various time intervals of flight can be used. For fragment simulating projectiles, velocity correction methodology shall be used to calculate the actual striking velocity and, where appropriate, actual residual velocity.

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

4.6.2.3 Environmental Test Conditions. All ballistic tests shall be performed 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 0.5 degree.

4.6.3 V50 BL Calculation. 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 minimum allowable V50 BL determination that will be accepted as reliable test results.

4.6.3.1 PP and CP Determination for V50. Complete and partial penetrations (see 6.9) will be determined based on the impressions left on an aluminum witness sheet. A 0.020 in. (0.051 mm thick 2024 T3 sheet of aluminum) will be placed 6 + 1/2 in. (152 + 12.7 mm) behind and parallel to the target. The aluminum witness sheet will be at least 15 x 15 in. size and be of sufficient size to capture all fragments resulting from the ballistic event, mounted rigidly around its parameter and placed so that the target impact location is approximately at the center of the aluminum sheet. Restraint is required during testing so that the material is not pulled through the ballistic test window frame. Unrestrained or improperly restrained materials will tend to pulled down the projectile line of flight. Restraint provides for more accurate and reproducible data if unifiedly applied. The following test conditions apply:

- For all size test panels a metallic (approx. 0.20 inch thick aluminum or steel) frame with minimum 1.4 inch webbing shall be employed to restrain the test material during ballistic impact.
- 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.
- The restraining frames will be cut so that a ballistic window with minimum sizing of 14.0 x 14.0 inch square will be used.
- The minimum size test panel that will be evaluated should be no smaller than 15.0 x 15.0 inch square for both handgun and fragmentation evaluations.
- No shots should be closer than 2.5 inch from any frame edge.
- Since the fibers tend to be strained and pulled in the +/- 90 degree (warp and fill) directions test shots should be staggered at least 0.75 inch off the horizontal and vertical lines of any previous shots.

- Test shots shall be sufficiently spaced so that sequential shots are not influenced by previous impact areas. A minimum shot spacing of 2.5 inch is required but 3.0 inch is recommended especially when testing against handgun projectiles.
- Depending on the test panel size it may be necessary to use 2-3 panels for the V50 determination.
- Fabric test specimens can be reconditioned to initial shape after every shot, if desired, but this is not required due to the higher test costs and some materials may not require this action. At a minimum the test specimen shall be reconditioned when excessive pulling from the restraining fixture is exhibited. Excessive pulling as defined by the fabric extending greater than 2.0 inch beyond the original rear surface plan of the armor or the distance between the rear armor surface is within 4.0 inch of the witness sheet.

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

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

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

- 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 Only. (see 6.8)

- OTV Vest panels configured in the armor material system approved under the First Article shall be used for production lot testing.

- Samples will be mounted on clay block described below (see 4.6.5.2).

- The first shot will be 3.0 $-0/+1/4$ " inch from any edge.

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

- The third shot location should be positioned 3.5 inch $-0/+1/2$ " from any of the 2 previous test shots.

- The fourth and fifth shots shall be located 3.5 inch $-0/+1/2$ " from any previous test shots and tested at 30 degrees obliquity.

- The transient deformation shall be measured (see 4.6.5.1) and test panel repositioned after the third and fifth test firings.

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 occur before, during or after the ballistic event. The clay 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 shall be conditioned for at least 3.0 hours at a temperature between 60 and 95 degrees Fahrenheit and worked thoroughly to remove any voids.

The clays consistency should be such that depression of 25 + 3 mm (1 + 0.1 in) in depth is obtained when a 1 kg + 10gm (2.2 lb + 0.35 oz) cylindrical steel mass, 44.5 + 0.5 mm (1.75 + 0.02 in) in diameter and having a hemispherical striking end is dropped from a height of 2 m + 2 cm (6.5 + 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 1.73 in. when measured from the original undisturbed surface of the backing material to the lowest point of the depression. The specimen may be smoothed between shots.

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

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

$$\text{System Stiffness} = \sum_{\text{Components}} [(G_{i, \text{warp}} + G_{i, \text{fill}}) / 2] \times \text{Layers}_i$$

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

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

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

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 SAPI into both OTV pockets without tools or special aids.

4.7.2 Insertion Using Protective Hand Gear Operation Demonstration. Demonstrate SAPI insertion and perform insertion into the OTV 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 $1,000 \pm 2$ 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 loadcell 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 loadcell 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 (see 6.2). When DoD personnel perform material packaging, those personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. The Inventory Control Point packaging activity within the Military Department of defense Agency, or within the Military Department's Systems Command, maintains packaging requirements. Packaging data retrieval is available from the managing Military Department's or defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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

6.1 Intended Use. The multiple threat body armor is a modular body armor providing multiple levels of ballistic protection depending on the system configuration. The Outer Tactical Vest (OTV) 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. OTV 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 required.
- d) Size Tariff

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

6.4 Seams. The following seam construction has shown to be effective per ASTM D-1693.

TABLE XIII. Seam Construction

| Characteristic | OTV Perimeter Seam | Single Needle Seams |
|--------------------------|-------------------------|------------------------|
| Seam Type | SSE-2 | - |
| Stitch Type | Lockstitch 301 | Lockstitch 301 |
| Stitches Per Inch | 9 - 10 | 9 - 10 |
| Nominal Thread Size; Tex | 70-100; 3 ply (V-T-295) | 70-200 3 ply (V-T-295) |
| Edge Finish | Efd-1 | - |

6.5 BarTacks. Thread size 70-100 Tex; 3 ply (V-T-295) thread has been found to be satisfactory.

6.6 Box X. Thread size 100-130 Tex (V-T-295) thread at 8-10 stitches per inch has been found to be satisfactory.

6.7 Qualifying, First Article Test. Current production items submitted with qualifying First Article Test data may be considered in the determination of reducing additional FAT verification by the Government.

6.8 Simulant/Surrogate Shoot-Pack. A Simulant/Surrogate Shoot-Pack system of OTV body armor may be used to represent the ballistic resistant materials of the OTV. The surrogate shoot pack system will consist of (1) a ballistic filler packet and (2) a ballistic filler carrier with insert pocket. The baseline ballistic filler packet will be 15 x 15 inches in size consisting of X plies proposed ballistic material system used in OTV base vest (see 3.3.1.6). The ballistic packet will be stitched diagonally across the 4 corners with a 5-inch line of 50 TEX Aramid thread at 5 to 10 stitches per inch. The 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. Woodland Camouflage, urethane back coated, textured nylon, Cordura. The insert pocket will be stitched on three sides to the face fabric with nylon or polyester thread. The 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, Cordura. The front and back filler carrier covers will be stitched together on 3 sides with nylon or polyester thread to form a pocket to hold the ballistic filler packet. The fourth side will remain unstitched but will have a minimum of 5 inches of not less than 0.5 inch hook and loop fastener centered and stitched to the top. Approved changes to the ballistic filler packet materials will result in their use in the surrogate shoot pack.

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

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

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

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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.

6.10 Contents of Labels and (Use and care instructions):

BODY ARMOR, "INTERCEPTOR" BASE VEST CARRIER
SIZE
NSN: XXXX-XX-XXX-XXXX

THE INTERCEPTOR OUTER TACTICAL VEST (OTV) WITH ALL SOFT BALLISTIC PANELS INSTALLED PROVIDES PROTECTION FROM FRAGMENTATION AND 9 MM 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 Small Arms Protective Inserts (SAPI) 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 OTV 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 ITEMS IF:

1. Frags or bullets have hit them.
2. The outer cover is torn or damaged beyond field repair.
3. The Velcro 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.
VEST SERIAL #:
CONTRACT #
MANUFACTURED BY

6.10 Contents of Labels and (Use and care instructions):

BODY ARMOR INTERCEPTOR - BALLISTIC PANEL, *LEFT FRONT
SIZE:
NSN:XXXX-XX-XXX-XXXX

**INSERT THIS SIDE TO BODY
FAILURE TO INSERT THIS BALLISTIC PANEL IN THE
INTERCEPTOR OTV OUTERSHELL WILL RESULT IN ABSENCE
OF BALLISTIC PERFORMANCE FROM FRAGMENTATION AND
9MM SUBMARINE GUN OR LESSER THREATS**

DO NOT LAUNDER BALLISTIC PANELS

Avoid submerging in water. DO NOT bleach. DO NOT Machine Wash
DO NOT Dry Clean. DO NOT apply solvents.

FOR CLEANING: ONLY Remove loose dirt from surface and wipe clean
With a moistened cloth or soft brush.

If Ballistic Panels become wet allow to air dry in a flat position away
From heat sources and out of direct sunlight. If ballistic panel becomes
Saturated with liquids such as gasoline, bleach or other lubricants,
Turn in for replacement as soon as possible.

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

***ABOVE LABEL TO BE USED WITH BALLISTIC PANELS LEFT AND RIGHT,
IMPRINT LEFT OR RIGHT WHERE APPLICABLE.**

6.10 Contents of Labels and (Use and care instructions):

| |
|---|
| <p>BODY ARMOR, INTERCEPTOR, BALLISTIC PANEL, BACK SIZE: NSN: XXXX-XX-XXX-XXXX</p> <p>INSERT THIS SIDE TO BODY FAILURE TO INSERT THIS BALLISTIC PROTECTIVE PANEL IN THE OUTER TACTICAL VEST SHELL WILL RESULT IN THE ABSENCE OF PROTECTION FROM FRAGMENTATION & 9 MM SUB-MACHINE GUN OR LESSER THREATS!</p> <p>DO NOT MACHINE WASH OR DRY BALLISTIC PANELS!</p> <p>Avoid submerging in wash water. Avoid caustic cleaners, DO NOT bleach! DO NOT machine wash! DO NOT dry clean! DO NOT apply solvents!</p> <p>CLEANING: ONLY remove loose dirt from surface & wipe clean with a moistened cloth or soft bristle brush. When 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.</p> <p>LOT NUMBER DATE OF MFG. SERIAL #: CONTRACT #: MANUFACTURED BY:</p> |
|---|

| |
|--|
| <p>BODY ARMOR, INTERCEPTOR, BALLISTIC PANEL, COLLAR *RIGHT SIZE NSN XXXX-XX-XXX-XXXX</p> <p><u>INSERT THIS SIDE TO BODY</u> FAILURE TO INSERT THIS BALLISTIC PANEL IN THE COLLAR ASSEMBLY OUTERSHELL WILL RESULT IN ABSENCE OF BALLISTIC PROTECTION.</p> <p>Refer to the OTV outershell Label for cleaning and maintenance instructions.</p> <p>LOT NO. DATE OF MFG SERIAL NO. CONTRACT # MANUFACTURED BY:</p> |
|--|

***ABOVE LABEL TO BE USED WITH BALLISTIC PANELS LEFT AND RIGHT, IMPRINT LEFT OR RIGHT WHERE APPLICABLE.**

6.10 Contents of Labels and (Use and care instructions):

BODY ARMOR, INTERCEPTOR, YOKE AND COLLAR OUTERSHELL
SIZE
NSN XXXX-XX-XXX-XXXX

THIS SIDE TO BODY

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

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

BODY ARMOR, INTERCEPTOR, BALLISTIC PANEL THROAT PROTECTOR
NSN XXXX-XX-XXX-XXXX

INSERT THIS SIDE TO BODY

FAILURE TO INSERT THIS BALLISTIC PANEL IN THE
COLLAR ASSEMBLY OUTERSHELL WILL RESULT IN
ABSENCE OF BALLISTIC PROTECTION.

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

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

BODY ARMOR, INTERCEPTOR, THROAT PROTECTOR OUTERSHELL
NSN XXXX-XX-XXX-XXXX

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

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

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6.10 Contents of Labels and (Use and care instructions):

| |
|--|
| <p>BODY ARMOR, INTERCEPTOR, BALLISTIC PANEL, GROIN PROTECTOR SIZE: NSN:XXXX-XX-XXX-XXXX</p> <p>INSERT THIS SIDE TO BODY</p> <p>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 OTV Outershell Label for cleaning and maintenance instructions.</p> <p>LOT NUMBER DATE OF MFG. SERIAL # CONTRACT # MANUFACTURED BY:</p> |
|--|

| |
|--|
| <p>BODY AMOR INTERCEPTOR, GROIN PROTECTOR OUTERSHELL SIZE: NSN:XXXX-XX-XXX-XXXX</p> <p>Check to insure the correct side of the Ballistic Panel will be against the Body before attaching to the OTV</p> <p>Refer to the OTV outershell Label for cleaning and maintenance instructions.</p> <p>LOT NUMBER DATE OF MFG SERIAL# CONTRACT # MANUFACTURED BY:</p> |
|--|

BODY ARMOR INTERCEPTOR,*AXILLARY (UNDERARM) PROTECTOR OUTERSHELL
SIZE: ONE SIZE
NSN XXXX-XX-XXX-XXXX

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

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

***ABOVE LABEL TO BE USED WITH AXILLARY (UNDERARM) AND DELTOID (SHOULDER) PROTECTOR, WHERE APPLICABLE.**

BODY AMOR INTERCEPTOR, BALLISTIC PANEL AXILLARY (UNDERARM) PROTECTOR
SIZE: ONESIZE
NSN:XXXX-XX-XXX-XXXX

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 OTV Outershell Label for cleaning and maintenance instructions.

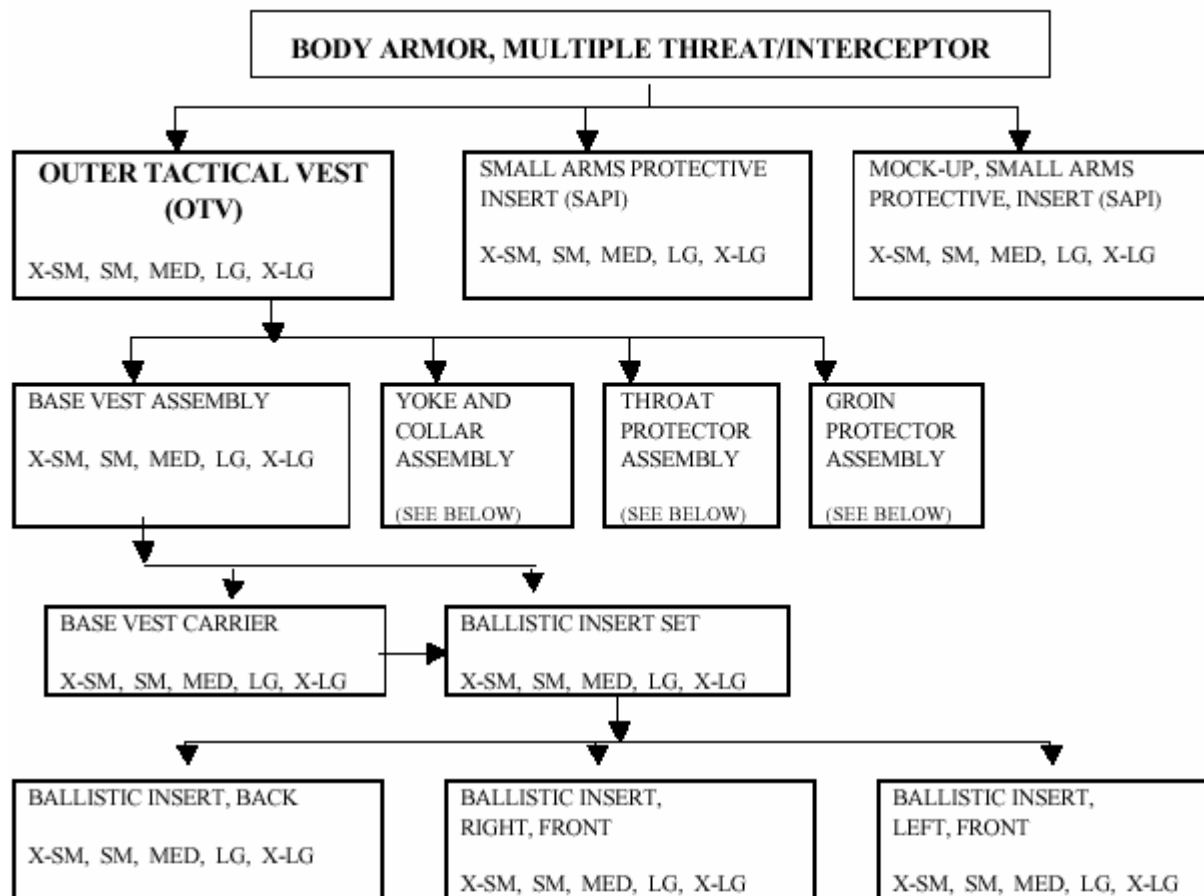
Check to insure the correct side of the Ballistic Panel will be against the Body before attaching to the OTV

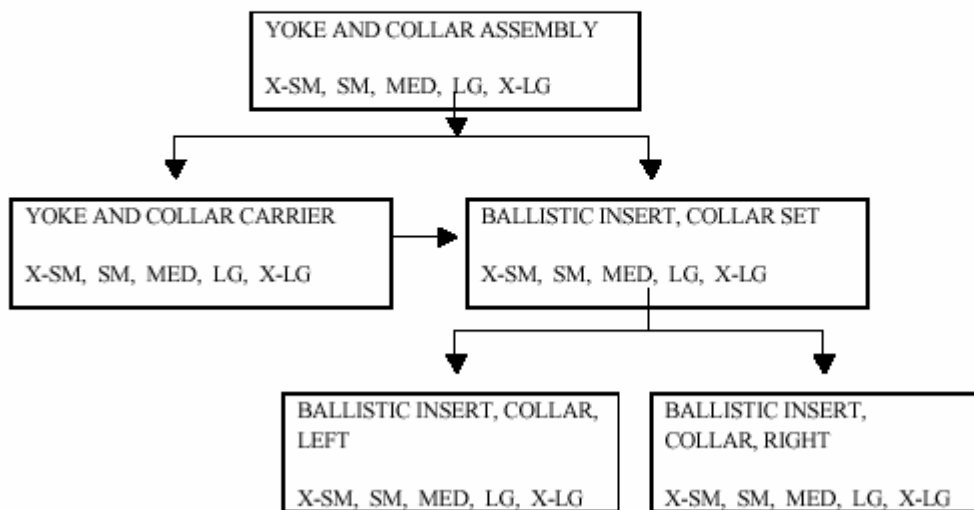
Refer to the OTV outershell Label for cleaning and maintenance instructions.

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

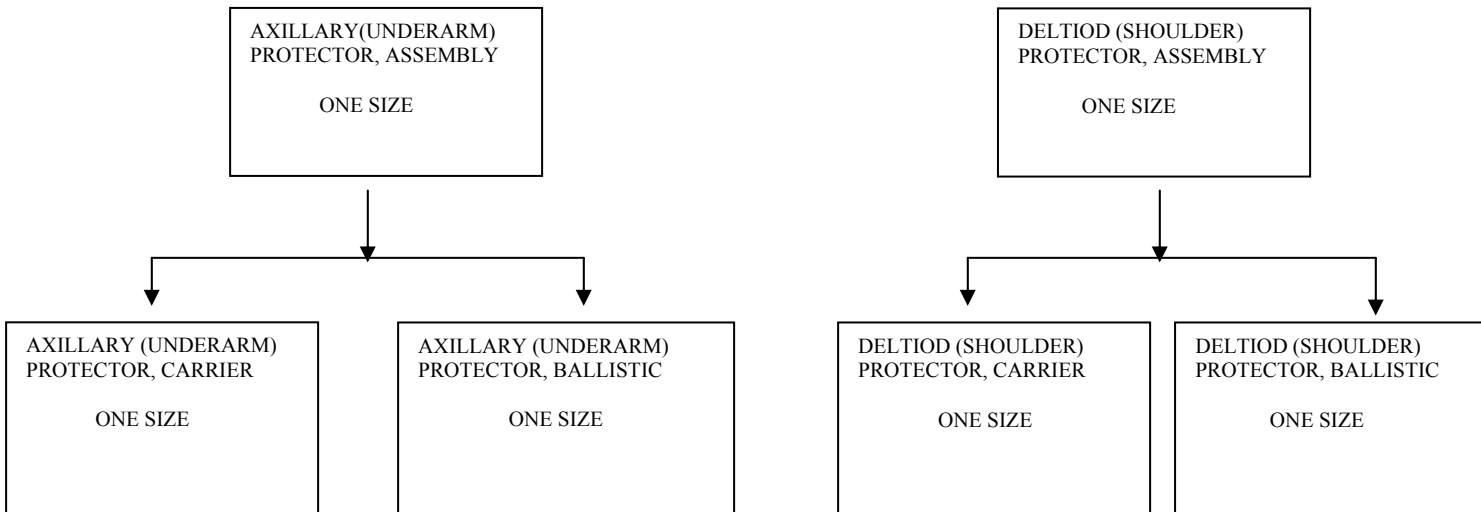
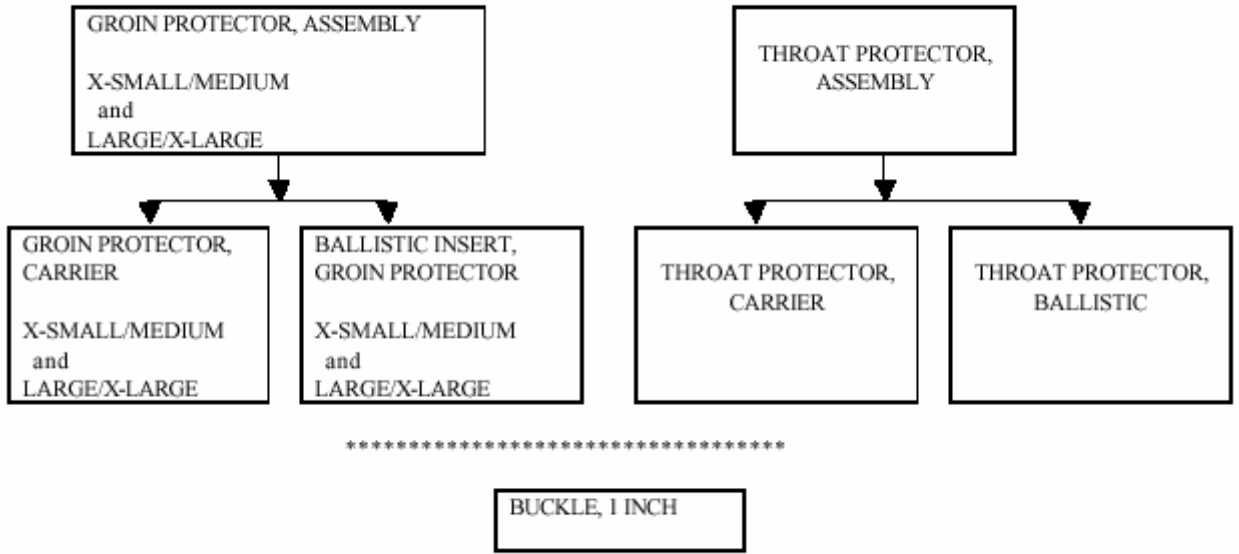
***ABOVE LABEL TO BE USED WITH AXILLARY (UNDERARM) AND DELTOID (SHOULDER) PROTECTOR, BALLISTIC PANEL, WHERE APPLICABLE.**

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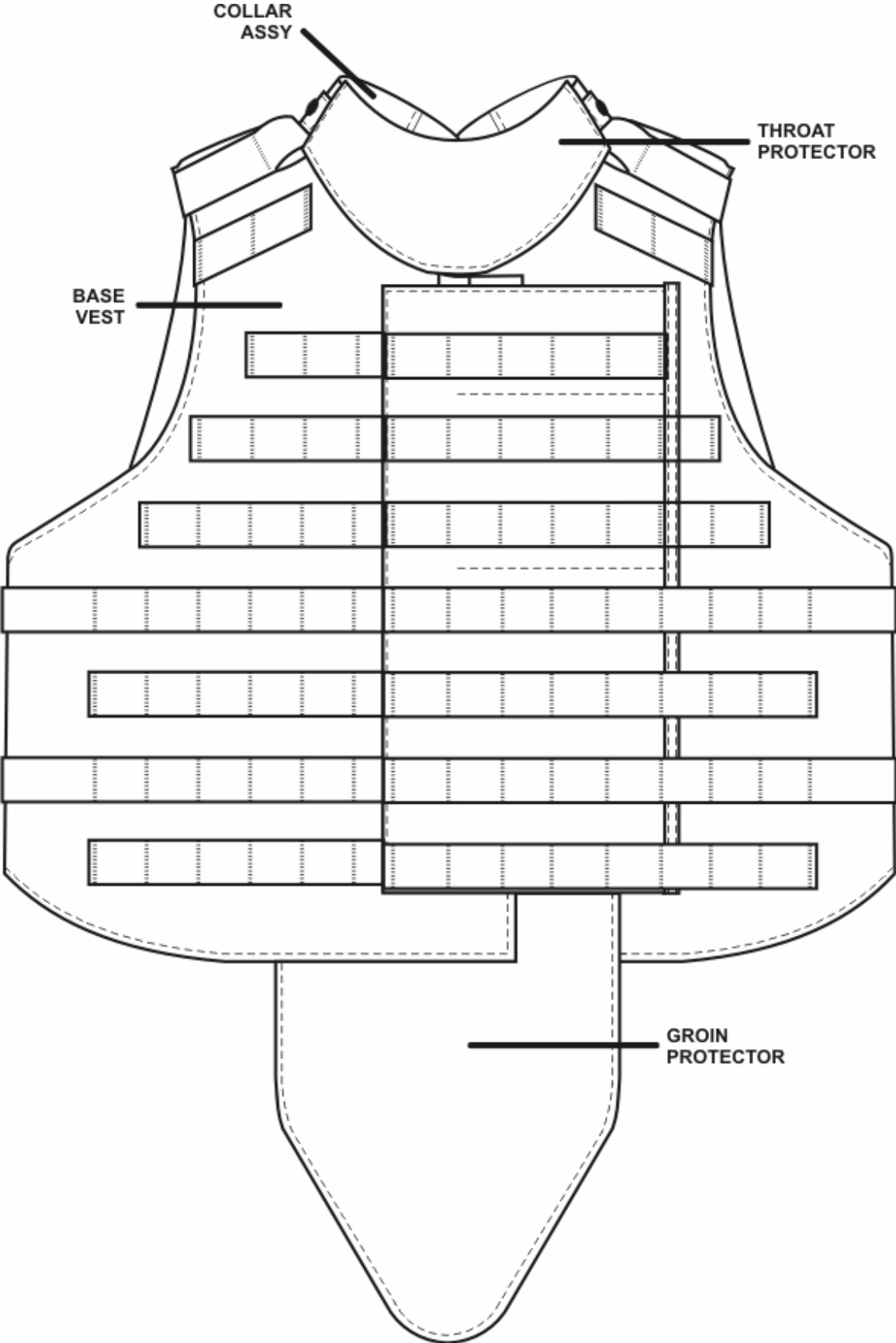




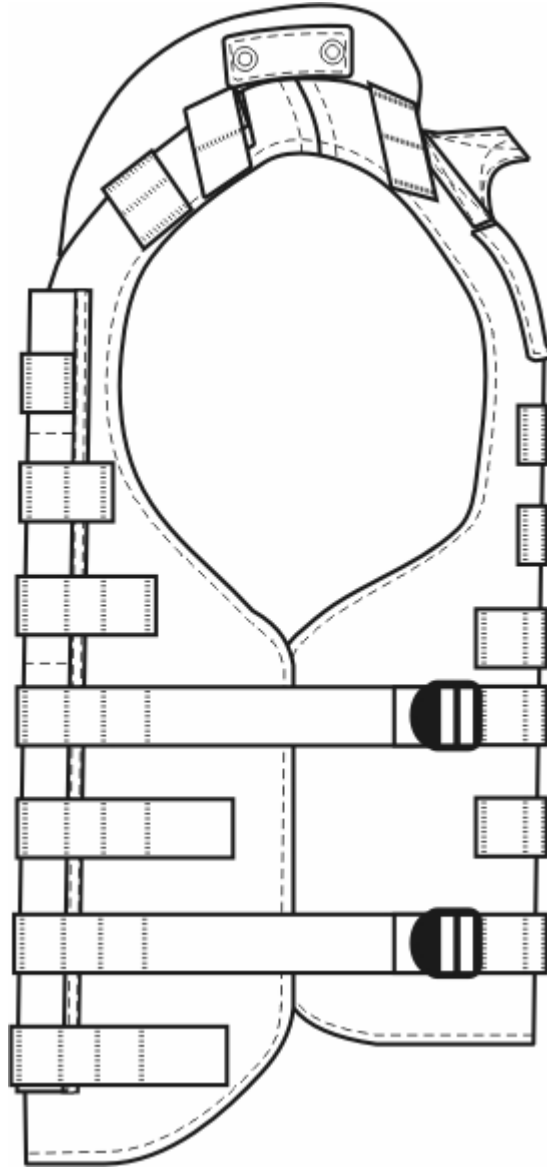
6.11 Configuration (Cont'd).



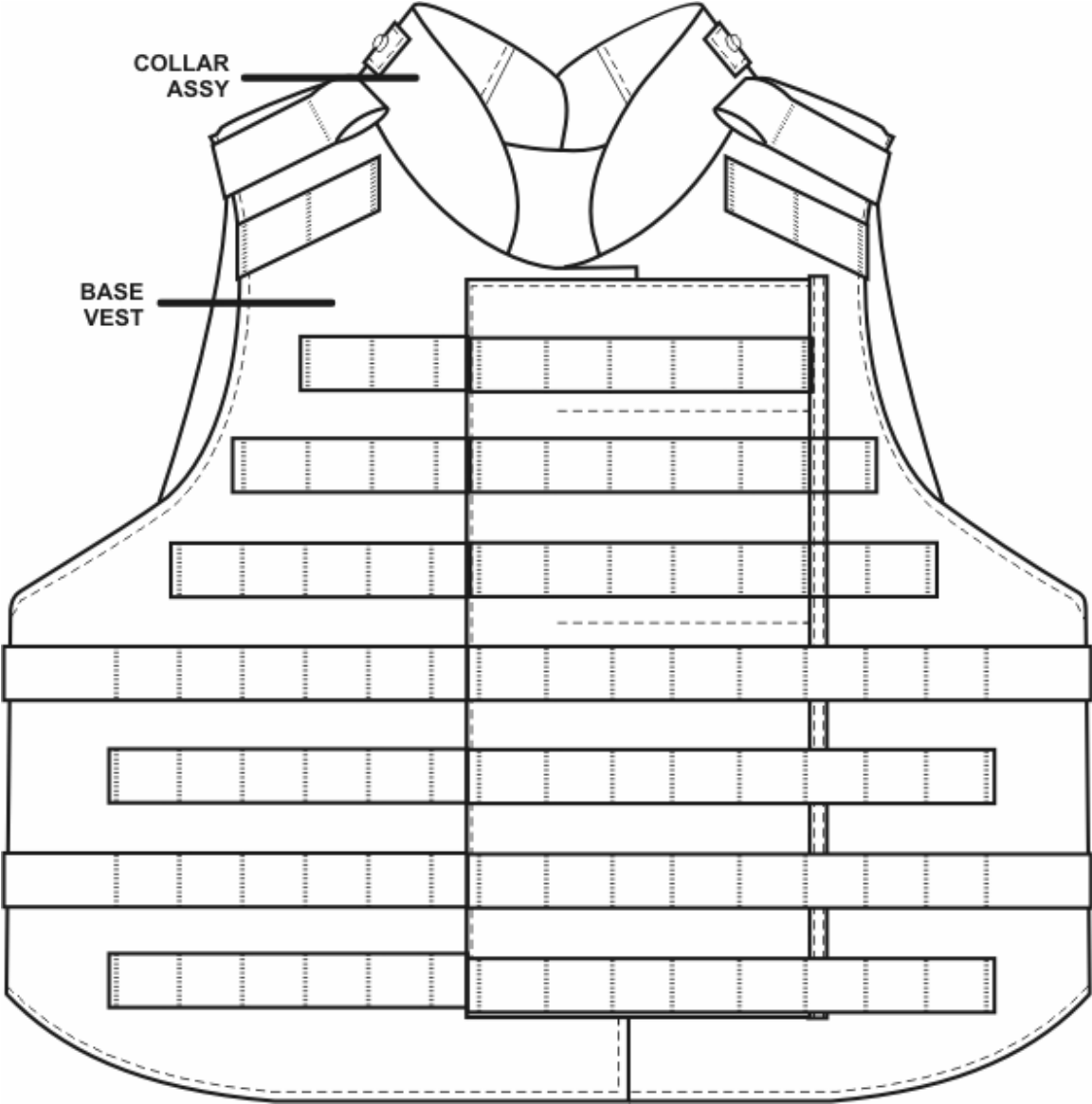
OTV COMPLETE – FIGURE 1



OTV LEFT SIDE – FIGURE 2

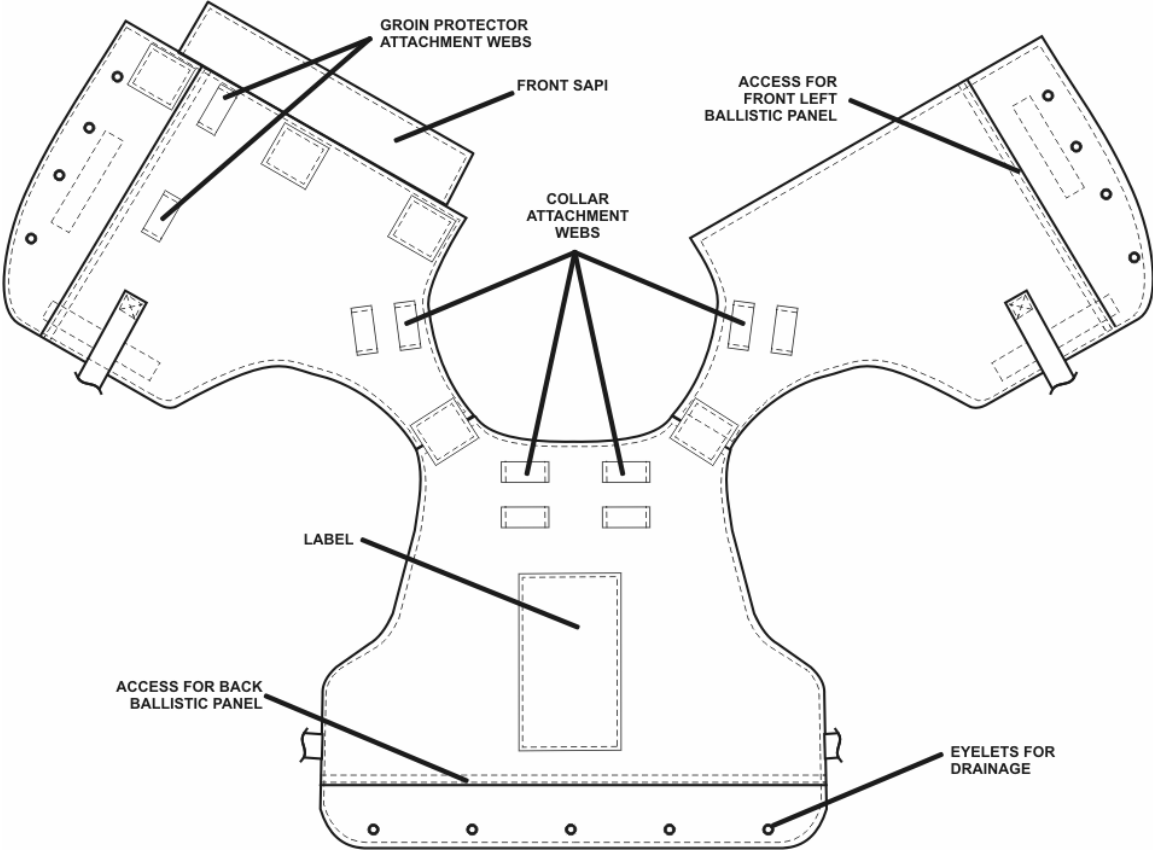


OTV VEST AND COLLAR - FIGURE 3



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OTV EXPLODED INSIDE – FIGURE 4



OTV EXPLODED OUTSIDE – FIGURE 5

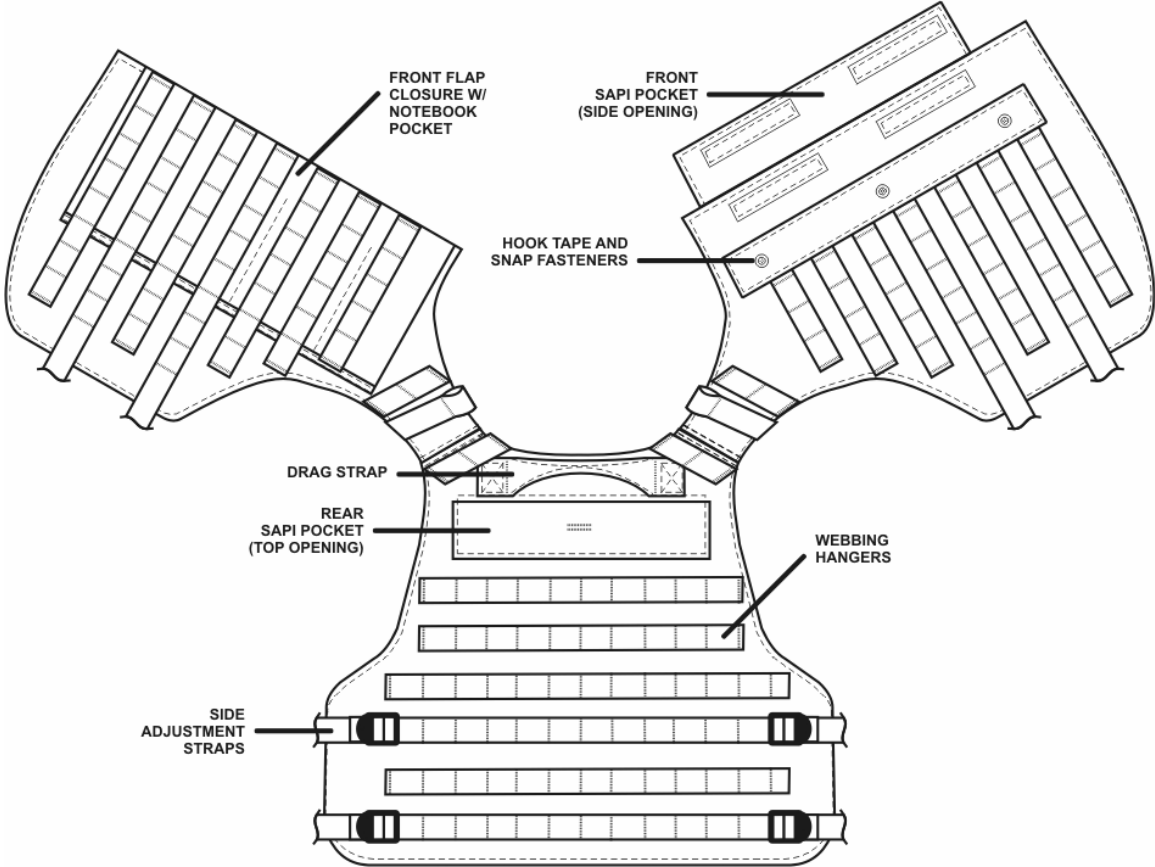


FIGURE 6
Name / Rank Velcro Loop Placement

