



Standard Practice for Body Armor Wearer Measurement and Fitting of Armor¹

This standard is issued under the fixed designation E3003; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice provides measurement and fit guidance for soft ballistic-resistant or stab-resistant body armor, or both, covering the torso. Proper measurement of the wearer and fitting of armor to that individual are necessary to obtain sufficient coverage of the torso and vital organs while allowing the full range of motion required for officer operations.

1.2 This practice is primarily directed toward law enforcement and corrections officers and addresses measurements for and fit of concealable (normal duty) body armor worn under or over the uniform for both male and female wearers. This practice addresses only body armor composed of front and back protective panels contained within a carrier that positions and holds the panels on the torso.

1.3 Female wearers require more measurements than male wearers to achieve proper armor fit; therefore, the minimum required measurements are specified individually for males and females.

1.4 In addition to the required measurements, optional measurements are recommended when necessary to accommodate the wearer's body shape and dimensions.

1.5 Measurement guidance is provided in Section 5 of this practice. Section 5 may also be used to train individuals on proper measurement techniques.

1.6 In addition to measurement guidance, this practice provides two tools for assessing armor relative to the intended wearer:

(1) Comparison of wearer measurements and armor measurements in Section 6.

(2) Personal armor fit assessment in Section 7.

1.7 *Units*—English units are specified in this standard to be consistent with measurement units used in the United States body armor community. Approximate values in SI units are given in parentheses.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the*

responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 *ASTM Standards*:²

D5219 Terminology Relating to Body Dimensions for Apparel Sizing

E3005 Terminology for Body Armor

F1731 Practice for Body Measurements and Sizing of Fire and Rescue Services Uniforms and Other Thermal Hazard Protective Clothing

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *apex, n*—the greatest protrusion of the breast as seen from the side (Terminology **D5219**). (See Fig. 1 and Fig. 2.)

3.1.2 *armhole, n*—in garment construction, the area of a garment through which the arm passes or into which a sleeve is fitted. (Practice **F1731** – 96 (2013))

3.1.3 *back break-point, n*—the location on the back of the torso where the arm separates from the body (Terminology **D5219**). See Fig. 1 and Fig. 2.

3.1.4 *back width, n*—the horizontal distance straight across the back of the torso at the level of the back break-points; for the purposes of this practice, the back width measurement is defined to be the same value as the chest width measurement. See Fig. 3.

3.1.5 *body armor, n*—an item of personal protective equipment intended to protect the wearer from threats that may include ballistic threats, stabbing, fragmentation, or blunt impact. (Terminology **E3005**)

3.1.5.1 *Discussion*—Law enforcement and corrections officers typically refer to body armor as a *vest*.

3.1.6 *bust point to bust point, n*—the horizontal distance from apex to apex. (Adapted from Terminology **D5219**.) See Fig. 4.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

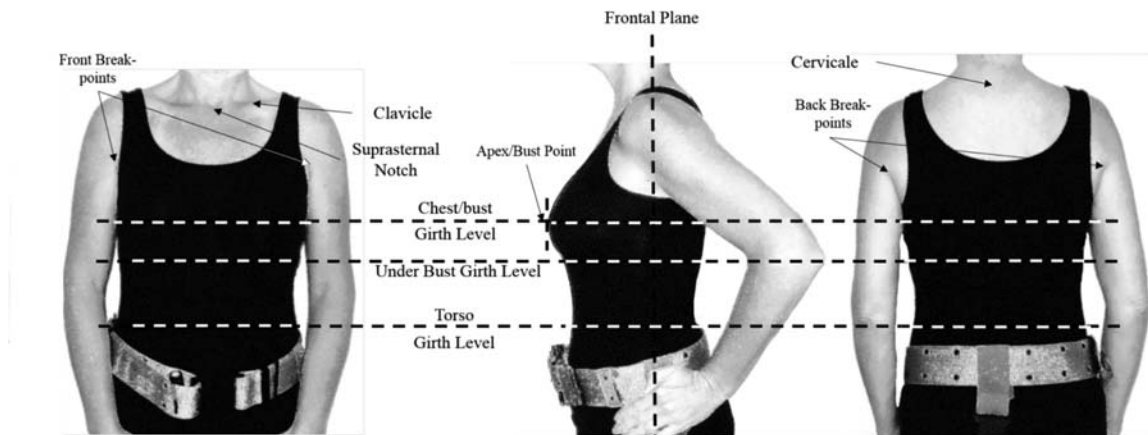


FIG. 1 Female Torso Body Landmarks

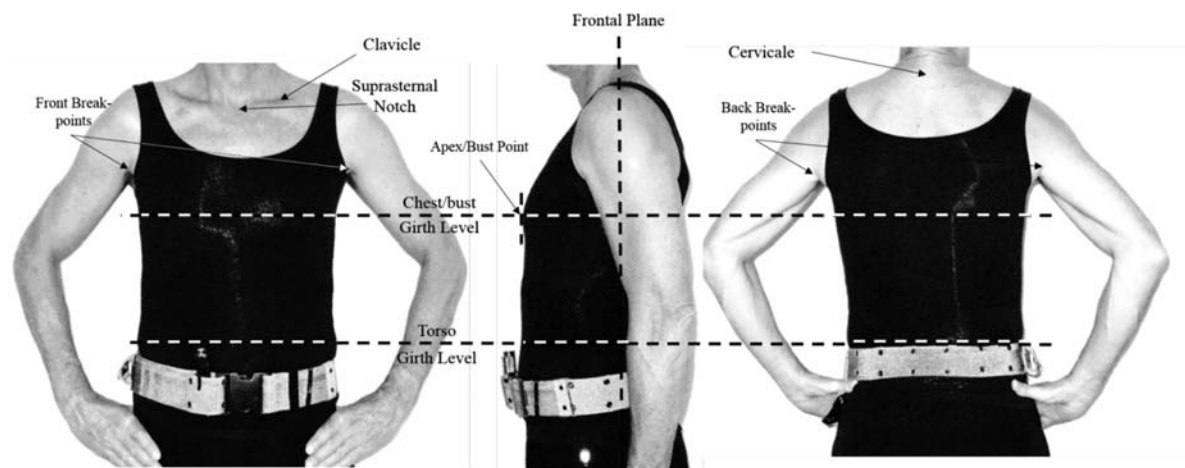


FIG. 2 Male Torso Body Landmarks

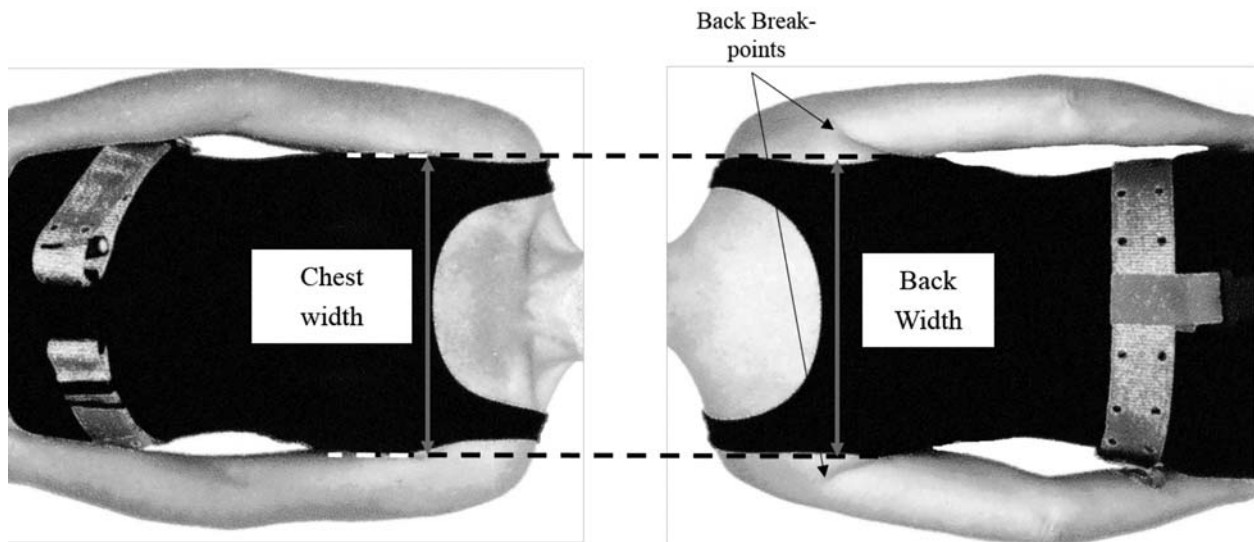


FIG. 3 Chest and Back Widths

3.1.7 *bust point to side seam, n*—on either side of the body, the horizontal distance from apex to the midpoint between front break-point and back break-point. See Fig. 4.

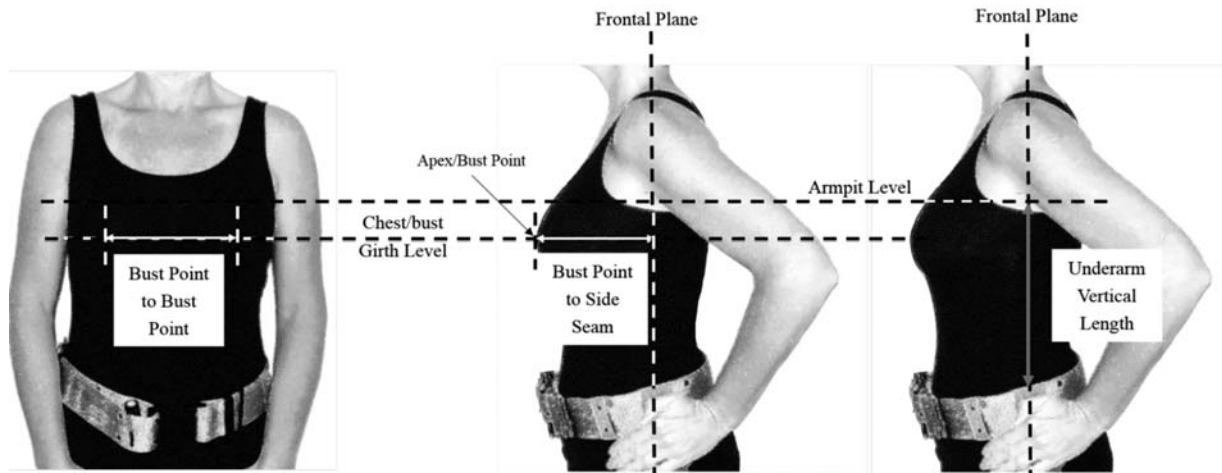


FIG. 4 Female Torso Front and Side Measurements

3.1.8 *cervicale, n*—the superior palpable point of the spine of the seventh cervical (C7) vertebra. (Anthropometric Survey (ANSUR) II Pilot Study: Methods and Summary Statistics)³; the most protruding vertebrae at the back of the base of the neck. Refer to Fig. 1 and Fig. 2.

3.1.9 *chest/bust girth, n*—the horizontal circumference around the torso, taken under the arms and at the level of the apex. (Terminology D5219.) See Fig. 1 and Fig. 2 showing the location of this measurement.

3.1.10 *chest width, n*—the horizontal distance straight across the chest between the front break-points. Refer to Fig. 3 for the location of this measurement.

3.1.11 *chest width, shooting stance, n*—the horizontal distance straight across the chest between the front break-points, taken while the wearer is in the preferred handgun shooting stance. See *shooting stance*.

3.1.12 *clavicle, n*—the long curved bone that connects the upper part of the breastbone with the shoulder blade at the top of each shoulder; the clavicle may also be referred to as the collarbone. See Fig. 1 and Fig. 2 showing the location of the clavicle.

3.1.13 *concealable armor, n*—vest designed to be worn under the shirt (uniform or undercover) or in a carrier that looks like a uniform shirt so that it is not easily seen. (Terminology E3005.)

3.1.14 *duty belt, n*—a belt worn around the waist by law enforcement and corrections personnel to which essential equipment is attached.

3.1.15 *fit, n*—the quality, state, or manner in which the length and closeness of clothing, when worn, relates to the human body. (Practice F1731 – 96 (2013)); a characteristic of an individual body armor relative to the wearer that encompasses coverage, comfort, and functionality.

3.1.16 *front break-point, n*—the location on the front of the torso where the arm separates from the torso (Terminology D5219). Refer to Fig. 1 and Fig. 2.

3.1.17 *front center length, n*—the vertical distance from the bottom of the suprasternal notch to the top of the duty belt. See Fig. 5 and Fig. 6 for the location of this measurement.

3.1.18 *front lateral length, n*—the vertical distance from the top of the clavicle over the bust point to the top of the duty belt. See Fig. 5 and Fig. 6 for the location of this measurement.

3.1.19 *shooting stance, n*—body and arm positioning of a shooter relative to the target when preparing to fire a handgun; four types of shooting stances are typical for law enforcement.

3.1.19.1 *isosceles stance, n*—a shooting stance in which the individual is directly facing or squared up to the target, with feet shoulder width apart, and is aiming the handgun with both arms held toward the target and parallel to the ground.

3.1.19.2 *modern isosceles stance, n*—a stance in which the individual is directly facing or squared up to the target, with feet shoulder width apart, and aiming the handgun with both arms straight and both shoulders rolled forward.

3.1.19.3 *modified Weaver stance, n*—a stance in which the individual is directly facing or squared up to the target, with feet shoulder width apart and is aiming the handgun with the primary arm held straight toward the target and parallel to the ground and the support arm elbow bent toward the ground.

3.1.19.4 *Weaver stance*—a stance in which the individual faces the target at an angle with the primary foot back and is aiming the handgun with the primary arm held straight toward the target and parallel to the ground and the support arm elbow bent toward the ground.

3.1.20 *suprasternal notch, n*—the depression in the top of the sternum between its articulations with the two clavicles; called also jugular notch (Merriam-Webster); the notch at the top of the sternum. See Fig. 1 and Fig. 2.

3.1.21 *torso, n*—the human trunk. (Practice F1731 – 96 (2013))

3.1.22 *torso girth, n*—the largest horizontal circumferential measurement around the torso below the rib cage near the waist; this measurement is not necessarily the wearer's belt size or waist size. See Fig. 1 and Fig. 2 for the location of this measurement.

³ Available from www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA498172.

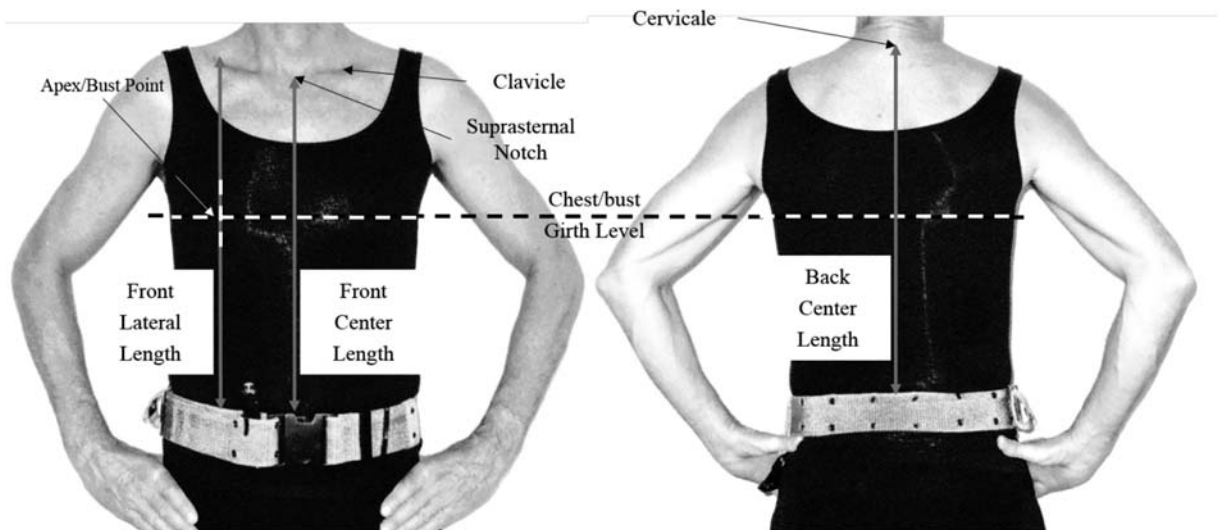


FIG. 5 Male Torso Vertical Measurements

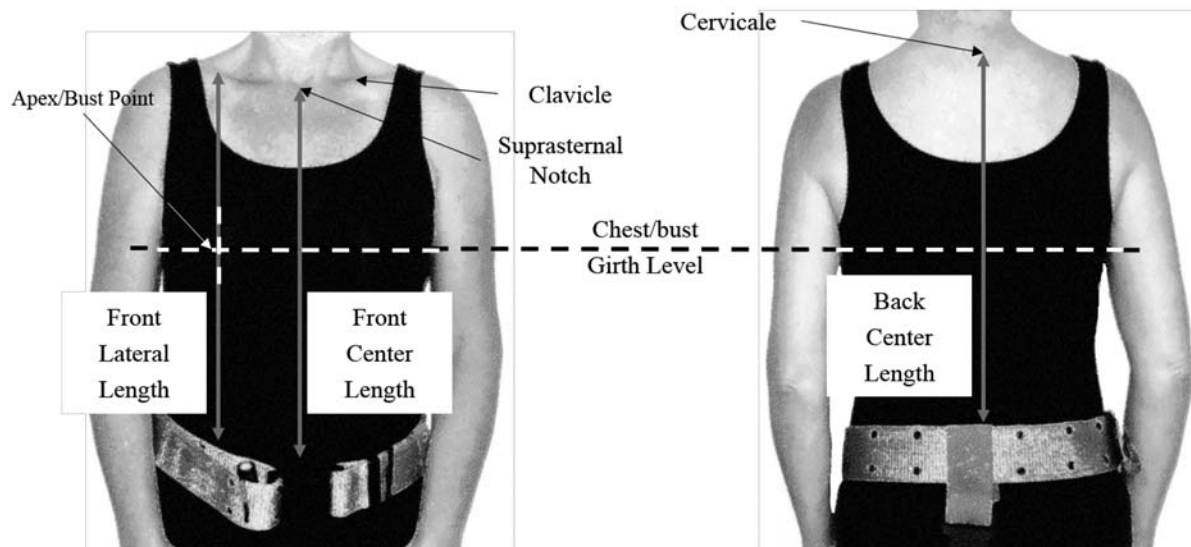


FIG. 6 Female Torso Vertical Measurements

3.1.23 *underarm vertical length, n*—the vertical distance between the armpit and the top of the duty belt measured while the wearer is seated. See Fig. 4 for the location of this measurement.

3.1.24 *underarm vertical length, adjusted, n*—the measured underarm vertical length minus approximately 3 in. (7.6 cm). See Fig. 7 and Fig. 8.

3.1.25 *under-bust girth, n*—the horizontal circumference around the torso under the arms and bust (Terminology D5219). See Fig. 1 and Fig. 2 for the under-bust girth measurement location.

3.1.26 *vest, n*—a type of body armor intended to protect the wearer's torso (Terminology E3005).

3.1.27 *waist, n*—in anatomy, the part of the body at the location between the lowest rib and hip identified by bending the body to the side. (Practice F1731 – 96 (2013))

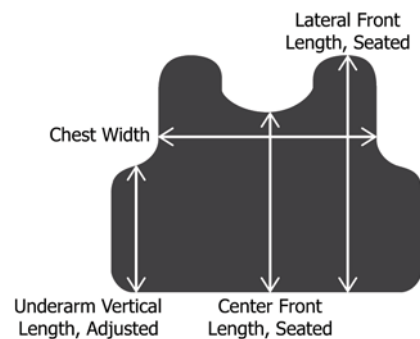


FIG. 7 Front Panel Measurements

4. Significance and Use

4.1 Properly sized and fitted body armor enhances the safety and performance of the wearer by providing protection while not restricting movement. Having body armor that fits well begins with appropriate and accurate measurements. The

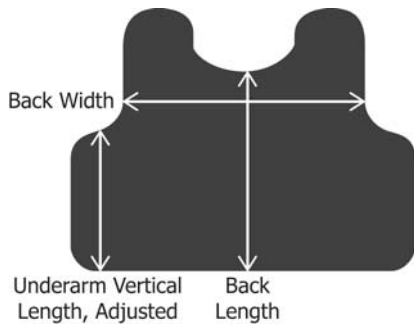


FIG. 8 Back Panel Measurements

measurement guidance of this practice will facilitate consistency of measurement across the body armor industry and will help wearers understand proper measurements.

4.2 Accurate measurements do not necessarily result in well-fitting armor, so this practice goes a step further by providing (1) a method for assessing how closely an armor matches the corresponding wearer measurements, and (2) a description of well-fitting armor along with a personal armor fit assessment that the wearer can do for himself/herself.

4.3 The measurement and fitting guidance specifically addresses officer-stated requirements for side overlap of front and back body armor panels, minimizing the armhole opening, eliminating any “V” gap (or similar) between the front and back panels, and providing vertical coverage on the front torso from the “2nd uniform shirt button to 2 to 3 finger widths above duty belt.” Those requirements were considered in the development of this practice and the definition of measurements that can be consistently made for any individual.

4.4 This practice describes measurements for the front, back, and sides of the wearer, in addition to girth measurements, to achieve proper sizing of front and back panels and proper fit of the complete armor.

4.5 This practice can be used to train individuals on proper measurement techniques and to train wearers on proper fitting of body armor.

5. Measurement Procedures

5.1 Apparatus:

5.1.1 *Chair for Seated Position Measurements*—The recommended chair shall be a rigid, non-adjustable chair, having a back and a flat, rigid seat, and resting on flat surface. The chair should have no arm rests.

5.1.2 *Markers*—The use of markers to identify the location of relevant body landmarks on the wearer is recommended to facilitate the measurement process, and the markers should remain in place during all measurements. The remainder of the document refers to these markers; if the measurer chooses not to use the markers, he/she is responsible for accurately locating the body landmarks referred to.

5.1.2.1 *Chest/bust Girth Marker*—A length of stretchable cord, twine, narrow masking tape, or other thin material (for example, elastic) for encircling the torso and marking the chest/bust girth level. The ends of the material should be joined at the back of the body using removable clips, and the marker

should be positioned appropriately across the front of the body by the wearer. The measurer should ensure that the marker is level horizontally around the body. See Fig. 4, Fig. 5, or Fig. 6.

5.1.2.2 *Side Marker*—A length of cord, twine, narrow masking tape, or other thin material (could be elastic but need not be stretchy) for marking the midpoint between the front and back break-points on one side of the body. The marker should be held vertically in place between the chest/bust girth marker and the duty belt. The measurer should ensure that the side marker is perpendicular to the chest/bust girth marker.

5.1.3 *Tape Measure*—The tape used shall be flexible and non-stretchable, have a length of at least 60 in. (1.5 m), with at least ¼-in. or mm divisions. An anthropometric tape, such as Lafayette Instrument model J00305 or equivalent, is recommended, but a tailor’s tape may also be used. Prior to using any flexible tape for making measurements, a verification check is recommended to check that the tape has not stretched since the last use and may be done by comparing the flexible tape measure to a non-stretchable tape, such as a Lufkin model L610 steel tape or equivalent.

5.1.4 *Weighing Scale*—A bathroom scale shall be used for weighing, if weight is unknown, and the scale shall have the capability to be zeroed prior to weighing, shall provide weight in units of pounds or kilograms, shall indicate weight to at least the nearest pound or kilogram, and shall have weight capacity appropriate for the individual being weighed. If better quality than a bathroom scale is available, such as a medical or fitness scale, it is acceptable to use such a scale for measurements, given that the other requirements of this section are met.

5.2 Measurement Skill, Accuracy, and Cautions:

5.2.1 *Measurement Skill*—Individuals making measurements must have a complete understanding of this practice and demonstrate their ability to make accurate measurements. (Adapted from Practice F1731 – 96 (2013).)

5.2.2 *Measurement Accuracy*—Measurement accuracy depends on (1) the skill of the individual doing the measuring, (2) the condition of the equipment being used for making measurements, and (3) the level of cooperation from the subject being measured. Reliable measurements can be made only when all of the above variables are controlled. (Adapted from Practice F1731 – 96 (2013).) The body measurements described in this practice cannot be made accurately on oneself but require another individual as the measurer.

5.2.3 Cautions:

5.2.3.1 When measuring female officers, care should be taken to make appropriate measurements from behind with the wearer adjusting the tape over her chest.

5.2.3.2 When measuring officers and discussing their measurements, care should be taken to be sensitive to the desire for privacy of body measurements.

5.3 Preparation for Measuring the Wearer:

5.3.1 The type of clothing worn during measuring can influence the accuracy of the measurements, and the following clothing and equipment shall be worn during measuring:

5.3.1.1 Uniformed officers being measured for concealable body armor worn under the uniform shirt shall wear a snugly fitting T-shirt, duty pants, duty belt with their typical gear installed (for example, weapon, magazine pouch, restraints),

inner belt (if normally worn), and keepers. The position of the duty belt on the wearer shall be as is typically worn, and the position should not be artificially adjusted. Females shall wear the type of bra that they usually wear on duty.

5.3.1.2 Uniformed officers being measured for concealable body armor worn over the uniform shirt in an outer carrier shall wear the uniform shirt, a T-shirt (if normally worn), duty pants, duty belt with their typical gear installed (for example, weapon, magazine pouch, restraints), inner belt (if normally worn), and keepers. The position of the duty belt on the wearer shall be as is typically worn, and the position should not be artificially adjusted. Females shall wear the type of bra that they usually wear on duty.

5.3.1.3 Non-uniformed personnel (for example, special agents, detectives) being measured for concealable body armor worn under the outermost shirt shall wear a snugly fitting T-shirt, pants, and a belt that are representative of what is worn on duty. The position of the belt on the wearer shall be as is typically worn, and the position should not be artificially adjusted. Females shall wear the type of bra that they usually wear on duty.

5.3.2 Markers should be appropriately placed on the wearer. Refer to 5.1.2. The chest/bust girth marker should be put in place and positioned with the aid of the wearer, especially across the front of the body. The measurer should adjust the position properly on the sides and back.

5.3.3 All linear and circumferential measurements shall be taken to the nearest $\frac{1}{4}$ in. or cm.

NOTE 1—One cm is not equivalent to $\frac{1}{4}$ in. but is sufficient for these measurements.

5.3.4 For all measurements, the wearer shall breathe normally without holding the breath and shall not hold in the stomach.

5.3.5 For all measurements requiring the wearer to be in a standing position, except chest width, the wearer shall stand with feet shoulder width apart, facing forward, arms relaxed down at the sides, and looking straight ahead. For chest width, shooting stance, the wearer shall assume his/her preferred shooting stance with the hands touching as if holding a handgun. If the wearer does not carry a handgun during normal duties, the arms shall be extended in front of the body and parallel to each other and to the floor.

5.3.6 For all measurements requiring the wearer to be in a seated position, the wearer shall sit straight up in a natural comfortable position, facing forward and looking straight ahead with feet apart flat on the floor and arms relaxed at sides. If the chair has arm rests, the individual being measured should not place either arm on the arm rests but have arms relaxed at the sides.

5.4 Measuring the Wearer:

5.4.1 *Weight*—The measurer shall record the wearer's weight in pounds or kilograms and to the nearest pound or kilogram (for example, 125 lb or 57 kg) either by having the wearer specify his or her known weight or weighing the wearer. If the wearer needs to be weighed, the measurer shall ensure that the scale is set to zero initially and record the weight of the wearer to the nearest pound or kilogram. If the

wearer is a uniformed officer and is being weighed, ensure that the officer removes the duty belt prior to being weighed.

5.4.2 *Female Wearers Only: Bust Point to Bust Point*—The wearer shall align the tape appropriately from bust point to bust point and hold the tape in position while the measurer records the value. Refer to Fig. 4 for the location of this measurement.

5.4.3 *Female Wearers Only: Bust Point to Side Seam*—The wearer shall align the tape appropriately from bust point to the side marker and hold the tape in position while the measurer records the value.

NOTE 2—If holding the tape in position is difficult for the wearer, the measurer may assist in holding the end of the tape in line with the side marker so that the wearer can lower her arm. Refer to Fig. 4 for the location of this measurement.

5.4.4 *Chest/Bust Girth*—With the wearer's arms raised slightly away from the sides, the measurer shall wrap the tape around the torso horizontally under the arms and aligned with the chest/bust girth marker. The measurer should stand behind the wearer to take the measurement, and the wearer should position the tape correctly across the front of the chest. Once the tape is in place, the wearer shall lower the arms to his or her sides, and the measurement shall be taken, ensuring that the tape is snug around the torso. Refer to Fig. 1 and Fig. 2 for the location of this measurement.

5.4.5 *Female Wearers Only: Under-Bust Girth*—With the wearer's arms raised slightly away from the sides, the measurer shall wrap the tape around the rib cage horizontally under the arms and under the bust. The measurer should stand behind the wearer to take the measurement, and the wearer should position the tape correctly under the bust. Once the tape is in place, the wearer shall lower the arms to her sides, and the measurement shall be taken, ensuring that the tape is snug around the torso and horizontally level. Refer to Fig. 1 for the location of this measurement.

5.4.6 *Torso Girth*—With the wearer standing, the measurer shall wrap the tape around the torso at the largest circumference below the rib cage and near the waist, keeping the tape horizontally level. Once the tape is in place, the measurement shall be taken ensuring that the tape is snug around the torso and that the wearer is breathing normally and keeping the torso muscles relaxed. Refer to Fig. 1 and Fig. 2 for the location of this measurement.

5.4.7 *Chest Width*—With the wearer standing with arms down at sides, the measurer shall measure the horizontal distance straight across the front of the chest between the front break-points. Refer to Fig. 3 for the location of this measurement.

5.4.8 *Chest Width, Shooting Stance*—With the wearer positioned in his/her preferred shooting stance, the measurer shall measure the horizontal distance straight across the front of the chest at the front break-point.

5.4.9 *Back Width*—Back width is not measured in this version of the practice because there is not a body landmark on the back of the torso that facilitates consistent measurement. The value for *chest width* shall be recorded as the *back width*. Refer to Fig. 3.

5.4.10 *Underarm Vertical Length*—With the wearer in a seated position and the right arm slightly raised to the side, the

measurer shall place a plastic ruler under the arm where the arm joins the torso, ensuring the ruler is horizontally level. The wearer shall lower the right arm trapping the ruler. The top of the ruler corresponds to the armpit location. The measurer shall measure the vertical length straight from the armpit to the top of the duty belt. Refer to [Fig. 4](#) for the location of this measurement.

5.4.11 Front Center Length – Standing—The measurer shall measure vertically from the bottom of the wearer’s suprasternal notch to the top of the duty belt. Refer to [Fig. 5](#) and [Fig. 6](#) for this measurement location.

5.4.12 Front Lateral Length – Standing—The measurer shall measure vertically, following the body, from the top of the wearer’s clavicle over the bust point to the top of the duty belt. The wearer shall position the tape correctly over the bust point. Refer to [Fig. 5](#) and [Fig. 6](#) for this measurement location.

5.4.13 Female Wearers Only: Front Lateral Length from the Top of Clavicle to the Bust Point – Standing—The measurer shall measure vertically, following the body, from the top of the wearer’s clavicle to the bust point. The wearer shall position the tape correctly over the bust point. Refer to [Fig. 6](#).

5.4.14 Front Center Length – Seated—The wearer shall be seated during this measurement. The measurer shall measure vertically, following the body, from the bottom of the wearer’s suprasternal notch to the top of the duty belt.

5.4.15 Front Lateral Length – Seated—The wearer shall be seated during this measurement. The measurer shall measure vertically, following the body, from the top of the wearer’s clavicle over the bust point to top of the duty belt. The wearer shall position the tape correctly over the bust point.

5.4.16 Female Wearers Only: Front Lateral Length from the Top of the Clavicle to Bust Point – Seated—The wearer shall be seated during this measurement. The measurer shall measure vertically, following the body, from the top of the wearer’s clavicle to the bust point. The wearer shall position the tape correctly over the bust point.

5.4.17 Back Length—The measurer shall measure the vertical distance from the top of the wearer’s cervicale (C7 vertebra) to the top of the duty belt in the back. See [Fig. 5](#) and [Fig. 6](#).

5.4.18 Female Wearers Only: Type of Bra—The measurer shall ask the wearer to specify the type of bra typically worn as either (1) sports bra or (2) non-sports bra.

5.5 Documentation:

5.5.1 For each individual being measured, the following information shall be recorded on a data sheet: information about the wearer, the measurer, the specific body armor model or supplier, and clothing worn during measurement and the actual measurements. A sample data sheet for recording the above information for male wearers is provided in [Appendix X1](#). A sample data sheet for recording the above information for female wearers is provided in [Appendix X2](#).

5.5.2 It is recommended that purchasers (agencies or individuals) require suppliers to perform measurements as specified in this practice and to provide a data sheet for each wearer containing the details shown in [Appendix X1](#) or [Appendix X2](#) as a part of the purchase agreement for body armor.

6. Comparison of Wearer Measurement and Body Armor Measurements

6.1 Overview:

6.1.1 It would be advantageous to be able to compare how closely the dimensions of an armor will match the dimensions of the wearer prior to manufacturing or procuring the armor. There are six wearer measurements that can be compared to corresponding armor measurements, and this section provides a tool for making that comparison.

6.1.2 The measurements that can be directly compared for a wearer and his/her body armor are noted below:

6.1.2.1 Chest width, shooting stance.

6.1.2.2 Front center length – seated.

6.1.2.3 Front lateral length – seated.

6.1.2.4 Underarm vertical length, adjusted (that is, the measured underarm vertical length minus 3 in.).

6.1.2.5 Back width (same as chest width).

6.1.2.6 Back Length.

6.1.3 It is recommended that the comparison of a wearer’s measurements and armor measurements be used as part of the procurement process for purchasing new or replacement armor. Prior to making the decision to purchase a specific armor model, the purchaser (agency or individual) could require the body armor supplier to measure the wearer as specified in [Section 5](#) of this practice and provide the required measurement comparison data as specified in this section.

6.2 Method:

6.2.1 Wearer Measurements—These measurements shall be copied from the wearer measurement sheet onto the comparison of wearer measurements and armor measurements sheet, except for *underarm vertical length, adjusted*. (*Underarm vertical length, adjusted* is derived from the *underarm vertical length*, which is on the wearer measurement sheet.) See [Appendix X3](#) for a sample comparison of wearer measurements and armor measurements sheet.

6.2.2 Armor Measurements—These measurements shall be taken on the front and rear armor panels in the locations corresponding to where the measurements are made on the wearer’s body. See [Fig. 7](#) and [Fig. 8](#). These measurements shall be documented on the comparison sheet.

6.2.3 Comparison—The wearer and armor measurements shall be compared, and an explanation of any differences between the respective measurements shall be indicated on the comparison sheet.

6.2.3.1 Discussion—Although a wearer’s measurements and the armor measurements are not expected to be an exact match, the goal is to facilitate the selection of an armor style or model that matches the wearer to fit as closely as possible without restricting movement.

6.2.3.2 Discussion—This comparison will be useful in determining whether sizes offered by a manufacturer are a good match for a specific individual.

7. Personal Armor Fit Assessment

7.1 Overview:

7.1.1 The purpose of this assessment is to assist an officer in determining how well his/her body armor fits. Proper fit is a balance of coverage, comfort and functionality. For example,

too little coverage may feel comfortable and allow great functionality but offer insufficient protection to the wearer. Performing the personal armor fit assessment helps the user evaluate this balance and will reveal issues that may not be otherwise obvious to the wearer.

7.1.2 The assessment should be performed upon receipt of a new armor. Any observed problems noted during the assessment may be an indication that the armor has not been properly fitted for the officer, and problems should be brought to the attention of supervisors.

7.1.3 The assessment may be performed any time the wearer's body measurements have significantly changed.

7.1.4 Well-fitting armor exhibits the characteristics listed below:

7.1.4.1 Does not restrict breathing.

7.1.4.2 Allows wearer to assume the preferred handgun shooting stance with minimal to no bicep rubbing or discomfort, tingling in arms or hands, or interference with arms.

7.1.4.3 Allows wearer to shoulder a long gun with minimal to no bicep rubbing or discomfort, tingling in arms or hands, or interference with arms.

7.1.4.4 Allows the wearer to perform typical officer movements (for example, squatting, sitting, kneeling, running) with minimal pinching at sides, pinching at the duty belt, or interference at neck or arms.

7.1.4.5 Allows the wearer to reach equipment located at the center back of the duty belt with minimal interference at the arms in back.

7.1.4.6 Has no gaps between the torso and the armor at the armhole (that is, armor is flush against the torso).

7.1.4.7 Has continuous coverage along the front armhole edge in the chest/bust area. **Fig. 9** provides an example of lack of continuous coverage in this area.

7.1.4.8 When seated, has front panel coverage that vertically extends from the suprasternal notch at the base of the neck to the top of the duty belt.

NOTE 3—This vertical coverage when seated appears differently when standing; there is expected to be a small gap of less than 2 in. (5 cm) between the front panel and the top of the duty belt when standing to allow the front panel to meet the top of the duty belt when seated. That 2-in. gap may be approximated by checking to see that the gap is no more than two to three finger widths. **Fig. 10** provides an example of lack of vertical coverage on the torso front.

7.1.4.9 Has back panel coverage that vertically extends from the most prominent vertebra at the neck to near the top of the duty belt. **Fig. 11** provides an example of lack of vertical coverage on the torso back.

NOTE 4—The bottom edge of the back panel should be level with the bottom edge of the front panel.

7.1.4.10 Has side coverage that vertically extends from within 3 in. (7.5 cm) of the armpit to near the top of the duty belt.

NOTE 5—The bottom edge on the sides should be level with the bottom edge of the front panel.

7.1.4.11 Has at least a 2-in. (5 cm) overlap of the front and back panels on both sides. **Fig. 12** provides an example of lack of coverage on the side.

7.1.4.12 Has minimal to no gap between the armor edge and the biceps when the wearer is in the preferred shooting stance.

7.1.4.13 Has no discontinuities at the upper and lower edges of the overlap of the front and back panels. **Fig. 12** provides an example of such discontinuities.

7.2 Assessment Method:

7.2.1 Assessment categories are identified below, and detailed steps for assessing each item are included in the sample personal armor fit assessment form provided in **Appendix X4**:

7.2.1.1 Donning the armor with other duty gear.

7.2.1.2 Shooting stance with a handgun.

7.2.1.3 Shooting stance with a shoulder weapon.

7.2.1.4 Restraint operations.

7.2.1.5 Sitting position.

7.2.1.6 Vehicle operation.

7.2.1.7 Visual examination.

7.2.2 The wearer should perform each of the assessment steps identified in **Appendix X4** and document his/her observations.



NOTE 1—The unprotected “triangle” at the bust is of concern.

FIG. 9 Example Armor Showing Lack of Continuous Coverage



NOTE 1—The unprotected area between the bottom edge of vest and the duty belt is of concern.

FIG. 10 Example Armor Showing Lack of Vertical Coverage on the Torso Front



NOTE 1—The unprotected area above the top edge of vest is of concern.

FIG. 11 Example Armor Showing Lack of Vertical Coverage on the Torso Back



FIG. 12 Example Armor Showing Lack of Overlap on the Side and Discontinuity at Upper Side Edge of Vest

8. Keywords

8.1 body armor; fit; measurement; wearer



APPENDIXES

(Nonmandatory Information)

X1. SAMPLE ASTM MALE BODY ARMOR WEARER MEASUREMENT SHEET

Date: _____

Wearer Information

First Name: _____ Last Name: _____

Gender: _____

Badge/Serial Number: _____ Agency: _____

Phone: _____ Email: _____

Shipping Address: _____

Signature: _____

Measurer Information

Organization: _____

Name: _____

Signature: _____

Phone: _____

Email Address: _____

Armor Information

If the wearer is being measured for a particular body armor, please provide the required information below.

Manufacturer: _____

Point of Contact: _____

Email Address: _____

Model/Style: _____

Brand: _____

Standard and Protection Level
(e.g., NIJ Standard-0101.06, Type
III A): _____

Preparation for Measuring the Male Body Armor Wearer

The type of clothing worn during measuring can influence the accuracy of the measurements, and it is recommended that the following clothing and equipment be worn during measuring:

- Uniformed officers being measured for concealable body armor worn under the uniform shirt should wear a snugly fitting T-shirt, duty pants, duty belt with their typical gear installed (for example, weapon, magazine pouch, restraints), inner belt (if normally worn), and keepers. The position of the duty belt on the wearer should be as is typically worn, and the position should not be artificially adjusted.
- Uniformed officers being measured for concealable body armor worn over the uniform shirt in an outer carrier should wear the uniform shirt, a T-shirt (if normally worn), duty pants, duty belt with their typical gear installed (for example, weapon, magazine pouch, restraints), inner belt (if normally worn), and keepers. The position of the duty belt on the wearer should be as is typically worn, and the position should not be artificially adjusted.
- Non-uniformed personnel (for example, special agents, detectives) being measured for concealable body armor worn under the outermost shirt should wear a snugly fitting T-shirt, pants, and a belt that are representative of what is worn on duty. The position of the belt on the wearer should be as is typically worn, and the position should not be artificially adjusted.

If markers are used, they should be appropriately placed on the wearer according to section 5.1.2 of the ASTM Standard E3005.

All linear and circumferential measurements shall be taken to the nearest ¼ in or cm.

For all measurements, the wearer shall breathe normally without holding the breath and shall not hold in the stomach.

For all measurements requiring the wearer to be in a standing position, except *chest width*, the wearer shall stand with feet shoulder width apart, facing forward, arms relaxed down at the sides, and looking straight ahead. For *chest width*, *shooting stance*, the wearer shall assume his preferred shooting stance with the hands touching as if holding a handgun. If the wearer does not carry a handgun during normal duties, the arms shall be extended in front of the body and parallel to each other and to the floor.

For all measurements requiring the wearer to be in a seated position, the wearer shall sit straight up in a natural comfortable position, facing forward and looking straight ahead with feet apart flat on the floor and arms relaxed at sides. If the chair has arm rests, the individual being measured should not place either arm on the arm rests.

Clothing and Equipment Worn During Measurement

Was the clothing and equipment worn by the officer being measured consistent with the guidelines above? Check as appropriate.

	Yes
	No

If the answer is "no", provide a brief explanation: _____

Wearer Name and Date: _____

**Male Body Armor Wearer Measurement Data**

Check the appropriate box to indicate the measurement units being used:

<input type="checkbox"/>	lbs, inches
<input type="checkbox"/>	kg, cm

Item of Interest	Criteria or Measurements
1. Weight	
2. Chest/bust girth	
3. Torso girth	
4. Chest width	
5. Chest width, shooting stance Indicate preferred stance: _____	
6. Back width (Not measured; same value as chest width)	
7. Underarm vertical length	
8. Front center length – standing	
9. Front lateral length – standing	
10. Front center length – seated	
11. Front lateral length – seated	
12. Back Length	

Wearer Name and Date: _____



X2. SAMPLE ASTM FEMALE BODY ARMOR WEARER MEASUREMENT SHEET

Date: _____

Wearer Information

First Name: _____ Last Name: _____

Gender: _____

Badge/Serial Number: _____ Agency: _____

Phone: _____ Email: _____

Shipping Address: _____

Signature: _____

Measurer Information

Organization: _____

Name: _____

Signature: _____

Phone: _____

Email Address: _____

Armor Information

If the wearer is being measured for a particular body armor, please provide the required information below.

Manufacturer: _____

Point of Contact: _____

Email Address: _____

Mode/Style: _____

Brand: _____

Standard and Protection Level
(e.g., NIJ Standard-0101.06, Type
III A): _____

Preparation for Measuring the Female Body Armor Wearer

The type of clothing worn during measuring can influence the accuracy of the measurements, and it is recommended that the following clothing and equipment be worn during measuring:

- Uniformed officers being measured for concealable body armor worn under the uniform shirt should wear a snugly fitting T-shirt, duty pants, duty belt with their typical gear installed (for example, weapon, magazine pouch, restraints), inner belt (if normally worn), and keepers. The position of the duty belt on the wearer should be as is typically worn, and the position should not be artificially adjusted. Females need to wear the type of bra that they usually wear on duty.
- Uniformed officers being measured for concealable body armor worn over the uniform shirt in an outer carrier should wear the uniform shirt, a T-shirt (if normally worn), duty pants, duty belt with their typical gear installed (for example, weapon, magazine pouch, restraints), inner belt (if normally worn), and keepers. The position of the duty belt on the wearer should be as is typically worn, and the position should not be artificially adjusted. Females need to wear the type of bra that they usually wear on duty.
- Non-uniformed personnel (for example, special agents, detectives) being measured for concealable body armor worn under the outermost shirt should wear a snugly fitting T-shirt, pants, and a belt that are representative of what is worn on duty. The position of the belt on the wearer should be as is typically worn, and the position should not be artificially adjusted. Females need to wear the type of bra that they usually wear on duty.

If markers are used, they should be appropriately placed on the wearer according to section 5.1.2 of the ASTM Standard E3005.

All linear and circumferential measurements shall be taken to the nearest ¼ in or 1 cm.

For all measurements, the wearer shall breathe normally without holding the breath and shall not hold in the stomach.

For all measurements requiring the wearer to be in a standing position, except *chest width*, the wearer shall stand with feet shoulder width apart, facing forward, arms relaxed down at the sides, and looking straight ahead. For *chest width, shooting stance*, the wearer shall assume her preferred shooting stance with the hands touching as if holding a handgun. If the wearer does not carry a handgun during normal duties, the arms shall be extended in front of the body and parallel to each other and the floor.

For all measurements requiring the wearer to be in a seated position, the wearer shall sit straight up in a natural comfortable position, facing forward and looking straight ahead with feet apart flat on the floor and arms relaxed at sides. If the chair has arm rests, the individual being measured should not place either arm on the arm rests.

Clothing and Equipment Worn During Measurement

Was the clothing and equipment worn by the officer being measured consistent with the guidelines above? Check as appropriate.

	Yes
	No

If the answer is "no", provide a brief explanation: _____

Wearer Name and Date: _____

**Female Body Armor Wearer Measurement Data**

Check the appropriate box to indicate the measurement units being used:

<input type="checkbox"/>	lbs, inches
<input type="checkbox"/>	kg, cm

Item of Interest	Criteria or Measurements
1. Weight	
2. Bust point to bust point	
3. Bust point to side seam	
4. Chest/bust girth	
5. Under-bust girth	
6. Torso girth	
7. Chest width	
8. Chest width, shooting stance Indicate preferred stance: _____	
9. Back width (Not measured; same value as chest width)	
10. Underarm vertical length	
11. Front center length – standing	
12. Front lateral length – standing	
13. Front lateral length from the top of clavicle to the bust point – standing	
14. Front center length – seated	
15. Front lateral length – seated	
16. Front lateral length from the top of clavicle to the bust point –seated	
17. Back Length	
18. Female: Type of bra (1) sports bra or (2) non-sports bra.	

Wearer Name and Date: _____



X3. SAMPLE ASTM COMPARISON OF WEARER MEASUREMENTS AND ARMOR MEASUREMENTS SHEET

The information on this sheet shall be based on data recorded on a wearer measurement sheet, and this sheet and wearer measurement sheet shall be cross-referenced by the wearer's name and the date of measurement.

Date: _____

Wearer Information

First Name:	_____	Last Name:	_____
Badge Number:	_____	Agency:	_____
Phone:	_____	Email:	_____

Information on Individual Completing this Data Sheet

Organization: _____

Name: _____

Signature: _____

Phone: _____

Email Address: _____

**Comparison of wearer measurements and armor measurements sheet**

Item	Wearer Measurement	Body Armor Panel Measurement	Explanation of Difference Between Measurements
Chest width, shooting stance	<u>Wearer Front:</u>	<u>Front panel:</u>	
Front center length – seated	<u>Wearer Front:</u>	<u>Front panel:</u>	
Front lateral length – seated	<u>Wearer Front:</u>	<u>Front panel:</u>	
Underarm vertical length, adjusted	<u>Wearer Side:</u>	<u>Front panel:</u>	
Back Width	<u>Wearer Back (same value as chest width*):</u>	<u>Back panel:</u>	
Back Length	<u>Wearer Back:</u>	<u>Back panel:</u>	
Underarm vertical length, adjusted	<u>Wearer Side:</u>	<u>Back panel:</u>	

* Wearer Back = Chest width. This value is the chest width that is measured while not in the preferred shooting stance.

Wearer Name and Date: _____

X4. SAMPLE ASTM PERSONAL ARMOR FIT ASSESSMENT

Overview:

The purpose of this assessment is to assist you in determining how well your body armor fits. While it is understood that body armor is not necessarily comfortable, any observed and noted problems during the assessment may be an indication that your armor has not been properly fitted for you and should be brought to the attention of your supervisor.

This assessment is included in ASTM E3005, which contains information explaining the characteristics of well-fitting armor.

Instructions:

- 1) Insert the information requested on this page.
- 2) Using the table on the following pages, perform each of the steps as instructed and check all items in the second column that apply and note additional observations or comments in the third column.
- 3) If you did not note any issues with your armor during the assessment, please indicate this by checking the box below:
☐ After performing all steps in the assessment, I found no issues with my armor.

Date: _____

Officer Information

First Name: _____	Last Name: _____
Badge Number: _____	Agency: _____
Phone: _____	Email: _____

Preparation: Donning the armor and other gear		
<ol style="list-style-type: none"> 1. While wearing the same type of clothing worn during measurement for the armor, don the body armor per manufacturer instructions, adjusting the shoulder and side straps so that the armor is snug on the torso but not overly tight. 2. Take 5 deep breaths. If you are not able to take deep breaths without restriction, loosen the straps slightly. Repeat this step until you are able to take deep breaths comfortably. 3. If applicable, check the box at right and note any comments. 4. If the armor is intended to be worn under the uniform shirt, don the uniform shirt and other external items (e.g., duty belt and required equipment). 	<input type="checkbox"/> I cannot breathe comfortably, even after adjusting the straps.	Comments:

Visual Examination (Note: Proper examination requires standing in front of a mirror or having a buddy perform the examination.)		
<p>5. If necessary, remove any clothing covering the armor. As you perform the steps below, check the appropriate boxes at right and note any comments.</p> <p>6. Stand comfortably with arms lowered to the sides. Examine the armhole area to determine whether the armor is flush with the torso, or if there are gaps between the torso and the armor.</p> <p>7. Sit comfortably with arms lowered to the sides. Examine the front panel to determine whether the upper edge extends vertically to the suprasternal notch (V) at the base of the neck and the lower edge extends vertically to the top of the duty belt. Note: <i>If the armor is too high or low on your torso, adjust the shoulder straps.</i></p> <p>8. Stand comfortably with arms lowered to the sides. Examine the front panel to determine whether the lower edge extends vertically to within 2 to 3 finger widths from the top of the duty belt.</p> <p>9. Stand comfortably with arms lowered to the sides. Examine the back panel to determine whether the upper edge extends vertically to the most prominent vertebra at the neck and the lower edge is level with the lower edge of the front panel.</p> <p>10. Stand comfortably with arms raised slightly from the sides. Examine both sides of the armor:</p> <ul style="list-style-type: none"> To determine if the upper edge of each side vertically extends to within 3 inches of the armpit and the lower edge of each side extends vertically to near the top of the duty belt. For at least 2-inch overlap of front and back panels (protective material, not just panel cover). For any discontinuities at the upper and lower edges of the armor, such as V shapes, between front and back panels. 	<input type="checkbox"/> Gaps between torso and armor at armhole.	Comments:
	<input type="checkbox"/> When seated, front panel upper edge <u>not</u> near V at neck.	
	<input type="checkbox"/> When seated, front panel lower edge <u>not</u> touching top of duty belt.	
	<input type="checkbox"/> When standing, front panel lower edge <u>not</u> within 2 to 3 finger widths of duty belt.	
	<input type="checkbox"/> Back panel upper edge <u>not</u> near most prominent vertebra.	
	<input type="checkbox"/> Back panel lower edge <u>not</u> near top of duty belt.	
	<input type="checkbox"/> Upper edge of side <u>does not</u> extend to within 3 inches of the armpit.	
	<input type="checkbox"/> Lower edge of side <u>does not</u> extend to the top of the duty belt.	
	<input type="checkbox"/> Less than 2-inch overlap on sides.	
<input type="checkbox"/> Discontinuities at upper or lower side edges.		
<input type="checkbox"/> Other problems: _____		

Note: Items checked in the second column indicate fitting issues with the armor.



Handgun Shooting Stance (if applicable)		
11. Draw the handgun and unload and clear the weapon. 12. Stand comfortably with arms lowered at sides. Assume the preferred shooting stance. Hold that position for 10 to 15 seconds. Relax and re-holster your handgun. 13. Repeat the above step 10 times. 14. Check the appropriate boxes at right and note any comments. Circle your preferred shooting stance below: <div style="display: flex; justify-content: space-around;"> Isosceles Modern Isosceles </div> <div style="display: flex; justify-content: space-around;"> Weaver Modified Weaver </div>	<input type="checkbox"/> Interference with arms at chest level.	Comments:
	<input type="checkbox"/> Bicep discomfort/rubbing.	
	<input type="checkbox"/> Tingling in arms, hands, or other area.	
	<input type="checkbox"/> Other problem: _____	
Shoulder Weapon Shooting Stance (if applicable)		
15. Unload and clear the shoulder weapon. 16. Stand comfortably holding the shoulder weapon in a carry position. Assume the shooting stance and shoulder the weapon. Hold that position for 10 to 15 seconds. Relax and lower the weapon to the carry position. 17. Repeat the above step 10 times. 18. Check the appropriate boxes at right and note any comments.	<input type="checkbox"/> Interference with arms at chest level.	Comments:
	<input type="checkbox"/> Bicep discomfort.	
	<input type="checkbox"/> Tingling in arms, hands, or other area.	
	<input type="checkbox"/> Other problem: _____	
	<input type="checkbox"/> No discomfort or interference.	

Note: Items checked in the second column indicate fitting issues with the armor.

Restraint Operations		
19. Stand comfortably with arms lowered at sides and perform the following movements, returning to a standing position between each movement: <ul style="list-style-type: none"> • Reach to the center back of the duty belt as if reaching for restraints. • Squat for 10 seconds. • Drop to one knee and remain in this position for 10 seconds. • Reach to the center back of the duty belt as if returning the restraints to the holder. 20. Check the appropriate boxes at right and note any comments.	<input type="checkbox"/> Interference with arms when reaching back.	Comments:
	<input type="checkbox"/> Pinching at sides or near duty belt.	
	<input type="checkbox"/> Choking at neck.	
	<input type="checkbox"/> Interference with arms at chest level in front.	
	<input type="checkbox"/> Other problem: _____	
Sitting Position		
21. Stand comfortably beside a typical office chair with arms lowered at sides. Lower into the chair and assume a typical posture with elbows resting on a desktop or table. Hold that position for 10 to 15 seconds. Return to the standing position. 22. Repeat the above step 10 times. 23. Check the appropriate boxes at right and note any comments.	<input type="checkbox"/> Pinching at sides or near duty belt.	Comments:
	<input type="checkbox"/> Choking at neck.	
	<input type="checkbox"/> Interference with arms at chest level.	
	<input type="checkbox"/> Other problem: _____	

Note: Items checked in the second column indicate fitting issues with the armor.

Vehicle Operation		
24. Stand comfortably beside your law enforcement vehicle with the door open (see <i>note below</i>). Get into the driver's seat and fasten the seatbelt. Place hands on the steering wheel at the 10:00 and 2:00 locations. Hold that position for 10 to 15 seconds. Remove the seatbelt, and exit the vehicle. 25. Repeat the above step 10 times. 26. Check the appropriate boxes at right and note any comments. <i>Note: These motions could be simulated by sitting in a typical office chair instead of a vehicle if a vehicle is not available. Circle as appropriate below.</i> <div style="text-align: center;"> <input type="checkbox"/> Performed in vehicle <input type="checkbox"/> Performed in office chair </div>	<input type="checkbox"/> Pinching at sides or near duty belt.	Comments:
	<input type="checkbox"/> Choking at neck.	
	<input type="checkbox"/> Interference with arms at chest level.	
	<input type="checkbox"/> Other problem: _____	
	<input type="checkbox"/> Tingling in arms, hands, or other area.	
End.		

Note: Items checked in the second column indicate fitting issues with the armor.

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