



Designation: E2902 – 12

Standard Practice for Measurement of Body Armor Wearers¹

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1. Scope

1.1 The document provides measurement guidance to assist in fitting ballistic-resistant body armor and stab-resistant body armor covering the torso. Proper measurement is necessary to obtain sufficient coverage of the torso and vital organs while allowing the range of motion required for officer operations.

1.2 This document addresses measurements for concealable (normal duty) and tactical (special duty) armor for both male and female wearers.

1.3 This standard does not address area of coverage (that is, how much of the torso is covered by the vest).

1.4 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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. Some specific hazards statements are given in Section 7 on Hazards.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D5219 Terminology Relating to Body Dimensions for Apparel Sizing](#)

2.2 *National Institute of Justice Standards:*

[NIJ Standard-0116.00 CBRN Protective Ensemble Standard for Law Enforcement](#)

3. Terminology

3.1 *Definitions:*

3.1.1 *acromion*, *n*—that part of the shoulder blade located at the end of the spine, which articulates with the collarbone (that is, clavicle). (Terminology [D5219](#).) See [Fig. 1](#).

¹ This practice is under the jurisdiction of ASTM Committee E54 on Homeland Security Applications and is the direct responsibility of Subcommittee E54.04 on Personal Protective Equipment (PPE).

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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.

3.1.2 *apex*, *n*—the greatest protrusion of the breast as seen from the side (Terminology [D5219](#)). See [Fig. 2](#).

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](#).

3.1.4 *bust point to bust point*, *n*—the horizontal distance from bust apex to bust apex, taken with the arms down. (Terminology [D5219](#)). See [Figs. 3 and 4](#).

3.1.5 *center front length to belt*, *n*—the vertical distance from bottom of the suprasternal notch to the top of the wearer's duty belt. If the officer has a large abdomen or the duty belt angles down in the front, or both, the measurement should extend to a horizontal plane set at the top of the duty belt in the back; otherwise, when the front panel is made, it may extend too low on the wearer. See [Fig. 4](#) showing the suprasternal notch, and refer to [Fig. 5](#) showing the center front length to belt measurement.

3.1.6 *cervicale*, *n*—the prominent point of the seventh or lowest neck vertebra at the back of the torso (Terminology [D5219](#)). Refer to [Fig. 1](#).

3.1.7 *chest/bust girth*, *n*—the horizontal circumference around the torso, taken under the arms and across the fullest part of the chest/bust apex including the lower portion of the shoulder blades (Terminology [D5219](#)). See [Fig. 6](#) showing the chest/bust girth measurement location.

3.1.8 *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. 4](#) showing the location of the clavicle.

3.1.9 *duty belt*, *n*—a belt worn around the waist by law enforcement personnel to which essential equipment is attached (NIJ Standard-0116.00).

3.1.10 *front break-point*, *n*—the location on the front of the torso where the arm separates from the torso (Terminology [D5219](#)). Refer to [Fig. 3](#).

3.1.11 *front chest depth*, *n*—the horizontal distance between the right bust apex and a frontal plane through a point halfway between the front break-point and the back break-point on the right side. See [Fig. 7](#).

3.1.12 *height*, *n*—the vertical distance from the crown of the head to the floor, taken with subject standing and without shoes (Terminology [D5219](#)). See [Fig. 8](#).

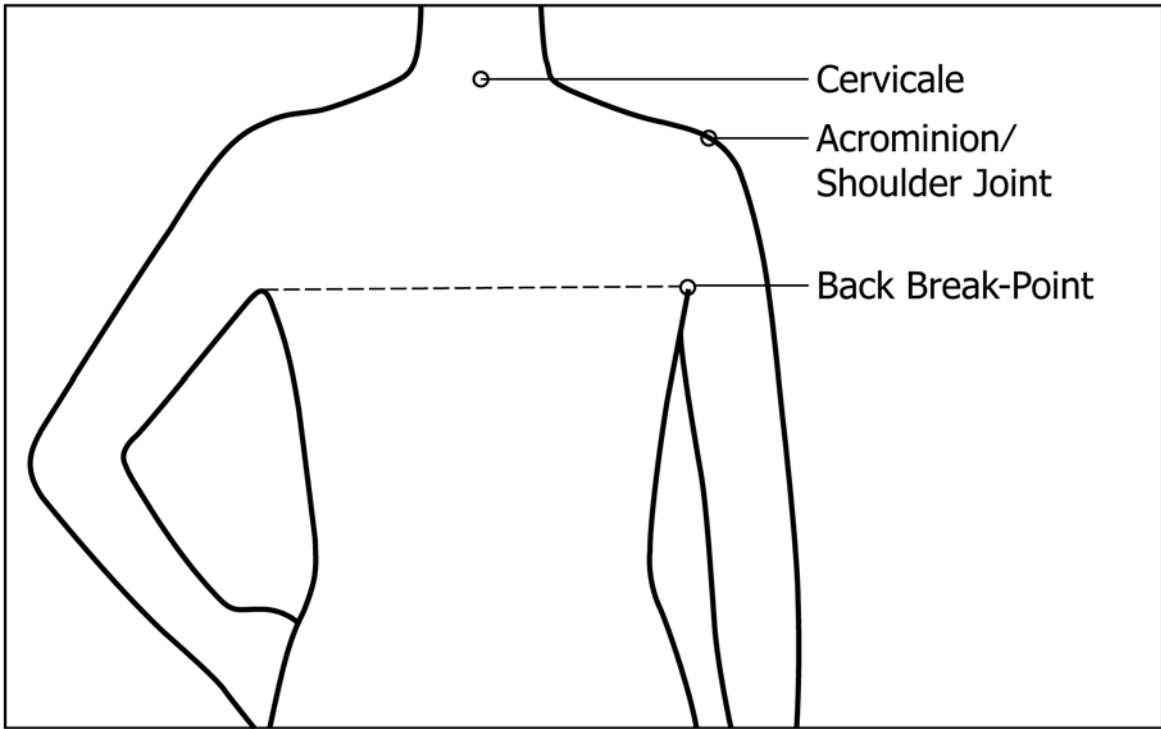


FIG. 1 Back Torso Measurement Locations

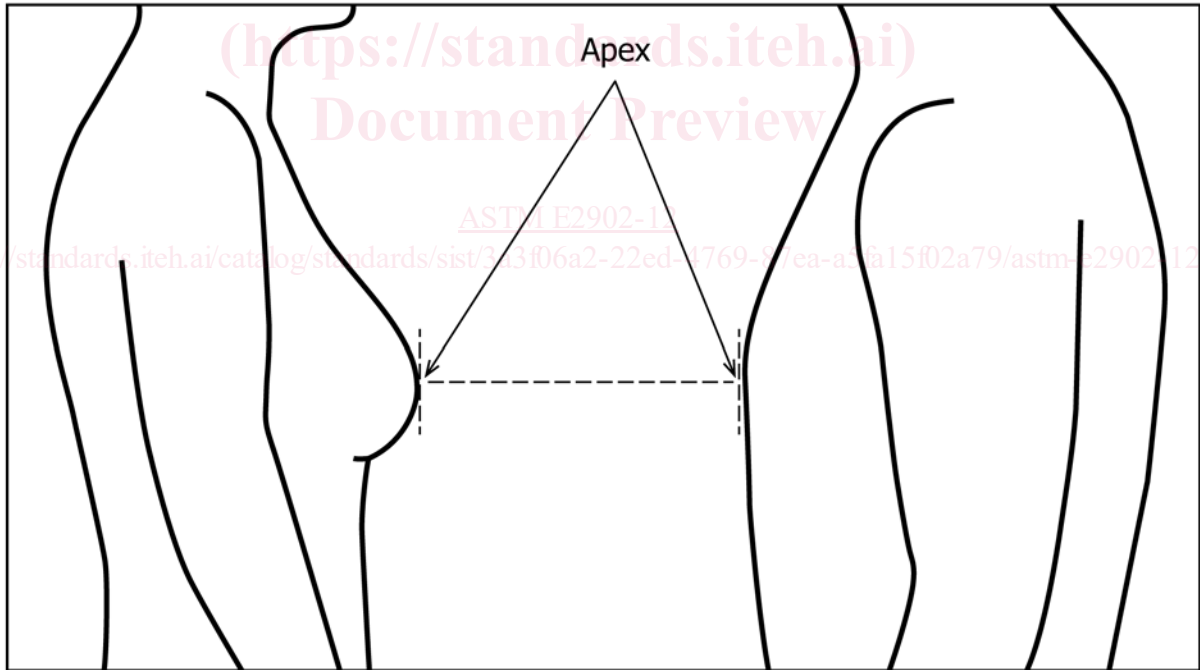


FIG. 2 Apex, Female and Male

3.1.13 *lateral front length to belt, n*—the vertical distance from the top of the clavicle to the top of the duty belt over the bust point. See Fig. 9.

3.1.14 *shoulder joint, n*—the juncture of the collarbone (that is, clavicle) and the shoulder blade (Terminology D5219). See Fig. 1.

Upper Front Chest Width

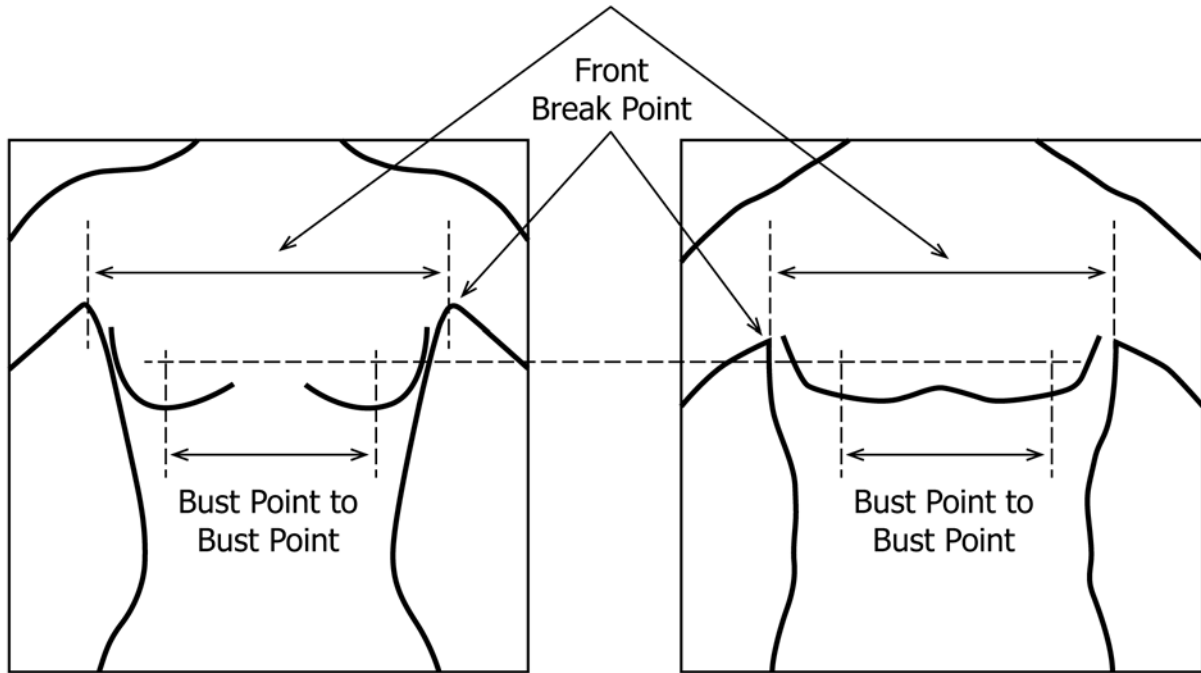


FIG. 3 Front Torso Measurement Locations, Female and Male

Clavicle

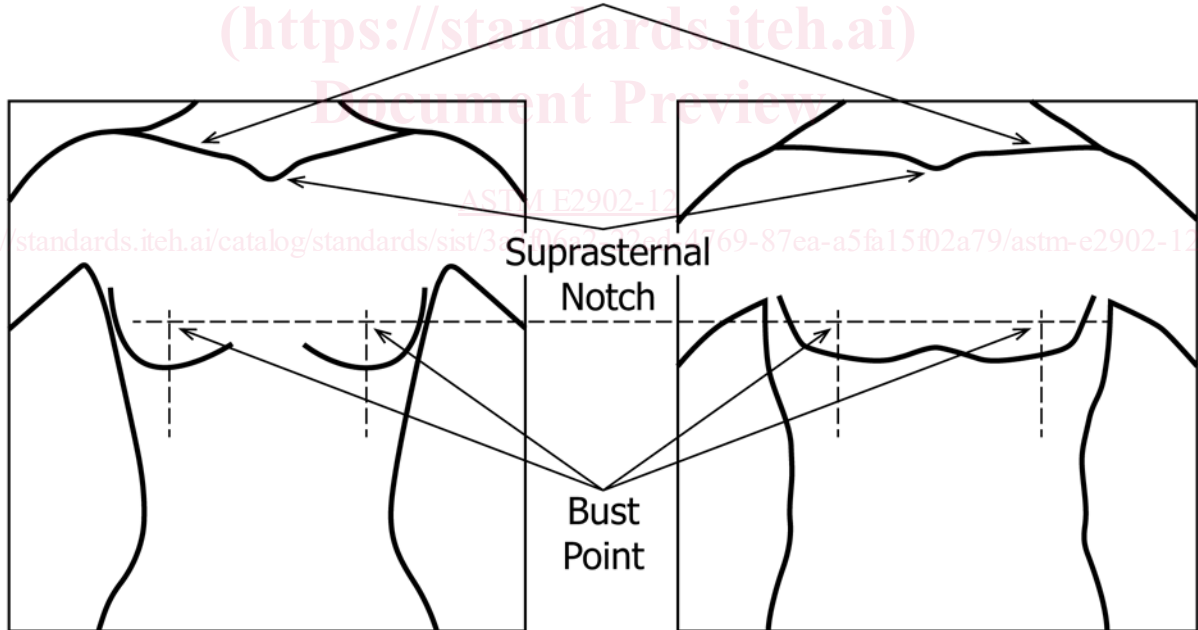


FIG. 4 Front Torso Feature and Measurement Locations, Female and Male

3.1.15 *suprasternal notch, n*—the depression in the top of the sternum between its articulations with the two clavicles—called also jugular notch (Merriam-Webster).

3.1.16 *torso girth, n*—the largest horizontal circumferential measurement around the torso between under-bust girth and the wearer’s duty belt. This measurement is not the wearer’s belt size or waist circumference.

3.1.17 *under-bust girth, n*—the horizontal circumference around the torso under the arms and bust (Terminology D5219). See Fig. 6 for the under-bust girth measurement location.

3.1.18 *upper-front chest width, n*—the horizontal distance across the front of the chest at the mid-point between the top of the shoulder joint and the front break-point level, taken with

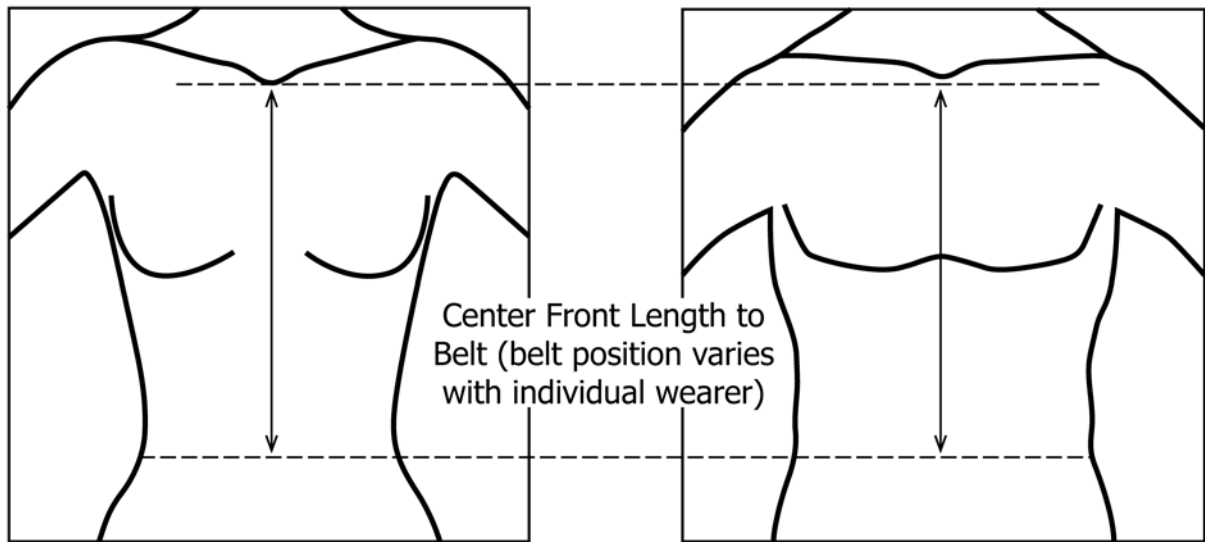


FIG. 5 Center Front Length to Belt Length, Female and Male

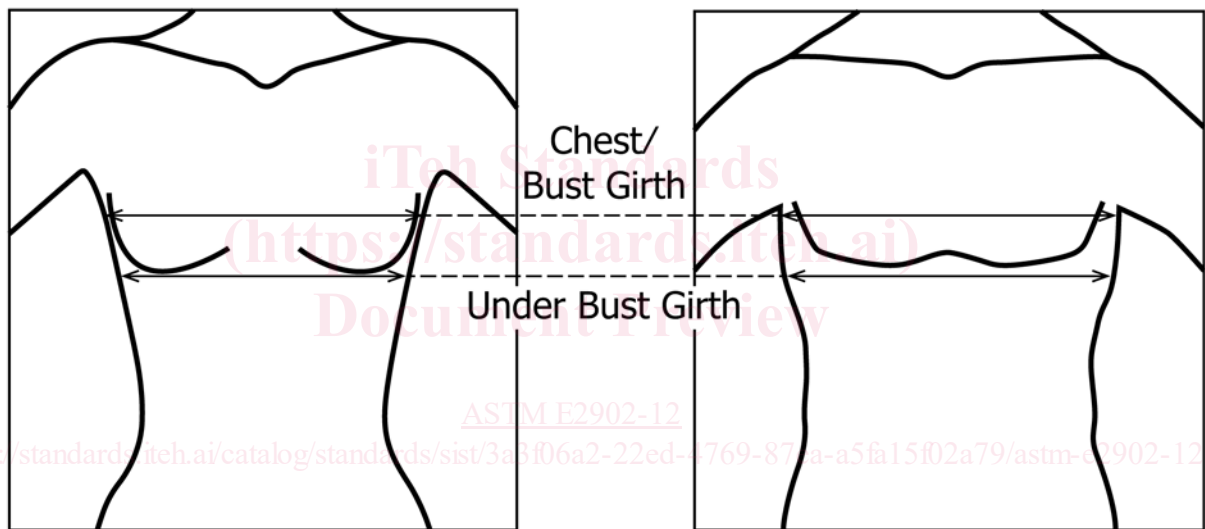


FIG. 6 Girth Measurement Locations, Female and Male

the arms extended in front of the body (Adapted from Terminology D5219). Refer to Fig. 3.

4. Significance and Use

4.1 Having body armor that fits well and is comfortable begins with appropriate and accurate measurements. Armor suppliers typically have trained representatives that conduct proper measurement and fitting, but not all armor retailers have such trained individuals. This standard will facilitate consistency of measurement across the body armor industry and will help wearers understand proper measurement.

5. Procedure

5.1 Preparation for Measuring the Wearer

5.1.1 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:

5.1.1.1 Uniformed officers should wear a T-shirt, duty pants, duty belt with gear installed (for example, weapon, magazine pouch, restraints), inner belt (if normally worn), and keepers when being measured. Females need to wear the type of bra that they usually wear on duty.

5.1.1.2 Non-uniformed personnel (for example, special agents, detectives) should wear a T-shirt, pants, and a belt that are representative of what is worn on duty. Females need to wear the type of bra that they usually wear on duty.

5.1.2 The position of the duty belt on the wearer should be as is typical, and the position should not be artificially adjusted.

5.1.3 All linear and circumferential measurements shall be taken to the nearest ¼ in., except for height which shall be to the nearest inch.

5.1.4 For all measurements requiring the wearer to be in a standing position, except upper-front chest width, the wearer shall stand with feet together facing forward, arms relaxed down at the sides, and looking straight ahead. For upper-front

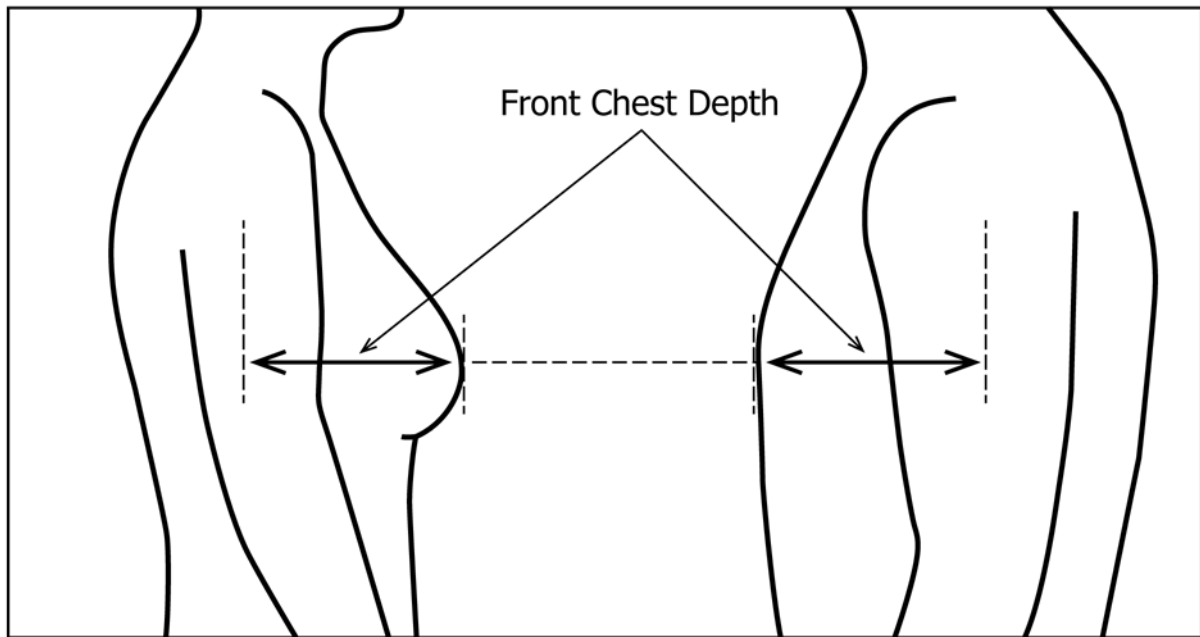


FIG. 7 Front Chest Depth, Female and Male

chest width, the arms shall be extended in front of the body and parallel to each other and the floor.

5.1.5 For all measurements requiring the wearer to be in a seated position, the wearer shall sit in a natural comfortable position, facing forward, and looking straight ahead. The wearer shall **not** sit up straight in an unnatural position.

5.2 Equipment

5.2.1 *Tape*—The tape used shall be flexible and non-stretchable, have a length of at least 60 in., and provide measurements in English units of at least ¼ in. 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, it should be verified to be accurate and not stretched by comparing it to a non-stretchable tape, such as a Lufkin model L610 steel tape or equivalent.

5.2.2 *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, shall indicate weight to at least the nearest pound, 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.

5.2.3 *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 either have no arm rests, or the individual being measured should not place his or her arms on the arm rests.

5.3 Measuring the Wearer and Recording the Measurements

5.3.1 *Height*—The measurer shall record the wearer's height in feet and inches (for example, 6 ft., 1 in.) either by having the wearer specify his or her known height or measuring the height. If measuring height, have the wearer stand with his or her back against a wall, without shoes and looking straight ahead. The measurer shall mark on the wall the level of the top of subject's head and measure the vertical distance from the standing surface to the mark.

5.3.2 *Weight*—The measurer shall record the wearer's weight in pounds and to the nearest pound (for example, 125 lbs) either by having the wearer specify his or her known weight or weighing the wearer. If weighing the wearer, ensure that the scale is set to zero initially, and record the weight to the nearest pound. If the wearer is a uniformed officer and is being weighed, ensure that the officer removes the duty belt during weighing.

5.3.3 *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 across the fullest part of the chest/bust, at the apex in front and including the lower portion of the shoulder blades in the back. 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.

NOTE 1—If the measurement is taken while the wearer's arms are raised, there will be a 1 to 2 in. difference as compared to the measurement taken with the arms lowered. This is very important. Refer to Fig. 6.

5.3.4 *Under-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 arm and under the bust. Once the tape is in place, the wearer shall lower the arms to his

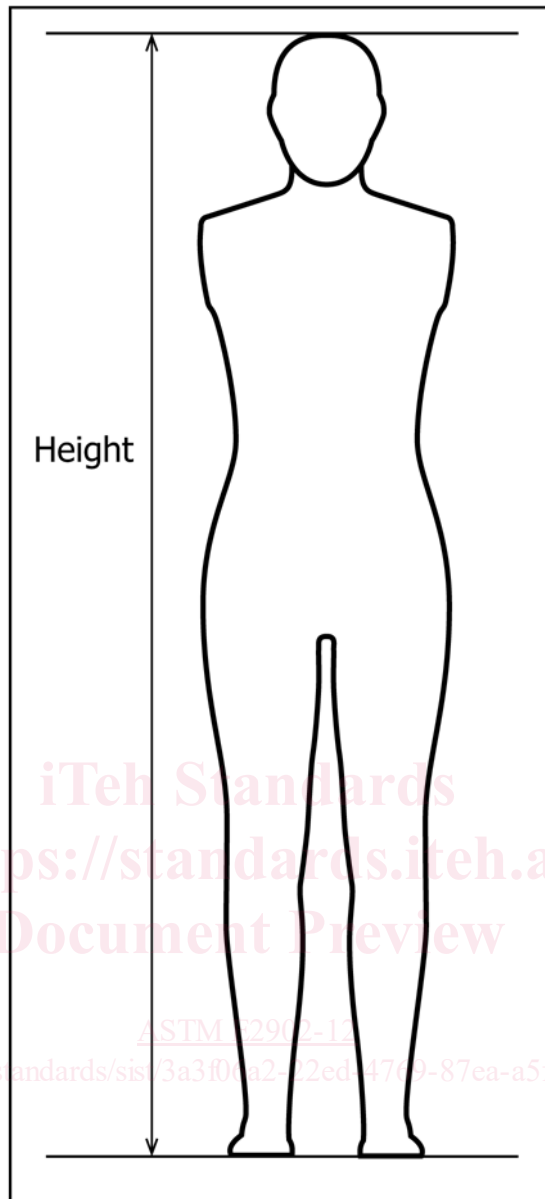


FIG. 8 Height

or her sides, and the measurement shall be taken, ensuring that the tape is snug around the torso. Refer to Fig. 6.

5.3.5 *Upper-Front Chest Width*—With the wearer’s arms extended in front of the body and parallel to each other and to the floor, the measurer shall measure the horizontal distance across the front of the chest at the front break-point level. Refer to Fig. 3.

5.3.6 *Torso Girth*—With the wearer standing, the measurer shall locate and measure the largest horizontal circumference of the wearer’s torso beneath the under-bust girth and above the wearer’s duty belt. The measurement should be taken at the horizontal plane set at the top of the duty belt in the back.

5.3.7 *Front Length to Belt—Standing*—The measurer shall take at least one front length to belt measurement, with the wearer standing, and shall follow the appropriate steps below:

Center Front Length to Belt – Standing. The measurer shall measure vertically, following the body contour, from the bottom of the wearer’s suprasternal notch to the top of the duty belt in front. If the wearer has a large abdomen or the duty belt angles down in the front, or both, the measurement shall be taken from the bottom of the wearer’s suprasternal notch to a horizontal plane set at the top of the duty belt in the back. Refer to Fig. 5.

Lateral Front Length to Belt – Standing. The measurer shall measure from the top of the wearer’s clavicle to the top of the duty belt over the bust point. This vertical distance shall be recorded in two measurements: (1) from the top of clavicle to the bust point, following the body contour, and (2) from the bust point to the top of duty belt. If the wearer has a large abdomen or the duty belt angles down in the front, or both, the