



# Standard Specification for Headgear Used in Women’s Lacrosse (excluding Goalkeepers)<sup>1</sup>

This standard is issued under the fixed designation F3137; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification defines performance requirements for headgear to be used by field player’s participating in the sport of women’s lacrosse. The technical requirements in this specification do not address the administrative requirements of lacrosse governing bodies, so it should not be assumed that any headgear satisfying this specification will be acceptable for use in sanctioned lacrosse events.

1.2 The purpose of this specification is to provide reliable and repeatable test methods for the evaluation of protective headgear for women’s adult and youth lacrosse training and play. When designated optional equipment by lacrosse governing bodies, it is important that it not increase the risk of injury to players who choose not to wear it. Impacts from stick, ball, other player, ground, or other objects may be decreased in severity by use of this headgear. However, the relationship between impact and injury is not fully understood.

1.3 No headgear can provide protection against all impacts, foreseeable or not. This specification does not address the potential for injury from any type of impact.

1.4 All testing and requirements of this specification shall be in accordance with Test Methods F1446 and Specification F3077, except where noted in this specification. If there is a conflict between this standard and Test Methods F1446 and Specification F3077, this standard shall control.

1.5 Partial compliance with this standard is prohibited.

1.6 The values stated in SI (International System of Units) units are to be regarded as the standard. The values given in parentheses are for information only. Metric units of measurement in this specification are in accordance with the International System of Units (SI). If a value for measurement as given in this specification is followed by an equivalent value in other units, the first stated is to be regarded as the requirement. A given equivalent value may be approximate.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee F08.53 on Headgear and Helmets.

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1.7 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.8 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

F1446 Test Methods for Equipment and Procedures Used in Evaluating the Performance Characteristics of Protective Headgear

F2220 Specification for Headforms

F3077 Specification for Eye Protectors for Women’s Lacrosse

### 2.2 Other Standards:

ND001 NOCSAE Standard Test Method and Equipment Used in Evaluating the Performance Characteristics of Protective Headgear/Equipment

ND021 NOCSAE Standard Projectile Impact Testing Method and Equipment Used in Evaluating the Performance Characteristics of Protective Headgear, Faceguards or Projectiles

ND049 NOCSAE Standard Performance Specification For Newly Manufactured Lacrosse Balls

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, see Test Methods F1446.

### 3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *helmet position index (HPI), n*—a manufacturer of headgear may specify the HPI to be used to achieve a

<sup>2</sup> 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.

reasonable fit during testing. If no HPI is specified, the fitting instructions shall be used to obtain a reasonable fit. If the specified HPI does not provide a reasonable fit as determined by the technician, or the fit with the specified HPI or fitting instructions is likely to yield erroneous test results, the technician shall fit the headgear to the best of their ability on the most appropriate headform.

#### 4. Significance and Use

4.1 Women's Lacrosse is a distinctive sport with inherent risks. Participation in the sport implies acceptance of risk of injury. This specification was developed to address forces of some of the incidental stick and ball to headgear impacts to non-goaltending field players that may occur while engaging in Women's Lacrosse. Although headgear satisfying this specification may provide limited protection against some impacts, catastrophic/life threatening impacts are not addressed by this specification. In addition, the cumulative effect of multiple sub-concussive impacts is not addressed here.

NOTE 1—Protection provided by headgear satisfying this specification is not equivalent to the protection provided by "helmets" used in many other sports activities. Headgear that meets these standard specifications may not provide significant protection in some head impact situations.

#### 5. Classification

5.1 Women's lacrosse headgear (adult and youth) shall be classified into the following types:

5.2 *Type I*—A headgear without protective eyewear, in the condition offered for sale, that allows for the proper use of protective eyewear meeting Specification F3077.

5.3 *Type II*—A headgear designed to be worn with specific protective eyewear meeting Specification F3077 integrated into the headgear, in the condition as offered for sale.

#### 6. General Construction

6.1 *Materials of Construction:*

6.1.1 Materials coming into contact with the wearer's face or skin shall not be of a type known to cause skin irritation.

6.1.2 Materials coming into contact with the wearer's face or skin, except replaceable padding, shall not undergo significant loss of strength or flexibility, or other physical change as a result of perspiration, oil, or grease from the wearer's skin and hair.

6.1.3 Any material used in the construction of headgear shall not be adversely affected by ordinary household soap and water, mild household detergent, or cleaners recommended by the manufacturer.

6.1.4 For Type II Headgear, any components relating to the specific protective eyewear used to pass Specification F3077 can be omitted from 6.1 (Materials of Construction) and 6.2 (Construction).

6.1.5 Exterior surfaces of the headgear portion must be of a flexible composition and this is to be confirmed by using the deformation test as described in 14.4 (Deformation Test).

##### 6.2 Construction:

6.2.1 Any optional devices, excepting eye protection, for the headgear shall be designed so that they are unlikely to cause any injury to the wearer or other participants during contact.

6.2.2 All edges shall be smooth and rounded and there shall be no rigid projections on the inside of the headgear that could come in contact with the wearer's head.

6.2.3 All external projections shall be smooth to other surfaces.

6.3 *Protected Area*—The area above the test line (see Fig. 1) shall be considered the protected area. All parts of the wearer's head covered by the area of the headgear shall be protected at least to the minimum performance requirements of 7.2 (Shock Absorption Test), 7.3 (Ball Impact Absorption Test) and 7.4 (Deformation Test). Within the Deformation Test, the portions which relate to the specific protective eyewear can be omitted, see 6.1.4.

#### 7. Performance Requirements

7.1 *General*—Headgear shall be capable of meeting the requirements in this performance specification throughout their full range of adjustment.

7.2 *Shock Absorption Test*—When tested in accordance with Section 14 (Mechanical Tests), the peak acceleration of any impact shall not exceed 80 g.

7.3 *Ball Impact Absorption Test*—When tested in accordance with Section 14 (Mechanical Tests), the peak acceleration of any impact shall not exceed 80 g.

7.4 *Deformation Test*—When tested in accordance with Section 14 (Mechanical Tests), the headgear must make contact with the MEP pad on both sides of the half-rod anvil as indicated by contact paste.

7.5 The headgear shall remain intact with no visible cracks through the thickness of the outer covering.

#### 8. Apparatus

8.1 Apparatus used for this testing shall be in accordance with Test Methods F1446 except as noted herein.

8.2 *Shock Absorption Test*—The apparatus for the shock absorption test shall consist of the following:

8.2.1 *Test Headforms*—Test headforms that correspond to the physical dimensions defined in Specification F2220 as sizes A, E, and J. The weight of the drop assembly, including the headform, shall be in accordance with 8.2.3. The test headforms shall include surface markings corresponding to the basic, coronal, midsagittal, and reference planes.

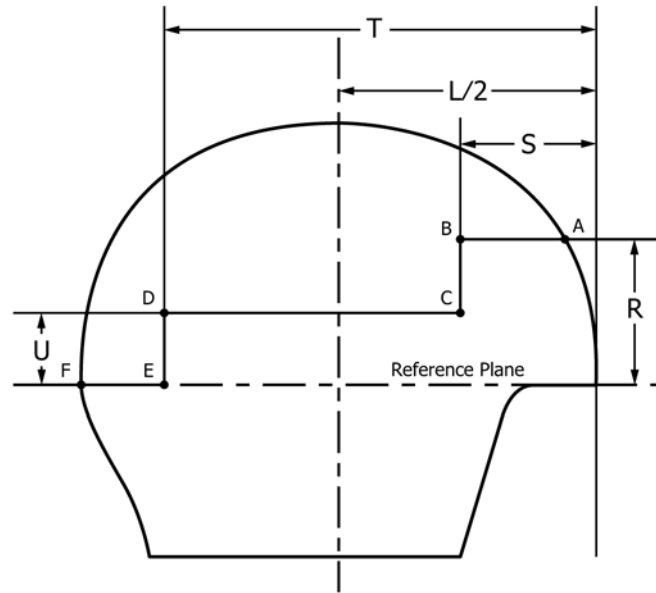
8.2.2 *Guide Assembly*—The headform shall be attached to the free fall drop assembly carriage by an adjustable mounting that will allow impacts to be delivered to any prescribed point on the headgear. For more information see Test Methods F1446.

8.2.3 *Headform and Carriage Assembly*—The test headforms shall be made of K1A magnesium material. The headform and carriage assembly shall have a mass of:

J—headform and carriage assembly =  $4.7 \pm 0.14$  kg  
 E—headform and carriage assembly =  $4.1 \pm 0.12$  kg  
 A—headform and carriage assembly =  $3.1 \pm 0.10$  kg

8.2.3.1 The carriage assembly (excludes ball arm and clamp) shall contribute to no more than 50 % of the total mass.

8.2.4 *Impact Surface*—The impact surface shall be a flat modular elastomer programmer (MEP) 152.4 mm (6 in.) in



Headform Size	Dimension				
	T	L/2	U	R	S
A	137.0	88.0	25.0	50.0	19.5
E	146.5	94.5	25.0	50.0	20.5
J	155.0	101.0	25.0	50.0	20.5

FIG. 1 Headform Test Line

(<https://standards.iteh.ai>)

diameter and 25.4 mm (1 in.) in thickness which is firmly fixed to the top surface of a flat anvil. The MEP required is a  $60 \pm 5$  Durometer Shore A Hardness impact surface. The base shall consist of a rigid slab weighing at least 136.1 kg (300 lb). The top surface of this base may be used as the flat metal anvil if it is faced with a steel plate with minimum thickness of 25.4 mm (1 in.) and minimum top surface area of 0.09 m<sup>2</sup> (1 ft<sup>2</sup>). If a detachable flat metal anvil is used it must have a top surface area of at least 290.3 cm<sup>2</sup> (45 in.<sup>2</sup>). The MEP is mounted on an aluminum plate with a minimum thickness of 5.6 mm (0.220 in.) after grinding.

8.3 Ball Impact Absorption Test:

8.3.1 Apparatus used for this testing shall be in accordance with NOCSAE ND001 and NOCSAE ND021 except as noted herein.

8.3.2 The propelling device shall be capable of hurling the test projectiles horizontally at the speed described in 14.3.2.

8.3.3 Projectiles (balls) shall be intended for use in the game of women’s lacrosse and shall meet the requirements of NOCSAE ND049.

8.3.4 Equipment employed to measure the speed of the test ball within 1.0 m of impact shall be accurate to within  $\pm 1.0$  m/s muzzle velocity. Each impact velocity shall be measured and if not within the tolerance, that impact is not valid.

8.3.5 Test Headforms—Headforms to be used shall be NOCSAE small headforms and meet the headform specifications outlined in NOCSAE ND001.

8.4 Deformation Test:

8.4.1 Test Headforms—Test headforms that correspond to the physical dimensions defined in Specification F2220 as sizes A, E, and J. The weight of the drop assembly, including the headform, shall be in accordance with 8.4.3. The test headforms shall include surface markings corresponding to the basic, coronal, midsagittal, and reference planes.

8.4.2 Guide Assembly—The headform shall be attached to the free fall drop assembly carriage by an adjustable mounting that will allow impacts to be delivered to any prescribed point on the headgear. For more information, see Test Methods F1446.

8.4.3 Headform and Carriage Assembly—The test headforms shall be made of K1A magnesium material. The headform and carriage assembly shall have a mass of:

- J—headform and carriage assembly =  $4.7 \pm 0.14$  kg
- E—headform and carriage assembly =  $4.1 \pm 0.12$  kg
- A—headform and carriage assembly =  $3.1 \pm 0.10$  kg

8.4.3.1 The carriage assembly (excludes ball arm and clamp) shall contribute to no more than 50 % of the total mass.

8.4.4 Impact Surface—The impact surface shall be a flat modular elastomer programmer (MEP) described in 8.2.3 with the addition of the Rod Anvil described in 8.4.5. The rod anvil shall be affixed on top of the MEP surface and be centrally located so as to always divide the MEP surface in equal halves. Impact surface is to be covered with a layer of contact paste. Layer of paste should be no thicker than 1.5 mm (0.0625 in).

8.4.5 Rod Anvil—The rod anvil shall be one half of a cylinder with a diameter of 12.7 mm (0.5 in)  $\pm 0.5$  mm and a

minimum length of 152.4 mm (6 in.) (see Fig. 2). The rod anvil shall be of steel construction and rigidly attached to the MEP surface, so as to not move during the Deformation Test.

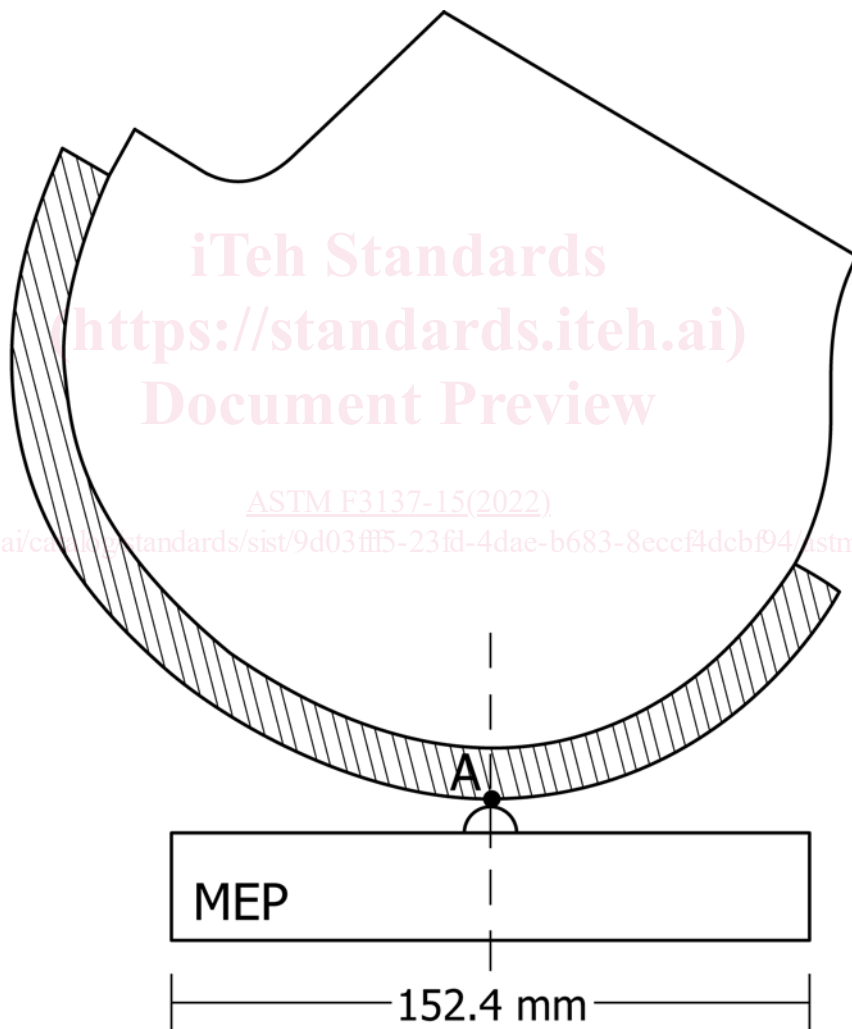
**9. Equipment Calibration and System Checks**

9.1 Instrumentation used in testing shall be calibrated according to the requirements of Test Methods F1446, as noted herein.

9.2 *Shock Absorption Test Instrument System Check*—The system instrumentation shall be checked before and after each series of tests by dropping the spherical impactor onto the MEP pad at an impact velocity of  $2.6 \pm 0.1$  m/s ( $8.53 \pm 0.3$  ft/s). Impact velocity shall be measured during the last 40 mm (1.575 in.) of free fall for each test. The weight of the drop assembly (which is the combined weight of the instrumented spherical impactor and supporting assembly) for the shock

absorption test shall be  $5 \pm 0.1$  kg ( $11.00 \pm 0.2$  lb). Three such impacts, at intervals of  $75 \pm 15$  s, shall be performed before and after each series of tests. The peak acceleration obtained during impact shall be  $148 \pm 8$  g. If the average peak acceleration obtained in the post test impacts differs by more than 5 % from the average peak acceleration obtained in the pretest impacts, the following checks shall be made. Checks of the mechanical condition of the drop system and checks of the calibration of the instruments and transducers are required and all data obtained during that series of headgear tests should be discarded.

9.3 *Ball Impact Absorption Test Instrument System Check*—The system instrumentation shall be checked before and after each series of tests by referencing the calibration methods outlined in NOCSAE ND001 (Headform Calibration & System Check).



A Closest point to MEP

 Half Rod Anvil

FIG. 2 Deformation Test: Lowest Point on Headgear to Touch Half Rod Anvil