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An American National Standard

Standard Specification for Helmets Used in Pole Vaulting[1]

This standard is issued under the fixed designation F2400; 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.

INTRODUCTION

Pole vaulting by its very nature carries a risk of serious injury and even death. Participation in pole vaulting (just as in other sports involving speed, heights, and falls) implies acceptance of this risk. Measures to significantly reduce this risk include, first and foremost, the use of regulation sized pole vault pits and padded standard base covers, along with the removal or padding of any adjacent hard surfaces. Education of pole vault coaches and athletes is another important risk reduction measure. Helmets might be part of a plan to reduce risk as well. A helmet that meets this specification might be helpful for certain events like a bounce out, a fall while exiting the pole vault pit, or other impacts. A helmet, however, is not likely to prevent serious injury or death if a vaulter lands outside of the pole vault pit and strikes his or her head after a vault.

1. Scope

1.1 This specification covers performance requirements for helmets to be used in the activity of pole vaulting.

1.2 All testing and requirements of this specification are to be carried out in accordance with Test Methods F1446 except where noted in this specification.

1.3 Partial utilization of this specification is prohibited. Any statement of compliance with this specification shall be a certification that the product meets all of the requirements of the specification in their entirety. A product that fails to meet any one of the requirements of this specification is considered to have failed the specification and shall not be sold with any indication that it meets parts of the specification.

1.4 Helmets designed to comply with this and other standards may proclaim uses as certified by the manufacturer.

1.5 The values stated in SI units are to be regarded as the standard.

1.6 *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]

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

3. Terminology

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

4. Number of Samples

4.1 Five helmets are required of each model and size to be tested.

5. Conditioning

5.1 Conditioning of test samples shall be in accordance with the requirements of the section on Conditioning Environments of Test Methods F1446.

6. Selection of Headform

6.1 The appropriate size headform shall be selected based on the headform size selection terminology of Test Methods F1446 for the helmet to be tested. Headforms to be used shall be as specified in Test Methods F1446, using the variable mass drop assembly configuration.

[1] 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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[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.

7. Reference Marking

7.1 Marking the test line shall be in accordance with the Reference Marking requirements of Test Methods F1446.

7.2 The preload ballast weight shall be 5 kg.

7.3 Mark the test line ABCD on the helmet as shown in Fig. 1.

8. Helmet Inspection

8.1 The configuration requirements of the section on Configuration in Test Methods F1446 shall be satisfied.

8.1.1 In addition, for this specification no aerodynamic fairings will be allowed as pole-vaulters try or tend to land on their back.

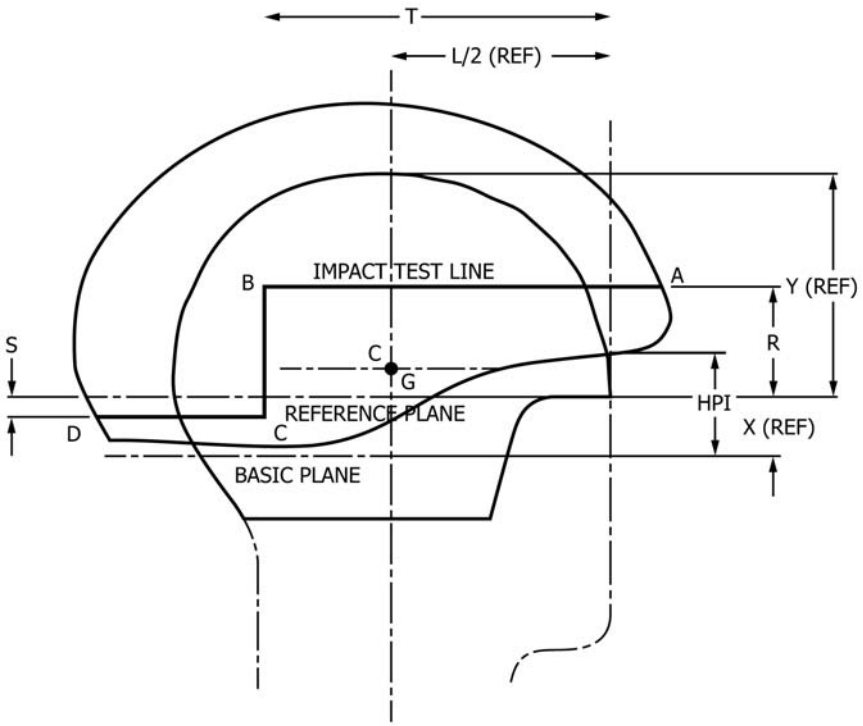
8.1.2 Ventilation ports are allowed as long as all other requirements of this specification are met.

8.1.3 When mounted on the reference headform in accordance with the section on Reference Marking of Test Methods F1446, determine the minimum distance from the headform to the outer surface of the helmet at any point above the test line. In this context, the outer surface can be defined by conforming a flexible strip of steel to the outer surface. No portion of the helmet's outer surface shall be more than 15 mm further from the surface of the test headform than the minimum distance.

8.1.4 Lateral visual clearance shall be unobstructed through at least 105° to each side of the median plane and upward visual clearance must be unobstructed through at least 40° above the reference plane.

8.1.4.1 The clearance for peripheral vision will be checked by placing the helmet on each appropriate headform, positioning it according to the helmet positioning index, and holding it in place with the preload ballast weight of 5 kg. The clearance must include the upward visual clearance and the lateral visual clearance. The helmet shall be tested with all detachable components removed and all adjustable components set in the most unfavorable manner for the test. No part of the helmet shall intrude into the required clearance.

8.1.4.2 The upward visual clearance is the solid angle bounded by the reference plane of the headform and a second plane tilted upward from the reference plane. This second plane intersects the reference plane at two points on the front surface of the headform that are 31 mm to the right and left of the longitudinal plane as shown in Figure 13 of Test Methods



HEADFORM SIZE	DIMENSION X	L/2	Y	R	S	T
A	24.0	88.0	89.7	47.5	7.0	142.0
E	26.0	94.5	96.0	49.0	8.0	151.0
J	27.5	101.0	102.5	50.5	8.0	160.0
M	29.0	106.0	107.0	52.0	8.0	166.0
O	30.0	108.5	110.0	53.0	9.0	170.0

NOTE 1—The center of impact can be anywhere on or above the test line.

FIG. 1 Test Line

F1446. The dihedral angle formed by the reference plane and this second plane shall be at least 40°.

8.1.4.3 The lateral visual clearance, as shown in Figure 13 of Test Methods F1446, is the solid angle bounded by the reference plane, the basic plane and two more planes that are perpendicular to the reference plane and that contain the point on the front surface of the headform at which the reference and longitudinal planes intersect. Each of these two planes forms a dihedral angle with the longitudinal plane as specified in the individual standard. This angle shall be 105°.

8.2 The materials requirements of the section on Materials in Test Methods F1446 shall be satisfied.

8.3 *Labeling Requirements:*

8.3.1 Each helmet shall contain labels that satisfy the labeling requirements of Test Methods F1446.

8.3.2 In addition, one or more of the interior labels of the helmet shall have the words: for use in the sport of pole vaulting.

8.4 The interior projections requirements of the section on Interior Projections of Test Methods F1446 shall be satisfied.

9. Conditioning

9.1 A single sample of the helmets shall be conditioned in the ambient, low temperature, high temperature, and water immersion conditions identified in the section on Conditioning Environments of Test Methods F1446 prior to subsequent testing.

10. Order of Testing

10.1 Determination of compliance with this specification shall be performed in the sequence indicated in Sections 11 and 12.

11. Retention System Testing

11.1 Retention system testing shall be performed before impact testing.

11.2 *Dynamic Strength Retention Test*—The hot and cold and water immersed helmets shall be subjected to the dynamic loading test in accordance with the Dynamic Strength Retention Test of Test Methods F1446.

11.2.1 The sliding drop mass shall be 4 kg with a drop height of 0.6 m.

11.2.2 The retention system shall remain intact without elongating more than 30 mm.

11.3 The ambient helmet shall be subjected to the positional stability testing in accordance with the section on Roll-Off of Test Methods F1446.

11.3.1 The sliding drop mass shall be 4 kg with a drop height of 0.6 m.

11.3.2 The retention system shall remain intact and the helmet must remain on the headform.

12. Impact Testing

12.1 All impact testing shall be carried out in accordance with the section on Impact Attenuation of Test Methods F1446.

12.2 Anvils as specified in the section on Impact Anvils of Test Methods F1446 to be used for impact tests in this specification include flat and curbstone.

12.2.1 Test anvils can be oriented in any horizontal, centered direction.

12.3 Each helmet shall be given two flat anvil impacts and two curbstone anvil impacts in any sequence. The four impacts shall be on different impact sites on the helmet. The impact sites may be anywhere on or above the test line.

12.4 The helmets shall be dropped onto the flat anvil at an impact velocity of 6.2 m/s corresponding to the theoretical drop height of 2.0 m.

12.5 The helmet shall be dropped onto the Curbstone Anvil at an impact velocity of 4.8 m/s corresponding to a drop height of 1.2 m.

12.6 The peak acceleration of any impact shall not exceed 300 g.

13. Keywords

13.1 helmet(s); pole vault; protective headgear