



# Standard Specification for Determining the Rating Velocities of an Archery Bow<sup>1</sup>

This standard is issued under the fixed designation F 1544; 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 covers the testing technique to determine the rating velocities of an archery bow.

1.2 This specification will provide only a certification of performance; that is, the velocities at which a given bow will launch arrows of specified weights under standard conditions.

1.3 This specification is not intended to provide any engineering or structural evaluation of the bow that would determine its fitness for the use intended, safe function, or any other attribute except as stated.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 The following safety hazards caveat pertains only to the test methods portion, Section 4, of this specification: *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. Terminology

### 2.1 Definitions of Terms Specific to This Standard:

2.1.1 *archery manufacturers organization (AMO) draw length,  $n$* —the distance at the archer's full draw from the string at the nocking point to a vertical line through the pivot point of the bow grip,  $+1\frac{3}{4}$  in. (44 mm).

2.1.2 *draw length pressure point (DLPP) draw length,  $n$* —the distance at the archer's full draw from the string at the nocking point to a vertical line through the distal or pivot point of the bow grip.

2.1.3 *force-draw curve*—the graph curve generated by recording the draw force readings of an archery bow at 1.00-in. (25.4-mm) intervals or less, from brace height through set weight and to the center of the valley (if present), in order to reveal the energy storage characteristics of the bow.

2.1.4 *rating velocities,  $n$* —the initial velocities of a 360-grain (23.33-g) arrow and a 540-grain (34.99-g) arrow shot from a bow set at 60-lb (267-N) peak draw force and 30-in. (762-mm) AMO draw length.

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2.1.5 *shooting machine*—a device, equipped with a mechanical release, that secures a bow and releases an arrow to obtain highly repeatable shooting results for various testing purposes.

2.1.6 *stored energy*—the energy required to draw a bow from brace height to full draw, usually expressed in foot-pounds (joules).

## 3. Significance and Use

3.1 This specification will be used to determine a velocity under standard test conditions for rating an archery bow.

## 4. Test Methods

### 4.1 Force Draw Data:

4.1.1 For bows with adjustable draw force, adjust peak or maximum draw force to  $60 \pm 1$  lb ( $267 \pm 1$  N). For conventional bows and bows without let-off, the 60-lb maximum draw force shall be attained or held at  $28\frac{1}{4}$ -in. (717-mm) DLPP (30-in. (762-mm) AMO) draw length. The center of the valley of the force-draw curve (lowest force) on compound bows shall be located at  $28\frac{1}{4}$ -in. DLPP,  $\pm\frac{1}{4}$  in. (6 mm).

4.1.2 For bows with nonadjustable draw force, the draw force shall fall between 60 and 65 lb (267 and 289 N). Adjust the rating velocity mathematically to the 60-lb (267-N) level of draw force (refer to 4.5.2). Performance of this item is not necessary if the bows draw force needs no adjustment.

4.1.3 Measure and record the draw force at 1.00-in. (25.4-mm) (or less) increments from brace height to at least  $28\frac{1}{4}$  in. (717-mm) DLPP (30-in. (762-mm) AMO) draw length.

4.1.4 From the force-draw curve, determine the peak or maximum draw force and the holding force at the standard test draw length of  $28\frac{1}{4}$ -in. (717-mm) DLPP (30-in. (762-mm) AMO).

### 4.2 Test Arrows:

4.2.1 Select the test arrows of a shaft material, size, and stiffness to match the specified standard test peak draw force and draw length, and meet the 360-grain (23.33-g) and 540-grain (34.99-g) weight requirement ( $\pm 0.5$  grain (0.03 g)).

4.2.2 The arrows need not be fletched.

4.3 Set up the test bow in the shooting machine.

4.3.1 Mount the bow in a shooting machine with a mechanical release. Set the draw length at  $28\frac{1}{4}$ -in. (717-mm) DLPP ( $30 \pm \frac{1}{16}$ -in. ( $762 \pm 1.58$ -mm) AMO).

4.3.2 Set the initial chronograph gate at a distance of 36 in. (914 mm) from the pivot point of the bows handle.

#### 4.4 Shooting Test:

4.4.1 Chronograph a minimum of five shots for each test arrow using the standard test arrows to obtain a satisfactory arrow velocity averages. The velocity values of all shots for a given test arrow must fall within a range of 2 ft/s (0.60 m/s). Photoelectric-type gate or trigger circuits spaced no more than 48 in. (1219 mm) apart, are satisfactory for use in conjunction with the chronograph.

4.4.2 Use an appropriate multiple gate chronograph.

#### 4.5 Correction of Test Data:

4.5.1 The average arrow velocity value obtained from the shooting test may require correction to conform to standard conditions.

4.5.2 On bows with nonadjustable draw force, the actual measured peak draw force may differ from the standard 60 lb (267 N) specified (refer to 4.1.2). If this situation exists, then make the following correction:

$$\text{corrected rating velocity} = 671 \sqrt{\frac{\{P.D.F. (standard)\} V^2}{450\,240 \{P.D.F. (test)\}}} \quad (1)$$

where:

$V$	= actual average chronographed velocity, ft/s or m/s (see 4.5.1),
$P.D.F. (standard)$	= standard peak draw force, either 60 lb or 267 N, if using SI units, and
$P.D.F. (test)$	= peak draw force measured for test bow (see 4.1.2) in inch-pound or SI units as applicable within ¼ lb (1 N).

## 5. Keywords

5.1 draw length; force draw curve; rating velocity; shooting machine; stored energy

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