Standard Test Method for
Measurement of Arrow Shaft Static Spine (Stiffness)[1]

1. Scope

1.1 This test method covers the formulation and designation of arrow spine measurement standards and nomenclature for arrow shafts.

1.2 The English system of measurement, specifically inches of deflection, shall be used for all spine values expressed for a given arrow shaft.

1.3 *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 *arrow spine*—the deflection of the shaft, measured in inches, in a three-point load scenario where a specified mass is applied to the midpoint of the arrow shaft supported at a fixed span.

2.1.2 *spine around shaft variation*—spine variation between four readings taken at 90° spacing around the shaft.

2.1.3 *static spine*—stiffness of the arrow shaft at rest on a spine measurement device.

3. Significance and Use

3.1 This test method is intended to provide a stable industry standard by which benchmarks and comparisons can be made by manufacturers and consumers.

3.2 This test method is intended to clarify and define arrow spine or stiffness as it pertains to the archery industry and sport.

4. Measurement Guidelines for Arrow Spine

4.1 *Arrow Spine Measurement*—The most prevalent and commonly accepted method of measuring arrow shaft spine involves supporting the arrow shaft along a known, fixed span, and using an indicator device while the arrow shaft is deflected

with a known weight depending from or pressing upon the arrow shaft at the exact center between the supports for the shaft. For this test method, a span type measurement is to be used. The length of the arrow shaft to be tested, the span distance to be used, and the equipment to be used are defined as follows:

4.1.1 *Shaft Length*— The shaft length to be used for standard spine measurement is the span distance plus 1 in. to allow for axial travel during deflection.

4.1.2 *Span Distance*— The length of the span to be used for this test is 28 in. (71.1 cm). For those shafts that are manufactured less than 29 in. (73.7 cm) in length, the span distance to be used is 23 in. (58.4 cm).

4.1.2.1 Span = 28 in. (71.1 cm) for shafts longer than 29 in. (73.7 cm).

4.1.2.2 Span = 23 in. (58.4 cm) for shafts shorter than 29 in. (73.7 cm).

4.1.2.3 Approximate conversion formula to convert a spine at 23 in. (58.4 cm) span to a 28 in. (71.1 cm) span:

$$\frac{28^3 \ in.^3 \ (71.1^3 \ cm^3)}{23^3 \ in.^3 \ (58.4^3 \ cm^3)} = 1.804$$

or 23 in. (58.4 cm) spine × 1.804 = 28 in. (71.1 cm) spine

4.1.3 *Measurement Location*—Arrow shafts shall be measured for spine at the center of the span. In instances where this is not practical due to shaft design, the manufacturer shall disclose the measurement location(s) from an identifiable datum on the shaft.

4.1.4 *Measurement Equipment*—Measurement equipment may involve the use of dial indicators, probe indicators, and laser gauging devices.

4.1.4.1 *Mechanical Indicators*—In the case of mechanical indicators, probe pressure should be limited to no more than 0.176 oz (5 g).

4.1.4.2 *Noncontact Gauging Equipment*—Noncontact gauging equipment, such as laser gauging equipment, shall read to within 0.001 in. of mechanical contact measurement equipment conforming to the test methods and specifications outlined herein.

4.1.5 *Span Support Points*—Support points shall allow free axial travel of the shaft as the shaft is deflected during measurement.

4.1.5.1 *Span Support Point Configuration*—The shaft support point shall have a maximum diameter of 0.125 in. (3.175 mm) at the point of contact with the arrow shaft.

4.1.6 *Test Description*— The arrow shaft shall be deflected by a 1.94 lb (880 g) weight at the center of the span. The weight may depend from or rest upon the shaft. The difference between the position of a given datum at the center of the shaft and the position of the same datum during deflection shall be the shaft spine value. The reading shall be taken within 30 s to prevent plastic deformation of the shaft material from affecting the readings.

4.2 *Measurement Accuracy*—The accuracy and span tolerance of the equipment and setup shall have a measured accuracy of at least ±0.002 in. (0.05 mm).

5. Industry Guidelines for Specification Disclosure

5.1 The term *standard spine* may be used in instances where a reading is taken in accordance with this test method.

5.2 Spine readings shall be taken within a standard temperature range of 65 to 75°F (18 to 24°C). Because humidity is not a factor in arrow shaft measurement a relative humidity range of 5 to 85 % is permissible.

5.3 The shaft span for which the reading has been taken shall be clearly defined in English units, specifically inches (for example, 0.470 in. arrow shaft spine @ 28 in. span).

5.4 Spine variation around the arrow shaft may be expressed as *standard spine around shaft variation > (x)* where *x* is a value, in inches of the total spine variation, derived from four spine readings taken at locations evenly spaced 90° around the shaft.

5.5 In instances where a manufacturer wishes to specify a plus/minus reading, this should be indicated as distinct from standard spine (for example, ±0.001 in.)

6. Precision and Bias

6.1 It is not practical to specify the precision of the procedure of this test method because it has not yet been determined.

6.2 The procedure described in this test method has no bias because the spine of an arrow shaft is defined only as prescribed in this test method.

7. Keywords

7.1 archery; arrow shafts; spine; static spine; total indicator reading