



Designation: D4923 – 01

## Standard Specification for Reinforced Thermosetting Plastic Poles<sup>1</sup>

This standard is issued under the fixed designation D4923; 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 reinforced thermosetting plastic poles used for outdoor lighting. Such poles may be applicable to electric power and telecommunication distribution installations.

1.2 The design parameters of the poles shall be agreed upon by the purchaser and supplier and should take into consideration the anticipated service conditions of installation and transportation of the product.

1.3 This specification includes poles with above-ground or standard mounting height of 10 ft (3.05 m) through 50 ft (15.24 m). Two classes of poles are covered, one of standard design, the other of stiff design.

1.4 The values stated in inch-pound units are to be regarded as standard. Equivalent SI units are indicated in parentheses.

1.5 The following precautionary caveat pertains only to the test methods portion of this specification, Section 10: *This standard does not purport to address all of the safety problems, 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:<sup>2</sup>

A153/A153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.18 on Reinforced Thermosetting Plastics.

Current edition approved Feb. 10, 2001. Published April 2001. Originally published as D4923-89. Last previous edition D4923-92. DOI: 10.1520/D4923-01.

<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.

D257 Test Methods for DC Resistance or Conductance of Insulating Materials

D635 Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

D883 Terminology Relating to Plastics

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

#### 2.2 AASHTO Standard:

Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 1985 <sup>3</sup>

### 3. Terminology

3.1 *Definitions: General*—All other terms not specifically defined shall be in accordance with Terminology D883.

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

3.2.1 *anchor base*—a device attached to the bottom end of a pole designed to be mounted on an accommodating platform.

3.2.2 *arm*—a structural member, approximately perpendicular to a pole, that supports a luminaire.

3.2.3 *direct burial*—a term used to refer to a pole designed to be supported by surrounding earth (soil). (See also 3.2.9)

3.2.4 *effective projected area (EPA)*—maximum projected area of an object multiplied by a drag coefficient ( $C_d$ ) for the specific shape of the object.

3.2.5 *flexural fatigue*—change in property(ies) of a pole as influenced by cyclical wind loading that induces flexural stresses and strains in the pole.

3.2.6 *luminaire*—a complete lighting fixture that includes light source, lens, reflector, housing, mounting provision, and may include ballast.

3.2.7 *mounting height*—the vertical distance between ground level and the center of the light source in a post top or arm-mounted luminaire.

3.2.8 *percent deflection*—the ratio (expressed in percent) of the pole-top deflection caused by a specific load to the above-ground height of the pole.

<sup>3</sup> Available from the American Association of State Highway and Transportation Officials, 444 North Capitol St N.W., Washington, DC 20001.

\*A Summary of Changes section appears at the end of this standard.

3.2.9 *pole*—a reinforced thermosetting plastic shaft that includes provisions for installing a luminaire or arm(s) and is provided with service access and wire entry holes (if required).

3.2.10 *S-1 soil*—a soil that will effectively anchor a direct burial pole in the ground and resist environmental conditions.<sup>4</sup>

3.2.11 *service access (or hand hole)*—a covered opening in the pole, the axis of which is perpendicular to the axis of the pole and located above ground level, that provides access to internal wiring and wire splices.

3.2.12 *shaft*—the fully cured, reinforced thermosetting plastic tubular portion of the pole before installing luminaire or attachment of fittings and cutting access holes.

3.2.13 *slip fitter*—a cylindrical receptacle in the base of a luminaire that engages a pole top tenon, or the end of an arm.

3.2.14 *surfacing veil*—a surfacing mat, as defined in Terminology **D883**, sometimes used in the outer surrounding layer of a pole to produce a smooth surface, or other desired surface characteristics.

3.2.15 *tenon*—a metal sleeve, cylinder, or other device permanently secured to, (or embedded in) the top of the pole, or the arm that inserts into the base (or slip fitter) of a luminaire.

3.2.16 *wind load*—the effect of specific wind speed acting on the pole, or all accoutrements which the pole is intended to support, expressed as a force.

NOTE 1—Wind load is derived from the wind pressure formula in **Appendix X1** using wind velocities for geographical location of the pole installation site from the Isotach chart in **Appendix X2**.

3.2.17 *wire entry*—an opening in a pole, the axis of which is perpendicular to the axis of the pole, located below ground level, that provides passage of below ground service wiring into pole cavity.

## 4. Classes

4.1 *Class 1*—The standard pole as determined by deflection (see **8.1.2.1**).

4.2 *Class 2*—A stiff pole as determined by deflection (see **8.1.2.2**).

## 5. Ordering Information

5.1 To allow pole manufacturers to determine proper pole dimensions and strength for specific applications, purchase orders and requests for quotation should provide the following information:

5.1.1 Type of pole mounting, direct burial or anchor base.

5.1.2 The luminaire mounting height and embedded depth of pole.

5.1.3 Luminaire EPA, weight, slip fitter diameter, and quantity of luminaires per pole.

5.1.4 If the luminaire will be supported by an arm(s), specify number of arms, length, rise, weight, EPA, centroid location, attachment detail, and attachment position on pole.

5.1.5 Wind speed at pole-installation site, in accordance with AASHTO Isotach Chart (see **Appendix X2**), or as otherwise specified.

5.1.6 The number, size, and location of access openings.

5.1.7 Applicable local, state, and national codes.

5.1.8 Operating and maintenance practices and equipment to be used in servicing that may cause additional loads to be applied to the pole.

5.1.9 Color and finish (smooth or textured) of pole.

5.1.10 Class of pole (1 or 2).

## 6. Materials and Manufacture

### 6.1 Shaft:

6.1.1 The shaft shall be a composite of thermosetting resin, reinforced with glass or other fibers of such quantity and orientation to meet or exceed performance requirements set forth in Section **8** when installed as a pole.

6.1.2 The shaft exterior surface may have a textured pattern or a smooth finish.

## 7. Requirements Requirements

7.1 *Direct-Burial Poles*—The embedded end of direct-burial poles shall prevent rotation when subjected to specific torsional requirements and embedded in suitable soil. (S-1 soil shall be the referee soil.)

### 7.2 Base-Mounted Poles:

7.2.1 Poles designed to be mechanically fastened to ground foundations must have shafts permanently affixed to an anchor base. The total system must be capable of withstanding the combined forces for which the pole is designed.

7.2.2 The anchor-base flange shall have four radial slots to receive anchor bolts and spaced 90° on a bolt circle as agreed upon between purchaser and supplier.

7.3 *Poles Designed for Post-Top Luminaires*—Poles designed for post-top luminaires shall be provided with a permanently affixed tenon nominally 3.5 in. (8.9 cm) in length. The outside diameter shall accommodate either a 2<sup>3</sup>/<sub>8</sub>-, 3-, or 4-in. (6.03-, 7.62-, or 10.16-cm) slip fitter as specified by the user.

NOTE 2—It is important that pole-top geometry be coordinated with fixture geometry. The pole top may require specific inside-diameter dimensions, or other modifications.

7.4 *Poles Designed for Support-Arm Application*—Poles designed for support-arm application shall be provided with a cap to close the top of the shaft. The cap shall be corrosion resistant and must remain in place when subjected to maximum wind loads for which the pole is designed.

## 8. Performance Requirements

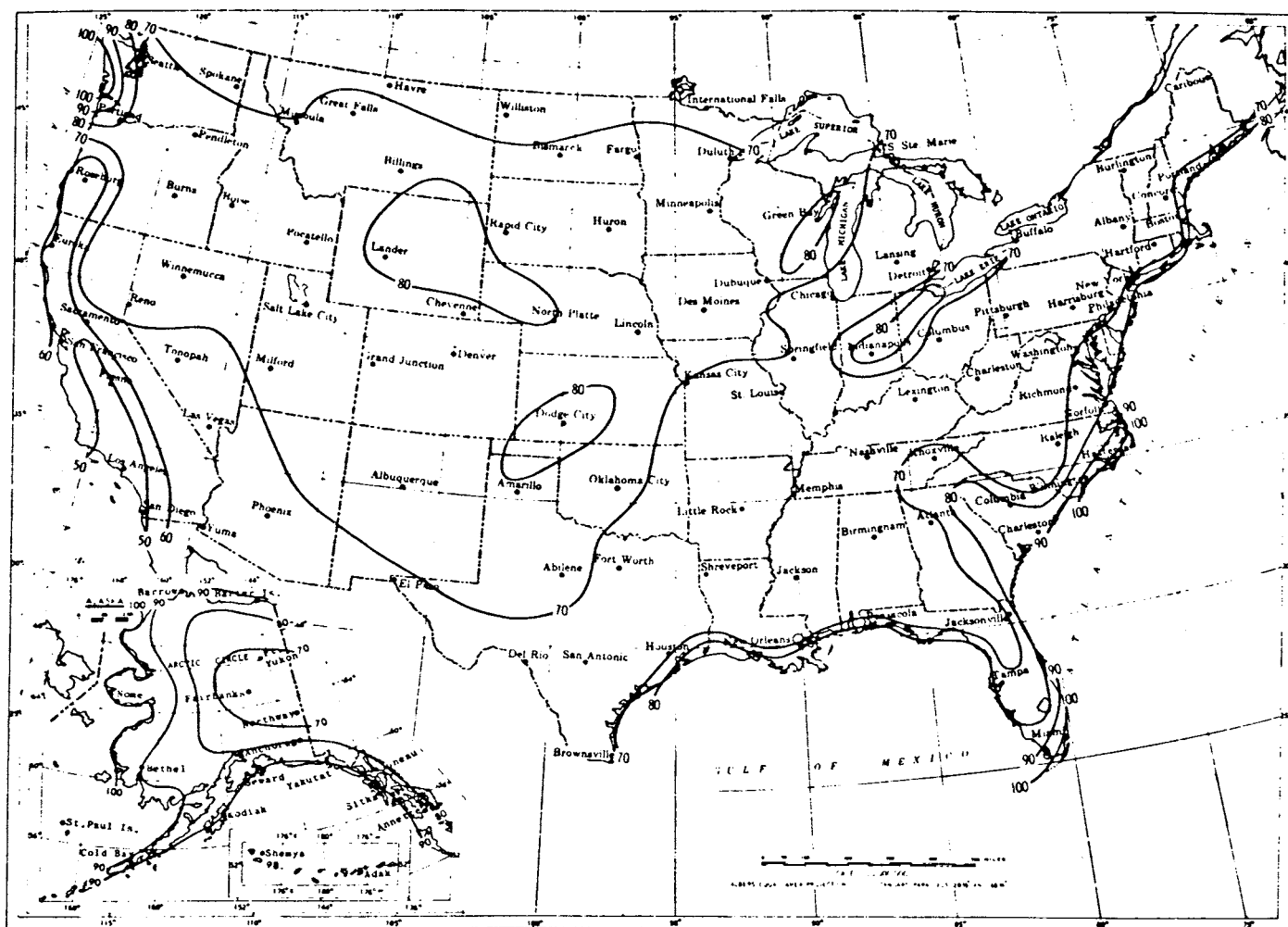
8.1 The pole, with specified luminaire(s) and arm(s) installed, when exposed to winds determined in accordance with **Fig. 1** shall meet the following requirements:

NOTE 3—Unless a specific luminaire(s) and arm(s), if applicable, is (are) specified, conformance shall be based on the maximum size (EPA) luminaire and, if applicable, longest arm and maximum size (EPA) for which it is claimed that the pole is suitable at a specified wind speed.

NOTE 4—Statistical guidance established according to principles of Practices **E29** and **E691** shall be considered when determining conformance.

8.1.1 *Bending Moment*—The pole shall withstand at least one and one-half times the maximum bending moment imposed

<sup>4</sup> National Cooperative Highway Research Program Report No. 230, March, 1981, available from Transportation Research Board, National Research Council, Washington, DC.



Isotach 0.04 Quantiles, in Miles Per Hour: Annual Extreme-Mile 30 Feet Above Ground, 25-Year Mean Recurrence Interval

FIG. 1 Application of Wind Load

by the wind when tested (if applicable) in accordance with 14.1 see Appendix X1 for calculations.

8.1.2 *Pole-Top Deflection*—Poles, when tested in accordance with procedures such as described in Appendix X3, shall meet the following:

8.1.2.1 *Standard Pole (Class 1)*—The pole-top deflection induced by the wind acting on the pole and all accoutrements attached thereto shall not exceed 15 % of the above ground height.

8.1.2.2 *Stiff Pole (Class 2)*—The pole-top deflection induced by the wind acting on the pole and all accoutrements attached thereto shall not exceed 10 % of the above ground height.

8.1.3 *Torsional Moment (Applicable to Poles with Arm-Mounted Luminaires Only)*—The pole shall withstand at least one and one-half times the maximum torsional moment induced by the wind, as determined in Section 14.2. See also Appendix X4.

8.1.4 *Flexural Fatigue*—The pole shall resist degradation due to flexural fatigue, as determined in 14.3.

8.1.5 *Burn Rate*—The shaft shall not burn at a rate that exceeds 1.0 in./min (2.54 cm/min) as determined in 14.4.

8.1.6 *Conductivity*—The shaft shall be electrically nonconductive.

NOTE 5—In general, the pole shall not permit dangerous leakage currents at voltages used with commercial luminaires. Where specific insulation properties are required, these properties shall be described in such a manner that testing can be obtained in accordance with Test Methods D149 or D257.

8.1.7 *Breakaway Poles*—Requirements for breakaway poles are not a mandatory part of this specification. When agreed to between producer and consumer, such requirements shall use Section 13 as a guide.

## 9. Workmanship, Finish, and Appearance

9.1 There shall be no unsaturated fibers exposed on the exterior surface of the pole.

## 10. Wiring and Access

### 10.1 Wiring:

10.1.1 The pole shall permit complete internal wiring from an underground source.

10.1.2 The pole shaft shall have an inside diameter of not less than 2 in. (5.08 cm) for its entire length.