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Standard Specification for Spun Cast Prestressed Concrete Bases for Tapered Steel Lighting Poles[1]

This standard is issued under the fixed designation C1804; 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.

~~ε[1] NOTE—Editorial changes were made throughout in April 2015.~~

1. ~~Scope~~ Scope*

1.1 This specification covers spun cast prestressed concrete bases used in lighting structures.

1.2 *Units*—The values stated in SI units are to be regarded as standard.

1.3 *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*:[2]

A416/A416M Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete
A421/A421M Specification for Stress-Relieved Steel Wire for Prestressed Concrete
~~A496/A496M Specification for Steel Wire, Deformed, for Concrete Reinforcement (Withdrawn 2013)[3]~~
A615/A615M Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
~~A617/A617M Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement (Withdrawn 1999)[3]~~
A641/A641M Specification for Zinc–Coated (Galvanized) Carbon Steel Wire
A722/A722M Specification for High-Strength Steel Bars for Prestressed Concrete
A996/A996M Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
A1064/A1064M Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
B86 Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings
C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field
C33/C33M Specification for Concrete Aggregates
C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens
C42/C42M Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C150/C150M Specification for Portland Cement
C172/C172M Practice for Sampling Freshly Mixed Concrete
C260/C260M Specification for Air-Entraining Admixtures for Concrete
C330/C330M Specification for Lightweight Aggregates for Structural Concrete
C494/C494M Specification for Chemical Admixtures for Concrete
C595/C595M Specification for Blended Hydraulic Cements
C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
C989/C989M Specification for Slag Cement for Use in Concrete and Mortars
C1157/C1157M Performance Specification for Hydraulic Cement
C1240 Specification for Silica Fume Used in Cementitious Mixtures
F593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

[1] This test method is under the jurisdiction of ASTM Committee C27 on Precast Concrete Products and is the direct responsibility of Subcommittee C27.20 on Architectural and Structural Products.

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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.

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

2.2 *AASHTO Standard:*
Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals (LTS-6)[3]
2.3 *ACI Standard:*[4]
ACI 301 Specifications for Structural Concrete
2.4 *ASCE7 Standard:*[5]
Minimum Design Loads for Buildings and Other Structures
2.5 *PCI Guides:*
Guide for Design of Prestressed Concrete Poles
Guide Specification for Prestressed Concrete Poles

3. Terminology

3.1 *Definitions:*

3.1.1 *cracking load*—a load which creates a bending moment of enough magnitude to produce a tensile stress greater than the sum of induced compression plus the tensile strength of the concrete resulting in tensile cracks on the tension face of the base.

3.1.2 *cylindrical section*—lower portion of base designed to be buried in concrete backfill below ground line.

3.1.3 *spun base*—a base in which the concrete is distributed and compacted through centrifugal force.

3.1.4 *tapered section*—upper portion of base, which has a taper designed to match overlapping steel pole taper.

3.1.5 *ultimate load*—maximum load the base will carry in the specified direction, before the concrete or steel will reach its limiting state.

4. Basis of Acceptance

4.1 Acceptability of spun prestressed concrete bases produced in accordance with this specification shall be determined by the test results of compressive strength tests of concrete cylinders and mill certificates for the reinforcing steel. The manufacturer shall certify that the cement, aggregates, admixtures, and steel shall conform to the applicable specification for each material. The manufacturer shall also certify adherence to tolerance on dimensions and mass. In addition the acceptability of the bases, produced in accordance with this specification, shall be verified by the results of full scale bending tests. The purchaser shall specify the number and frequency of full-scale tests. Bases shall be accepted on the basis of producer certifications and historical test data of full-scale bending and tests on equal or larger bases.

5. Materials

5.1 *Cement*—Portland cement shall conform to the requirements of Specification C150/C150M or shall be portland blast-furnace slag cement or portland-pozzolan cement conforming to the requirements of Specification C595/C595M. Performance cement for specific use shall conform to Specification C1157/C1157M.

5.1.1 *Supplementary Cementitious Materials*—Fly ash shall conform to the requirements of Specification C618. Slag cement (ground granulated blast furnace slag) shall conform to the requirements of Specification C989/C989M. Silica fume shall conform to Specification C1240.

5.2 *Aggregate*—Aggregates shall conform to Specification C33/C33M except that the requirements for grading shall not apply. If a producer can demonstrate that aggregates conforming to Specification C330/C330M could be used to manufacture an acceptable product, those aggregates may be used.

5.3 *Water*—Water used for mixing concrete shall be free of oils, organic matter, and other substances in amounts that may be deleterious to concrete or reinforcing steel, and it shall not contain concentration of chloride ions in excess of 500 ppm or sulfate ions in excess of 1000 ppm.

5.4 *Admixture*—Chemical admixtures shall conform to Specification C494/C494M. Air-entraining admixtures shall conform to Specification C260/C260M. Admixtures shall not cause the chloride ion content of the concrete to exceed 0.06 % by mass of cementitious materials.

5.5 *Steel*—Prestressing steel shall conform to Specification A416/A416M, A421/A421M, or A722/A722M. Nontensioned longitudinal reinforcement shall conform to Specification A615/A615M, ~~A617/A617M~~A996/A996M, or ~~A496/A496M~~A1064/A1064M. Circumferential wire reinforcement shall conform to Specification A1064/A1064M~~,~~ ~~A496/A496M,~~ or A641/A641M.

5.6 All inserts shall be made from zinc alloy in accordance with Specification B86 or stainless steel in accordance with Specification F593. No aluminum inserts shall be allowed.

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[3] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.

[4] Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, http://www.concrete.org.

[5] Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, http://www.asce.org.

5.7 The top and bottom ends of the bases shall be sealed to prevent ground or rain water from wicking into the strand ends. The sealing compound shall be specified by the purchaser.

6. Requirements

6.1 *General Requirements:*

6.1.1 *Concrete Cover*—The minimum concrete cover over longitudinal reinforcing steel shall be ¾ in. (19 mm). The concrete cover can be reduced to ⅝ in. (16 mm) minimum for portions of the base not exposed to soil or weather.

6.1.2 *Circumferential Wire*—Circumferential wire spacing shall be 3 in. (76 mm) nominal, except at the ends (measured from either the top or bottom to a distance of 1 ft (305 mm)) where the nominal spacing shall be 1 in. (25 mm).

6.1.3 *Grounding*—The purchaser shall specify any grounding requirements needed.

6.1.4 *Exterior Surface Treatment*—Exterior concrete surface finish shall be as specified by the purchaser.

6.1.5 *Prestressing*—Initial prestress shall not be released until the concrete strength has reached the greater of 4500 psi (31 MPa) or 1.67 times the maximum expected stress in the concrete due to the prestressing forces immediately after transfer and before losses occur.

6.1.6 The minimum 28-day compressive strength for concrete used in bases shall be 9000 psi (62 MPa) as determined using Test Method C39/C39M or C42/C42M, or as specified by the purchaser. The cylinders for compression tests shall be made in accordance with Practice C31/C31M and C172/C172M.

6.1.7 If required by the purchaser, air entrainment of concrete shall be in accordance to ACI 301.

6.2 *Load Requirements:*

6.2.1 Bases shall be designed to withstand ultimate load. Ultimate capacity of the base shall be determined in accordance with the PCI Guide for Design (2.5). Where local codes so require, seismic loads shall be considered in the design of bases. Bases shall be proportioned so that loads produced by the manufacturing process, transportation, and installation, as well as dead and live loads, will not be detrimental to the strength, serviceability requirements, and aesthetics of the structure.

6.2.2 Unless local codes or agency standards require otherwise, one of the following loading criteria shall apply:

6.2.2.1 AASHTO loading criteria.

6.2.2.2 ASCE7 loading criteria.

7. Bending Test Procedures

7.1 The bases shall be tested in a horizontal position.

7.2 The method of attaching the test loads to produce bending and applying the test loads shall simulate actual light structure loading. Test procedure and types of measurements shall be approved by the purchaser before testing begins.

7.3 The producer shall furnish the purchaser copies of the test report. This report shall include all recorded test data as well as drawings describing the test.

8. Tolerances

8.1 The following tolerances are based on experience with the spun base manufacturing process:

8.1.1 *Length* shall vary by no more than 2 in. (50 mm) or 1 in. (25 mm) plus ¼ in. (6 mm) per 10 ft (3 m), whichever is greater.

8.1.2 *Cross Section:*

8.1.2.1 *Outside Diameter Cylindrical Section* shall vary by no more than ¼ in. (6 mm).

8.1.2.2 *Outside Diameter Tapered Section* shall vary by no more than 1/16 in. (1.6 mm).

8.1.2.3 *Wall Thickness* shall vary by no more than minus 12 % of the design thickness or no more than ¼ in. (6 mm), whichever is greater.

8.1.3 *Deviation from Longitudinal Axis (Sweep)* shall vary no more than ¼ in. (6 mm) per 10 ft (3 m) of length, applicable for the entire length or any segment thereof.

8.1.4 *End Squareness* shall vary no more than ¼ in. (6 mm) per 1 ft (305 mm) of diameter.

8.1.5 *Mass* shall vary no more than minus 10 % and plus 20 % of the design mass.

8.1.6 *Reinforcement Placement:*

8.1.6.1 *Longitudinal Reinforcement* shall vary no more than ¼ in. (6 mm) for individual elements and no more than ⅛ in. (3 mm) for the centroid of a group.

8.1.6.2 *Spiral Reinforcement* shall be within ±1¼ in. (32 mm) of its specified location, except at the ends (measured from either top or bottom to a distance of 1 ft (305 mm)) where the spacing location shall be within ±¼ in. (6 mm). The number of spirals of circumferential wire along any 3 ft (0.9 m) of length shall not be less than required by design.

8.1.7 *Longitudinal Aperture Placement* shall vary no more than 2 in. (50 mm) from the designated location.

9. Drawings

9.1 The producer shall furnish the purchaser with drawings that shall include the following information (see Fig. 1):

9.1.1 Size dimensions,