

**FMPA TECHNICAL SPECIFICATION FA-CP-1
SPECIFICATIONS FOR
CONCRETE POLES**

1. SCOPE

This specification covers the manufacture of pre-stressed spun and static cast concrete poles for use in distribution and street lighting structures.

2. GENERAL REQUIREMENTS

- 2.1 Structural calculations for the design of all poles must be prepared by an Engineer registered in the State of Florida and experienced in pre-stressed concrete design.
- 2.2 Except as otherwise specified, the concrete poles furnished under these specifications shall be manufactured in accordance with requirements and/or recommendations of the American Concrete Institute Standard "Building Code Requirements for Reinforced Concrete" (ACI 318-Latest Edition).
- 2.3 Poles shall be designed in accordance with the Pre-stressed Concrete Institute's (PCI) Guide for Design of Pre-stressed Concrete Poles.

3. PHYSICAL CHARACTERISTICS

- 3.1 Shape and Length: Poles shall be square in cross-section, with chamfered corners, and shall have a standard taper of 0.162 inch per foot. The allowable tolerance shall be +3 inches and -0 inch in the overall length.
- 3.2 Voids: The pole shall contain a void of design consistent with strength requirements and weight reduction. This void shall not be obstructed by "Bulkheads" where expandable tubes change size.
- 3.3 Finish: The pole shall have a smooth, uncolored finish with no cracks. Immediately after the screening has been completed, the top surface of the pole in the form shall be troweled smooth and the edges shall be tooled. The top surface of each pole shall be troweled until all projections, depressions, and irregularities have been removed and the entire surface has a smooth texture and neat lines, square corners and sharp edges shall be tooled to form smooth, chamfered corners.

- 3.3.1 All small cavities caused by air bubbles, honeycomb, or other small voids shall be cleaned, saturated with water and then carefully pointed with mortar. A small cavity is defined as one not larger than 1/2 inch in diameter nor deeper than 1/4 inch. Large cavities not exceeding 2" long shall be repaired by opening the cavity sides on a 1 to 1 slope with a mechanical grinder, cleaning thoroughly, and patching with an epoxy-aggregate mixture in accordance with the product manufacturers specifications. Poles damaged with cavities larger than the foregoing shall be rejected.
- 3.4 Sealing Steel Strands: The end of each steel-reinforcing strand (in the top and butt) shall be burned back to a minimum depth of 1 inch. The holes left by the removal of the strand shall be thoroughly cleaned of any loose residue. The holes shall then be completely filled with an epoxy grout. After the epoxy grout has set, the patched holes shall be given a final coat of marine type epoxy paint.
- 3.5 Cover:The reinforcing steel shall have a minimum cover of 1-1/2 inches of concrete to the outside face and to the inside void. The minimum cover of concrete between the reinforcing steel and the holes that are drilled at the time of the manufacture of the pole shall be 3/4 inch. The centerline axis along the four pole faces shall be clear of embedded steel so that a 3/4 inch diameter hole may be drilled in the future without interference from any steel and with a minimum of 1 inch cover remaining between the holes and the reinforcing steel.
- 3.6 Sweep: Sweep is the deviation of a pole from straightness. Sweep will be allowed in one place and one direction only. A straight line joining the edge of the pole at the butt and the edge of the pole at the top shall not be distant from the surface of the pole at any point by more than 3/8 inch for each 10 feet of length between these points.
- 3.7 Expected Dimension and Weight: The expected dimensions and weight of most of the poles are shown on Table 2, which is attached. These are the approximate dimension and weights the utilities have been installing. If the proposed poles differ significantly in size or weight the bidder shall provide similar information on the proposed poles with the bid.
- 3.8 Framing: Typical framing specifications for Participating Members are attached for reference. Final framing specifications will be provided by the Participating Member at the time the order is placed.
- 3.8.1 The unit price bid will include framing as specified in the attached framing specifications. For additional holes (not shown in the framing specifications) requested by Participating Members, the bidder is requested to provide a charge for each hole drilled.

- 3.9 Lighting Poles: The Bid Form designates lighting pole quantities with the suffix "SL". Refer to the Participating Member(s) framing specifications for details such as hand-holes, embedded conduit, and coupling sleeves.

4. MATERIALS

- 4.1 The chemical properties of materials used shall be free from chlorides and/or sulfates.
- 4.2 All inserts or attachments, if required, shall be non-corrosive material.
- 4.3 Concrete: Concrete used in poles shall have a cylinder strength at transfer of not less than 4,000 psi, and a 28 day cylinder strength of not less than 6,000 psi.
- 4.4 Pre-stressing Steel: Steel tendons shall conform to ASTM a 416 (latest revision) "Specifications for Uncoated Seven-Wired Stress Relieved Strand for Pre-stressed Concrete", Grade 270.

5. STRENGTH REQUIREMENTS

- 5.1 All poles of each type, unless otherwise specified, shall be designed to withstand the rated design (cracking) and ultimate strength, shown in Table 1, with modification to accommodate allowances for handling, transportation and erection. The rated strength is that load, which if applied in a direction perpendicular to the pole axis 2 foot below the pole tip and with the bottom of the pole (ten percent of its length plus two feet from the butt) held firm, will produce the first sign of hairline cracks. The ultimate strength is the maximum design load, at which point failure occurs and shall be a minimum of two times the rated strength.
- 5.2 All poles shall be capable of withstanding single point pickup from the horizontal position when lifting from a point 30% of the overall length from the top.

6. GROUND DETAILS

- 6.1 A #4 awg bare medium hard drawn copper ground wire shall be embedded in each pole. It shall be continuous with no splices and shall extend from the top to approximately 12 inches below ground-line. Top and bottom projections shall be a minimum of 3 feet. Additional pigtailed shall be provided at locations shown on the attached drawing(s). The pigtailed shall also extend a minimum of 3 feet from the pole surface. All connections of pigtailed to the main ground wire shall be made with properly sized compression connectors.
- 6.2 The provisions of paragraph 6.1 are general guidelines only and will govern in lieu of specific details from Participating Member(s). Each bidder should carefully review the framing specifications for each Participating Member. In the event of conflicts between the provisions of paragraph 6.1 and individual framing specifications, the individual framing specifications will take precedence.

7. MARKING

- 7.1 Birthmark: All poles shall have imprinted on one face a legible birthmark containing manufacturer's name, the letters "of the participating utility", year and month of manufacture, weight, length, and pole type, located 12 feet from butt on all type poles. In addition, all poles shall have length legibly stenciled on pole butt.
- 7.2 Additional Information: The information listed below shall also be marked on the pole in legible, durable ink or paint or it may be cast into the pole. These marks shall be kept small but conspicuous.
- 7.2.1 Dunnage Points.
- 7.2.2 Two-point pickup locations for handling the pole in a horizontal position.
- 7.2.3 One-point pickup location for use in raising the pole to a vertical position and handling the setting operation.

8. DRAWING AND DESIGN INFORMATION

- 8.1 The supplier will furnish detailed design drawings and computations of the poles for approval by the Participating Member before manufacture of the poles is begun.
- 8.2 In addition to manufacturing details the following additional information for approval must be submitted:
- 8.2.1 Total weight and center of gravity of each pole.
- 8.2.2 Calculations of cracking and ultimate moments at 5 foot intervals.
- 8.2.3 Dunnage and pickup points, including both one-point and two-point pickup locations.
- 8.2.4 Detail of cross sections at all points where reinforcing changes.
- 8.2.5 Ultimate shear calculations at 5 foot intervals.
- 8.2.6 Calculations of maximum vertical loads, considering buckling, acting at the pole tips assuming an embedment length of 10% of pole height plus 2 feet.
- 8.3 The ultimate moment is the maximum designed moment, based on the ultimate strength specified, under which the pole can be operated without failure.
- 8.3.1 The ultimate shear is the maximum allowable shear calculated in accordance with the value "OYN" defined in the appropriate chapter of the latest ACI 318, under which the pole can be operated without creating shear cracks.

9. INSPECTION AND TESTING

- 9.1 The Participating Member and FMPA's authorized representatives shall have access to the work at any time during the manufacturing process and the manufacturer shall notify the FMPA and the Participating Member when manufacturing of the poles will be done.
- 9.2 All materials will be subject to job site inspection. Material may be rejected at the time of the first inspection or at any time defects are found during the process of erection or installation. Inspection by the buyer or waiving of inspection shall not relieve the manufacturer from the responsibility for furnishing products that conform to the requirements of this specification, nor invalidate any claim of the buyer because of defective or unsatisfactory material and workmanship.
- 9.3 A certified test report shall be provided showing the details of at least one test to failure of like or similar poles to those being furnished hereunder.
- 9.4 The buyer at his expense may request that one or more poles, picked from the production at random, be tested to the full design load. The design will be considered acceptable if no part of the structure shows evidence of significant permanent deformation. Supplier shall submit a proposed method of testing to the buyer for approval before the test is to be performed.

Upon satisfactory completion of the test, the tested pole may be applied to the buyer's purchase order.

In case of failure, the supplier will be responsible for the cost of the initial test. He shall then undertake corrective measures or redesign the structure at his own expense in the presence of the buyer or his representative. The supplier shall furnish a test report for each structure tested. The test report shall include the method of application of the loads, and the deflections under the various conditions.

10. DELIVERY

- 10.1 The supplier shall deliver poles to the members designated location by its own vehicles. The Participating Member will be responsible for unloading.
- 10.2 For pricing purposes the supplier should assume that the members will request delivery of a normal fully loaded truck. In addition, the supplier is requested to provide the additional charge applicable for a delivery of less than a full truckload.

11. ALTERNATE BIDS

The Participating Members are evaluating the use of pre-stressed spun concrete poles in lieu of static cast concrete poles. The Participating Members are requesting that qualified bidders assist their evaluation by suggesting, on the alternate bid forms provided, spun poles that will perform at the same level as the designated static cast pole. It is the intent of the Participating Members that the spun poles exhibit the same “in the field performance” in regard to such parameters as wind loading. The spun poles bid do not have to be the same type and class as the designated static cast pole.

11.1 Spun concrete poles delivered under this specification shall meet all the above requirements, **where appropriate**. The intent of this specification is that the spun poles delivered shall exhibit performance equivalent to their corresponding static cast pole.

11.1.1 Poles shall be pre-stressed concrete manufactured by the centrifugal spinning process, round in cross section with a hollow center.

12. APPROVED MANUFACTURERS

The following manufacturers are the only manufacturers of concrete poles that are acceptable to FMPA and the Participating Members:

For Static Cast Concrete Poles

USI (Not accepted at The City of Bushnell and The Ft. Pierce Utilities Authority)

Accord

StressCrete (Not accepted at The City of Bushnell and The Ft. Pierce Utilities Authority)

Newmark (Not accepted at The City of Bushnell and The Ft. Pierce Utilities Authority)

PreCast Specialties (Not accepted at The City of Bushnell and The Ft. Pierce Utilities Authority)

Durastress

Southeastern Prestressed (Not accepted at The City of Bushnell and The Ft. Pierce Utilities Authority)

For Spun Concrete Poles

Accord

StressCrete (Not accepted at The City of Bushnell and The Ft. Pierce Utilities Authority)

Valmont-Newmark (Not accepted at The City of Bushnell and The Ft. Pierce Utilities Authority)

Skycast (Not accepted at The City of Bushnell and The Ft. Pierce Utilities Authority)

Durastress

TABLE 1

| TYPE | CRACKING LOAD @2' | ULTIMATE LOAD @ 2' |
|-------|----------------------|-----------------------|
| I | 600 | 1200 |
| ISL | 600 | 1200 |
| II | 1200 | 2400 |
| III | 1500 | 3000 |
| IIIA | 1750 | 3500 |
| IIIB | 2000 | 4000 |
| IIISL | 1350 | 2600 |
| IV | 2250 | 4500 |
| V | 3000 | 6000 |
| H | 3250 | 6500 |
| VI | 3750 | 7500 |

TABLE 2

EXPECTED DIMENSIONS AND WEIGHT

| TYPE | LENGTH | OUTSIDE DIAMETER | | CORE DIAMETER | | TOTAL WEIGHT (LBS) |
|-------|--------|------------------|------|---------------|-------|-----------------------|
| | | BASE | TOP | BASE | TOP | |
| III | 35' | 11.7" | 6" | 6.5" | 2.0" | 2350 |
| | 40' | 12.5" | 6" | 7.7" | 2.0" | 2900 |
| | 45' | 13.3" | 6" | 8.0" | 2.0" | 3510 |
| | 50' | 14.1" | 6" | 8.8" | 2.0" | 4600 |
| IIIA | 40' | 12.9" | 6.5" | 7.1" | 2.0" | 3200 |
| | 45' | 13.7" | 6.5" | 7.8" | 2.0" | 3900 |
| | 50' | 14.5" | 6.5" | 8.5" | 2.0" | 4900 |
| IV | 40' | 15.5" | 9" | AS REQUIRED | | 5700 |
| | 45' | 16.2" | 9" | AS REQUIRED | | 6700 |
| | 50' | 17.1" | 9" | AS REQUIRED | | 7900 |
| | 55' | 17.9" | 9" | AS REQUIRED | | 7770 |
| | 60' | 18.7" | 9" | AS REQUIRED | | 8980 |
| | 65' | 19.5" | 9" | AS REQUIRED | | 10200 |
| | 70' | 20.3" | 9" | AS REQUIRED | | |
| H | 45' | 16.2" | 9" | 7.8" | SOLID | 7100 |
| | 50' | 17.0" | 9" | 8.5" | SOLID | 8400 |
| | 55' | 17.8" | 9" | 8.5" | SOLID | 9900 |
| | 60' | 18.7" | 9" | 8.5" | SOLID | 11900 |
| | 65' | 19.5" | 9" | 8.5" | SOLID | 13590 |
| IIISL | 35' | 11.7" | 6" | 6.5" | 2.0" | 2350 |
| | 45' | 13.3" | 6" | 8.0" | 2.0" | 3510 |

