SPECIFICATION NUMBER ENG 91-09

SPECIFICATION

FOR

600 VOLT MULTI-CONDUCTOR CABLE

JUNE, 1996

CITY OF LAKELAND

DEPARTMENT OF ELECTRIC AND WATER UTILITIES

LAKELAND, FLORIDA

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SPECIFICATION FOR

600 VOLT MULTI-CONDUCTOR CABLE

1. GENERAL REQUIREMENTS

A. SUMMARY OF WORK

1. This specification covers the requirements for furnishing multi-conductor cable to be installed in outdoor substations by the City of Lakeland, Florida. Work under this specification includes design, manufacturer, procurement and delivery of cable(s).

B. STANDARDS

1. All equipment and materials shall be designed, constructed, assembled and tested in accordance with, but not limited to, the applicable standards listed in this specification.

    a) National Electrical Manufacturers Association - NEMA
    b) American National Standards Institute - ANSI
    c) Institute of Electrical and Electronic Engineers - IEEE
    d) American Society for Testing and Materials - ASTM
    e) Insulated Power Cable Engineers Association - IPCEA
    f) Underwriter's Laboratories - UL

2. Any conflict between specifications, standards and the manufacturer's recommendations shall be referred to the Owner for final decision.

C. TECHNICAL REQUIREMENTS

1. The multi-conductor cable shall be suitable for wet or dry locations in ducts, conduits, cable trench or trays. The cable shall be designed for operation at ac and dc potentials of positive and negative polarity up to and including 600 volts.

2. 600 volt multi-conductor cable.

    a) The cable shall be insulated with moisture and heat resistant cross-linked synthetic polymer for use on power circuits operating at 600 volts or less.
    b) Conductors will be soft drawn, annealed, uncoated or tinned, copper wire. The physical and electrical properties shall comply with ASTM standards. All conductors shall have class "B" stranding.

c) Conductor insulation shall be sunlight resistant, flame retardant, moisture and heat resistant cross-linked synthetic polymer compound, rated 75 degree C wet and 90 degree C dry locations. It shall be approved by the Underwriter's Laboratories as Type XHHW. Insulation shall be free stripping.

d) Jacket material and construction shall be heavy duty black colored thermoplastic CPE, and shall be moisture, sunlight, heat, oil and abrasion-resistant.

e) Identify individual conductors of multiple-conductor cable by coloring insulation or application of colored sheaths with standard color sequence. Color coding will be in accordance with IPCEA Part 5, Method 1. Cables coded by printing name of color on each conductor will not be acceptable. The assembly of cables composed of 12 conductors or less shall be in accordance with the color combinations indicated in appendix A.

f) The required number of conductors shall be cabled in accordance with NEMA standards. Non-hygroscopic flame retardant fillers shall be used to provide a firm, circular cross-section.

g) The cable shall be identified throughout its entire length by a "permanent type" marking embossed in or white printed onto the outer jacket. The marking shall include the manufacturer of cable, conductor size (AWG), conductor material (CU), rated voltage, shield and insulation type and thickness, year of manufacture, UL label, number of conductors, and footage markings. The above marking shall be printed on the jacket at not more than 24 inch intervals or as approved. Reels should be classified with reel number and footage.

h) Cable shall be supplied on non-returnable reels of heavy wood or metal construction with a hole through the center of the hub of not less than 3 inches.

i) Only one size of cable shall be wound on a reel. The cable shall be shipped in the manufacturer's standard lengths but in no case less than 1000 foot lengths. Cables and conductors on individual reels shall be continuous and joint free.

j) Reel shall become property of owner at receipt.

k) A watertight seal shall be applied to each end of the cable to prevent the entrance of moisture during transit or outdoor storage prior to installation. Both ends of cable on each reel shall be readily accessible for "Megger" tests prior to installation.

3. 600 Volt multi-conductor shielded cable

a) When specified a non-magnetic metal shield component consisting of either coated or uncoated copper tape shall be applied over the conductor binder tape or extended binder. The copper tape shall have a thickness of at least 5.0 mils and shall comply with NEMA and IPCEA standards. The shield shall be copper tape applied helically or longitudinal, so as to

completely cover the insulation shield and shall have a minimum overlap of 10 percent. Shield shall be smooth or corrugated and in accordance with IPCEA 8-19- 81, Part 4.

D. FACTORY TESTS

1. Each reel of cable shall be fully tested in accordance with the production tests defined in the applicable ANSI, NEMA and IPCEA standards. The Manufacturer shall notify the Owner ten days in advance of the schedule for tests and shall provide the Owner with a schedule for testing. The Owner reserves the right for the Owner to witness testing at the manufacturer's facilities and to inspect the cable before shipment for conformity to these specifications.

2. Certified test reports shall be furnished to the Materials Planner, City of Lakeland Purchasing Department.

3. Cables shall be rated for installation in wet locations and shall meet the requirements of IPCEA, water immersion at 75 degrees C for six months. A certified test report from cable manufacturer, indicating compliance with IPCEA standards shall be provided.

APPENDIX A

CITY OF LAKELAND

MULTI CONDUCTOR CABLE

Conductor Number	Color - Tracer
1	Black
2	White
3	Red
4	Green
5	Orange
6	Blue
7	White-Black
8	Red-Black
9	Green-Black
10	Orange-Black
11	Blue-Black
12	Black-White
13	Red-White
14	Green-White
15	Blue-White
16	Black-Red
17	White-Red
18	Orange-Red
19	Blue-Red
20	Red-Green
21	Orange-Green