SPECIFICATIONS FOR MEDIUM VOLTAGE WIRES AND CABLES
ELECTRICAL CONTRACTORS
THE UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. Extent of electrical wire and electrical cable work is indicated by drawings and schedules.

B. Types of wire, cable and connectors in this section include, but are not limited to, the following and requirements of the service application:

   - Copper conductors.
   - Deadbreak separable splices.
   - Loadbreak elbows.
   - Cold shrinkable metallic shield kit.

C. Applications for wire, cable and connectors required for project are as follows:

   - Medium voltage power distribution circuitry.
   - Appliance and equipment circuitry.
   - Motor-branch circuitry.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

   1. Wire and Cable:
      Okonite
      Keyrite

   2. Connectors:
      3M Corporation
      Cooper Power Systems
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2.02 MEDIUM VOLTAGE POWER CABLE

15KV POWER CABLE

A. Primary voltage power cable shall be 15,000 volts; single conductor Class “B” stranded copper, ethylene propylene thermosetting type elastomer insulation (EPR), tape shielded and PVC jacketed. The cable shall be suitable for wet or dry location in conduit underground duct systems and direct burial. Contractor shall indicate if cable is compact or compressed stranded. Cables shall have uncoated soft annealed copper conductors in accordance with ASTM-B8

B. The cable shall be rated 105 degrees C for normal operations, 140 degrees C for emergency overload operation, and 250 degrees C for short circuit conditions.

The conductor screen shall be an extruded layer of semiconducting EPR thermosetting compound which shall have minimum elongation after an air oven test at 121 degrees C for 168 hours of 100% and a brittleness temperature no warmer than – 50 degrees C. The conductor screen shall be clean stripping from the conductor and inseparably bonded to the overlying insulation.

C. The insulation system shall consist of a triple tandem extruded semi-conducting thermostat EPR strand screen, ethylene propylene rubber insulation, and a semiconducting thermoset EPR insulation screen. The insulation shall contain no polyethylene nor exceed 72 percent by weight of ethylene in the copolymer to limit the degree of susceptibility to treeing. (Any bid proposing an alternate to the specified cable must contain a statement from the manufacturer confirming strict compliance with the preceding underlined portion of the specifications. Otherwise, that bid cannot be considered.) The insulation shall be compounded by the cable manufacturer in its own facility using a closed system to insure maximum cleanliness. All will be mixed, screened through a 320 mesh screen pack and then treated with the accelerator or crosslinking agent to insure complete blending and uniformity of the final compound. The insulation thickness shall be 220 mils (133 percent insulation level.)

D. The metallic shielding shall be a 5 mil bare copper tape with a 25 percent nominal helically overlap.

E. The insulation shall be triple-tandem extruded with the conductor screen and insulation screen to prevent intersurface contamination, and to permit accurate measurement of each layer of compound during manufacturing.
F. The overall jacket shall be polyvinylchloride of a minimum average thickness of 80 mils. The jacket shall be continuous, abrasion, moisture, heat and oil resistant, meeting or exceeding the requirement of ICEA S-68-5167, applied over the metallic shield.

G. The cable shall be manufactured and tested in complete and strict accordance with AEIC CS6-82 and applicable sections of ICEA CS6. (Paragraph G and D shall be reported with the bid).

H. Cable shall have twenty-five (25) year warranty from date of shipment by seller to purchaser.

5KV POWER CABLE

A. Primary voltage power cable shall be 15,000 volts; single conductor Class “B” stranded copper, ethylene propylene thermosetting type elastomer insulation (EPR), tape shielded and PVC jacketed. The cable shall be suitable for wet or dry location in conduit underground duct systems and direct burial. Contractor shall indicate if cable is compact or compressed stranded. Cables shall have uncoated soft annealed copper conductors in accordance with ASTM-B8

B. The cable shall be rated 105 degrees C for normal operations, 140 degrees C for emergency overload operation, and 250 degrees C for short circuit conditions.

The conductor screen shall be an extruded layer of semiconducting EPR thermosetting compound which shall have minimum elongation after an air oven test at 121 degrees C for 168 hours of 100% and a brittleness temperature no warmer than – 50 degrees C. The conductor screen shall be clean stripping from the conductor and inseparably bonded to the overlying insulation.

C. The insulation system shall consist of a triple tandem extruded semi-conducting thermoset EPR strand screen, ethylene propylene rubber insulation, and a semiconducting thermoset EPR insulation screen. The insulation shall contain no polyethylene nor exceed 72 percent by weight of ethylene in the copolymer to limit the degree of susceptibility to treeing. (Any bid proposing an alternate to the specified cable must contain a statement from the manufacturer confirming strict compliance with the preceding underlined portion of the specifications. Otherwise, that bid cannot be considered). The insulation shall be compounded by the cable manufacturer in its own facility using a closed system to insure maximum
cleanliness. All will be mixed, screened through a 320 mesh screen pack and then treated with the accelerator or crosslinking agent to insure complete blending and uniformity of the final compound. The insulation thickness shall be 115 mils (133 percent insulation level).

D. The metallic shielding shall be 5 mil bare copper tape with a 25 percent nominal helically overlap.

E. The insulation shall be triple-tandem extruded with the conductor screen and insulation screen to prevent intersurface contamination, and to permit accurate measurement of each layer of compound during manufacturing.

F. The overall jacket shall be polyvinylchloride of a minimum average thickness of 80 mils. The jacket shall be continuous, abrasion, moisture, heat and oil resistant, meeting or exceeding the requirement of ICEA S-68-5167, applied over the metallic shield.

G. The cable shall be manufactured and tested in complete and strict accordance with AEIC CS6-82 and applicable sections of ICEA CS6. (Paragraph G and D shall be reported with the bid).

H. Cable shall have twenty-five (25) year warranty from date of shipment by seller to purchaser.

2.03 15-KV TERMINATION

A. Termination kits shall be capable of properly terminating a 15 KV single conductor polymeric-insulated cable. Kits shall meet Class I requirements and be design-proof tested per IEEE 48-1975 and be capable of passing a test sequence per draft and revisions of IEEE 404-1986. Kits as specified shall accommodate any common form of cable shielding/construction without the need for special adaptors or accessories, and shall accommodate a wide range of cable size and, also, be capable of being properly installed on out-of-round or out-of-tolerance cable as per relevant IDEA standards. Kits shall accommodate commercially available connectors.

B. Terminations for single-conductor cable shall consist of cold-shrink stress control and outer non-tracking insulation tubes along with a high relative permittivity stress relief mastic for insulation shield cutback treatment with a cold shrink sealant.
for environmental sealing. Outdoor terminations shall include rain shields.

C. Termination kits shall be manufactured by 3M Corporation, Cooper.

D. All loadbreak elbows shall be equipped with peroxide-cured EPDM insulation, copper top connector, tin plated copper loadbreak probe with an ablative arc-follower tip, stainless steel reinforced pulling eye, and capacitive test point. Provide amperages as indicated on drawing, Cooper RTE or approved equal.

E. Deadbreak separable splices shall be equipped with peroxide-cured EPDM insulation, capacitive test points, and shall meet IEEE Standard 386 for separable insulated connector systems. Provide splices as indicated on drawings. Cooper SSPL series or approved equal.

F. All 600A connector plugs and 200/600A loadbreak adapters shall be EPDM insulation only.

PART 3 - EXECUTION:

3.01 INSTALLATION:

A. Factory Testing: Each insulated conductor provided under this section of the specification shall be tested in strict accordance with Section E of AAEIC CS6-87.

A certified copy of actual production test values for the cable provided under this section of the specification shall be provided, including the AEIC partial discharge corona test X-Y plot.

Factory testing/certified reports shall have an identification label in which a copy shall be installed on each cable/reel provided under this contract, making 100% identification that the cable/reel tested at the factory is the same as the one deliver to the project site. Not until this requirement is met will the cable/reel be accepted by the owner.

B. General: Install electrical cables, wires and connectors as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices as well as owner’s requirements.

C. Coordinate cable and wire installation work with electrical raceway and equipment
installation work, as necessary for proper interface.

D. Pull conductors together where more than one is being installed in a raceway.

E. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation.

F. Use pulling means, including fish tape, cable or rope which cannot damage raceway.

G. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members and follow surface contours, where possible.

H. No conductor splices shall be made without Engineer’s written approval.

I. Install splices and taps which have mechanical strength. Current and insulation rating shall be equivalent-or-better than conductor. All splices shall be compression type with cold shrink wrap and taped.

J. Use splice and tap connectors which are compatible with conductor material.

3.02 FIELD QUALITY CONTROL:

A. Prior to energization, high pot test cables and connectors using a non-destructive high voltage insulation resistance tester as per NETA requirements. Provide written test reports for all cables and connectors tested and submit them to the engineer’s or owner’s representative prior to energizing. Correct malfunctions where detected, including and up to providing new cable.

B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

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