## GENERAL:

The scope of this document is to provide instruction for the installation and testing of underground medium voltage cable systems installed on the system owner's campus

## DESIGN GUIDELINES:

1. Materials
   1.1. 15 kV Cable
      1.1.1. Conductor: Annealed, uncoated copper compact stranded ASTM B-496.
      1.1.2. Strand Screen: Extruded semiconducting EPR. Must meet electrical and physical requirements of ICEA S-93-639/NEMA WC74 S-97-682, AIEC CS8 and UL 1072.
      1.1.3. Insulation: 15 kV insulated with 100% Ethylene Propylene Rubber (EPR) for 133 percent insulation level, 220 mils average thickness (198 mils minimum) The insulation shall not contain any polyethylene
      1.1.4. Insulation Screen: Extruded semiconducting EPR. Must meet or exceed electrical and physical requirements of ICEA S-93-639/NEMA WC74 & S-97-682, AIEC CS8 and UL 1072. The screen shall not contain any polyethylene.
      1.1.5. Shield: Shield shall be overlapped 5 mil bare copper tape, helically applied.
      1.1.6. Jacket: Jacket thickness shall not be less than 80 mils of black polyvinyl chloride.
      1.1.7. Temperature Ratings
         1.1.7.1. Wet or dry normal rating - 105 deg C
         1.1.7.2. Emergency rating - 140 deg C
         1.1.7.3. Short circuit rating - 250 deg C
      1.1.8. Standard sizes used on University of Missouri – Columbia campus; System owner must approve the conductor sizes prior to installation.
         1.1.8.1. #2
         1.1.8.2. #4/0
         1.1.8.3. 350kcmil
         1.1.8.4. 500kcmil
      1.1.9. The cable must be flat line corona tested with less than 5 picocoulombs by manufacturer. Cable shall meet the requirements of AEIC CS6, ICEA S 68-516, and UL1072.
      1.1.10. Manufacturers: Okonite or Kerite - No substitutions are allowed.

   1.2. Terminations:
      1.2.1. Live front terminations shall be outdoor type cold shrink silicone rubber skirted termination kit as manufactured by 3M
      1.2.2. Separable connectors shall be 600A, deadbreak T-body terminations that meet or exceed IEEE Standard 386.
         1.2.2.1. Series 5815 as manufactured by 3M.
         1.2.2.2. Reducing Tap Plug: Hubbell 615ETP

1.2.2.3. Load break elbows shall not be used.

1.3. Splices: Splices shall be in-line cold shrink type QS-III or QS-4 as manufactured by 3M.

1.4. Fire Tape: Fire tape shall be 3 inch wide Scotch® 77 Fire-Retardant Electric Arc Proofing Tape manufactured by 3M.

2. Installation

2.1. All cables shall be installed in concrete encased duct banks, manholes or cable trays.

2.2. Care shall be taken not to damage the cable during installation. The cable ends shall be kept sealed when not being worked on to prevent water entry. System Owner shall be notified of any damage to evaluate repair or replacement requirements.

2.3. Pulling tensions and side wall pressures shall not exceed manufacturers maximum recommended values.

2.4. Cables shall be neatly trained around the walls of manholes utilizing cable support racks. Cables running across the middle of manholes will not be accepted.

2.5. Terminations and splices shall only be performed by personnel trained and experienced in the installation of this type of materials. Each termination or splice shall be inspected by System Owner personnel prior to the installation of the outer covering.

2.6. Fire tape all exposed cable in manholes using a minimum overlap of 50%. Fire tape into duct where practical.

2.7. Ground cables shall be installed in each section. A #2 stranded, 600V cable shall be used when a #2 or 4/0 primary cable is being installed and a 4/0 stranded, 600V cable shall be used when a 350kcmil or 500kcmil primary cable is being installed

2.8. Ground all terminations and splices in manholes or at equipment.

3. Testing

3.1. The cable shall have DC High Potential Test after it has been pulled into the duct and the splice or termination has been prepared but before the shrink tubing has been installed. Cable shall have 60kV DC applied for 15 minutes with data taken at 1 minute intervals. Written report shall be delivered to system owner including all data and results or conclusions. Cable is to be grounded for 30 minutes after test.

3.2. Insulation ground wall test (Megger) at 5kV DC to be performed after all splices and terminations have been completed. Written report of result of test with resistance values shall be delivered to system owner.

4. Commissioning

4.1. All in service switchgear shall be operated by System Owner personnel only.

4.2. All splices, terminations, testing, grounding, and fire taping shall be completed prior System Owner personnel energizing the cable

**REFERENCES**