Section 16122 PRIMARY POWER CABLES

PART 1 GENERAL:

- WORK INCLUDED

  The Contractor shall furnish and install all shielded power cable suitable for use on this project.

- RELATED WORK

  Section 16020: Tests

- SUBMITTALS

  The Contractor shall submit test and product data in accordance with Section OI 300.

PART 2 PRODUCTS:

Acceptable Manufacturer: Okonite Prysmiam, Southwire, or Kerite meeting these specifications is acceptable.

- TYPE AND RATING

  The cable shall be certified for normal operation at a conductor temperature of 105 degrees C; in wet and dry locations; in conduit above and below ground; in exposed cable tray runs. Conductors shall also be certified for operation at 1 30^0C during emergency conditions and 250^0C under short circuit conditions. The cable insulating and jacketing materials shall have a forty year average service life.

  All cable shall have the voltage ratings as hereinafter specified with ethylene propylene rubber insulation and suitably sized copper conductors. The cable shall be supplied in the quantities and number of conductors specified and for the functions as listed.

- SHIELDED POWER CABLE

Cable Type and Size	Voltage Rating
Copper Conductors Copper Foil Shield	15 kV - 133% Insulation

- QUALITY ASSURANCE

  Each power cable shall be given the manufacturer's standard production tests to assure that all cables adequately meet the requirements of these specifications. All cable shall conform to the applicable requirements of ICEA Publication S-68-516, UL 1072, Federal Standard 10 CFR 50, and UL Type MV 105 EPR and the latest specifications for extruded insulation. The copper conductors shall conform to ASTM-B8 for annealed copper, Class B stranded, compressed concentric round.

  Test data shall be furnished to the Owner. Test data may apply to the cables being furnished under this purchase order, or may be certified results of tests previously made on identical cables.

Materials used in the manufacture of the cable covered by these specifications shall be of the kind, composition and physical properties best adapted to their various purposes and conform to the standards of AEIC, ANSI, ASTM, IEEE, ICEA, NEC, NEMA and UL in effect on the date of the bid-opening as to material, workmanship, design and testing. Tolerances and practices in manufacture of finished cable shall conform to the best modern shop practices.

- SPECIFIC SUBMITTAL REQUIREMENTS

Materials Test Reports: Where specific materials tests are herein specified or where such tests are required by specific standard governing the manufacture of such materials, six (6) copies of certified test results shall be furnished by the manufacturer to the Contractor who shall submit them to the Owner.

The Contractor shall submit certified copies of the results of all standard production tests and tests performed in accordance with NEMA, and ICEA S-66-524 Standards as required by paragraph above, "Quality Assurance".

Technical Data: Contractor shall submit within 30 calendar days after receipt of Notice of Award values for all technical data regarding the cable being furnished.

- DESIGN AND CONSTRUCTION

Conductors: All copper conductors shall be stranded, and fabricated from uncoated, annealed copper wire conforming to ASTM B8. Stranding shall be concentric lay Class B, Standard, #2 cable.

Insulation: Conductors shall be insulated with ethylene propylene flexible thermosetting dielectric compound. The ethylene content of the compound shall not exceed 72% by weight of ethylene nor shall the compound contain any polyethylene. The insulation shall be triple-tandem extruded with the conductor and insulation screens. The extruded screen shall be free stripping. The outer screen/insulated core shall be covered with an uncoated copper tape. It shall be applied helically with 12.5% nominal overlap. The overall jacket shall be polyvinyl chloride.

Semi-Conductor Screens: These shall be Ethylpropylene based.

Identification: All cable shall have a permanent and readily identifiable exterior surface marking at appropriate intervals along its entire length. The method of marking shall be subject to the approval of the Owner. The marking shall contain the following information:

- Manufacturer
- Year of manufacture
- Size and type of conductor
- Rated voltage
- Insulation thickness
- Shield
- Type of jacket

Reels: All cable shall be furnished on reels. Each reel shall have the diameter of the drum large enough to prevent damage to the cable from reeling. The maximum flange diameter of the reel is not to exceed 78 inches. The outer end of the cable shall be securely fastened to the reel head so as to prevent the cable from becoming loose in transit. The inner end of the cable shall project into a slit in the side of the reel or into a housing on the inner side of the drum in such a way as to

make it available, if required, for test. The inner end shall be fastened to prevent it from becoming loose during installation. Each reel shall be plainly marked to indicate the direction in which it should be rolled to prevent loosening of the cable on the reel. The reels shall be lagged. Each length of cable shall be effectively sealed to prevent the entrance of moisture. The seal shall be applied in such a way as to prevent damage to the conductors or cable.

- DATE OF MANUFACTURE

All cable utilized in a pull shall have been manufactured during the same production run from the factory. All cable shall be new and shall have been manufactured within 3 months of the date of receipt at the job site. Storage of cable prior to installation shall comply with the recommendations of the manufacturer.

- GUARANTEE

The manufacturer of the cable shall furnish medium voltage cable which shall comply with the following warranty:

"The manufacturer shall warrant the cable to free from defects in material and workmanship for the 40 year design life of the cable; provided the cable is employed under the conditions contemplated and covered by the design specifications, and provided further that the cable is installed, spliced, terminated, maintained, and operated in accordance with the manufacturer's recommended procedures, at the time of bid.

In the event that the cable is defective in manufacture, as determined by the manufacturer and the University of Arizona jointly, the manufacturer's only responsibility will be to supply another cable for the defective portion, the new cable to be delivered free of charge to the University of Arizona.

Manufacturer shall not be responsible for any defects or repairs to, or replacement of, adjacent or connected equipment to which the cable may supply electric power or from which it may take electrical power or from which it may take electrical power. Manufacturer will not be responsible for any termination, maintenance, or operation which is not in accordance with the manufacturer's recommended standards and procedures."

PART 3 EXECUTION:

- INSTALLATION

Reels shall be rolled only in the direction indicated by the manufacturer and no reel containing cable shall be dropped from a truck or from any other comparable height, under any circumstances. In turning reels, particularly after the lagging has been removed, bars shall be used in such a manner that they will not bear against the cable. Reels shall not be rolled over rocks or other projecting objects which are liable to damage the cable and, when it is necessary to roll unlagged reels over soft ground, plant tracks shall be provided to keep the reel from sinking with possible damage to the cable. Cable shall be carefully handled during installation and shall be unreeled or uncoiled slowly to prevent damage to the insulation or sheath from sudden bending. The ends of any cable used shall be kept sealed from moisture at all times, either for cables that have been pulled and are awaiting connection, or for cables on reels in storage. In no case shall cables be allowed to lie on the floor or any other location where they may be subject to damage. If necessary, temporary supports shall be provided and arranged so as not to interfere with any provisions for permanent supports, or require any cable splicing. When reeling the cable

off of the reels and pulling it into the conduit every effort must be made to protect the cable from damage. The cable shall not be pulled off onto bare ground, asphalt, or concrete. Wherever it is required to pull cable off of the reel for a subpull it shall be necessary for the contractor to provide a surface which will not subject the cable to abrasion during the subpull.

Sharp kinks shall be avoided in any unreeling, uncoiling, and pulling operation, and the cable shall be carefully guided and trained into conduits or other raceways in as direct a manner as possible with a minimum amount of bending. The Contractor shall be responsible for keeping any cable bends to as large a radius as feasible and, where practicable, the minimum radius shall be kept at a value no less than 12 times the outer diameter of the insulation or covering. Where conditions dictate the installation, necessary bends of a small radius will be permitted, subject to the approval of THE UNIVERSITY OF ARIZONA. Any cable pulled in a manner resulting in damage to the shielding shall be removed and replaced at the direction of THE UNIVERSITY OF ARIZONA and at the Contractor's expense. Following the installation of the cable and until such time as the splice or stress cone is made the cable shall be resealed to prevent absorption of moisture into the insulation of the cable.

Before any cable is pulled in any conduit, such conduit shall have been tested for and cleared of, any obstruction in accordance with the requirements of Section 16115. The conduit termination shall be provided with a bushing or other suitable protector to guard against damage to the insulation or outside covering. Cable may be pulled by woven basket wire grips or by attachment of the pulling device directly to the conductor. Pulling tension shall not exceed the manufacturer's recommended limits. Soapstone, or other non-hardening pulling lubricant, approved by THE UNIVERSITY OF ARIZONA electrical engineer for the type of insulation involved, shall be used to help facilitate pulling requirements. All cable installed shall be arranged, and tied where necessary, in the opinion of THE UNIVERSITY OF ARIZONA, in a neat and orderly manner. Cable shall enter and leave in neat packs and shall be arranged in such a way as not to block openings or future use. The cables shall be supported clear of sharp edges or any structural framework. Cables shall be kept clear of any obstruction while placing. Cable installation procedures shall be reviewed by the U of A electrical engineer and shall be subject to the approval of the Owner.

Splices will not be permitted except where indicated on the drawings or where specifically approved by the engineer prior to start of work for high voltage cable. The Contractor shall furnish all materials and perform all work required for the complete termination or splicing of any wire, or cable including any stress cones that may be required. Terminations, splices and stress cones for high voltage cables and conductors shall be completed in accordance with manufacturer's recommendations or as directed by THE UNIVERSITY OF ARIZONA.

All high voltage cable splicing and dressing work shall be performed by men and crews thoroughly experienced (minimum five years) in such work, and each such cable splicer shall be approved by THE UNIVERSITY OF ARIZONA before splicing has begun. High voltage cable shall be given a high potential test per the requirements of section 16950 before final termination. Where desirable, the final termination taping shall be extended over the terminal connector onto the bus or bushing of the equipment to which the conductor is attached. Final taping shall generally be applied from bottom to top to provide the best possible shield and, in wet or damp locations, terminal taping shall be painted with insulating varnish. The Contractor may use premolded slip on type splices, taps and stress-cones. These premolded devices shall be made of ethylene propylene terpolymers. All cable splices shall be approved for use by the cable manufacturer on the specific cables.

Where T connections are approved by the UA Electrical Engineer, utilize bus bars with dead break elbow terminals and bushings. Use deadfront devices when they are available.

PART 4 PHASING AND IDENTIFICATION:

The contractor shall verify the existing phasing on all equipment being reconnected to a new service prior to removing the equipment and shall reconnect the equipment back to match original phasing following the completion of the installation of the new service.

End of Appendix Section 16122