Design Standard
Medium-Voltage Conductors

Purpose:

This design standard has the purpose of creating a consistent application for the installation of medium-voltage conductors throughout the East Side Union High School District, therefore achieving a standard of quality for maintenance, reliability, and operational efficiency throughout all renovation and new building projects.

Design Standard:

Design and specify the provision of wires, cables, connectors, lugs, and the like for a complete and operational electrical system.

- Wiring shall be copper, 600 volt rated throughout.
  i) Conductors #10 and smaller shall be solid.
  ii) #8 and larger shall be stranded, 90°c rated.
  iii) Conductors 3 AWG and larger, minimum insulation rating of 75C.
  iv) Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.
- MC Cable:
  i) High strength galvanized steel or aluminum flexible armor.
  ii) Full length minimum size No. 12 copper ground wire, THHN 90C conductors, full length tape marker. Overall PVC or nylon cable tape.
  iii) Short circuit throat insulators, mechanical compression termination.
  iv) MC Cable is allowed for 20 and 30 amp branch circuiting only when the following conditions are met:
    (1) Where there is a suspended ceiling with accessible space above (example: suspended acoustic ceiling panels).
    (2) Do not use for homeruns from branch circuit to first device or luminaire in circuit.
    (3) For drops to ceiling-mounted luminaires in areas with accessible ceiling space.
- All circuits feeding convenience outlets where computers may be connected shall have a separate neutral and shall carry an insulated ground conductor.
- The electrical engineer must provide for the possible effects of harmonics on the neutral wire and the transformer.
- Phase color to be consistent at feeder terminations; A-B-C, top to bottom, left to right, front to back.
- Color Code Conductors as follows:

PHASE	208 VOLT WYE	240 VOLT DELTA	480 VOLT
A	Black	Black	Brown
B	Red	Orange (High Leg)	Orange
C	Blue	Blue	Yellow
Neutral	White	White	Or White w/ colored strip
Ground	Green	Green	Green
Isolated Ground	Green w/yellow trace	N/A	N/A

- Connectors types shall have the following characteristics:
  i) Copper Pads: Drilled and tapped for multiple conductor terminals.
  ii) Lugs: Indent/compression type for use with stranded branch circuit or control conductors.
  iii) Conductor Branch Circuits: Wire nuts with integral spring connectors for conductors 18 through 8AWG. Push-in type connectors where conductors are not required to be twisted together are not acceptable.
  iv) Conductor Installation:
    (1) Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
    (2) Install conductors with care to avoid damage to insulation.
    (3) Do not apply greater tension on conductors than recommended by manufacturer during installation.
    (4) Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation. Do not use pulling compounds for installation of conductors connected to GFCI circuit breakers or GFCI receptacles.
- Conductor Size and Quantity:
  i) Install no conductors smaller than 12AWG.
  ii) Provide required conductors for a fully operable system.
- Provide dedicated neutrals (one neutral conductor for each phase conductor) in the following single phase circuits:
  i) Dimmer controlled circuits.
  ii) Isolated ground circuits.
  iii) Ground fault protected circuits where a GFCI breaker is used in a panelboard.
  iv) Other electronic equipment which produces a high level of harmonic distortion including but not limited to computers, printers, plotters, copy machines, and fax machines.
- Conductors in Cabinets:
  i) Cable and tree wires in panels and cabinets for power and control. Use plastic ties in panels and cabinets.
  ii) Tie and bundle feeder conductors in wireways of panelboards.
  iii) Hold conductors away from sharp metal edges.

- Test conductor insulation on feeders of 100 amps and greater for conformity with 1000 volt megohmmeter. Use Insulated Cable Engineers Association testing procedures. Minimum insulation resistance acceptable is 1 megohm for systems 600 volts and below. Notify District if insulation resistance is less than 1 megohm.

Approved Manufacturers:

- Medium-voltage conductors
  - General Cable
  - Southwire
  - Carol
- Lugs
  - Anderson
  - Ilsco
  - Panduit
  - Thomas & Betts
  - 3M
- Wire Nuts
  - 3M
  - Ideal

Substitutes Allowed:

Yes, if performance and quality equivalency can be evidenced.

Associated Design Standards and Construction Specifications:

- Division 22 Plumbing Design Standards
- Division 23 HVAC Design Standards
- Division 25 Integrated Automation Design Standards
- Division 26 Electrical Design Standards
- Division 27 Communications Design Standards
- Division 28 Electronic Safety and Security Design Standards

End of Document