



Design Standard Wires, Cables and Connectors

Purpose:

This design standard has the purpose of creating a consistent application for the installation of wires, cables, and connectors throughout the South San Francisco Unified School District therefore achieving a standard of quality for maintenance, reliability, and operation 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. Stranded allowed if required by specific conditions.
 - 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.
- All cable runs to be in conduit, ¾" EMT minimum. Use rigid conduit where required by code.
- MC cable or flex is allowed only allowable for light and equipment whips within 10' of fixture.
- All circuits feeding convenience outlets, where computers will be connected, shall have a separate neutral.
- Elsewhere the electrical design 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	480 VOLT
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Or White w/ colored strip
Ground	Green	Green
Isolated Ground	Green w/yellow trace	N/A



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- 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. Manufacturers: Anderson, IlSCO, Panduit, Thomas & Betts, 3M, or approved.
 - 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. Manufacturers: 3M, Ideal, or approved.
- Conductor Installation:
 - i) Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
 - ii) Install conductors with care to avoid damage to insulation.
 - iii) Do not apply greater tension on conductors than recommended by manufacturer during installation.
 - iv) 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. Allow sufficient slack for future re-positioning of circuits at panel.
 - 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.



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Approved Manufacturers:

- General Cable
- Southwire
- Carol Brand

Substitutes Allowed:

Yes, if performance and quality equivalency can be evidenced.

Associated Design Standards:

- 26 05 26 – Design Standard Grounding
- 26 05 33 – Design Standard Raceways
- 26 05 48 – Design Standard Supporting Devices
- 26 05 53 – Design Standard Identification

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