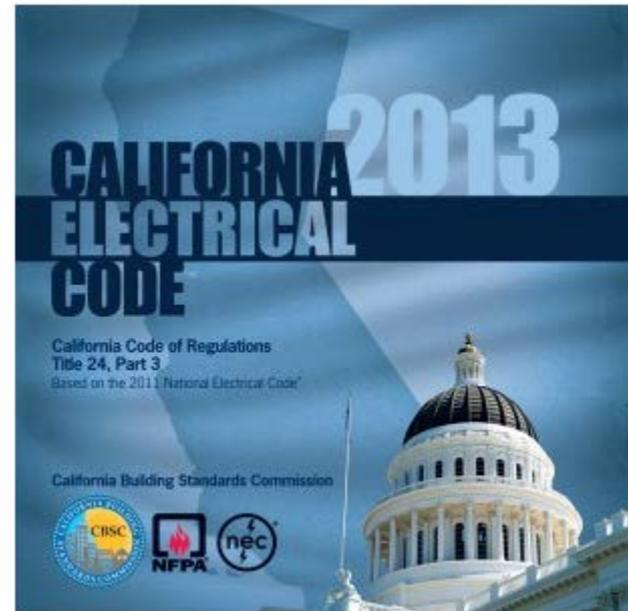
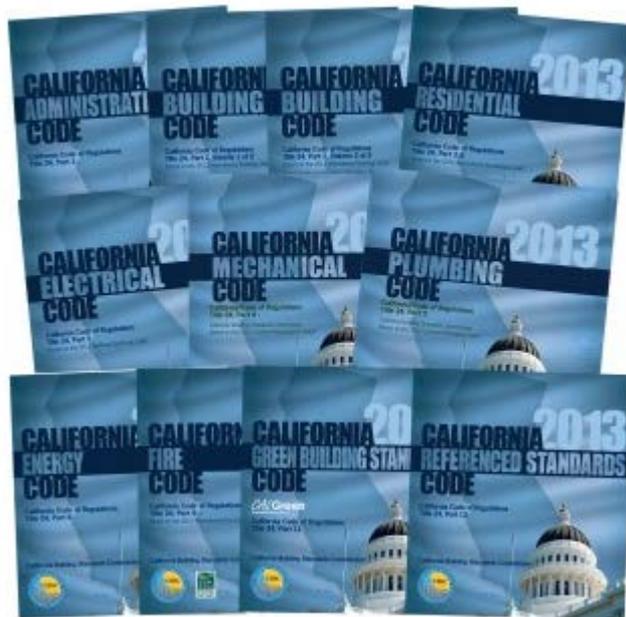




Office of Statewide Health Planning and Development Facilities Development Division

Brian Coppock,
Regional Compliance Officer





2013 California Electrical Code

First: Always consider why we do what we do

California hospitals are considered to be some of the most complex buildings in the world to design, construct, maintain and remodel. California Hospital buildings must be designed, constructed, maintained and remodeled to provide care and service to its constituents 24 hours a day, seven days a week, 365/366 days a year. Hospitals' continuous operation requirements are regardless of environmental conditions, and natural or manmade disasters that may impact the hospitals facilities and staffs. California has developed rigorous hospital building standards and procedures to ensure that hospital facilities will be able to meet these needs. Professional skill and commitment to these rigorous hospital building standards and procedures is required to execute the work of the Inspector of Record and California healthcare construction.

The principle of Public Health and Safety





2013 California Electrical Code

OSHPD Vision and Mission

- **Vision:**
 - Access to Safe, Quality Healthcare Environments that meet California's Diverse and Dynamic Needs
- **Mission:**
 - OSHPD Advances Access to Safe, Quality Healthcare Environments through Innovative and Responsive Services and Information that:
Ensure Safe Facilities





2013 California Electrical Code

How to Distinguish Between Model Code Language and California Amendments

To distinguish between model code language and the incorporated California amendments, including exclusive California standards, California amendments will appear in italics.

Symbols in the margins indicate the status of code changes as follows:

[SFM] This symbol identifies which State agency(s), by its “acronym”, has amended a section of the model code. For a complete listing of the State agency acronyms, see the Application Section within Chapter 1.





2013 California Electrical Code

C
A This symbol indicates a California amendment has been made to the model code.

|| This symbol indicates that a change has been made to a California amendment.

> This symbol indicates deletion of California language.

NOTATIONS USED IN THE *NATIONAL ELECTRICAL CODE*

The following notation appears in the *National Electrical Code* to aid the user:

Shaded text indicates that the material differs from the previous edition. The user should inspect this text carefully, as some requirements may have been changed.

| A vertical line in the margin indicates an entirely new article.





2013 California Electrical Code

ARTICLE 517 HEALTH CARE FACILITIES

III. Essential Electrical System

517.25 Scope. The essential electrical system for these facilities shall comprise a system capable of supplying a limited amount of lighting and power service, which is considered essential for life safety and orderly cessation of procedures during the time normal electrical service is interrupted for any reason. This includes clinics, medical and dental offices, outpatient facilities, nursing homes, limited care facilities, hospitals, and other health care facilities serving patients.

- Informational Note: For information on the need for an essential electrical system, see **NFPA 99-2005**, *Standard for Health Care Facilities*.





2013 California Electrical Code

517.30 Essential Electrical Systems for Hospitals

(B) General.

(1) Separate Systems. Essential electrical systems for hospitals shall be comprised of two separate systems capable of supplying a limited amount of lighting and power service that is considered essential for life safety and effective hospital operation during the time the normal electrical service is interrupted for any reason. These two systems shall be the emergency system and the equipment system.

- **Two electrical power systems: Normal System/Essential Electrical System**
- **Essential Electrical System** is the equipment system and emergency system.
- The emergency system contains the life safety branch and the critical branch





2013 California Electrical Code

517.30 Essential Electrical Systems for Hospitals

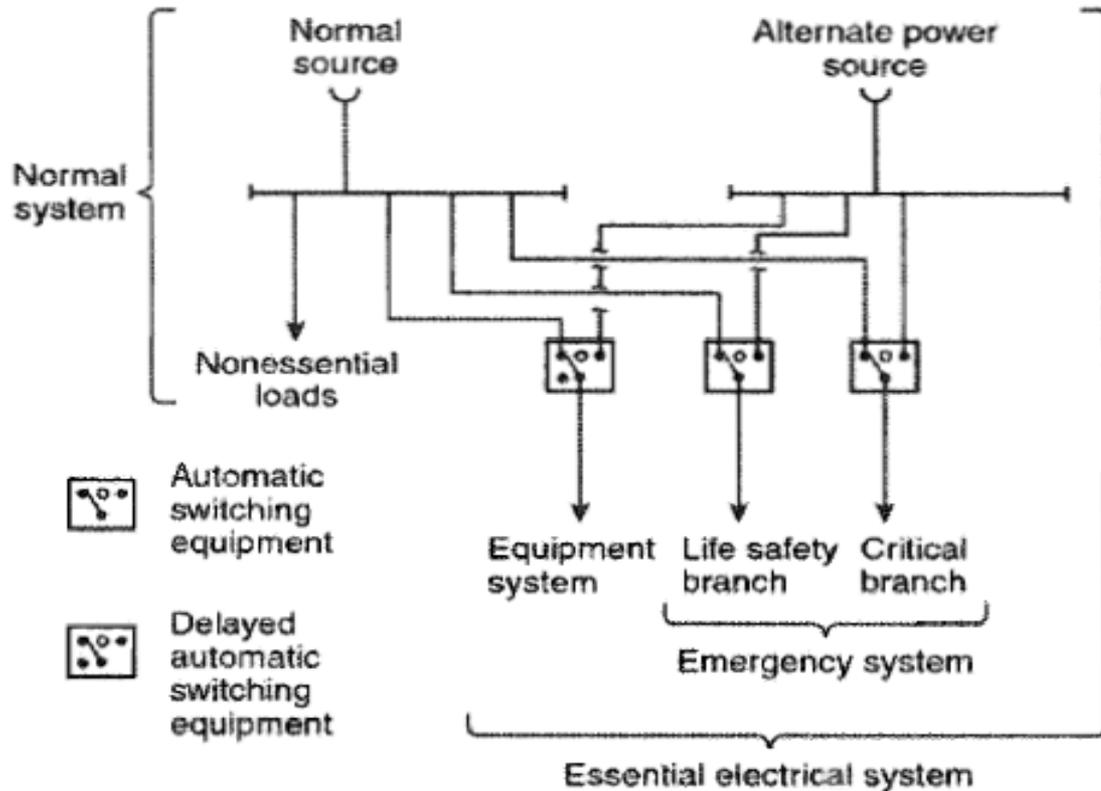
- **Emergency Systems.** The emergency system shall be limited to circuits essential to life safety and critical patient care. These are designated the life safety branch and the critical branch [99:4.4.2.2.1.1]
- **Equipment System.** The equipment system shall supply major electrical equipment necessary for patient care and basic hospital operation.





2013 California Electrical Code

ARTICLE 517 HEALTH CARE FACILITIES Essential Electrical System



Greater than
150 kVA





2013 California Electrical Code

517.30 Essential Electrical Systems for Hospitals.

(8) General.

(1) Separate Systems. Essential electrical systems for hospitals shall be comprised of two separate systems capable of supplying a limited amount of lighting and power service that is considered essential for life safety and effective hospital operation during the time the normal electrical service is interrupted for any reason. These two systems shall be the **emergency system** and the **equipment system**.





2013 California Electrical Code

Essential Electrical Systems for Hospitals

517.31 Emergency System. Those functions of patient care depending on lighting or appliances that are connected to the emergency system shall be divided into two mandatory branches: **the life safety branch** and the **critical branch**, described in 517.32 and 517.33.

The branches of the emergency system shall be installed and connected to the alternate power source so that all functions specified herein for the emergency system shall be automatically restored to operation within **10 seconds** after interruption of the normal source. [99:4.4.2.2.2.1,4.4.3.1]





2013 California Electrical Code

Essential Electrical Systems for Hospitals

517.32 Life Safety Branch.

No function other than those listed in 517.32(A) through (H) shall be connected to the life safety branch.

The life safety branch of the emergency system shall supply power for the following lighting, receptacles, and equipment.





2013 California Electrical Code

517.32 Life Safety Branch

(A) Illumination of Means of Egress.

(B) Exit Signs

(C) Alarm and Alerting Systems. Alarm and alerting systems including the following:

(1) Fire alarms

(2) Alarms required for systems used for the piping of nonflammable medical gases

(3) Mechanical, control, and other accessories required for effective life safety systems operation shall be permitted to be connected to the life safety branch.

(D) Communications Systems





2013 California Electrical Code

517.32 Life Safety Branch

(E) Generator Set and Transfer Switch Locations.

Task illumination battery charger for battery-powered lighting Unit(s) and selected receptacles at the generator set and essential transfer switch locations. [99:4.4.2.2.2.2(5)]

(F) Generator Set Accessories.

Generator set accessories as required for generator performance.

(G) Elevators.

Elevator cab lighting, control, communications, and signal systems.

(H) Automatic Doors.

Automatically operated doors used for building egress. [99:4.4.2.2.2.2(7)]





2013 California Electrical Code

Essential Electrical Systems for Hospitals

517.33 Critical Branch.

(A) Task Illumination and Selected Receptacles. The critical branch of the emergency system shall supply power for task illumination, fixed equipment, selected receptacles, and special power circuits serving the following areas and functions related to patient care:

- (1) Critical care areas that utilize anesthetizing gases task illumination, selected receptacles, and fixed equipment
- (2) The isolated power systems in special environments





2013 California Electrical Code

517.33 Critical Branch.

(3) Patient care areas task illumination and selected receptacles in the following:

- a. Infant nurseries
- b. Medication preparation areas
- c. Pharmacy dispensing areas
- d. Selected acute nursing areas
- e. Psychiatric bed areas (omit receptacles)
- f. Ward treatment rooms
- g. Nurses' stations (unless adequately lighted by corridor luminaires)





2013 California Electrical Code

517.33 Critical Branch.

(4) Additional specialized patient care task illumination and receptacles, where needed

(5) Nurse call systems [OSHPD 1, 2 & 4] Exception: Battery powered components of wireless emergency nurse call systems complying with the latest edition of ANSI/UL 1069, Standard for Hospital Signaling and Nurse Call Equipment.

(6) Blood, bone, and tissue banks

(7) Telephone [OSHPD 1, 3, & 4] and information technology equipment rooms and closets

Orange and *Italicized* indicate CA Amendments





2013 California Electrical Code

517.33 Critical Branch.

(8) Task illumination, selected receptacles, and selected power circuits for the following:

a. General care beds (at least one duplex receptacle in each patient bedroom)

a.1. [OSHPD 1, 2, 3, & 4] General care beds

b. Angiographic labs

c. Cardiac catheterization labs

d. Coronary care units

e. Hemodialysis rooms or areas

f. Emergency room treatment areas (selected)

g. Human physiology labs

h. Intensive care units





2013 California Electrical Code

517.33 Critical Branch.

(8) Task illumination, selected receptacles, and selected power circuits for the following: Continued

- i.** Postoperative recovery rooms (selected) [*Subsections j through n OSHPD 1*]
- j.** Lithotripsy treatment rooms
- k.** Laser operating rooms
- l.** Electric clocks as required by Part 2, Title 24, CCR.
- m.** Food preparation areas, central supply, and utility rooms
- n.** Electrical and mechanical rooms





2013 California Electrical Code

517.33 Critical Branch

(9) Additional task illumination, receptacles, and selected power circuits needed for effective hospital operation. Single-phase fractional horsepower motors shall be permitted to be connected to the critical branch.

[99:4.4.2.2.2.3(9)]

(10) [OSHPD 1,2, 3, & 4] Sensor-operated fixtures when used to comply with Table 4-2, California Plumbing Code.

(11) [OSHPD 1 & 4] Alarm systems for monitoring negative pressure isolation rooms and positive pressure isolation rooms.





2013 California Electrical Code

Essential Electrical Systems for Hospitals

517.34 Equipment System Connection to Alternate Power Source.

The equipment system shall be installed and connected to the alternate power source such that the equipment described in **517.34(A)** is automatically restored to operation at appropriate time-lag intervals following the energizing of the emergency system. Its arrangement shall also provide for the subsequent connection of equipment described in **517.34(B)**. [99:4.4.2.2.3.2]





2013 California Electrical Code

517.34 Equipment System Connection to Alternate Power Source

(A) Equipment for Delayed Automatic Connection. The following equipment shall be permitted to be arranged for delayed automatic connection to the alternate power source:

- (1) Central suction systems serving medical and surgical functions, including controls. Such suction systems shall be permitted on the critical branch.
- (2) Sump pumps and other equipment required to operate for the safety of major apparatus, including associated control systems and alarms.
- (3) Compressed air systems serving medical and surgical functions, including controls. Such air systems shall be permitted on the critical branch.





2013 California Electrical Code

517.34 Equipment System Connection to Alternate Power Source continued

- (4) Smoke control and stair pressurization systems, or both.
- (5) Kitchen hood supply or exhaust systems, or both, if required to operate during a fire in or under the hood.
- (6) Supply, return, and exhaust ventilating systems for airborne infectious/isolation rooms, protective environment rooms, exhaust fans for laboratory fume hoods, nuclear medicine areas where radioactive material is used, ethylene oxide evacuation, and anesthesia evacuation. Where delayed automatic connection is not appropriate, such ventilation systems shall be permitted to be placed on the critical branch.

[99:4.4.2.2.3.4(1) through (6)]





2013 California Electrical Code

517.34 Equipment System Connection to Alternate Power Source continued

(7) Supply, return, and exhaust ventilating systems for operating and delivery rooms.

Exception: Sequential delayed automatic connection to the alternate power source to prevent overloading the generator shall be permitted where engineering studies indicate it is necessary.

(B) Equipment for Delayed Automatic or Manual Connection. The following equipment shall be permitted to be arranged for either delayed automatic or manual connection to the alternate power source:

(1) Heating equipment to provide heating for operating, delivery, labor, recovery, intensive care, coronary care, nurseries, infection/isolation rooms, emergency treatment spaces, and general patient rooms and pressure maintenance (jockey or make-up) pump(s) for water based fire protection systems.





2013 California Electrical Code

ARTICLE 300 WIRING METHODS

300.37 Aboveground Wiring Methods.

Aboveground conductors shall be installed in rigid metal conduit, in intermediate metal conduit, in electrical metallic tubing, in RTRC [Reinforced Thermosetting Resin Conduit (DZKT/DZKT7)] and PVC conduit, in cable trays, in auxiliary gutters, as busways, as cablebus, in other identified raceways, or as exposed runs of metal-clad cable suitable for the use and purpose. In locations accessible to qualified persons only, exposed runs of Type MY cables, bare conductors, and bare busbars shall also be permitted. Busbars shall be permitted to be either copper or aluminum.





California Electrical Code

IOR Recertification Seminar March 2014

- **ARTICLE 300 WIRING METHODS 300.50**

- Underground Installations.**

- (A) General. Underground conductors shall be identified for the voltage and conditions under which they are installed. Direct-burial cables shall comply with the provisions of 310.10(F). Underground cables shall be installed in accordance with 300.50(A)(1) or (A)(2), and the installation shall meet the depth requirements of Table 300.50.





2013 California Electrical Code

- **ARTICLE 300 WIRING METHODS 300.50
Underground Installations.**

(B) Wet Locations. The interior of enclosures or raceways installed underground shall be considered to be a wet location. Insulated conductors and cables installed in these enclosures or raceways in underground installations shall be listed for use in wet locations and shall comply with 310.10(C). Any connections or splices in an underground installation shall be approved for wet locations.

Shaded text indicates that the material differs from the previous edition.





2013 California Electrical Code

ARTICLE 314 OUTLET, DEVICE, PULL AND JUNCTION BOXES; CONDUIT BODIES; FITTINGS; AND HANDHOLES

314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies.

Boxes and conduit bodies shall be of sufficient size to provide free space for all enclosed conductors. In no case shall the volume of the box, as calculated in 314.16(A), be less than the fill calculation as calculated in 314.16(B). The minimum volume for conduit bodies shall be as calculated in 314.16(C).





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314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies.

(C) Conduit Bodies.

(1) General. Conduit bodies enclosing 6 AWG conductors or smaller, other than short-radius conduit bodies as described in 314.16(C)(2), shall have a cross sectional area not less than twice the cross-sectional area of the largest conduit or tubing to which they can be attached. The maximum number of conductors permitted shall be the maximum number permitted by Table 1 of Chapter 9 for the conduit or tubing to which it is attached.





2013 California Electrical Code

314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies.

(C) Conduit Bodies.

(2) With Splices, Taps, or Devices. Only those conduit bodies that are durably and legibly marked by the manufacturer with their volume shall be permitted to contain splices, taps, or devices. The maximum number of conductors shall be calculated in accordance with 314.16(B). Conduit bodies shall be supported in a rigid and secure manner.





2013 California Electrical Code

314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies.

(C) Conduit Bodies.

(3) Short Radius Conduit Bodies. Conduit bodies such as capped elbows and service-entrance elbows that enclose conductors 6 AWG or smaller, and are only intended to enable the installation of the raceway and the contained conductors, shall not contain splices, taps, or devices and shall be of sufficient size to provide free space for all conductors enclosed in the conduit body.





California Electrical Code

IOR Recertification Seminar March 2014

314.17 Conductors Entering Boxes, Conduit Bodies, or Fittings. Conductors entering boxes, conduit bodies, or fittings **shall be protected from abrasion** and shall comply with 314.17(A) through (D).

Workmanship issue.





2013 California Electrical Code

ARTICLE 392 CABLE TRAYS

392.18 Cable Tray Installation.

(A) Complete System. Cable trays shall be installed as a complete system. Field bends or modifications shall be so made that the electrical continuity of the cable tray system and support for the cables is maintained. Cable tray systems shall be permitted to have mechanically discontinuous segments between cable tray runs or between cable tray runs and equipment.

(B) Completed Before Installation. Each run of cable tray shall be completed before the installation of cables.





2013 California Electrical Code

ARTICLE 392 CABLE TRAYS

392.18 Cable Tray Installation continued.

(C) Covers. In portions of runs where additional protection is required, covers or enclosures providing the required protection shall be of a material that is compatible with the cable tray.

(D) Through Partitions and Walls. Cable trays shall be permitted to extend transversely through partitions and walls or vertically through platforms and floors in wet or dry locations where the installations, complete with installed cables, are made in accordance with the requirements of 300.21.





2013 California Electrical Code

ARTICLE 392 CABLE TRAYS

392.18 Cable Tray Installation continued.

(E) Exposed and Accessible. Cable trays shall be exposed and accessible, except as permitted by 392.10(D).

(F) Adequate Access. Sufficient space shall be provided and maintained about cable trays to permit adequate access for installing and maintaining the cables.





2013 California Electrical Code

ARTICLE 392 CABLE TRAYS

392.18 Cable Tray Installation continued.

(G) Raceways, Cables, Boxes, and Conduit Bodies

Supported from Cable Tray Systems. In industrial facilities where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the cable tray systems are designed and installed to support the load, such systems shall be permitted to support raceways and cables, and boxes and conduit bodies covered in 314.1. For raceways terminating at the tray, a listed cable tray clamp or adapter shall be used to securely fasten the raceway to the cable tray system. Additional supporting and securing of the raceway shall be in accordance with the requirements of the appropriate raceway article. For raceways or cables running parallel to and attached to the bottom or side of a cable tray system, fastening and supporting shall be in accordance with the requirements of the appropriate raceway or cable article.





2013 California Electrical Code

ARTICLE 392 CABLE TRAYS

392.18 Cable Tray Installation continued.

(G) continued. For boxes and conduit bodies attached to the bottom or side of a cable tray system, fastening and supporting shall be in accordance with the requirements of 314.23.

(H) Marking. Cable trays containing conductor rated over 600 volt shall have a permanent legible warning notice carrying the wording "DANGER – HIGH VOLTAGE - KEEP AWAY" placed in a readily visible position on all cable trays, with the spacing of warning notices not to exceed 3 meters (10 feet).





2013 California Electrical Code

Does anyone have any questions for the answers I have prepared?

