

**REVISION RECORD  
FOR THE STATE OF CALIFORNIA  
ERRATA**

**January 1, 2014**

**2013 Title 24, Part 3, California Code of Regulations**

General Information:

1. The date of this erratum is for identification purposes only. See the History Note Appendix on the backside or accompanying page.
2. This erratum is issued by the California Building Standards Commission in order to correct non-substantive printing errors or omissions in California Code of Regulations, Title 24, Part 3, of the 2013 California Electrical Code. Instructions are provided below.
3. Health and Safety Code Section 18938.5, establishes that only building standards in effect at the time of the application for a building permit may be applied to the project plans and construction. This rule applies to both adoptions of building standards for Title 24 by the California Building Standards Commission, and local adoptions and ordinances imposing building standards. An erratum to Title 24 is a non-regulatory correction because of a printing error or omission that does not differ substantively from the official adoption by the California Building Standards Commission. Accordingly, the corrected code text provided by this erratum may be applied on and after the stated effective date.
4. You may wish to retain the superseded material with this revision record so that the prior wording of any section can be easily ascertained.

**Title 24, Part 3**

<b>Remove Existing Pages</b>	<b>Insert Buff-Colored Pages</b>
<b>Pages 70-xv through 70-xvi</b>	<b>Pages 70-xv through 70-xvi</b>
<b>Pages 70-250.1 through 70-250.2</b>	<b>Pages 70-250.1 through 70-250.2</b>
<b>Pages 70-366.3 through 70-366.4</b>	<b>Pages 70-366.3 through 70-366.4</b>
<b>Pages 70-445 through 70-446</b>	<b>Pages 70-445 through 70-446</b>
<b>Pages 70-457 through 70-462</b>	<b>Pages 70-457 through 70-462</b>



**California Matrix Adoption Tables**

*Format of the Matrix Adoption Tables*

The matrix adoption tables, which follow, show the user which state agencies have adopted and/or amended given sections of model code for applications within their respective authorities. See Article 89, Sections 089.102 through 89.114, for building application and enforcement responsibilities.

The side headings identify the scope of the state agencies’ adoption as follows:

*Adopt the entire NEC article without state amendments*

If there is an “X” under a particular state agency’s acronym in this row, it means that particular state agency has adopted the entire model code chapter without any state amendments.

Example:

**ARTICLE 89 - GENERAL CODE PROVISIONS**

Adopting Agency	BSC	SFM	HCD		DSA		OSHPD				DPH	
			1	2	AC	SS	1	2	3	4		
<b>Adopt Entire Article</b>												
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below	<b>X</b>											
Article / Section												
89.101	<b>X</b>							<b>X</b>				
89.102	<b>X</b>							<b>X</b>				

*Adopt the entire NEC article as amended (amendments listed below)*

If there is an “X” under a particular state agency’s acronym in this row, it means that particular state agency has adopted the entire model code chapter, with state amendments.

Each state-amended section that the agency has added to that particular chapter is listed. There will be an “X” in the column, by that particular section, under the agency’s acronym, as well as an “X” by each section that the agency has adopted.

Example:

**ARTICLE 89 - GENERAL CODE PROVISIONS**

Adopting Agency	BSC	SFM	HCD		DSA		OSHPD				DPH	
			1	2	AC	SS	1	2	3	4		
<b>Adopt Entire Article</b>												
Adopt Entire Article as amended (amended sections listed below)	<b>X</b>											
Adopt only those sections that are listed below												
Article / Section												
89.101	<b>X</b>											
89.102	<b>X</b>											

Adopt only those sections which are listed below:

If there is an “X” under a particular state agency’s acronym in this row, it means that particular state agency is adoption only specific model code or state-amended sections within this chapter. There will be an “X” in the column under the agency’s acronym, as well as an “X” by each section that the agency has adopted.

Example:

**ARTICLE 89 - GENERAL CODE PROVISIONS**

Adopting Agency	BSC	SFM	HCD		DSA		OSHPD				DPH	
			1	2	AC	SS	1	2	3	4		
<b>Adopt Entire Article</b>												
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below	<b>X</b>											
Article / Section												
89.101	<b>X</b>											
89.102	<b>X</b>											

**Legend of Abbreviations of Adopting State Agencies**

- BSC California Building Standards Commission (see Section 89.102)
- SFM Office of the State Fire Marshal (see Section 89.111)
- HCD 1 Department of Housing and Community Development (see Section 89.108.2.1.1)
- HCD 1/AC Department of Housing and Community Development (see Section 89.108.2.1.2)
- HCD 2 Department of Housing and Community Development (see Section 89.108.2.1.3)
- DSA-AC Division of the State Architect-Access Compliance (see Section 89.109.1)
- DSA-SS Division of the State Architect-Structural Safety (see Section 89.109.1)
- DSA-SS/CC Division of the State Architect-Structural Safety/Community Colleges (see Section 89.102.2.2)
- OSHPD 1 Office of Statewide Health Planning and Development (see Section 89.110.1)
- OSHPD 2 Office of Statewide Health Planning and Development (see Section 89.110.2)
- OSHPD 3 Office of Statewide Health Planning and Development (see Section 89.110.3)
- OSHPD 4 Office of Statewide Health Planning and Development (see Section 89.110.4)
- DPH Department of Public Health (see Section 89.107)
- AGR Department of Food and Agriculture (see Section 89.106)
- CEC California Energy Commission (see Section 100 in Part 2, the California Energy Code)
- DCA Department of Consumer Affairs (see Section 89.104):
  - Board of Barbering and Cosmetology
  - Board of Examiners in Veterinary Medicine
  - Board of Pharmacy
  - Acupuncture Board
  - Bureau of Home Furnishings
  - Structural Pest Control Board
- SL State Library
- SLC State Lands Commission
- DWR Department of Water Resources (see Section 1.12 of Chapter 1 of the California Plumbing Code in Part 2 of Title 24)

**ARTICLE 400 – FLEXIBLE CORDS AND CABLES**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X	X	X		X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below					X							
Article / Section												
404 FPN					X							

**ARTICLE 402 – FIXTURE WIRES**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X		X	X		X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 404 – SWITCHES**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X	X	X		X	X			X		
Adopt Entire Article as amended (amended sections listed below)								X	X		X	
Adopt only those sections that are listed below					X							
Article / Section												
404 FPN					X							
404.4								X	X		X	

**ARTICLE 406 – RECEPTACLES, CORD CONNECTORS, AND ATTACHMENT PLUGS (CAPS)**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X	X	X		X	X			X		
Adopt Entire Article as amended (amended sections listed below)								X	X		X	
Adopt only those sections that are listed below					X							
Article / Section												
406 FPN					X							
406.9 (C)(1)								X	X		X	

**ARTICLE 408 – SWITCHBOARDS AND PANELBOARDS**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X	X	X		X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 409 – INDUSTRIAL CONTROL PANELS**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X	X	X		X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 410 – LUMINAIRES (LIGHTING FIXTURES), LAMPHOLDERS, AND LAMPS**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X	X	X		X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 411 – LIGHTING SYSTEMS OPERATING AT 30 VOLTS OR LESS**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X	X	X		X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 422 - APPLIANCES**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X	X	X		X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below		X										
Article / Section												
422.10-422.12		X										
422.16		X										

**ARTICLE 511 – COMMERCIAL GARAGES, REPAIR AND STORAGE**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X				X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 513 – AIRCRAFT HANGARS**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X				X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 514 – MOTOR FUEL DISPENSING FACILITIES**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X				X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 515 – BULK STORAGE PLANTS**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X				X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

**ARTICLE 516 – SPRAY APPLICATIONS, DIPPING, AND COATING PROCESSES**

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article	X	X				X	X	X	X	X	X	
Adopt Entire Article as amended (amended sections listed below)												
Adopt only those sections that are listed below												
Article / Section												

ARTICLE 517 – HEALTH CARE FACILITIES

Adopting Agency	BSC	SFM	HCD		DSA			OSHPD				DPH
			1	2	AC	SS	SS/CC	1	2	3	4	
Adopt Entire Article						X	X					
Adopt Entire Article as amended (amended sections listed below)		X						X	X	X	X	
Adopt only those sections that are listed below												
Article / Section												
517.2								X	X	X	X	
517.4		X						X	X		X	
517.10.1								X	X	X	X	
517.12(A)								X	X		X	
517.16		X						X	X	X	X	
517.18(A) w/Exc. 2 & 2.1								X	X	X	X	
517.18(B) Exc. 1								X	X	X	X	
517.18(B) Exc. 3								X	X	X		
517.18(D)								X	X		X	
517.19(B) Exc. 1								X	X		X	
517.22		X						X	X	X	X	
517.22(A), (C), & (D)								X	X	X	X	
517.22(B)								X	X	X	X	
517.22(B)(1)								X		X	X	
517.22(B)(2)									X			
517.24								X	X	X	X	
517.30(A)								X			X	
517.30(B)(5)								X		X	X	
517.30(B)(7)								X	X		X	
517.30(D.1)								X	X	X	X	
517.30(E)								X			X	
517.33(A)(5)		X						X	X		X	
517.33(A)(7)		X						X		X	X	
517.33(A)(8)a.1								X	X	X	X	
517.33(A)(8)j. – n.								X				
517.33(A)(10)								X	X	X	X	
517.33(A)(11)								X			X	
517.34(B)(1.1)								X			X	
517.35(B)(4)		X						X	X		X	
517.35(C)								X	X			
517.40(A.1)								X	X		X	
517.41(E)									X		X	
517.42(C.3)		X										
517.42(C.3) With Exc.								X	X		X	
517.43(A)(6), (7)								X	X		X	
517.43(A)(8)								X	X	X	X	
517.43(B)(1.1)								X	X		X	
517.44(B.1) w/Exc. 1								X	X		X	
517.44(B.1) Exc. 2		X						X	X		X	
517.45(D.1)								X	X	X	X	
517.45(E)										X	X	
517.45(F)								X		X	X	
517.45(G)								X	X	X	X	
517.123		X						X	X	X	X	

1. This state agency adopts the entire article as amended except for those sections indicated by the following symbol: †





C (3) Individual bed area lighting in intensive care and  
A coronary care units shall be controlled by a dimmer or other  
C means of multiple switching, to provide varied lighting  
A intensities.

C 517.24 [OSHPD 1, 2, 3, & 4] Mobile Medical Facilities.

C (A) Feeder. The feeder shall be sized in accordance with the  
A requirements of Article 220.

C (B) Service Receptacle. The service receptacle shall be listed  
A and rated for its use.

C (C) Disconnect. A disconnecting means listed and rated for  
A its use shall be located adjacent to and within sight of the  
C service receptacle. It shall be capable of simultaneously  
A disconnecting the ungrounded conductors which supply the  
C service receptacle

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*.

517.26 Application of Other Articles. The essential electrical system shall meet the requirements of Article 700, except as amended by Article 517.

Informational Note: The provisions of NFPA 110-2010, *Standard for Emergency and Standby Power Systems*, should be considered when designing and installing essential electrical power supply systems.

517.30 Essential Electrical Systems for Hospitals.

C (A) Applicability. The requirements of Part III, 517.30  
A through 517.35, shall apply to hospitals [OSHPD 1, 3  
C (ambulatory surgical clinics only), & 4] correctional  
A treatment centers providing optional services where an  
C essential electrical system is required.

Informational Note No. 1: For performance, maintenance, and testing requirements of essential electrical systems in hospitals, see NFPA 99-2005, *Standard for Health Care Facilities*. For installation of centrifugal fire pumps, see NFPA 20-2010, *Standard for the Installation of Stationary Fire Pumps for Fire Protection*.

Informational Note No. 2: For additional information, see NFPA 99-2005, *Standard for Health Care Facilities*.

(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.

(2) 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]

(3) Equipment System. The equipment system shall supply major electrical equipment necessary for patient care and basic hospital operation.

(4) Transfer Switches. The number of transfer switches to be used shall be based on reliability, design, and load considerations. Each branch of the emergency system and each equipment system shall have one or more transfer switches. One transfer switch shall be permitted to serve one or more branches or systems in a facility with a maximum demand on the essential electrical system of 150 kVA.

Informational Note No. 1: See NFPA 99-2005, *Standard for Health Care Facilities*: 4.4.3.2, Transfer Switch Operation Type I; 4.4.2.1.4, Automatic Transfer Switch Features; and 4.4.2.1.6, Nonautomatic Transfer Device Features.

Informational Note No. 2: See Informational Note Figure 517.30, No. 1.

Informational Note No. 3: See Informational Note Figure 517.30, No. 2.

(5) Optional Loads. Loads served by the generating equipment not specifically named in Article 517 shall be served by their own transfer switches such that the following conditions apply:

- (1) These loads shall not be transferred if the transfer will overload the generating equipment.
- (2) These loads shall be automatically shed upon generating equipment overloading.

[For OSHPD 1, 3, & 4] Loads served by such transfer switches, including the receptacles required to be supplied by the normal system pursuant to Articles 517-18 and 517-19, shall not be considered to be on the essential system.]

(6) Contiguous Facilities. Hospital power sources and alternate power sources shall be permitted to serve the essential electrical systems of contiguous or same site facilities. [99:13.3.4.3]

(7) [OSHPD 1, 2 & 4] All automatic transfer switches in general acute care hospitals, ambulatory surgical clinics, and correctional treatment centers providing optional services shall be provided with an in-phase monitor relay and shall have provisions for electrically by-passing and isolating the transfer switch. The by-pass switch shall be capable of by-passing loads to the emergency source or normal source if the selected by-pass source voltage is available.

(C) Wiring Requirements.

(1) Separation from Other Circuits. The life safety branch and critical branch of the emergency system shall be kept entirely independent of all other wiring and equipment and shall not enter the same raceways, boxes, or cabinets with each other or other wiring.

Where general care locations are served from two separate transfer switches on the emergency system in accordance with 517.18(A), Exception No. 3, the general care circuits from the two separate systems shall be kept independent of each other.



## VII. Isolated Power Systems

### 517.160 Isolated Power Systems.

#### (A) Installations.

**(1) Isolated Power Circuits.** Each isolated power circuit shall be controlled by a switch or circuit breaker that has a disconnecting pole in each isolated circuit conductor to simultaneously disconnect all power. Such isolation shall be accomplished by means of one or more isolation transformers, by means of generator sets, or by means of electrically isolated batteries. Conductors of isolated power circuits shall not be installed in cables, raceways, or other enclosures containing conductors of another system.

**(2) Circuit Characteristics.** Circuits supplying primaries of isolating transformers shall operate at not more than 600 volts between conductors and shall be provided with proper overcurrent protection. The secondary voltage of such transformers shall not exceed 600 volts between conductors of each circuit. All circuits supplied from such secondaries shall be ungrounded and shall have an approved overcurrent device of proper ratings in each conductor. Circuits supplied directly from batteries or from motor generator sets shall be ungrounded and shall be protected against overcurrent in the same manner as transformer-fed secondary circuits. If an electrostatic shield is present, it shall be connected to the reference grounding point. [99:4.3.2.6.1]

**(3) Equipment Location.** The isolating transformers, motor generator sets, batteries and battery chargers, and associated primary or secondary overcurrent devices shall not be installed in hazardous (classified) locations. The isolated secondary circuit wiring extending into a hazardous anesthetizing location shall be installed in accordance with 501.10.

**(4) Isolation Transformers.** An isolation transformer shall not serve more than one operating room except as covered in (A)(4)(a) and (A)(4)(b).

For purposes of this section, anesthetic induction rooms are considered part of the operating room or rooms served by the induction rooms.

(a) *Induction Rooms.* Where an induction room serves more than one operating room, the isolated circuits of the induction room shall be permitted to be supplied from the isolation transformer of any one of the operating rooms served by that induction room.

(b) *Higher Voltages.* Isolation transformers shall be permitted to serve single receptacles in several patient areas where the following apply:

- (1) The receptacles are reserved for supplying power to equipment requiring 150 volts or higher, such as portable X-ray units.
- (2) The receptacles and mating plugs are not interchangeable with the receptacles on the local isolated power system.

[99:13.4.1.2.6.6]

**(5) Conductor Identification.** The isolated circuit conductors shall be identified as follows:

- (1) Isolated Conductor No. 1 — Orange with at least one distinctive colored stripe other than white, green, or gray along the entire length of the conductor

- (2) Isolated Conductor No. 2 — Brown with at least one distinctive colored stripe other than white, green, or gray along the entire length of the conductor

For 3-phase systems, the third conductor shall be identified as yellow with at least one distinctive colored stripe other than white, green, or gray along the entire length of the conductor. Where isolated circuit conductors supply 125-volt, single-phase, 15- and 20-ampere receptacles, the striped orange conductor(s) shall be connected to the terminal(s) on the receptacles that are identified in accordance with 200.10(B) for connection to the grounded circuit conductor.

**(6) Wire-Pulling Compounds.** Wire-pulling compounds that increase the dielectric constant shall not be used on the secondary conductors of the isolated power supply.

Informational Note No. 1: It is desirable to limit the size of the isolation transformer to 10 kVA or less and to use conductor insulation with low leakage to meet impedance requirements.

Informational Note No. 2: Minimizing the length of branch-circuit conductors and using conductor insulations with a dielectric constant less than 3.5 and insulation resistance constant greater than 6100 megohm-meters (20,000 megohm-feet) at 16°C (60°F) reduces leakage from line to ground, reducing the hazard current.

#### (B) Line Isolation Monitor.

**(1) Characteristics.** In addition to the usual control and overcurrent protective devices, each isolated power system shall be provided with a continually operating line isolation monitor that indicates total hazard current. The monitor shall be designed such that a green signal lamp, conspicuously visible to persons in each area served by the isolated power system, remains lighted when the system is adequately isolated from ground. An adjacent red signal lamp and an audible warning signal (remote if desired) shall be energized when the total hazard current (consisting of possible resistive and capacitive leakage currents) from either isolated conductor to ground reaches a threshold value of 5 mA under nominal line voltage conditions. The line monitor shall not alarm for a fault hazard of less than 3.7 mA or for a total hazard current of less than 5 mA.

*Exception: A system shall be permitted to be designed to operate at a lower threshold value of total hazard current. A line isolation monitor for such a system shall be permitted to be approved, with the provision that the fault hazard current shall be permitted to be reduced but not to less than 35 percent of the corresponding threshold value of the total hazard current, and the monitor hazard current is to be correspondingly reduced to not more than 50 percent of the alarm threshold value of the total hazard current.*

**(2) Impedance.** The line isolation monitor shall be designed to have sufficient internal impedance such that, when properly connected to the isolated system, the maximum internal current that can flow through the line isolation monitor, when any point of the isolated system is grounded, shall be 1 mA.

*Exception: The line isolation monitor shall be permitted to be of the low-impedance type such that the current through the line isolation monitor, when any point of the isolated system is grounded, will not exceed twice the alarm threshold value for a period not exceeding 5 milliseconds.*

Informational Note: Reduction of the monitor hazard current, provided this reduction results in an increased “not alarm” threshold value for the fault hazard current, will increase circuit capacity.

**(3) Ammeter.** An ammeter calibrated in the total hazard current of the system (contribution of the fault hazard current plus monitor hazard current) shall be mounted in a plainly visible place on the line isolation monitor with the “alarm on” zone at approximately the center of the scale.

*Exception: The line isolation monitor shall be permitted to be a composite unit, with a sensing section cabled to a separate display panel section on which the alarm or test functions are located.*

Informational Note: It is desirable to locate the ammeter so that it is conspicuously visible to persons in the anesthetizing location.

## ARTICLE 518 Assembly Occupancies

**518.1 Scope.** Except for the assembly occupancies explicitly covered by 520.1, this article covers all buildings or portions of buildings or structures designed or intended for the gathering together of 100 or more persons for such purposes as deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar purposes.

**518.2 General Classification.**

**(A) Examples.** Assembly occupancies shall include, but not be limited to, the following:

Armories	Exhibition halls
Assembly halls	Gymnasiums
Auditoriums	Mortuary chapels
Bowling lanes	Multipurpose rooms
Club rooms	Museums
Conference rooms	Places of awaiting transportation
Courtrooms	Places of religious worship
Dance halls	Pool rooms
Dining and drinking facilities	Restaurants
	Skating rinks

**(B) Multiple Occupancies.** Where an assembly occupancy forms a portion of a building containing other occupancies, Article 518 applies only to that portion of the building considered an assembly occupancy. Occupancy of any room or space for assembly purposes by less than 100 persons in a building of other occupancy, and incidental to such other occupancy, shall be classified as part of the other occupancy and subject to the provisions applicable thereto.

**(C) Theatrical Areas.** Where any such building structure, or portion thereof, contains a projection booth or stage platform or area for the presentation of theatrical or musical productions, either fixed or portable, the wiring for that area, including associated audience seating areas, and all equipment that is used in the referenced area, and portable equipment and wiring for use in the production that will not be connected to permanently installed wiring, shall comply with Article 520.

Informational Note: For methods of determining population

capacity, see local building code or, in its absence, NFPA 101-2009, *Life Safety Code*.

**518.3 Other Articles.**

**(A) Hazardous (Classified) Areas.** Electrical installations in hazardous (classified) areas located in assembly occupancies shall comply with Article 500.

**(B) Temporary Wiring.** In exhibition halls used for display booths, as in trade shows, the temporary wiring shall be permitted to be installed in accordance with Article 590. Flexible cables and cords approved for hard or extra-hard usage shall be permitted to be laid on floors where protected from contact by the general public. The ground-fault circuit-interrupter requirements of 590.6 shall not apply. All other ground-fault circuit-interrupter requirements of this Code shall apply.

Where ground-fault circuit interrupter protection for personnel is supplied by plug-and-cord-connection to the branch circuit or to the feeder, the ground fault circuit interrupter protection shall be listed as portable ground fault circuit interrupter protection or provide a level of protection equivalent to a portable ground fault circuit interrupter, whether assembled in the field or at the factory.

*Exception: Where conditions of supervision and maintenance ensure that only qualified persons will service the installation, flexible cords or cables identified in Table 400.4 for hard usage or extra-hard usage shall be permitted in cable trays used only for temporary wiring. All cords or cables shall be installed in a single layer. A permanent sign shall be attached to the cable tray at intervals not to exceed 7.5 m (25 ft). The sign shall read*

*CABLE TRAY FOR TEMPORARY WIRING ONLY*

**(C) Emergency Systems.** Control of emergency systems shall comply with Article 700.

**518.4 Wiring Methods.**

**(A) General.** The fixed wiring methods shall be metal raceways, flexible metal raceways, nonmetallic raceways encased in not less than 50 mm (2 in.) of concrete, Type MI, MC, or AC cable. The wiring method shall itself qualify as an equipment grounding conductor according to 250.118 or shall contain an insulated equipment grounding conductor sized in accordance with Table 250.122.

*Exception: Fixed wiring methods shall be as provided in*

- (a) Audio signal processing, amplification, and reproduction equipment — Article 640*
- (b) Communications circuits — Article 800*
- (c) Class 2 and Class 3 remote-control and signaling circuits — Article 725*
- (d) Fire alarm circuits — Article 760*

**(B) Nonrated Construction.** In addition to the wiring methods of 518.4(A), nonmetallic-sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid nonmetallic conduit shall be permitted to be installed in those buildings or portions thereof that are not required to be of fire-rated construction by the applicable building code.

Informational Note: Fire-rated construction is the fire-resistive classification used in building codes.

**(C) Spaces with Finish Rating.** Electrical nonmetallic tubing and rigid nonmetallic conduit shall be permitted to be installed in club rooms, conference and meeting rooms in hotels or motels, courtrooms, dining facilities, restaurants, mortuary chapels, museums, libraries, and places of religious worship where the following apply:

- (1) The electrical nonmetallic tubing or rigid nonmetallic conduit is installed concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.
- (2) The electrical nonmetallic tubing or rigid nonmetallic conduit is installed above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

Electrical nonmetallic tubing and rigid nonmetallic conduit are not recognized for use in other space used for environmental air in accordance with 300.22(C).

*Informational Note:* A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

**518.5 Supply.** Portable switchboards and portable power distribution equipment shall be supplied only from listed power outlets of sufficient voltage and ampere rating. Such power outlets shall be protected by overcurrent devices. Such overcurrent devices and power outlets shall not be accessible to the general public. Provisions for connection of an equipment grounding conductor shall be provided. The neutral conductor of feeders supplying solid-state phase control, 3-phase, 4-wire dimmer systems shall be considered a current-carrying conductor for purposes of ampacity adjustment. The neutral conductor of feeders supplying solid-state sine wave, 3-phase, 4-wire dimming systems shall not be considered a current-carrying conductor for purposes of ampacity adjustment.

*Exception:* The neutral conductor of feeders supplying systems that use or may use both phase-control and sine-wave dimmers shall be considered as current-carrying for purposes of ampacity adjustment.

*Informational Note:* For definitions of solid-state dimmer types, see 520.2.

## ARTICLE 520

### Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations

#### I. General

**520.1 Scope.** This article covers all buildings or that part of a building or structure, indoor or outdoor, designed or used for presentation, dramatic, musical, motion picture projection, or similar purposes and to specific audience seating areas within motion picture or television studios.

#### 520.2 Definitions.

**Border Light.** A permanently installed overhead strip light.

**Breakout Assembly.** An adapter used to connect a multipole connector containing two or more branch circuits to multiple individual branch-circuit connectors.

**Bundled.** Cables or conductors that are tied, wrapped, taped, or otherwise periodically bound together.

**Connector Strip.** A metal wireway containing pendant or flush receptacles.

**Drop Box.** A box containing pendant- or flush-mounted receptacles attached to a multiconductor cable via strain relief or a multipole connector.

**Footlight.** A border light installed on or in the stage.

**Grouped.** Cables or conductors positioned adjacent to one another but not in continuous contact with each other.

**Performance Area.** The stage and audience seating area associated with a temporary stage structure, whether indoors or outdoors, constructed of scaffolding, truss, platforms, or similar devices, that is used for the presentation of theatrical or musical productions or for public presentations.

**Portable Equipment.** Equipment fed with portable cords or cables intended to be moved from one place to another.

**Portable Power Distribution Unit.** A power distribution box containing receptacles and overcurrent devices.

**Proscenium.** The wall and arch that separates the stage from the auditorium (house).

**Solid-State Phase-Control Dimmer.** A solid-state dimmer where the wave shape of the steady-state current does not follow the wave shape of the applied voltage, such that the wave shape is nonlinear.

**Solid-State Sine Wave Dimmer.** A solid-state dimmer where the wave shape of the steady-state current follows the wave shape of the applied voltage such that the wave shape is linear.

**Stand Lamp (Work Light).** A portable stand that contains a general-purpose luminaire or lampholder with guard for the purpose of providing general illumination on the stage or in the auditorium.

**Strip Light.** A luminaire with multiple lamps arranged in a row.

**Two-Fer.** An adapter cable containing one male plug and two female cord connectors used to connect two loads to one branch circuit.

**520.3 Motion Picture Projectors.** Motion picture equipment and its installation and use shall comply with Article 540.

**520.4 Audio Signal Processing, Amplification, and Reproduction Equipment.** Audio signal processing, amplification, and reproduction equipment and its installation shall comply with Article 640.

#### 520.5 Wiring Methods.

**(A) General.** The fixed wiring method shall be metal raceways, nonmetallic raceways encased in at least 50 mm (2 in.) of concrete, Type MI cable, MC cable, or AC cable containing an insulated equipment grounding conductor sized in accordance with Table 250.122.

*Exception: Fixed wiring methods shall be as provided in Article 640 for audio signal processing, amplification, and reproduction equipment, in Article 800 for communications circuits, in Article 725 for Class 2 and Class 3 remote-control and signaling circuits, and in Article 760 for fire alarm circuits.*

**(B) Portable Equipment.** The wiring for portable switchboards, stage set lighting, stage effects, and other wiring not fixed as to location shall be permitted with approved flexible cords and cables as provided elsewhere in Article 520. Fastening such cables and cords by uninsulated staples or nailing shall not be permitted.

**(C) Nonrated Construction.** Nonmetallic-sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid nonmetallic conduit shall be permitted to be installed in those buildings or portions thereof that are not required to be of fire-rated construction by the applicable building code.

**520.6 Number of Conductors in Raceway.** The number of conductors permitted in any metal conduit, rigid nonmetallic conduit as permitted in this article, or electrical metallic tubing for circuits or for remote-control conductors shall not exceed the percentage fill shown in Table 1 of Chapter 9. Where contained within an auxiliary gutter or a wireway, the sum of the cross-sectional areas of all contained conductors at any cross section shall not exceed 20 percent of the interior cross-sectional area of the auxiliary gutter or wireway. The 30-conductor limitation of 366.22 and 376.22 shall not apply.

**520.7 Enclosing and Guarding Live Parts.** Live parts shall be enclosed or guarded to prevent accidental contact by persons and objects. All switches shall be of the externally operable type. Dimmers, including rheostats, shall be placed in cases or cabinets that enclose all live parts.

**520.8 Emergency Systems.** Control of emergency systems shall comply with Article 700.

**520.9 Branch Circuits.** A branch circuit of any size supplying one or more receptacles shall be permitted to supply stage set lighting. The voltage rating of the receptacles shall be not less than the circuit voltage. Receptacle ampere ratings and branch-circuit conductor ampacity shall be not less than the branch-circuit overcurrent device ampere rating. Table 210.21(B)(2) shall not apply.

**520.10 Portable Equipment Used Outdoors.** Portable stage and studio lighting equipment and portable power distribution equipment not identified for outdoor use shall be permitted for temporary use outdoors, provided the equipment is supervised by qualified personnel while energized and barriered from the general public.

## II. Fixed Stage Switchboards

**520.21 Dead Front.** Stage switchboards shall be of the dead-front type and shall comply with Part IV of Article 408 unless approved based on suitability as a stage switchboard as determined by a qualified testing laboratory and recognized test standards and principles.

**520.22 Guarding Back of Switchboard.** Stage switchboards having exposed live parts on the back of such boards shall be enclosed by the building walls, wire mesh grilles, or by other approved methods. The entrance to this enclosure shall be by means of a self-closing door.

**520.23 Control and Overcurrent Protection of Receptacle Circuits.** Means shall be provided at a stage-lighting switchboard to which load circuits are connected for overcurrent protection of

stage-lighting branch circuits, including branch circuits supplying stage and auditorium receptacles used for cord-and-plug-connected stage equipment. Where the stage switchboard contains dimmers to control nonstage lighting, the locating of the overcurrent protective devices for these branch circuits at the stage switchboard shall be permitted.

**520.24 Metal Hood.** A stage switchboard that is not completely enclosed dead-front and dead-rear or recessed into a wall shall be provided with a metal hood extending the full length of the board to protect all equipment on the board from falling objects.

**520.25 Dimmers.** Dimmers shall comply with 520.25(A) through (D).

**(A) Disconnection and Overcurrent Protection.** Where dimmers are installed in ungrounded conductors, each dimmer shall have overcurrent protection not greater than 125 percent of the dimmer rating and shall be disconnected from all ungrounded conductors when the master or individual switch or circuit breaker supplying such dimmer is in the open position.

**(B) Resistance- or Reactor-Type Dimmers.** Resistance- or series reactor-type dimmers shall be permitted to be placed in either the grounded or the ungrounded conductor of the circuit. Where designed to open either the supply circuit to the dimmer or the circuit controlled by it, the dimmer shall then comply with 404.2(B). Resistance- or reactor-type dimmers placed in the grounded neutral conductor of the circuit shall not open the circuit.

**(C) Autotransformer-Type Dimmers.** The circuit supplying an autotransformer-type dimmer shall not exceed 150 volts between conductors. The grounded conductor shall be common to the input and output circuits.

Informational Note: See 210.9 for circuits derived from autotransformers.

**(D) Solid-State-Type Dimmers.** The circuit supplying a solid-state dimmer shall not exceed 150 volts between conductors unless the dimmer is listed specifically for higher voltage operation. Where a grounded conductor supplies a dimmer, it shall be common to the input and output circuits. Dimmer chassis shall be connected to the equipment grounding conductor.

**520.26 Type of Switchboard.** A stage switchboard shall be either one or a combination of the types specified in 520.26(A), (B), and (C).

**(A) Manual.** Dimmers and switches are operated by handles mechanically linked to the control devices.

**(B) Remotely Controlled.** Devices are operated electrically from a pilot-type control console or panel. Pilot control panels either shall be part of the switchboard or shall be permitted to be at another location.

**(C) Intermediate.** A stage switchboard with circuit interconnections is a secondary switchboard (patch panel) or panelboard remote to the primary stage switchboard. It shall contain overcurrent protection. Where the required branch-circuit overcurrent protection is provided in the dimmer panel, it shall be permitted to be omitted from the intermediate switchboard.

## 520.27 Stage Switchboard Feeders.

**(A) Type of Feeder.** Feeders supplying stage switchboards shall be one of the types in 520.27(A)(1) through (A)(3).

**(1) Single Feeder.** A single feeder disconnected by a single disconnect device.

**(2) Multiple Feeders to Intermediate Stage Switchboard (Patch Panel).** Multiple feeders of unlimited quantity shall be permitted, provided that all multiple feeders are part of a single system. Where combined, neutral conductors in a given raceway shall be of sufficient ampacity to carry the maximum unbalanced current supplied by multiple feeder conductors in the same raceway, but they need not be greater than the ampacity of the neutral conductor supplying the primary stage switchboard. Parallel neutral conductors shall comply with 310.10(H).

**(3) Separate Feeders to Single Primary Stage Switchboard (Dimmer Bank).** Installations with separate feeders to a single primary stage switchboard shall have a disconnecting means for each feeder. The primary stage switchboard shall have a permanent and obvious label stating the number and location of disconnecting means. If the disconnecting means are located in more than one distribution switchboard, the primary stage switchboard shall be provided with barriers to correspond with these multiple locations.

**(B) Neutral Conductor.** For the purpose of ampacity adjustment, the following shall apply:

- (1) The neutral conductor of feeders supplying solid-state, phase-control 3-phase, 4-wire dimming systems shall be considered a current-carrying conductor.
- (2) The neutral conductor of feeders supplying solid-state, sine wave 3-phase, 4-wire dimming systems shall not be considered a current-carrying conductor.
- (3) The neutral conductor of feeders supplying systems that use or may use both phase-control and sine wave dimmers shall be considered as current-carrying.

**(C) Supply Capacity.** For the purposes of calculating supply capacity to switchboards, it shall be permissible to consider the maximum load that the switchboard is intended to control in a given installation, provided that the following apply:

- (1) All feeders supplying the switchboard shall be protected by an overcurrent device with a rating not greater than the ampacity of the feeder.
- (2) The opening of the overcurrent device shall not affect the proper operation of the egress or emergency lighting systems.

Informational Note: For calculation of stage switchboard feeder loads, see 220.40.

### III. Fixed Stage Equipment Other Than Switchboards 520.41 Circuit Loads.

**(A) Circuits Rated 20 Amperes or Less.** Footlights, border lights, and proscenium sidelights shall be arranged so that no branch circuit supplying such equipment carries a load exceeding 20 amperes.

**(B) Circuits Rated Greater Than 20 Amperes.** Where only heavy-duty lampholders are used, such circuits shall be permitted to comply with Article 210 for circuits supplying heavy-duty lampholders.

**520.42 Conductor Insulation.** Foot, border, proscenium, or portable strip lights and connector strips shall be wired with conductors that have insulation suitable for the temperature at which the conductors are operated, but not less than 125°C (257°F). The ampacity of the 125°C (257°F) conductors shall be that of 60°C (140°F) conductors. All drops from connector strips shall be 90°C (194°F) wire sized to the ampacity of 60°C (140°F) cords and cables with no more than 150 mm (6 in.) of conductor extending into the connector strip. Section 310.15(B)(3)(a) shall not apply.

Informational Note: See Table 310.104(A) for conductor types.

### 520.43 Footlights.

**(A) Metal Trough Construction.** Where metal trough construction is employed for footlights, the trough containing the circuit conductors shall be made of sheet metal not lighter than 0.81 mm (0.032 in.) and treated to prevent oxidation. Lampholder terminals shall be kept at least 13 mm (½ in.) from the metal of the trough. The circuit conductors shall be soldered to the lampholder terminals.

**(B) Other-Than-Metal Trough Construction.** Where the metal trough construction specified in 520.43(A) is not used, footlights shall consist of individual outlets with lampholders wired with rigid metal conduit, intermediate metal conduit, or flexible metal conduit, Type MC cable, or mineral-insulated, metal-sheathed cable. The circuit conductors shall be soldered to the lampholder terminals.

**(C) Disappearing Footlights.** Disappearing footlights shall be arranged so that the current supply is automatically disconnected when the footlights are replaced in the storage recesses designed for them.

### 520.44 Borders, Proscenium Sidelights, Drop Boxes, and Connector Strips.

**(A) General.** Borders and proscenium sidelights shall be as follows:

- (1) Constructed as specified in 520.43
- (2) Suitably stayed and supported
- (3) Designed so that the flanges of the reflectors or other adequate guards protect the lamps from mechanical damage and from accidental contact with scenery or other combustible material

**(B) Connector Strips and Drop Boxes.** Connector strips and drop boxes shall be as follows:

- (1) Suitably stayed and supported
- (2) Listed as stage and studio wiring devices

### (C) Cords and Cables for Border Lights, Drop Boxes, and Connector Strips.

**(1) General.** Cords and cables for supply to border lights, drop boxes, and connector strips shall be listed for extra-hard usage. The cords and cables shall be suitably supported. Such cords and cables shall be employed only where flexible conductors are necessary. Ampacity of the conductors shall be as provided in 400.5.



## HISTORY NOTE APPENDIX

### California Electrical Code Title 24, Part 3, California Code of Regulations

*Notes:*

For prior history, see the History Note Appendix to the *California Electrical Code*, 2010 Triennial Edition, effective January 1, 2011.

1. (BSC 01/12, SFM 01/12, HCD 01/12, DSA-SS 03/12, OSHPD 01/12, DSA-AC 05/09) Adoption by reference of the *2008 National Electrical Code (NEC)* with necessary state amendments and repeal of the 2008 edition of the *NEC*; effective on January 1, 2014.

2. Errata to correct editorial errors within the preface and Article 406 and 517 of this code. Effective Jan. 1, 2014.

