



**CITY OF LONG BEACH**  
 Department of Development Services  
 BUILDING AND SAFETY BUREAU

**ELECTRICAL  
 PLAN REVIEW CHECKLIST**

**DATE:XX-XX-XX**

<b>INFORMATION</b>	PROJECT NO.:	EXPIRATION DATE:	STATUS:
	PROJECT ADDRESS:		
	WORK DESCRIPTION:		
	APPLICANT'S NAME:		TEL. NO.:
	E-MAIL:		FAX NO.:
<b>INSTRUCTIONS</b>	<p>Your application for a permit, together with plans and specifications, has been examined and you are advised that the issuance of a permit is withheld for the reasons hereinafter set forth. The approval of plans and specifications does not permit the violation of any sections of the Electrical Code or other local ordinances or state laws.</p> <p>In an effort to streamline the plan review process, please follow the steps outlined below to ensure that there is no delay in processing your application and reviewing your responses to these plan check comments.</p> <ul style="list-style-type: none"> <li>Revised plans and calculations shall incorporate or address all comments marked on the original checked set of plans, calculations, and this plan review checklist. Provide a written response to each comment and show where and how it has been addressed. Identify the sheet number and detail or reference note on the revised plans where the corrections are made. Time spent searching for the corrected items on the revised plans or calculations will delay the review and approval process. Once all comments on the plans, calculations, and this checklist have been addressed, contact the plan check staff to <b>SCHEDULE AN APPOINTMENT</b> to review the changes made.</li> </ul>		
	PLAN REVIEWER: _____		TEL. NO.: _____
	ADDRESS: <u>411 W. OCEAN BLVD., 2<sup>ND</sup> FLOOR, LONG BEACH, CA 90802</u>		
	EMAIL: _____		WEBSITE: <u>lbs.longbeach.gov</u>
<b>NOTE</b>	<p>Numbers within the parenthesis ( ) refer to the section of the applicable code. 2019 California Building Code (CBC). Table (T). 2019 California Electrical Code (CEC). 2019 California Plumbing Code (CPC). 2019 California Mechanical Code (CMC). Long Beach Municipal Code (LBMC). Health and Safety Code (HSC).</p>		

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**A. PERMIT APPLICATION ok**

1. Valuation provided or determined during the initial submittal process was not accurate. Valuation is revised to \$\_\_\_\_\_. Pay additional required plan check fee of \$\_\_\_\_\_.
2. When all required approvals are obtained, the permit application must be signed by the property owner, licensed contractor, or authorized agent at the time the permit is to be issued:
  - a. For owner-builder permits: Owner's signature can be verified with owner's driver license. Owner's representatives must present owner's approval with a notarized letter from the owner.
  - b. For contractor building permits: Prior to the issuance of a building permit, the contractor shall have the following:
    - i. Certificate of workers Compensation Insurance made out to the Contractors State License Board.
    - ii. Copy of Contractors State License or pocket ID.
    - iii. Copy of city business tax registration certificate or a newly paid receipt for one.
    - iv. Notarized letter of authorization for agents.

4. Remove all plans, details or notes that do not pertain to the project from the final set of construction documents.

**C. PLAN RESUBMITTAL**

1. Submit plans as directed under subtitle B (Plan Submittal).
2. Return this notice with a response letter.
3. Return a copy of the checked set of plans even though there is no correction marked in red.
4. The response letter shall include comments on marked up plans.

**B. PLAN SUBMITTAL ok**

1. Each sheet of the construction documents must bear stamp, signature, registration number and expiration date of the Responsible Party. The Responsible Party is the Registered Electrical Engineer, or Licensed Architect, or Licensed Electrical Contractor (C-10).
2. The address of the project and the name/address of the owner are required on the first sheet or title sheet of the construction documents. Include the name/address of the registered design professionals and/or consultants on the construction documents where applicable.
3. Two final set(s) of construction documents will be required during permit issuance. Construction documents must be:
  - a. Quality blue or black line drawings with uniform and light background color.
  - b. All required State of California Title 24 documents, wet signed by the Responsible Party, shall be included on the plans.
  - c. Max. 36" x 48" size with min. 1/8" lettering size.
  - d. Provide a complete and accurate Electrical Permit application.

**D. ELECTRICAL PLAN CHECK COMMENTS**

**GENERAL REQUIREMENTS:**

1. Provide 2 sets of plans with stamp, signature, printed name and Calif. State license number of the approved responsible party on each sheet. (BU-015)
2. Provide a complete and accurate item counts on the permit application. Additional fee may be added due to correct count. (BU-015)
3. All plan sheets are to be legible enough to read clearly and for scanning purposes.
4. See additional corrections marked in red on the check set of plans.
5. Plans are incomplete, additional corrections may follow.
6. Corridor and hallway widths. Every corridor and hallway serving an occupant load of 10 or more shall not be less than 44 inches in width. Corridors and hallways serving an occupant load less than 10 shall not be less than 36 inches in width. (2019 CBC 1133B.3)
7. Using the attached calculation worksheet as a guideline for sizing panel board, overcurrent protection and feeders. This worksheet is for reference and consults the 2019 California Electrical Code for specific requirements.
8. All electrical devices mounting height should be based on the requirements of ADA. Modify any mounting height that is different from ADA.

**9. MARIJUANA:**

10. A single line diagram of the existing and proposed electrical system, including the main electrical service, shall be provided to the city (215.5)
11. Flexible cords (extension cords) are not to be used as a substitute for fixed wiring nor run through holes or concealed in walls, structural ceilings, suspended ceilings, dropped ceiling or floors; run through doorways, windows or similar openings; attached to building surfaces (400.12)
12. Provide complete wiring detail from the power panel via time control to the plant growth lighting fixture. The detail shall include wiring method and mounting detail of ballast and lighting fixture.
13. Growth rooms will be considered damp/wet locations as they are subject to wash down and are subjected to high humidity. Indoor wet location wiring methods shall meet the requirements of 300.6(D).
14. Grow lights must be installed per manufacture instructions and wired per 410:
  - a) Remote Ballasts shall be installed as near to the lamp as practicable to keep the secondary conductors as short as possible (410.144(B))
  - b) Ballast secondary cord/conductors cannot pass through partitions and must be visible its entire length outside the fixture. (410.62(C)(1))
15. High-Intensity Discharge Lighting. Luminaires that use a Metal Halide lamp, other than a thick-glass parabolic reflector lamp (PAR), shall be provided with a containment barrier (Lens) on the fixture. 410.130(F)(5)
16. Is the area to be considered as Hazardous Location per Fire Plan Check?
17. Lighting for plant growth or maintenance is exempt from Title 24 if it is controlled by a multi-level astronomical time-switch control that complies with standard 110.9(b).

18. Does the existing building/structure intent for sustaining such a high heat generated from the plant growth production lightings?
19. Special concerns shall be considered in compliance with the following two requirements:
  - a) Where two different ampacities apply to adjacent portions of a circuit, the ampacity shall be per the 310.15(2) exception.
  - b) Where the maximum ambient temperature is over 30°C, (86°F), the referenced correction factors shall apply to conductors. (310.15(B)(2))
20. Provide air conditioning BTU at the area that is used to cool off the dissipated heated delivered by the plant growth lamps and/or ballasts. The comparison of the A/C BTU and the lighting device BTU is required.

#### 21. WORK CLEARANCE AND DEDICATED SPACES:

22. Provide and maintain required work space, adequate illumination, access to work space and head room about electrical equipment. (110.26)
23. Personnel Doors. Where equipment rated **800A** or more and there is a personnel door(s) intended for entrance to and egress from the working space less than 25ft from the nearest edge of the working space, the door(s) shall open in the direction of egress and be equipped with **listed panic hardware**. (110.26(C)(3))
24. Dedicated equipment space located outdoor equal to the width and depth of the equipment and extending from grade to a height of 6ft above the equipment. (110.26(E)(2))
25. Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, or motor control centers installed indoor and shall not be controlled by automatic mean only. (110.26(D))
26. For electrical equipment rated 1200 amperes or more and over 1.8m (6 ft) wide: (110.26(C))
  - a) There shall be a personnel door(s) intended to and egress from the working space less than 25ft from the nearest edge of the working space.
  - b) The door(s) shall open in the direction of egress and be provided with approved panic bars.
  - c) There shall be one entrance to and egress from the required working space not less than 610mm (24 in.) wide and 2.0 m (6-1/2 ft) high at each end of the working space.
  - d) A single entrance to and egress from the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (C)(2)(b) is met

#### 27. BRANCH CIRCUITS:

28. Guest rooms or guest suites in hotels, motels, sleeping rooms in dormitories, and similar occupancies shall have receptacle outlets installed in accordance with 210.52(A) and (D). Guest rooms and guest suites provided with permanent provision for cooking shall have receptacle rules in 210.52. (210.60 (A))
29. In applying the provisions of 210.52(A), the total number of receptacle outlets shall not be less than the minimum number that would comply with the provisions of that section. These receptacle outlets shall be permitted to be located conveniently for permanent furniture layout. At least two receptacle outlets shall be readily accessible. Where receptacles are installed behind the bed, the receptacle shall be located to prevent the bed from contacting any attachment plug that may be installed or the receptacle shall be provided with a suitable guard. (210.60(B))
30. Each meeting room of not more than 1000 sq. ft in other than dwelling units shall have outlets for nonlocking-type, 125-volt, 15- or 20-ampere receptacles. The outlets shall be installed in accordance with 210.62(B). Where a room or space is provided with movable partition(s), each room size shall be determined with the partition in the position that results in the smallest size meeting room, (210.65(A))

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31. Hotel motel guest rooms shall have captive card key controls, occupancy sensing controls, or automatic controls such that, no longer than 20 minutes after the guest room has been vacated, lighting power is switched off. EXCEPTION to section 130.1(c)8: One high efficacy luminaire as defined in TABLE 150.0-A or 150.0-B that is switched separately and where the switch is located within 6 feet of the entry door.
32. All nonlocking-type, 125-volt, 15- and 20-ampere receptacles located in 406.12(1) to (8) shall be listed tamper-resistant receptacles. (406.12)
33. Conductors size No.1 AWG and smaller with 75 degree C and 90 degree C insulation are to use the 60 degree column of the code, Table 310-16, to determine ampacity. Conductors #1/0 AWG and larger with 75 degree and 90 degree insulation are to use the 75 degree column of the code, Table 310-16, to determine ampacity. (110.14(C))
34. All GFCIs for personnel must be installed in a readily accessible location. (210.8)
35. Conductors in parallel only in sizes 1/0 AWG and larger. (310.10H)
36. All electrical power outlets and lightings at the Type 1 Hood shall be shut off during fire.
37. Provide a complete kitchen equipment schedule including all pertinent electrical information for all equipment and/or appliances on the plans. Include the location of all equipment on the electrical power plan via flag notations or other approved means, If applicable, all Type 1 Hood exhaust and make up air interlock controls, fire suppression controls panel(s), under hood lighting and control, and a complete Type 1 Hood control schematic drawing.
38. Comply with the requirements of the Hood and Duct Fire Suppression Systems from Long Beach Fire Department (see attachment for details).
39. Is there any new branch circuit added for the project? If there is, provide panel schedule and load calculation.
40. At least one receptacle outlet shall be installed within 18 in. of the top a show window for each linear or major fraction thereof show window area measured horizontally at its maximum width. (210.62)
41. Show windows shall be calculated in accordance in either of the following: (220.14.G)
  - a) The unit load per outlet as required in other provisions of this section
  - b) At 200VA per 1 ft of show window
- 42. FEEDERS:**
43. One feeder or branch circuit shall supply a building or structure. (225.30)
44. The following feeders are undersized. (310.15, 110.14(c), 240.4)
45. The tap conductors terminate in a single circuit breaker or set of fuses that will limit the load to the ampacity of the secondary conductors. The provisions of 240.4(B) shall not be permitted for tap conductors.
46. Where a building or structure has any combination of feeders, branch circuits, or services passing through it or supplying it, a permanent plaque or directory shall be installed at each feeder and branch-circuit disconnect location denoting all other services, feeders, or branch circuits supplying that building or structure or passing through that building or structure and the area served by each (225.37)
- 47. BRANCH CIRCUITS & FEEDER CALCULATIONS:**
48. Provide proper feeder, panel board and branch circuit ampacity for general lighting as required for the particular occupancy. (220.12, 220.40, 215.2)

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49. Provide a dedicated branch circuit for the light and air conditioning and heating sources for each elevator car. (620.23)
50. Provide a dedicated circuit for the elevator equipment room luminaires(s) and 120V maintenance receptacle, provide a dedicated circuit for the elevator pit luminaire and 120V maintenance receptacle, provide a lockable disconnect for the required dedicated circuit for the elevator cab lighting. (620.22, .23, .24 and .25)
51. Feeder loads were incorrectly calculated or omitted. (220.40)
52. **Switches containing** overcurrent devices shall be readily accessible and shall be installed so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0m (6ft 7in.) above the floor or working platform. (240.24)
53. The circuits of emergency system, health care facilities and elevator system shall not be series rated because these circuits are required to be **selective coordinated** in compliance with 517.17, **700.31, 700.32 and 620.62.**
54. GFCI protection on the main overcurrent protective device **supply** the marina, boatyard, **and commercial and noncommercial docking facilities** is required, or individual GFCI protection on each branch circuit or feeder is required. (555.3)
55. Unless code modification is filed and approved, provide each single receptacle that supplies shore power to boats shall be supplied from a marine power outlet or panelboard by an individual branch circuit of the voltage class and rating corresponding to the rating of the receptacle. (555.19(A)(3))
56. Selective Coordination: Critical operations data system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices. (645.27)
- 57. SERVICES:**
58. Provide ground-fault protection of equipment for solidly grounded wye electrical **services (or feeder)** of more than 150 volts to ground but not exceeding 1000 volts phase-to-phase for each service disconnect rated 1000A or more. The grounded conductor for the solidly ground without inserting any resistor or impedance device. (230.95, 215.10)
59. Each branch circuit disconnect rated 1000A or more and installed on solidly grounded wye electrical of more than 150 volts to ground (but not exceeding 600 volts) to be provided with GFPE. (210.13)
- ~~60. Outlet(s) installed for the purpose of charging electric vehicles required to be supplied by a separate branch circuit with no other outlets. (210.17)~~
61. Provide all pertinent "Available fault current" (AFC) information and supporting documentation from the serving utility on the plans. Show all fault current calculations throughout, indicate the AFC at each pertinent location of the single line and indicate the required overcurrent device buss bracing AIC at the panel schedule(s).
62. The service equipment shall comply with the labeling requirements in 230.2 and the location requirements in 230.72(B).
63. Provide single line diagram; show electrical panel load schedules, conduit and conductor sizes and ground electrode detail.
64. Determining the existing load of panels shall be per 220.87.
65. Electrical panel load schedules that reference "Existing loads " require clarification.
66. Electrical circuitry diagrams are to be accurate; provide numbers next to each circuit on plans.
67. Provide voltage drop calculations for all conductors over 100 feet.

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68. Where the phase conductors are increased in size (e.g., for voltage drop compensation), the equipment grounding conductor shall be increased in size proportionately. (250.122(B))

69. The maximum combined voltage drop on both installed feeder conductors and branch circuit conductors to the farthest connected load or outlet shall not exceed 5 percent, (130.5(c))

~~**Feeders.** Feeder conductors shall be sized for a maximum voltage drop of 2 percent at design load. **Branch Circuits.** Branch circuit conductors shall be sized for a maximum voltage drop of 3 percent at design load. (130.5(C))~~

70. ADD NOTE TO PLAN NEXT TO SINGLE LINE DIAGRAM OR SERVICE EQUIPMENT: Letter for short circuit current value from Southern California Edison shall be available at the job site for inspection.

71. Where the service is new or upgraded, provide available fault current from Southern California Edison service planner and documentation of preliminary design approval. The available fault current letter from SCE is required to be posted on single line diagram.

72. Identify any grounding system (from utility or separately derived system) that is either grounding one of the transformers in a delta-connected system (high-leg delta system) or grounding one corner of a delta system.

73. The grounded conductor of a 3-phase, 3-wire delta service shall have an ampacity not less than that of the ungrounded conductors. 250.24(C)

74. Provide written SCE documentation verifying SCE approval of existing service buss tap.

75. Show available fault current at points of termination and A.I.C rating of electrical distribution equipment on plans.

76. Show the service conductor routing from the utility service point.

77. Service disconnect(s) shall be located nearest the point of entrance of the service entrance conductors. (230.70(A))

78. No more than six service disconnecting means is permitted at any one location. (230.71(A))

79. The two to six disconnects as permitted in section 230.71 shall be grouped. (230.72(A))

80. Provide the size of the service conductors and the combined load calculation. The combined calculated load of two to six overcurrent protective devices does not exceed the ampacity of the service conductors. (230.90 (A) Exception 3)

81. The service conductors shall be protected in compliance with 230.6.

82. No more than one service disconnecting means is permitted for motor control centers. (430.95)

83. The service equipment shall have a rating not less than the load served. This load shall be calculated per article 220. (230.79)

84. Where a building or structure is supplied by more than one service, or any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. 230.2(E)

85. When more than one building or other structure is on the same property and under single management, each building or structure shall be provided with means for disconnecting all ungrounded conductors. (225.31)



86. Equipment shall not be connected to the supply side of the service disconnecting means. (230.82)
87. In a multiple occupancy building, occupants shall have access to their service disconnecting means. (230.72(C))
88. Provide service load calculation. (230.42, ~~93.0207(A)~~)
89. Service and feeder demand load calculation for existing installation shall be in accordance with article (220.87).
- 90. OVERCURRENT PROTECTION AND SHORT CIRCUIT PROTECTION:**
91. Submit overcurrent coordination study. (240.12, 620.62, Table 685.3)
92. Where the overcurrent device is rated over 800 amperes, the ampacity of the conductors is protected shall be equal to or greater than the rating of the overcurrent device defined in 240.6. (240.4(C))
93. Indicate the provisions to ensure the proper operation of Ground Fault Protection equipment on a separately grounded service and generator system. (215.10, 230.95(C), 240.13, ~~440.26~~)
94. Provide proper overcurrent protection for conductors on circuits (240.4)
95. Overcurrent devices shall be connected at the supply point of ungrounded conductors. (240.21)
96. Fused disconnects at above ceiling FC units not approved. Suggest using non-fused disconnect and HACR type OCPD at the source panel. (110.26, 240.24)
97. **Drawing notes should clearly call out, when needed, the requirements to meet selective coordination per CEC 620.62, 700.32, 701.27 or 708.54 where required.**
98. If series rating is used for short circuit protection:
- Indicate the series combination interrupting rating of overcurrent devices. Identify on the plan, the fuse class and the circuit breaker manufacturer, model designation, type and electrical rating used as part of series rating. The information shall be from manufacture's cut sheets and they shall **be posted** on the plans.
  - Series combination interrupting rating shall not be used when the second device in the series is subjected to a total connected full load motor current of more than 1% of it's AIC rating.
  - Motor circuit protectors shall not be used as part of a series combination interrupting rating. (110.3)
  - If series combination ratings are used, provide a cautionary label to the series rated device cover stating "Caution - Series Rated System \_\_\_\_\_ A available. Identified replacement component required."
  - The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection shall be documented and stamped by the professional engineer.
  - Series combination interrupting rating shall not be used for the circuits of emergency system, health care facilities and elevator system because these circuits are required to be selective coordinated in compliance with 517.17, 700.32 and 620.62.**
  - \_\_\_\_\_ (240.86, 110.3, 110.22, UL Recognition Directory)
99. Unless duct detectors are provided as part of an approved fire alarm system, provide line voltage circuitry for duct detectors and an interlocked shutdown control circuit at any / all HVAC "supply" unit(s) providing 2000 CFM or greater and / or multiple HVAC "supply" units providing a cumulative total of 2000 CFM or greater to any single enclosed area on the plans. (2016 CMC 609)
100. If back-fed device is required by the 2019 CEC, comply with the following: Indicate back-fed devices on panel schedules and single line diagram. Add note to the plans - Plug-in-type overcurrent protection devices or plug-in type main lug assemblies that are backfed and used to terminate field-installed ungrounded supply conductors shall be secured in place by an additional fastener that requires other than a pull to release the device from the mounting means on the panel. [2019 CEC 408.36(D)]



- 101. Fuses shall be provided with rejection type fuse holders. Add note to plans: Fuseholders shall be designed so that it will be difficult to put a fuse of any given class into a fuseholder that is designed for a current lower, or voltage higher, than that of the class to which the fuse belongs. Fuseholders for current-limiting fuses shall not permit insertion of fuses that are not current-limiting. (240.60(B))
- 102. Provide short circuit analysis including motor contribution. Fuse let-thru is not acceptable. (110.9 & 10.)
- 103. 100% rated overcurrent protection devices shall be used in the mounting and enclosure arrangements established by UL for 100% rating. It is essential to check the instructions given in the UL listing to determine if and under what conditions a circuit breaker (or a fuse in a switch) is rated for continuous operation at 100 percent of its current rating. (215.3 Exception 1)
- 104. Where 100 percent-rated OCPD is used, the basic rule in 215.2(A)(1) does not apply.
- 105. Provide GFCI protection for all nonresidential kitchen and food service area receptacles (including receptacles dedicated to equipment) per 2016 [CEC, 210.8(B)(2)]
- 106. Provide a ground fault circuit interrupter on the pool light circuit. (680.23)

**107. GROUNDING:**

- 108. Provide properly sized grounding electrode conductors for the service(s). (250.20, 250.26, 250.66)
- 109. Feeder Taps: Equipment grounding conductors run with feeder taps shall not be smaller than shown in table 250.122 based on the rating of the overcurrent device ahead of the feeder but shall not be required to be larger than the tap conductors. 250.122 (G)
- 110. Where a grounding electrode conductor exceeds 100 ft. in length, the conductor shall be upgraded at least one size up as specified in Table 250.66.
- 111. Where more than one building is supplied by a service, the grounded conductor supplying each building shall be adequately sized and grounded at each building or an equipment grounding conductor shall be provided from the main service to each building. (250.32 & 50)
- 112. All services supplying a building shall have the same grounding electrode system. (250.58)
- 113. Provide calculation to justify properly sized grounding conductors for equipment and raceway systems. Where ungrounded conductors are increased in size, equipment grounding conductors, where installed, shall be increased in size proportionately according to the circular mil area of the ungrounded conductors. (250.122)
- 114. Cold water pipe ground shall be supplemented by an additional ground electrode. (250.50, 250.52(A)). Where the cold water pipe is non-metallic, provide another electrode system per code.
- 115. All equipment fastened in place or connected by permanent wiring method shall be connected to equipment grounding conductor. (250.110 & 112)
- 116. Provide an equipment grounding conductor between service and remote panelboard serving swimming pool equipment. (680.25(B))
- 117. Provide equipment grounding conductors for all pool related equipment and bond together. (680.26)
- 118. Bonding by metal-to-metal mounting on a common frame or base shall be permitted. The metal bands or hoops used to secure wooden staves shall not be required to be bonded as required in 680.26. Equipotential bonding of perimeter surface in accordance with 680.26(B)(2) shall not be required to be provided for spas and hot tubs where all of the followings conditions apply: (680.42(B))

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- a) The spa or hot tub shall be listed as a self-contained spa for aboveground use.
- b) The spa or hot tub shall not be identified as suitable only for indoor use.
- c) The installation shall be in accordance with the manufacturer's instructions and shall be located on or above grade.
- d) The top rim of the spa or hot tub shall be at least 28in. above all perimeter surfaces that are within 30in. measured horizontally from the spa or hot tub. The height of nonconductive external steps for entry to or exit from the self-contained spa shall not be used to reduce or increase this rim height measurement.

119. Depict the equipment bonding jump in single line diagram and indicate the jumper size that complies with 250.102.
120. For maximum safety and to comply with 250.24(C), the neutral conductor or grounded conductor shall be run from a grounded system transformer to all services and be bonded to each service disconnecting means enclosure even though all power may be utilized at line voltage only. This is required even though the service might supply only line-to-line loads. (Not for high resistant grounding system: Line-to neutral loads are not served 250.36)
121. Building(s) or structure(s) supplied by feeder(s) or branch circuit(s) shall have a grounding electrode or grounding electrode system installed in according with Part III of Article 250.32(B) or (C).

**122. WIRING METHODS:**

123. Conductors rated over 600 volts shall not occupy the same wiring enclosure, raceway or cable with conductors of 600 volts or less. (300.3(C)(2))
124. In dwelling units and guest rooms of hotels, motels and similar occupancies, the lighting and outlet circuit voltage shall not exceed 120 volts nominal. (210.6(A))
125. Indicate the burial depth of underground conduits and conductors and specify the cover material. (Table 300.5)
126. Conduits that are exposed to widely different temperatures, such as coolers, freezers or service entrance conductors, shall be sealed to prevent circulation of air and/or moisture. (300.7(A))
127. Provide cable supports on vertical runs. (300.7 (A))
128. Cords are not permitted to be concealed by walls, floors, or ceilings nor are they permitted to be located above suspended or dropped ceilings [400.8(5)].
129. Provide a ground fault circuit interrupter on the pool light circuit. (680.23)
130. Provide rated electrical disconnect switch at direct connected electrical equipments/ appliances or lock-out device at circuit breakers. (422.31(B))
131. The ungrounded and grounded conductors of each mutliwire branch circuit shall be grouped by wire ties or similar means in at least one location within the panelboard or other point of origination. (210.4(D))
132. Each multiwire branch circuit shall be provided with a means that will simultaneously disconnect all ungrounded conductors at the point where the branch circuit originates. (210.4)
133. Multiwire branch circuits supplying power to the partition shall be provided with a mean to disconnect simultaneously all ungrounded conductors at the panelboard where the branch circuit originates. (605.7)
134. Wiring methods beneath the access floors shall comply with all requirements of Article 645.

**135. CONDUCTORS FOR GENERAL WIRING:**

136. Provide the proper wire type (temperature rating and copper or aluminum) for use in the project. (310.13)

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137. Where the number of conductors in a raceway or cable exceeds three, the allowable ampacity of each conductor shall be reduced per table 310.15(B)(3)(a).
138. Where the conductors or cables are installed in conduits exposed to direct sunlight on or above rooftops shall be reduced per table 310.15(B)(3)(c).
139. Where two different ampacities apply to adjacent portions of a circuit, the ampacity shall be per the 310.15(2) exception.
140. Where the maximum ambient temperature is over 30<sup>o</sup>C, (86<sup>o</sup>F), the referenced correction factors shall apply to conductors. (Table 310.16 to 19)

**141. CONDUIT, RACEWAYS, J-BOXES, ETC.:**

142. Indicate the number of conductors in raceways. (300.17, Chapter 9, table 1)
143. Exit signs shall not be used as J-boxes. Show location of required junction boxes. (700.9)
144. Indicate which wiring methods (E.g., FMC, EMT, AC, IMC, RMC, etc.) are to be installed at any / all locations on the plans. (Chapter 9, tables 4, 5 & 5A, Appendix C)
145. A separate grounding conductor shall be installed in nonmetallic conduit runs. (352.60)

**146. SWITCHES, PANELS, & ROOF EQUIPMENT:**

147. Provide permanent access to roof mounted equipment. (240.24, 430.102, 440.14)
148. The grounded circuit conductor for the controlled lighting circuit shall be provided at the location where switches control lighting loads that are supplied by a grounded general-purpose branch circuit. (404.2(C))
149. Switches, circuit breakers, fuses shall be readily accessible. (404.8(A), 240.24, 430.102, 440.14)
150. Where a receptacle outlet is supplied by a branch circuit that required arc-fault circuit interrupter protection as specified elsewhere in this code, a replacement receptacle at this outlet shall be one of the following: (406.4(D)(4))
- a) A listed outlet branch circuit type arc-fault circuit interrupter receptacle.
  - b) A receptacle protected by a listed outlet branch circuit type arc-fault circuit interrupter type receptacle.
  - c) A receptacle protected by a listed combination type arc-fault circuit interrupter type circuit breaker.
151. No Circuit shall be described in a manner that depends on transient conditions of occupancy. (408.4)
152. A panelboard shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. This overcurrent protective device shall be located within or at any point on the supply side of the panelboard. (408.36)
153. Panelboards equipped with snap switches rated at 30 amperes or less shall have overcurrent protection of 200 amperes or less. (408.36(A))
154. Provide weather proof, GFCI protected outlets within 25 feet (7.5 m) of heating, air conditioning, or refrigeration equipment. (210.63,210.8(B)(3))
155. Circuit breakers used as switches in 120 and 277 volt fluorescent lighting circuits shall be listed and marked “SWD” or “HID”. (240.83(D))
156. Electrical room doors require panic hardware and show detail on the plans.
157. Provide non-automatic lighting control(s) at electrical room(s). (110.26(D))

158. Provide a relay to interlock exhaust fan with light switch at a restroom.
159. Provide disconnecting means to disconnect power to all electronic equipment in the IDF/server room and to the power to all dedicated HVAC systems serving the room or designed zones. (645.10)
160. Any HVAC system that serves other occupancies shall be permitted to also serve the information technology equipment room if fire/smoke dampers are provided at the point of penetration of the room boundary. Such dampers shall operate on activation of smoke detectors and also by operation of the disconnecting means required by 645.10. (645.4)
- 161. MOTORS:**
162. Indicate the Duty-Cycle service and design of motors. This information should include the motors duty and time rating. (430.22, Table 430.22(E))
163. Provide proper conductor size for motor(s) (430.22, 430.24, 430.26)
164. Provide overload protection for motor(s) (430.31, 430.32)
165. Provide proper short circuit ground fault protection for motor(s). (specify breaker/fuse type). (430.52, 430.62)
166. Provide properly sized overcurrent protection for VAV-? per section 430.52. (Max 15A C.B.). See circuit XXX on sheet EXXX.
167. An individual branch circuit is required for each motor over one horsepower or 6 amperes of full load current. (430.53(A))
168. Provide properly located disconnects, types and size on motor(s) (430.102, 103, 109 & 110)
169. Provide calculation to justify the existing rating of the main breaker for the feeder short-circuit and ground-fault protection is still in compliance with 430.62(A) when new loads are added to the system.
170. 110.3(b) and 110.4 forbid 208V motors on 240V circuit.
171. An exhaust fan is installed at the upper terminus of the shaft that is power continuously in accordance with the provisions of 2016 CBC Section 909.11, so as to maintain a continuous upward airflow to the outside. (2016 CBC Section 716.5.3 Exception 2.3)
172. All mechanical equipment and sub-duct in support of smoke control system shall be on emergency power.
- 173. TRANSFORMERS:**
174. Provide overcurrent protection on the primary of the transformer. (450.3)
175. Provide overcurrent protection for the secondary conductors of transformer. (240.21)
176. Indicate transformer(s) secondary tap length(s). (240.21)
177. Provide adequate ventilation in transformer room(s). (450.9)
178. Indoor dry type transformers over 112.5kVA shall be installed in minimum 1-hour fire rated room. (450.21(B))
179. Transformers over 50kVA shall not be installed in hollow spaces, ceiling spaces of the building. (450.13(B))

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180. The secondary conductors terminate in a single circuit breaker or set of fuses that will limit the load to the ampacity of the secondary conductors. The provisions of 240.4(B) shall not be permitted for tap conductors.

181. Provide secondary conductors in compliance with 240.92.

182. Supply-side bonding jumper (250.30(A)(2)) – Term “equipment-bonding jumper” was changed to “supply-side bonding jumper” because it is and always has been located on the supply side. Since there is no OCPD ahead of these transformers’ secondary conductors. Table 250.66, in most cases, is used to size this supply-side bonding jumper, when it is installed in a single raceway per 250.30(A)(2) and 250.102(C)(1). The grounded conductor (may be a neutral per 220.61) is sized per 250(A)(3). It was necessary to make this change in order to ensure that the proper installation of bonding conductors installed within or on the supply side per 250.102(C) were properly identified. For example, if 4/0 AWG output conductor per 240.21(C)(2) are tapped (my words) from transformer’s secondary, a 2 AWG conductor from Table 250.66 is used.

**183. HAZARDOUS AREAS:**

184. Provide hazardous classification by class, division or zones and group, and show boundaries of the hazardous area(s). (Art. 500, 505)

185. Wiring in hazardous areas shall comply with the Code provisions for those areas. (Art. 500 thru 516)

186. Provide conduit seals at boundaries of hazardous areas. (501.15, 502.15, 504.70, 513.9, 514.7, 515.9)

187. Maximum permitted cross-section fill of seals shall not exceed 25% of the cross-sectional area of a conduit of the same trade size unless specifically approved. (501.15(C)(6))

188. Submit details of the natural or mechanical ventilation provided in garage area(s). (511.3)

189. Provide GFCI protection for outlets in repair garages. (511.12)

190. Classify the pits in the garage areas. (511.3(B))

191. Is there any electrical equipments/devices located at or routed through hazardous area(s)? If there is, comply with the followings:

- a) Provide classification by class, division or zones and group, and show boundaries of the hazardous area(s). (Art. 500, 505)
- b) Wiring in hazardous areas shall comply with the Code provisions for those areas. (Art. 500 thru 516)
- c) Provide conduit seals at boundaries of hazardous areas. (501.15, 502.15, 504.70, 513.9, 514.7, 515.9)
- d) Maximum permitted cross-section fill of seals shall not exceed 25% of the cross-sectional area of a conduit of the same trade size unless specifically approved. (501.15(C)(6))
- e) Provide details for hazardous location Class 1, Div. 1 / Div. 2. A seal-offs and wiring method for the electrical junction boxes at the extraction wellheads; “EYS” explosion proof fittings will be required.
- f) Plans shall show all classified boundaries at plan view(s) and elevation view(s). Indicate class and division of all hazardous areas via hatching or other approved means.
- g) Provide cut sheets for any electrical equipments/devices listed for the used at the hazardous areas.

192. All circuits (including associated power, communication, data, and video circuits) associated with motor fuel dispensing facilities require a means to simultaneously disconnect from the source of supply, including the grounded conductor, if any. Single-pole breakers utilizing handle ties shall not be permitted. (514.11 and 514.13)

**193. CLINICS:**

194. Equipment classified for life-support purpose shall be supplied from an essential system as required per sections 517.31 through 517.45.

195. Provide a generator to supply all the loads in the ambulatory surgical clinics. (517.45)

- 196. Wiring installation within an ambulatory surgical or hemodialysis clinics shall be in accordance with 517.45(D).
- 197. Patient care area receptacles shall be grounded by an insulated copper conductor. (517.13(B))
- 198. Panelboards serving power to same patient vicinity shall be bonded together with minimum 10 AWG insulated copper conductor. (517.14)
- 199. Is there any area classified as anesthetizing location? If there is, design project in compliance with Article 517 Part IV (Inhalation Anesthetizing Locations).
- 200. The circuits of emergency system, health care facilities and elevator system shall not be series rated because these circuits are required to be selective coordinated in compliance with 517.17, 700.27 and 620.62.
- 201. Use of general anesthesia in critical care areas where patients are subjected to invasive procedures and are connected to line operated, electro-medical devices will require an emergency power source, which requires a separate submittal and building permit.
- 202. Comply with Article 517- All branch circuits serving patient care areas / exam rooms shall be provided with a ground path for fault current by installation in a metal raceway system or cable assembly, which shall itself qualify as an equipment grounding return path in accordance with section [250.118]. Type AC, MC and MI cable shall have an outer metal armor or sheath that is identified as an acceptable grounding return path.

**203. FIRE PUMP:**

- 204. Fire pump circuit conduits shall be encased in no less than 2 inches of concrete. (695.6)
- 205. Show the routing of the fire pump feeder. (93.0207, 695.6)
- 206. Overcurrent protection for fire pump services shall provide short circuit protection and shall be set to carry fire pump motor locked rotor current indefinitely. (695.4(B)(1))
- 207. Provide an emergency source of power for fire pump. (695.3(B), 700.12)
- 208. No disconnecting means shall be installed within the fire pump feeder circuit. (695.4(A))
- 209. Transfer of power shall take place within the fire pump room. (695.12(A))
- 210. The disconnect means for the fire pump service is required to be remote from the normal building service disconnecting means in accordance with 230.72(B). Labeling of this service disconnecting means must be provided in accordance with 230.2(E), and the switch is to be bear a manufacturer's marking indicating it is "suitable for use as service equipment" per 695.4(B)(2)(1). The switch is required to be supervised using one of the methods specified in 695.4(B)(5). (Based on supervised connection 695.4 (B))
- 211. Because the utility supply is grounded, a grounded circuit conductor is required to be installed from the utility transformer to the fire pump service disconnecting means per 250.24(C). As specified in 250.24(C)(1), the neutral conductor size is determined by selecting from Table 250.66, based on the size of the ungrounded conductors. If the 3-phase motor is the only load being supplied, the circuit from the supervised disconnecting means to the fire pump controller and then on the fire pump motor can be three ungrounded conductors and an equipment grounding conductor. The equipment grounding conductor is sized from Table 250.122, based on the rating or setting of the overcurrent protective device. The equipment grounding conductor is not required to be larger than the ungrounded circuit conductors per 250.122 (A).

**212. HEALTH CARE NOTES**

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213. The circuits of emergency system, health care facilities and elevator system shall not be series rated because these circuits are required to be selective coordinated in compliance with 517.17, 700.27 and 620.62.
214. Use of general anesthesia in critical care areas where patients are subjected to invasive procedures and are connected to line operated, electro-medical devices will require an emergency power source, which requires a separate submittal and building permit.
215. Comply with Article 517- All branch circuits serving patient care areas / exam rooms shall be provided with a ground path for fault current by installation in a metal raceway system or cable assembly, which shall itself qualify as an equipment grounding return path in accordance with section [250.118]. Type AC, MC and MI cable shall have an outer metal armor or sheath that is identified as an acceptable grounding return path.
216. In clinic patient care areas, the grounding terminals of all receptacles and all noncurrent- carrying conductive surfaces of fixed electric equipment subject to personal contact, operating over 100 volts, shall be grounded by an insulated copper conductor. The grounding conductor shall be sized per Table 250-122 and installed with the branch circuit conductors in metal raceways per Section 517.13. Branch circuits on the plans shall identify this insulated grounding conductor.
217. The wiring method in Clinic patient care areas shall be in metal raceways or cable assemblies per Section 517.13. Metallic raceways and cable sheath assemblies shall be approved as a ground path as defined in Section 250.118. Note on the plans the type of wiring method.
218. The following wiring methods are not allowed in clinic patient care areas:
- a) Nonmetallic Cable Trays (Section 318.4)
  - b) Electrical Nonmetallic Tubing (Section 331.4)
  - c) Nonmetallic Extensions (Section 342.4)
  - d) Rigid Nonmetallic Conduit (Section 347.3)
  - e) Surface Nonmetallic Raceways (Section 352.22)
  - f) Except low voltage applications (Section 353)
219. Panel boards serving normal and essential branch circuits in clinics shall have their equipment grounding terminal busses bonded together with a minimum #10 insulated copper conductor. Identify equipment-grounding conductor on the plans. (517.14)
220. Provide a note on the plans stating that any receptacles with insulated grounding terminals in clinic patient care areas shall have identifiable means visible after installation. (517.16)
221. Provide ground fault protection for feeder disconnecting means supplying power to clinics if there is ground fault protection for the service disconnecting means as required in Sections 230.95 or 215.10. The ground fault protection for such feeders shall be selectively coordinated as required by Section 517.17.
222. All receptacle outlets and fixed equipment within wet location in clinics shall have GFCI protection. (517.20)
223. Fixed equipment installed in wet locations where an isolated power system is utilized, shall be listed for the purpose and installed in accordance with the provisions of Section 517.160 for Isolated Power Systems. (517.20)
224. Provide a generator with on-site fuel with a minimum capacity of 4 hours in locations with ambulatory surgical clinics. Note on the plans that power shall be restored by the generator within 10 seconds after loss of normal power. (517.50, 700.12)
225. Applicant has been informed that the City of Long Beach will not provide plan review, inspection, and certification for the project's compliance with the clinic standards stipulated in the California Building Standards Code.
226. All raceways in patient care areas require to be installed per 2016 CEC, 517.13 and 14.
227. Comply with Article 517 Part V for the X-Ray Installations.



228. Medical Clinics with Chronic Dialysis and/or Surgical Services is not plan-reviewed for OSHPD III requirements.

**229. EMERGENCY SYSTEMS:**

230. Provide (a) properly sized emergency power source(s) for required emergency load(s). (700.5)

231. A completely independent raceway and wiring system shall be installed for emergency circuits. (700.9)

232. Although the alternate power source is permitted to supply emergency loads as well as other loads, the transfer switch used for the emergency system is strictly limited to emergency loads, that is, loads classified as emergency in accordance with 700.1. Other loads, such as legally required standby loads or optional standby loads (covered by Articles 701 and 702) are not permitted to be supplied from the emergency system transfer switch. Where a single generator is used to supply both emergency and nonemergency loads, multiple transfer switches are required.

233. Show location of emergency power inverter; required to be physically separated from normal source power or enclosed in 1-hour rated enclosure. (700.12)

234. Inverter and inverter panel “INV” required to be EITHER outside of electrical room OR may be installed inside the electrical room when protected by 1-hour fire resistive enclosure (floor to ceiling metal studs with 5/8 inch drywall both sides, 1-hour rated door and ventilation opening with fire damper protection). (700-12)

235. Provide selective overcurrent protection. (700.27)

236. The branch circuit feeding the unit equipment (emergency light with self-contained rechargeable battery) shall be the same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches or time clocks. Indicate the correct circuit wiring diagram on the plans. (700.12(E))

237. Provide Coordination study for all emergency and legally required standby systems overcurrent protective devices. (700.27, 701.18)

238. Emergency generator where located within building shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth) or in spaces with a 1-hour fire rating. (700.12)

239. Emergency lighting systems shall be designed and installed so that the failure of any individual lighting element, such as the burning out of a light bulb, cannot leave in total darkness any space that requires emergency illumination. (700.16)

240. Does the new generator provide any lighting circuits or electrical devices to be classified as life safety? If it does, is the generator sufficient to power the total connected load during emergency operation? If load shading is required, provide load shading schedule and control sequence.

241. Describe the usage of the generator and classify the generator under which Article of the CEC, i.e. 700, 701 or 702.

242. Per Sections 700.8(B), 701.9(B) and 702.8(B) require that where the grounded circuit conductor connected to the emergency source is connected to a grounding electrode conductor at a location remote from the emergency source, a sign must be placed at the grounding location that shall identify all emergency and normal sources connected at that location.

243. AQMD permit is required prior to installing a generator set of 50 horsepower or larger.

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244. Marking shall be provided by the manufacturer to indicate whether or not the generator neutral is bonded to the generator frame. Where the bonding of a generator is modified in the field, additional marking shall be required to indicate whether the generator neutral is bonded to the generator frame. (445.11)
245. A listed SPD shall be installed in or on all emergency systems switchboards and panelboards. (700.8)
246. The branch circuit serving emergency lighting and power circuits shall not be part of a multiwire branch circuit. (700.19)
247. Where emergency illumination is provided by one or more directly controlled luminaires that respond to an external control input to bypass normal control upon loss of normal power, such luminaires and external bypass controls shall be individually listed for use in emergency systems. (700.24)
248. Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, installed, inspect, maintain, and operate the system. (700.27)
- 249. OVER 600 VOLTS:**
250. Provide proper type and size of overcurrent protection for high voltage feeders. (240.100)
251. On the plans, identify and show main 4160 volt switch gear, maximum voltage, amp and buss rating. (DM)
252. Specify overload relay setting – 52 at main gear. (DM)
253. Provide “tap detail” at main switchgear feeding new 600amp “LIS”. (DM)
254. Specify on plans when applying “tap rule” located outside of a building or structure and note any restrictions that may apply. (DM)
255. Provide manufacture specifications, cut sheets, listings and ampacity ratings for direct burial of specified MV cable. [Attach to electrical plans] (DM)
256. Select proper feeder ampacity per Ductbank Details in 310.60.
257. Medium voltage equipment shall be listed by a city recognized testing laboratory or approved by the Department. (110.2)
- a) Provide detail, specifications, and evidence of listings for the following: (110.2)
  - b) Cables.
  - c) Overcurrent protective devices (electrical ratings, listing, type, AIC rating, close-and-latch rating, breakers “K” factor, MVA rating, continuous current rating, fuse time-current curves, etc.)
  - d) Transformer(s) (rating, listing, etc.)
  - e) Raceway(s) (size, material, etc.)
  - f) Terminations and Splices.
  - g) Pull boxes and Manholes.
  - h) Disconnect devices (type, size, electrical rating, magnetizing current interrupting ratings, cable charging rating, fault close rating, etc.)
  - i) Switchgear(s), Substation(s), Unit substation(s).
  - j) Grounding Impedance (continues and watt rating, etc.)
  - k) Bracing.
  - l) \_\_\_\_\_ (110.8)
258. Clarify the grounding method used. Include information on size and termination method. (250)
259. Provide detail on high impedance grounding. (250)

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260. Grounding and Bonding of Fences and Other Metal Structures (250.194 over 1000V): Metallic fences enclosing, and other metal structures in or surrounding, a substation with exposed electrical conductors and equipment shall be grounded and bonded to limit step, touch, and transfer voltages.

- a) Metal Fences. Where metal fences are located within 16 ft of the exposed electrical conductors or equipment, the fence shall be bonded to the grounding electrode system with wire-type bonding jumpers as follows:
1. Bonding jumpers shall be installed at each fence corner and at maximum 160 ft intervals along the fence.
  2. Where bare overhead conductors cross the fence, bonding jumpers shall be installed on each side of the crossing.
  3. Gates shall be bonded to the gate support post, and each gate support post shall be bonded to the grounding electrode system.
  4. Any gate or other opening in the fence shall be bonded across the opening by a buried bonding jumper.
  5. The grounding grid or grounding electrode systems shall be extended to cover the swing of all gates.
  6. The barbed wire strands above fence shall be bonded to the grounding electrode system.

Alternate designs performed under engineering supervision shall be permitted for grounding or bonding metal fences.

- b) Metal Structures. All exposed conductive metal structures, including guy wires within 8 ft vertically or 16 ft horizontally of exposed conductors or equipment and subject to contact by persons, shall be bonded to the grounding electrode systems in the area.

261. Provide cable pull calculation.

262. Provide detailed short circuit analysis including a coordination study. The analysis should reflect the three and single phase fault as well as ground fault and line to line to ground fault (when applicable). (110.9 & 10, 240.21)

263. Provide a coordinated protection for the motor circuit. This coordination shall include the fault current, overload, circuit conductors and motor control apparatus. (430.225)

264. Provide means to discharge the stored energy in capacitors and provide a warning sign and discharge instructions on the equipment. (460.28)

**265. LOW VOLTAGE POWER CIRCUITS:**

266. Identify all Class 2 and Class 3 circuits. (725.41)

267. Low-Voltage Luminaires: Listed low-voltage luminaires not requiring grounding, not exceeding the low-voltage contact limit, and supplied by listed transformers or power supplies that comply with 680.23(A)(2) are permitted to be located less than 5ft from the inside walls of the pools. (680.22(B)(6))

**268. LIGHTING CONTROLS:**

269. The switching or control device shall be located so that a person using the device can see the lights or area controlled by that switch. Label the switches and lights correspondingly. (130.1.a.2)

270. Provide an independent switching or control device for each area enclosed by ceiling-height partitions. (130.1(a))

271. Provide multi-level switching for the general lighting so that reasonably uniform level of illuminance is maintained throughout the area controlled. The general lighting of any enclosed space 100 square feet or larger, and has a connected lighting load that exceeds 0.5 watts per square foot, shall have multi-level lighting controls. Multi-level controls shall be controlled per Table 130.1-A.

**272. RESIDENTIAL**

273. Kitchen - At least 50% of wattage to be high efficacy and separately switched from low efficacy.

274. Garage, Laundry and Utility Rooms – High efficacy and controlled by a manual on vacancy sensor.
275. Other rooms – High efficacy or controlled by a manual on vacancy sensor or dimmer.
276. Outdoor Lighting – High efficacy or controlled by photocontrol/motion sensor combination.
277. Bathrooms – At least one high efficacy luminaire. All other shall be high efficacy or controlled by vacancy sensor.
278. Recessed Fixtures in insulated ceiling – Rated for direct insulation contact (IC) and Airtight.
279. Provide light fixture schedule, show manufacture specifications, requirements for battery backup emergency ballasts, lamp wattage, voltage and total fixture wattage and completed mounting support details on plans.
280. Clearly designate all fixtures requiring emergency power source on the light fixture schedule.
281. The pole base detail cannot be approved through electrical review. All structural details must be reviewed and approved through “Building review”. Remove the detail from the electrical plans **OR** label detail **“For Reference Only – See structural plans for the approved detail”**.
282. Light standard pole bases require structural detail on the plans.
283. Provide all required 2016 Title 24 “Inside lighting” and “Outside lighting” documents, wet signed by the “Documentation Author” and the “Principal Lighting Designer”, on the plans. **Indicate the maximum rated wattage of the illuminaries instead of the rated lamp wattage.**
284. Residential Garages for Eight or More Vehicles. Lighting for residential parking garages for eight or more vehicles shall comply with the applicable requirements for nonresidential garages in Sections 110.9, 130.1, 130.4, 140.6, and 141.0.
285. Interior Common Areas of Low-rise Multi-Family Residential Buildings:
- a) In a low-rise multifamily residential building where the total interior common area in a single building equals 20 percent or less of the floor area, permanently installed lighting for the interior common areas in that buildings shall be high efficacy luminaries or controlled by an occupant sensor.
  - b) In a low-rise multifamily residential building where the total interior common area in a single building equals more than 20 percent of the floor area, permanently installed lighting in that building shall:
    1. Comply with the applicable requirements in Sections 110.9, 130.0, 130.1, 140.6 and 141.0; and
    2. Lighting installed in corridors and stairwells shall be controlled by occupant sensors shall be capable of turning the light fully On and Off from all designed paths of ingress and egress.
- 286. TITLE 24**
287. Provide requirements for metering and separation of electrical load per Title 24 Table 130.5A and Table 130.5B respectively when the new/upgraded service reach 50KVA, which is 60A at 277/480V three phase, 150A at 120/208V three phase and 200A at 120/240V single phase.
288. **Circuit Controls for 120-Volt Receptacles** – 130.5(d). In all buildings, both controlled and uncontrolled 120 volt receptacles shall be provided in each private office, open office area, reception lobby, conference room, kitchenette in office spaces, and copy room. Additionally, hotel/motel guest rooms shall comply with Item 5. Controlled receptacles shall meet the following requirements, as applicable:
- a) Electric circuits serving controlled receptacles shall be equipped with automatic shut-OFF controls following the requirements prescribed in Section 130.1(c)(1 through 5); and

- b) At least one controlled receptacle shall be installed within 6 feet from each uncontrolled receptacle or a split-wired duplex receptacle with one controlled and one uncontrolled receptacle shall be installed; and
- c) Controlled receptacles shall have a permanent marking to differentiate them from uncontrolled receptacles; and
- d) For open office areas, controlled circuits shall be provided and marked to support installation and configuration of office furniture with receptacles that comply with Section 130.5(d) 1, 2, and 3; and
- e) For hotel and motel guest rooms at least one-half of the 120-volt receptacles in each guest room shall be controlled receptacles that comply with Section 130.5(d)1, 2, and 3. Electric circuits serving controlled receptacles shall have captive card key controls, occupancy sensing controls, or automatic controls such that, no longer than 30 minutes after the guest room has been vacated, power is switched off.
- f) Plug-in strips and other plug-in devices that incorporate an occupant sensor shall not be used to comply with this requirement.

**289. LIGHTING (Indoor)**

**290. INDOOR MANDATORY MEASURES**

**291. MANDATORY LIGHTING CONTROLS 130.1(a)**

- a) Area Controls: Manual controls that control lighting in each area separately
- b) Multi-level Controls: Allow occupants to choose the appropriate light level for each area
- c) Shut-off Controls: Automatically shuts off lighting or reduces light levels when illumination is not needed
- d) Automatic Daylighting Controls: Adjust electric lighting in response to the presence of daylight
- e) Demand responsive controls: Receive and *automatically* respond to demand response (DR) signals

**292. MANUAL ON/OFF CONTROLS** - All lighting in each area must be controlled separately from luminaires in other areas by manual on/off lighting controls that are: 100.1

- a) All lighting in each area must be controlled separately from luminaires in other areas by manual on/off lighting controls that are:
- b) Readily accessible
- c) Located in the same room or area as the lighting they control and with the lighting in view
- d) Able to provide any required dimming or multi-level controls steps in addition to on/off

**293. EGRESS LIGHTING** - Up to 0.2 watts per square foot of lighting may remain on during occupied hours only for emergency egress. This lighting must be designated for emergency egress on building plans. When controls are required to shut off all lighting in a building, this includes emergency egress lighting. 130.1(a)

**294. SEPARATELY CONTROLLED LIGHTING SYSTEMS** - General lighting must be controlled separately from all other lighting systems in an area. Display lighting must each be separately controlled on circuits of 20 amps or less. For example, window displays must be controlled separately from wall displays, which must also be controlled separately from case displays. 130.1(a)

- a) When using track lighting:

1. General, display, ornamental, and special effects lighting must be separately controlled.
295. **PUBLIC RESTROOMS** - Any public restroom with two or more stalls may use a manual switch that is not accessible to unauthorized personnel. All other lighting controls are still required. 130.1(a)2
296. **MULTI-LEVEL LIGHTING CONTROLS** - Title 24 sets a minimum number of control steps and illuminance uniformity requirement for most major luminaire types in TABLE 130.1-A. These requirements are required in addition to any manual, daylight, shut-off or demand response controls. These criteria apply only to general lighting for enclosed areas that: 130.1(b)
- a) Are at least 100 square feet in size
  - b) Have a connected lighting load over 0.5 watts per square foot
  - c) Has more than one luminaire or more than two lamps
297. **MULTI-LEVEL LIGHTING CONTROLS:** Each luminaire must meet every step of the multi-level control requirement. Controlling alternating luminaires or rows of luminaires does not meet this requirement. 130.1(b)
298. **AUTOMATIC SHUT-OFF CONTROLS** - Automatic shut-off controls turn off the lights when a space is unoccupied. All lighting must be controlled by one or more of the following: 130.1(c)
- a) Occupant sensing control
  - b) Automatic time-switch
  - c) Building Energy Management System
  - d) Other control capable of automatically shutting off all lights for vacant periods
299. **AUTOMATIC SHUT-OFF CONTROLS** 130.1(c)
- a) Space parameters - Each room needs to be separately controlled. A single control may not monitor more than 5,000 square feet of floor area (20,000 square feet in malls and single-tenant retail spaces).
  - b) Applications - The following types of lighting must be separately controlled:
    1. General
    2. Display
    3. Ornamental
    4. Display case
300. **AUTOMATIC SHUT-OFF CONTROLS** - Countdown timer switches are usable only in: 130.1(c)
- a) Single-stall bathrooms smaller than 70 square feet
  - b) Closets smaller than 70 square feet
  - c) Lighting in server rooms smaller than 500 square feet. If time-based controls are used, occupants there after hours must be able to activate lighting as needed:
    1. Manual switch

2. Temporary override
3. Occupancy-based control

**301. AUTOMATIC SHUT-OFF CONTROLS** - Warehouse aisles and open areas 130.1(c)

- a) Each aisle must be independently controlled
- b) Minimum automatic 50% reduction in lighting power when vacant

**302. AUTOMATIC SHUT-OFF CONTROLS** - Corridors and stairwells 130.1(c)

- a) Sensors/controls should be activated from all potential entrances
- b) Minimum automatic 50% reduction in lighting power when vacant

**303. AUTOMATIC SHUT-OFF CONTROLS** - Spaces that are exempt from automatic shut-off controls requirements: 130.1(c)

- a) Buildings with lighting in continuous use 24 hours per day, 365 days per year
- b) Areas where partial on/off controls are required instead of shut-off controls (ex: stairwells and corridors)
- c) Electrical equipment rooms
- d) Emergency egress lighting

**304. AUTOMATIC DAYLIGHTING CONTROLS** - Automatic daylight controls adjust electric lighting power when daylight is available. Automatic daylighting controls are required for luminaires that: 130.1(d)

- a) Provide general lighting
- b) Are at least half in a skylit or sidelit area
- c) Are in an area where the total installed general lighting power exceeds 120 watts
- d) Are located in an area which has more than 24 square feet of glazing

**305. AUTOMATIC DAYLIGHTING CONTROLS** -Automatic daylighting controls requirements: 130.1(d)

- a) If the controlled lighting has a lighting power density greater than 0.3 watts per square foot, controls must provide multi-level lighting in accordance with Table 130.1-A.
- b) The combined illuminance from the controlled lighting and daylight must be at least as much as would be provided by the controlled lighting when no daylight is present.
- c) When the light received from daylight is more than 150% of the design illuminance of the general lighting system at full power, the general lighting power in that space must be reduced by at least 65%.

306. Due to the enforcement of 2016 Title 24, more forms and requirements are required during plan check, installation and acceptance phases. A list of documents generated from Energy Code Ace is required based on this project and the list is attached to the plan checklist for your reference. In order to remind contractor to provide corresponding forms to inspector for inspection, these forms shall be listed out as a note on the sheet where Title 24 forms are resided.



307. Daylit Zones shall be shown on plans and luminaries design shall be in compliance with Automatic Daylighting Control per Title 24 130.1(d).
308. In a parking garage area with a combined total of 36 square feet or more of glazing or opening, luminaries providing general lighting that are in the combined primary and secondary sidelit zones shall be controlled independently by automatic daylighting controls, and shall meet the following requirements as applicable:
- a) All primary and secondary sidelit daylit zones shall be shown on the plans.
  - b) Automatic Daylighting Controls Installation and Operation. Automatic daylighting control shall be installed and configured to operate according to all of the following requirements:
    1. Automatic daylighting controls shall have photosensors that are located so that they are not readily accessible to unauthorized personnel, and the location where calibration adjustments are made to the automatic daylighting controls shall not be readily accessible to unauthorized personnel.
    2. Automatic daylighting controls shall be multi-level, continuous dimming or ON/OFF.
    3. The combined illuminance from the controlled lighting and daylight shall not be less than the illuminance from controlled lighting when no daylight is available.
    4. When primary sidelit zones receive illuminance levels greater than 150 percent of the illuminance provided by the controlled lighting when no daylight is available, the controlled lighting power consumption shall be zero.
309. Provide multi-level lighting controls and uniformity requirements per (Table 130.1-A)
310. Provide all required 2016 Title 24 “Inside lighting” documents, wet signed by the “Documentation Author” and the “Principal Lighting Designer”, on the plans. **Indicate the maximum rated wattage of the illuminaries instead of the rated lamp wattage.**
311. Alterations that increase the connected lighting load, replace, or remove and re-install a total of 10% or more of the luminaries in an enclosed space, shall meet the requirements of Section 141.0 which is to provide all required 2016 Title 24 “Inside lighting” documents, wet signed by the “Documentation Author” and the “Principal Lighting Designer”, on the plans.
312. Lighting Wiring Alterations shall meet the applicable requirements in Sections 110.0, 130.1, and 130.4.
- a) Lighting Wiring Alternations include the following:
    1. Adding a circuit feeding luminaries.
    2. Modifying or relocating wiring to provide power to new or relocated luminaries.
    3. Replacing wiring between a switch or panelboard and luminaire(s).
    4. Replacing or installing a new panelboard feeding lighting systems.
313. Provide local shutoff switches within sight of the controlled luminaires at all interior locations.
314. If applicable, indicate skylight on plan and provide lighting design per Title 24 skylight system.
315. Lighting for security (Night-lights) are exempt from the local T-24 switching requirements up to 0.05W / sq. ft. along security and / or egress paths as **designated on the plans**. These fixtures are still required to have shutoff controls that are accessible to authorized personnel only. (Circuit breakers will suffice if they are switch rated). Include all “Night-lights”. If you choose to use switch rated breakers, indicate the requirement via plan note at the pertinent panel schedule. 130.1(C)
316. Show all required exit lighting on plans.

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317. Provide egress illumination with emergency power at exterior landing of exit discharge doorways in buildings required to have two or more exits. (C.B.C 1006.3)
318. Emergency lighting systems shall be designed and installed so that the failure of any individual lighting element, such as the burning out of a lamp, cannot leave in total darkness any space that requires emergency illumination. (700.16)
319. Emergency lighting facilities shall be arranged to provide initial illumination that is at least an average of 1 footcandle and a minimum at any point of 0.1 footcandle measured along the path of egress at floor level. Illumination levels shall be permitted to decline to 0.6 footcandle average and a minimum at any point of 0.06 footcandle at the end of the emergency lighting time duration. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded. (CBC 1006.3.1)
320. If emergency lighting is required by the CBC or NFPA, comply with the following: Indicate path of egress, provide illuminated exit signs, provide an emergency power source for the exit signs and egress path lighting with emergency foot candle on the plans. Add note to the plans - Test for illumination and exit signs, including directional exit signs powered by either the normal premises wiring or any additionally required emergency systems shall be conducted in the presence of the building inspection staff to ensure compliance. The test times for emergency systems shall be arranged in advance and all staffing cost associated with either pre-hours or after-hours shall be paid at this time. The testing and approval of such systems shall occur prior to the issuance of a Temporary Certificate of Approval or final approval of the project. Approved Date:\_\_\_\_\_ Approved By:\_\_\_\_\_
321. Mandatory Use of Occupancy Sensors: 130.1(c).5
- b) Offices 250 ft<sup>2</sup> or smaller
  - c) Multipurpose rooms < 1000 ft<sup>2</sup>
  - d) Classrooms or any size
  - e) Conference rooms of any size

**322. LIGHTING (Track)**

323. All line voltage track lighting shall be calculated at 150W/2LF. Low voltage track lighting shall be calculated at the output wattage of the transformer(s). [2016 CEC, 220.43(B), 2011 CEC].
324. Provide Title – 24 Energy Efficiency lighting worksheet LTG-5C for track lighting on the plans.

**325. LIGHTING (Sign)**

326. Provide Title – 24 Energy Efficiency lighting worksheet SLTG-1C for Sign lighting on the plans.
327. Provide any proposed exterior sign outlet(s) per [2016 CEC, 600.5]. (Calculate each circuit at 1200W plus 125% for continuous usage) on the plans.
328. All outdoor signs shall be controlled with a photo control or outdoor astronomical time switch control.
329. Provide code required exterior sign outlet(s) per [2016 CEC, 600.5]. (Calculate each circuit at 1200W plus 125% for continuous usage) on the plans.
330. In order to decrease the negative effects of light pollution, illumination for non-electronic billboards shall be designed, aimed, and shielded if necessary so that all light falls on the billboard display surface, and light trespass into the night sky or onto adjacent private or public property is prevented. **All service wiring shall be underground.** Prior to issuance of a building permit, the applicant shall provide proof to the satisfaction of the Director of Development Services that this requirement is met. It shall be the responsibility of the applicant or owner to develop and maintain the billboard lighting system in compliance with this Section. (21.54.250 Zoning Code)

331. Disconnect required to be located at the point feeder(s) or branch circuit(s) supplying a sign or outline lighting system enters sign enclosure or pole. (600.6(A)(1))

332. Metal parts of skeleton tubing as well as signs and outline lighting systems are required to be grounded by connection to the equipment grounding conductor of the supply branch circuit(s) or feeder. (600.7(A)(1))

### 333. TRACK LIGHT

334. When track lighting is used, general, display, ornamental, and special effects lighting shall each be separately controlled. (130.1(a)4(c))

335. **Track Lighting Integral Current Limiter.** An integral current limiter for line-voltage track lighting shall be recognized for compliance with Part 6 only if it meets all of the following requirements:

- a) Shall be certified to the Energy Commission as meeting all of the applicable requirements in Section 110.9(c); and
- b) Shall comply with the Lighting Control Installation requirements in accordance with Section 130.4; and
- c) Shall be manufactured so that the current limiter housing is used exclusively on the same manufacturer's track for which it is designed; and
- d) Shall be designed so that the current limiter housing is permanently attached to the track so that the system will be irreparably damaged if the current limiter housing were to be removed after installation into the track. Methods of attachment may include but are not limited to one-way barbs, rivets, and one-way screws; and
- e) Shall employ tamper resistant fasteners for the cover to the wiring compartment; and
- f) Shall have the identical volt-ampere (VA) rating of the current limiter, as installed and rated for compliance with Part 6 clearly marked as follows; and:
  1. So that it is visible for the building officials' field inspection without opening cover plates, fixtures, or panels; and
  2. Permanently marked on the circuit breaker; and
  3. On a factory-printed label that is permanently affixed to a non-removable base-plate inside the wiring compartment.
- g) Shall have a conspicuous factory installed label permanently affixed to the inside of the wiring compartment warning against removing, tampering with, rewiring, or bypassing the device; and
- h) Each electrical panel from which track lighting integral current limiters are energized shall have a factory printed label permanently affixed and prominently located, stating the following: "NOTICE: Current limiting devices installed in track lighting integral current limiters connected to this panel shall only be replaced with the same or lower amperage. Adding track or replacement of existing current limiters with higher continuous ampere rating will void the track lighting integral current limiter certification, and will require re-submittal of compliance documentation to the enforcement agency responsible for compliance with the California Title 24, Part 6 Building Energy Efficiency Standards."

336. **Track Lighting Supplementary Overcurrent Protection Panel.** A Track Lighting Supplementary Overcurrent Protection Panel shall be used only for line-voltage track lighting and shall be recognized for compliance with Part 6 only if it meets all of the following requirements: (110.9D)

- a) Shall comply with the Lighting Control Installation requirements in accordance with Section 130.4; and
- b) Shall be listed as defined in Section 100.1; and
- c) Shall be used only for line voltage track lighting. No other lighting or building power shall be used in a Supplementary Overcurrent Protection Panel used to determine input wattage for track lighting; and
- d) Be permanently installed in an electrical equipment room, or permanently installed adjacent to the lighting panel board providing supplementary overcurrent protection for the track lighting circuits served by the supplementary over current protection pane; and

- e) Shall have a permanently installed label that is prominently located stating the following: "NOTICE: This Panel for Track Lighting Energy Code Compliance Only. The overcurrent protection devices in this panel shall only be replaced with the same or lower amperage. No other overcurrent protective device shall be added to this panel. Adding to, or replacement of existing overcurrent protective device(s) with higher continuous ampere rating, will void the panel listing and require re-submittal of compliance documentation to the enforcement agency responsible for compliance with the California Title 24, Part 6 Building Energy Efficiency Standards."

### 337. LIGHTING (Outdoor)

338. Provide all required 2016 Title 24 "Outside lighting" documents, wet signed by the "Documentation Author" and the "Principal Lighting Designer", on the plans. **Indicate the maximum rated wattage of the illuminaries instead of the rated lamp wattage.**

339. Comply with all required state required 2016 Title 24 "Outside Lighting" "mandatory measures" and switching requirements.

### 340. OUTDOOR MANDATORY MEASURES

341. **PARKING GARAGES:** Parking garages are considered **interior** nonresidential spaces, except for the top level of a multi-tier garage. 130.1(c)7B

- a) General lighting must have occupant sensing controls with at least one control step between 20 and 50 percent of design lighting power
- b) No more than 500 watts of rated lighting power may be controlled together.
- c) A reasonably uniform level of illuminance shall be achieved in accordance with the applicable requirements in Table 130.1-A.
- d) The occupant sensing controls shall be capable of automatically turning the lighting fully ON only in the separately controlled space, and shall be automatically activated from all designed paths of egress.

342. **DAYLIGHT CONTROLS EXEMPTIONS IN PARKING GARAGES - Luminaires in the following areas do not need to use photocontrols:** 130.1(c)7B

- a) **Daylight transition zone:** The pathway vehicles use to enter a parking garage.
- b) **Dedicated ramps:** driveways specifically for the purpose of moving vehicles between floors of a parking garage and which have no adjacent parking.
- c) **Some Sidelit Zones:** If the primary sidelit zone uses less than 60W of lighting power, the combined primary and secondary sidelit zones do not require daylight controls.

343. **LUMINAIRES THAT DO NOT NEED TO COMPLY WITH BUG –** These limits do not apply to: 130.2(b)

- a) Signs
- b) Building facades, public monuments, statues, and vertical surfaces of bridges
- c) Lighting required for health or safety
- d) Temporary lighting
- e) Replacement of pole-mounted luminaires in areas where:

1. Spacing between poles is greater than six times the mounting height of the existing luminaires, and
2. No additional poles are being added, and
3. No new wiring is not being installed, and
4. The connected lighting power wattage is not increased

**344. MANDATORY REQUIREMENTS: ALL SPACES 130.2(a,c)**

- a) Any outdoor luminaire that is **capable** of operating an incandescent lamp that uses more than 100 watts must be controlled by a motion sensor.
- b) All outdoor lighting must be controlled by a photocontrol or astronomical time switch that turns off all lighting when daylight is available.
- c) Outdoor lighting must be circuited and controlled independently from other electrical loads.

**345. MANDATORY REQUIREMENTS: LUMINAIRES MOUNTED AT 24 FEET OR BELOW** - Where the bottom of a luminaire is mounted at 24 feet above the ground or lower, the following automatic lighting controls are required: 130.2(c)

- a) Motion sensors or other control systems that automatically control lighting in response to the area being vacated (at least 40%, not more than 80%)
- b) Controls must automatically turn on lights when an area becomes occupied
- c) No more than 1,500 watts of lighting power may be controlled together

**The following luminaire wattages are exempt:**

- a) Pole-mounted luminaires with a maximum rated wattage of 75 watts
- b) Non-pole-mounted luminaires with a maximum rated wattage of 30 watts
- c) Linear lighting with a maximum wattage of 4 watts per linear foot

**346. MANDATORY REQUIREMENTS: LUMINAIRES MOUNTED AT OR BELOW 24 FEET 130.2(c)**

- a) These requirements do not apply to the following spaces:
  1. Building facades, ornamental hardscape, and outdoor dining areas
  2. Sales frontage, lots, and canopies
  3. Any area listed in Section 140.7(a)

**347. MANDATORY REQUIREMENTS: LUMINAIRES MOUNTED BELOW 24 FEET 130.2(c)**

- a) There are different requirements for specific spaces:
  1. Sales frontage, lots, and canopies must have a part-night control or motion sensors with auto-on capability

2. Building facades, ornamental hardscapes, and outdoor dining must have a part-night control, motion sensor, or centralized time-based lighting control

*A **part-night control** is a time or occupancy based lighting control that is programmed to reduce or turn off the lighting power to an outdoor luminaire for a portion of the night.*

**348. MANDATORY REQUIREMENTS: LUMINAIRES MOUNTED BELOW 24 FEET 130.2(c)**

a) **Wall Packs**

1. If the bottom of the luminaire is mounted 24 feet or less above the ground, wall packs > 30W must be controlled by a motion sensor that reduces lighting power by **at least 40 percent but not more than 80 percent**.

**349. Light pollution reduction - Outdoor lighting systems shall be designed and installed to comply with the following: (CalGreen Code)**

- a) The minimum requirements in the California Energy Code for Lighting Zones 1-4 as defined in Chapter 10 of the California Administration Code; and
- b) Backlight, Uplight and Glare (BUG) ratings as defined in IES TM-15-11; and
- c) Allowable BUG ratings not exceeding those shown in Table 5.106.8

**350. SOLAR PHOTOVOTAIC:**

**351. Disconnects and Overcurrent Protection for Batteries Storage:** Where energy storage device output conductor length exceeds 5 ft, or where the circuits pass through a wall or partition the installation shall comply with (a) through (e): (690.7(F))

- a) A disconnecting means and overcurrent protection shall be provided at the energy storage device end of the circuit. Fused disconnecting means or circuit breakers are acceptable.
- b) Where fused disconnecting means are used, the “Line” terminals of the disconnecting means shall be connected toward the energy storage device terminals.
- c) Overcurrent devices or disconnecting means shall not be installed in energy storage device enclosures where explosive atmospheres can exist.
- d) A second disconnecting means located at the connected equipment shall be installed where the disconnecting means required by a) is not within sight of the connected equipment.
- e) Where the energy storage device disconnecting means is not within sight of the PV system ac and dc disconnecting means, placards or directories shall be installed at the locations of all disconnecting means indicating the location of all disconnecting means.

**352. Rapid Shutdown of PV System on Buildings:** PV system circuits installed on or in buildings shall include a rapid shutdown function that controls specific conductors in accordance with 690.12 (a) through (e) as follows: (690.12)

- a) Requirements for controlled conductors shall apply only to PV system conductors of more than 5 ft in length inside a building, or more than 10 ft from the PV array.
- b) Controlled conductors shall be limited to not more than 30 volts and 240 VA within 10 seconds of rapid shutdown initiation.
- c) Voltage and power shall be measured between any conductor and ground.
- d) The rapid shutdown initiation methods shall be labeled in accordance with 690.56(B).
- e) Equipment that performs the rapid shutdown shall be listed and identified.

**353. Utility-Interactive Inverters.** The output of a utility interactive inverter shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises. Where distribution equipment including switchgear, switchboards or panelboards is fed simultaneously by a primary source(s) of electricity and one or more utility-interactive inverters, and where this distribution equipment is

capable of supplying multiple branch circuits or feeders or both, the interconnecting provisions for the utility-interactive inverter(s) shall comply with (D)(a) through (D)(f). (705.12(D)(2))

- a) Dedicated Overcurrent and Disconnect. The source interconnection of one or more inverters installed in one system shall be made at a dedicated circuit breaker or fusible disconnecting means.
- b) Bus or Conductor Ampere Rating. One hundred twenty-five percent of the inverter output circuit current shall be used in ampacity calculations for the following:
  1. *Feeders*. Where the inverter output connection is made to a feeder at a location other than the opposite end of the feeder from the primary source overcurrent device, that portion of the feeder on the load side of the inverter output connection shall be protected by one of the following:
    - i. The feeder ampacity shall be not less than the sum of the primary source overcurrent device and 125 percent of the inverter output circuit current.
    - ii. An overcurrent device on the load side of the inverter connection shall be rated not greater than the ampacity of the feeder.
  2. *Taps*. In systems where inverter output connections are made at feeders, any taps shall be sized based on the sum of 125 percent of the inverter(s) output circuit current and the rating of the overcurrent device protecting the feeder conductors as calculated in 240.21(B).
  3. *Busbars*. One of the methods that follows shall be used to determine the ratings of busbars in panelboards.
    - i. The sum of 125 percent of the inverter(s) output circuit current and the rating of the overcurrent device protecting the busbar shall not exceed the ampacity of the busbar.
    - ii. Where two sources, one a utility and the other an inverter, are located at opposite ends of a busbar that contains loads, the sum of 125 percent of the inverter(s) output circuit current and the rating of the overcurrent device protecting the busbar shall not exceed 120 percent of the ampacity of the busbar. The busbar shall be sized for the loads connected in accordance with Article 220. A permanent warning label shall be applied to the distribution equipment adjacent to the back fed breaker from the inverter that displays the following or equivalent wording:

WARNING:

INVERTER OUTPUT CONNECTION;

DO NOT RELOCATE THIS OVERCURRENT DEVICE

The warning sign(s) or label (s) shall comply with 110.21(B).

- iii. The sum of the ampere ratings of all overcurrent devices on panelboards, both load and supply devices, excluding the rating of the overcurrent device protecting the busbar, shall not exceed the ampacity of the busbar. The rating of the overcurrent device protecting the busbar shall not exceed the rating of the busbar. Permanent warning labels shall be applied to distribution equipment that displays the following or equivalent wording:

WARNING:

THIS EQUIPMENT FED BY MULTIPLE SOURCES.  
TOTAL RATING OF ALL OVERCURRENT DEVICES,  
EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE,  
SHALL NOT EXCEED AMPACITY OF BUSBAR.

The warning sign(s) or label (s) shall comply with 110.21(B).

- iv. Connections shall be permitted on multiple-ampacity busbars or center-fed panelboards where designed under engineering supervision that includes fault studies and busbar load calculations.

354. Provide detail step-by-step calculation to justify the wire size and overcurrent rating. The calculation shall include, but not limited to, the followings:

- a) Determine continuous current (1.25Isc).
- b) Calculate 1.25 x continuous current (1.56Isc).
- c) Evaluate conductor ampacity under conditions of use (temperature, conduit fill).
- d) Evaluate at Terminal Temperatures (each terminal).
- e) Ensure overcurrent device protects selected conductor under conditions of use.

355. The Solar-Voltaic Electrical Systems Inspector/Installer Checklist is also given to designer and installer as reference and design guidelines.



356. Provide information if the utility-interactive inverters have redundant internal circuitry that prevents currents from being backfed through the inverter from the utility to faults in the PV arrays. If not, provide the inverter shall require overcurrent protective device (OCPD) at the inverter dc inputs or OCPD on each string of modules or OCPD in both locations.
357. If there are more than two strings of modules connected in parallel, then the calculations shall have to be made to ensure that  $(n-1) \times 1.25 \times I_{sc}$  is less than the module series protective fuse value. If not, fuses shall be used in each string. This calculation is applied when there is no current that may be backfed from the inverter or battery.
358. If back-fed device is required by the 2016 CEC, comply with the following: Indicate back-fed devices on panel schedules and single line diagram. All breakers that carry PV current (power) in a manner reverse to the normal current flow from a utility to the load must be suitable for backfeeding. 690.64(B)(5)
359. A.C. disconnect between inverter AC output and connection to utility to be a visible blade, lockable type disconnect listed for its use.
360. PV conductors must be routed through attics unless they are installed in a metallic raceway between the point of first penetration of the building structure and the first dc disconnect [690.14, 690.31(E)].
361. Where individual conductors are used in conduit installed in outdoor, sunlit locations, they should be conductors with at least 90°C insulation such as RHW-2, THW-2, THWN-2 or XHHW-2. Conduits installed in exposed locations are considered to be installed in wet locations.
362. Inverter integral AC/DC disconnects not approved unless disconnects are a separate component and the inverter can be removed for service or replacement without removing disconnect means. (690.15)
363. To limit the hazard of cutting live conduit in venting operations, DC wiring shall be run in metallic conduit or raceways when located within enclosed spaces in a building and should be run, to the maximum extent possible, along the bottom of load-bearing members.
364. Show existing main electric service equipment and ground electrode system, conduit and conductor sizes.
365. Is the Photovoltaic system grounded or ungrounded. Show complete grounding system per 2016 C.E.C. 690 Part V.
366. Ground electrode conductor from inverter to ground electrode to be minimum protection of bare armor sheathed cable, # 8 AWG minimum.
367. Building department structural review is required for plan check approval.
368. Fire department review is required in compliance with all Fire department requirements.
369. Provide the construction cost related to electrical items that include labors and materials.
370. Disconnecting means shall be installed on PV output circuits where overcurrent devices (fuses) must be serviced that cannot be isolated from energized circuits. The disconnecting means shall be within sight of, and accessible to, the location of the fuse or integrated with fuse holder and shall comply with 690.17. Where the disconnecting means are located more than 6 ft from the overcurrent device, a directory showing the location of each disconnect shall be installed at the overcurrent device location. Non-load-break-rated disconnecting means shall be marked "Do not open under load." (690.16 (B))
371. **Single Family Residences.** Single family residences located in subdivisions with ten or more single family residences and where the application for a tentative subdivision map for the residences has been deemed complete, by the enforcement agency, on or after January 1, 2016, shall comply with the requirements of Section 110.10(b) through 110.10(e).

372. Lighting installed in corridors and stairwells shall be controlled by occupant sensing controls that separately reduce the lighting power in each space by at least 50 percent when the space is unoccupied. The occupant sensing controls shall be capable of automatically turning the lighting fully ON only in the separately controlled space, and shall be automatically activated from all designed paths of egress. (130.1.c.7.A)
373. **Low-rise Multi-family Buildings.** Low-rise multi-family buildings shall comply with the requirements of Section 110.10(b) through 110.10(d).
374. **Hotel/Motel Occupancies and High-rise Multi-family Buildings.** Hotel/motel occupancies and high-rise multi-family buildings with ten stories or fewer shall comply with the requirements of Section 110.10(b) through 110.10(d).
375. **All Other Nonresidential Buildings.** All other nonresidential buildings with three stories or fewer shall comply with the requirements of Section 110.10(b) through 110.10(d).
376. **Solar Zone - 110.10(b)**
- a) **Minimum Area.** The solar zone shall have a minimum total area as described below. The solar zone shall comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction. The solar zone total area shall be comprised of areas that have no dimension less than five feet and are no less than 80 square feet each for buildings with roof areas less than or equal to 10,000 square feet or no less than 160 square feet each for buildings with roof areas greater than 10,000 square feet.
    1. **Single Family Residences.** The solar zone shall be located on the roof or overhang of the building and have a total area no less than 250 square feet.
    2. **Low-rise and High-rise Multi-family Buildings, Hotel/Motel Occupancies, and Nonresidential Buildings.** The solar zone shall be located on the roof or overhang of the building or on the roof or overhang of another structure located within 250 feet of the building or on covered parking installed with the building project and have a total area no less than 15 percent of the total roof area of the building excluding any skylight area.
  - b) **Orientation.** All sections of the solar zone located on steep-sloped roofs shall be oriented between 110 degrees and 270 degrees of true north.
  - c) **Shading.**
    1. No obstructions, including but not limited to, vents, chimneys, architectural features, and roof mounted equipment, shall be located in the solar zone.
    2. Any obstruction, located on the roof or any other part of the building that projects above a solar zone shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane.
  - d) **Structural Design Loads on Construction Documents.** For areas of the roof designated as solar zone, the structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.
377. **Interconnection Pathways – 110.10(c)**
- a) The construction documents shall indicate a location for inverters and metering equipment and a pathway for routing of conduit from the solar zone to the point of interconnection with the electrical service. For single family residences the point of interconnection will be the main service panel.
  - b) The construction documents shall indicate a pathway for routing of plumbing from the solar zone to the water-heating system.
378. **Documentation – 110.10(d).** A copy of the construction documents or a comparable document indicating the information from Sections 110.10(b) through 110.10(c) shall be provided to the occupant.
379. **Main Electrical Service Panel – 110.10(e)**
- a) The main electrical service panel shall have a minimum busbar rating of 200 amps.

- b) The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation.
  - 1. **Location.** The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.
  - 2. **Marking.** The reserved space shall be permanently marked as “For Future Solar Electric”.

### **380. SOLAR NOTES TO THE PLANS**

- 381. Inspection required for roof connection mounting assemblies prior to installing solar module.
- 382. Conduit raceways shall be provided with expansion fittings to compensate for thermal expansion and contraction. See 2016 C.E.C. 300.7[b] & 352.44.
- 383. Distance between inverter and next downstream A.C. overcurrent protection device to be maximum 25 feet. A.C. overcurrent device is required prior to entering the building.
- 384. Provide minimum 4 feet working clearances in front of all solar – voltaic equipment and 4 feet working clearances at side yard setbacks.
- 385. Where several modules are connected in series and parallel, terminal block or bus bar arrangement must be used so that one source circuit can be disconnected without disconnecting the grounded (on grounded system) conductor of other source circuits. [690.4(C)]
- 386. It is imperative that there be no more than one ground connection to the dc grounded conductor of a PV system.
- 387. Where all terminals of the disconnecting means may be energized in the open position, a sign shall be provided warning of the hazards (690.17)
- 388. Each ungrounded conductor of the multiwire branch circuit shall be identified by phase and system. (210.5)
- 389. Circuits over 250V to ground shall comply with Article 250.97, 250.92(B).
- 390. DC conductors either do not enter building or are run in metallic raceways or enclosures to the first accessible DC disconnecting means in compliant with Article 690.31(E).
- 391. The interconnection point shall be on the line side of all ground-fault protection equipment. Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources. Ground-fault protection devices used with supplies connected to the load-side terminals shall be identified and listed as suitable for backfeeding. [690.64(B)(3)]
- 392. Plug-in-type overcurrent protection devices or plug-in type main lug assemblies that are backfed and used to terminate field-installed ungrounded supply conductors shall be secured in place by an additional fastener that requires other than a pull to release the device from the mounting means on the panel. [2016 CEC 408.36(D)]
- 393. Building department structural review is required for plan check approval.
- 394. Fire department review is required in compliance with all Fire department requirements.
- 395. DC grounding electrode conductors are required to be run separately from all other conductors, including from the inverter to the existing service grounding electrode. No. 8 copper is the minimum size required. Installation shall be per Article 250 of California Electrical Code.
- 396. All signage for solar photovoltaic panels and/or disconnect switches shall be labeled with engraved metallic or phenolic nameplate, permanently mounted with corrosion-resistant screws or rivets.

### **397. CAR CHARGER (RESIDENTIAL)**

**398. New one- and two-family dwellings and town-houses with attached private garages.** For each dwelling unit, install a listed raceway to accommodate a dedicated 208/240-volt branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall originate at the main service or subpanel and shall terminate into a listed cabinet, box or other enclosure in close proximity to the proposed location of an EV space. Raceways are required to be continuous at enclosed, inaccessible or concealed areas and spaces. The service panel and/or subpanel shall provide capacity to install a 40-ampere minimum dedicated branch circuit and space(s) reserved to permit installation of a branch circuit overcurrent protective device. (4.106.4.1 Green Code)

- o **Identification.** The service panel or subpanel circuit directory shall identify the overcurrent protective device space(s) reserved for future EV charging as “EV CAPABLE”. The raceway termination location shall be permanently and visibly marked as “EV CAPABLE”. (4.106.4.1.1)

**399. Single EV space required (New multifamily dwelling where 3 or more LBMC 18.47.030).** Install a listed raceway capable of accommodating a 208/240-volt dedicated branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall originate at the main service or subpanel and shall terminate into a listed cabinet, box or other enclosure in close proximity to the proposed location of an EV space. Construction documents shall identify the raceway termination point. The service panel and/or subpanel shall provide capacity to install a 40-ampere minimum dedicated branch circuit and space(s) reserved to permit installation of a branch circuit overcurrent protective device. (4.106.4.2.3 Green Code)

**400. Multiple EV space required (New multifamily dwelling where 3 or more LBMC 18.47.030).** Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information on amperage of future EVSE, raceway method(s), wiring schematics and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformer(s), have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the EVSE. Plan design shall be based upon a 40-ampere minimum branch circuit. Raceways and related components that are planned to be installed underground, enclosed, inaccessible or in concealed areas and spaces shall be installed at the time of original construction. (4.106.4.2.4 Green Code)

**401. Identification.** The service panel or subpanel circuit directory shall identify the overcurrent protective device space(s) reserved for future EV charging as “EV CAPABLE”. (4.106.4.2.5 Green Code)

**402. CAR CHARGER (NON-RESIDENTIAL)**

**403. Electric vehicle (EV) charging (New Construction).** Construction shall comply with Section 5.106.5.3.1 or Section 5.106.5.3.2 to facilitate future installation of electric vehicle supply equipment (EVSE). When EVSE(s) is /are installed. It shall be in accordance with the California Building Code, the California Electrical Code and as follows: (5.106.5.3 Green Code)

- a) **Single charging space requirements (5.106.5.3.1).** When only a single charging space is required per LB BU-050, a raceway is required to be installed in accordance with the California Electrical Code. Construction plans and specifications shall include, but are not limited to, the following:
  1. The type and location of the EVSE.
  2. A listed raceway capable of accommodating a 208/240-volt dedicated branch circuit.
  3. The raceway shall not be less than trade size 1.
  4. The raceway shall originate at a service panel or a subpanel serving the area, and shall terminate in close proximity to the proposed location of the charging equipment and into a listed suitable cabinet, box, enclosure or equivalent.
  5. The service panel or subpanel shall have sufficient capacity to accommodate a minimum 40-ampere dedicated branch circuit for the future installation of the EVSE.
- b) **Multiple charging space requirements (5.106.5.3.2).** When multiple charging spaces are required per Table 5.106.5.3.3 raceway(s) is/are required to be installed at the time of construction and shall be installed in

accordance with the California Electrical Code. Construction plans and specifications shall include, but are not limited to, the following:

1. The type and location of the EVSE.
2. The raceway(s) shall originate at a service panel or a subpanel(s) serving the area, and shall terminate in close proximity to the proposed location of the charging equipment and into listed suitable cabinet(s), box(es), enclosure(s) or equivalent.
3. Plan design shall be based upon 40-ampere minimum branch circuits.
4. Electrical calculations shall substantiate the design of the electrical system, to include the rating of equipment and any on-site distribution transformers and have sufficient capacity to simultaneously charge all required EVs at its full rated amperage.
5. The service panel or subpanel(s) shall have sufficient capacity to accommodate the required number of dedicated branch circuit(s) for the future installation of the EVSE.

- c) EV charging space calculation (5.106.5.3.3).** LB BU-050 shall be used to determine if single or multiple charging space requirements apply for the future installation EVSE.

**Exception:** On a case-by-case basis where the local enforcing agency has determined EV charging and infrastructure is not feasible based upon one or more of the following conditions:

1. Where there is insufficient electrical supply.
2. Where there is evidence suitable to the local enforcing agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of Section 5.1.6.5.3, may adversely impact the construction cost of the project.

- d) Identification.** The service panel or subpanel(s) circuit directory shall identify the reserved overcurrent protective space(s) for future EV charging as “EV CAPABLE”. The raceway termination location shall be permanently and visibly marked as “EV CAPABLE”.

#### 404. APARTMENT

405. Provide a dedicated 20-ampere circuit for receptacles in dwelling unit bathroom(s). (210.11(C)(3), 210.52(D))
406. Provide Title 24 form MF-1R.
407. Provide receptacles as required in 210.52.
408. Common Area Branch Circuits – Branch circuits required for the purpose of lighting, central alarm, signal, communications, or other needs for public or common areas of a two-family dwelling, a multifamily dwelling, or a multi-occupancy building shall not be supplied from equipment that supplies an individual dwelling unit or tenant space. A separate panel and meter are required for these branch circuits. 210.25(B)
409. Provide arc-fault circuit interrupter (AFCI), combination type protection on branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, reaction rooms, closets, hallways, laundry areas, or similar areas. (210.12)
410. Outlet boxes or outlet box systems used as the sole support of a ceiling –suspended (paddle) fan shall be listed, shall be marked by their manufacturer as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 70lb. For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 35lb, the required marking shall include the maximum weight to be supported. Where spare, separately switched, ungrounded conductors are provided so a ceiling mounted outlets box, in a location acceptable for a ceiling-suspended (paddle) fan in single or multi-family dwellings, the outlet box or outlet box system shall be listed for sole support of a ceiling-suspended (paddle) fan. (314.27.C)
411. In every kitchen, family room, dining room, living room, parlor, library, den, sunroom, bedroom, recreation room, or similar room or area of dwelling units, receptacle outlets shall be installed in accordance with the general provisions specified in 210.52(A)(1) through (A)(3).

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412. In each attached garage and in each detached garage with electric power. The branch circuit supplying this receptacle(s) shall not supply outlets outside of the garage. At least one receptacle outlet shall be installed for each car space. (210.52(G))
413. At least one 125V, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed within 50ft of the electrical service equipment. (210.64)
414. Provide tamper-resistant receptacle in dwelling units. (406.12)
415. Provide ground fault circuit interrupter (GFCI) protection for personnel on receptacle(s) located in: (210.8)
- a) Kitchens (including all dishwashers), bathrooms, garages, outdoors, crawl spaces, and unfinished basements of dwelling units.
  - b) Within 6 feet of laundry, utility and wet bar sinks in dwelling units.
  - c) Bathrooms, commercial and institutional kitchens, and roof tops of any occupancy.
  - d) Outdoors in public spaces.
  - e) Boathouses.
  - f) Bathtubs or shower stalls – where receptacles are installed within 6ft of the outside edge of the bathtub or shower stall
  - g) Laundry areas

**COMPLETE AND PLACE THE FOLLOWING NOTES, VERBATIM, ON THE PLAN:**

1. All work to comply with 2016 Calif. Electric Code and 2016 Calif. Energy Code.
2. Service equipment in other than dwelling units shall be legibly marked in the field with the maximum available fault current. The field marking(s) shall include the date the fault current calculation was performed and be of sufficient durability to withstand the environment involved. (110.24)
3. Marking – Ungrounded systems shall be legibly marked “Ungrounded System” at the source or first disconnecting means of the system. The marking shall be of sufficient durability to withstand the environment involved. (250.21)(C)
4. Where spare, separately switched, ungrounded conductors are provided to a ceiling-mounted outlet box, in a location acceptable for a ceiling-suspended (paddle) fan in single or multi-family dwellings, the outlet box or outlet box system shall be listed for sole support of a ceiling-suspended (paddle) fan. (314.27)
5. Where a circuit breaker is utilized without an instantaneous trip, documentation shall be available to those authorized to design, install, operate or inspect the installation as to the location of the circuit breaker(s). Where a circuit breaker is utilized without an instantaneous trip, one of the following or approved equivalent means shall be provided: (240.87)
  - a) Zone-selective interlocking
  - b) Differential relaying
  - c) Energy-reducing maintenance switching with local status indicator
6. Provide switch and receptacle heights per State of California accessible requirements.
7. Receptacle Heights - Electrical receptacle outlets on branch circuits of 30 amperes or less and communication system receptacles shall be located no more than 48 inches measured from the top of the receptacle outlet box or receptacle housing nor less than 15 inches measured from the bottom of the receptacle outlet box or receptacle housing to the level of the finished floor or working platform. If the reach is over an obstruction (for example, a kitchen base cabinet) between 20 and 25 inches in depth, the maximum height measured at the box is reduced to

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44 inches for forward approach, or 46 inches for side approached, provided the obstruction is no more than 24 inches in depth. Obstructions shall not extend more than 25 inches from the wall beneath the receptacle. (CBC1117B.6.5.2, CBC1136A.1)

8. Switch and control height – Controls or switches intended to be used by the occupant of the room or area to control lighting and receptacle outlets, appliances, alarms or cooling, heating and ventilating equipment shall be located no more than 48 inches measured from the top of the outlet box nor less than 15 inches measured from the bottom of the outlet box to the level of the finished floor or working platform. If the reach is over a physical barrier or an obstruction (for example, a kitchen base cabinet) between 20 and 25 inches in depth, the maximum height measured at the box is reduced to 44 inches for forward approach, or 46 inches for side approached, provided the obstruction is no more than 24 inches in depth. Obstructions shall not extend more than 25 inches from the wall beneath the control. (CBC1117B.6.5.1, CBC1136A.2)
9. Type MV cable shall be installed, terminated and tested by qualified persons. (328.14)
10. The issuance of a permit shall not prevent the Building Official from requiring the correction of errors on these plans or from preventing any violation of the codes adopted by the city, relevant laws, ordinances, rules and/or regulations.
11. For fire rated wall/ceiling penetration and/or membrane penetration, complete NRTL Classification Sheets shall be provided to the inspector at the time of inspection.
12. Give Southern California Edison (SCE) written notice of the extent and nature of any material change in the size, character, or extent of the utilizing equipment or operations for which SCE is supplying electric service before making any such change.
13. Group the common neutral conductor for multiple circuits with its associated ungrounded conductors when contained in the same enclosure. (200.4(B))
14. The ungrounded and grounded conductors of each multiwire branch circuit shall be grouped by wire ties or similar means in at least one location within the panelboard or other point of origination. (210.4(D))
15. Each multiwire branch circuit shall be provided with a means that will simultaneously disconnect all ungrounded conductors at the point where the branch circuit originates. (210.4)
16. Multiwire branch circuits supplying power to the partition shall be provided with a mean to disconnect simultaneously all ungrounded conductors at the panelboard where the branch circuit originates. (605.7)
17. The wiring method in Article 645 at Room 220 (Server Room) shall not be allowed unless the room is in compliance with Article 645.4.
18. Where the building property is located in a flood zone area, all electrical equipment shall be installed one foot above the flood base elevation.
19. The circuits of emergency system, health care facilities and elevator system shall not be series rated because these circuits are required to be selective coordinated in compliance with 517.17, 700.27 and 620.62.
20. Provide separate submittal, obtain all required permits, inspections and approvals for all fire alarm system installations and / or modifications from the LBFD and the LBDS departments.
21. Provide separate submittal for all electrical subsystems with power supply(s) of more than 50VA and / or 24V. (E.g., security, card readers, telco / data, PA, audio / visual, nurse call, HVAC and refrigeration controls, etc.).
22. All installed materials and equipment shall be listed U.L., NRTL or listed and approved by a City of Long Beach approved testing laboratory.

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23. Provide arc flash labeling as required per (110.16).
24. All new overcurrent devices installed in existing panels / switchboards shall match the make, model and interrupting capacity of the existing overcurrent devices.
25. Raceway Seals. Conduits or raceways through which moisture may contact live parts shall be sealed or plugged at either or both ends.
26. Indoor locations, other than dwellings and associated accessory structures, fluorescent luminaires (fixtures) that utilize double ended lamps and contain ballast(s) so that can be serviced in place or ballasted luminaires that are supplied from multi-wire branch circuits and contain ballast(s) that can be serviced in place shall have a disconnecting means, either internal or external to each luminaires (fixture), to disconnect simultaneously from the source of supply, all conductors of the ballast, including the grounded conductor if one is provided. The line side terminals of the disconnecting means shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast. Exceptions are provided for hazardous (classified) locations, emergency illumination, cord and plug connected luminaires, industrial facilities and luminaires not supplied by a multi-wire branch circuit and in which disconnection does not leave the illuminated space in total darkness. (410.130(G))
27. Refrigerant Detection – Detection and alarm systems shall be powered and supervised as required for fire alarm systems in the Fire Code. (2016 CMC 1121.2)
28. The electrical room doors shall open in the direction of egress and be equipped with panic hardware. Provide dimensions of electrical rooms to verify clearances.
29. No piping, ducts or equipment foreign to electrical equipment shall be permitted to be located within the dedicated space above the electrical equipment. Provide a note on the plans. (110.26(F))
30. Provide and maintain required work space, adequate illumination, access to work space and head room about electrical equipment. (110.26)
31. Any piping, ductwork or conduit is prohibited in fire rated stairwells unless associated with illumination of the stairwell or the building fire suppression system.
32. Provide Isolated Ground Receptacles incorporating an isolated grounding conductor connection intended for the reduction of electrical noise (electromagnetic interference) as permitted in 250.146(D) shall be identified by an orange triangle located on the face of the receptacle.
33. Field verify service receptacle is provided within 25' of rooftop mechanical equipment. (210.63)
34. Underground wiring methods (0 to 600V) shall comply with 2016 CEC Table 300.5.
35. Underground wiring methods (over 600V) shall comply with 2016 CEC Table 300.50.
36. Ungrounded conductors in the premise wiring supplied from more than one nominal voltage system shall be identified by system permanently posted at each branch circuit panel board or similar distribution equipment". 2016 C.E.C 210.5(C). Color code conductors 120/208 volt phased as black – red – blue, 277/480 volt phased as brown – orange – yellow
37. Unfused service entrance conductors extending horizontally into the building are not approved unless encased in minimum 2 inches of concrete.
38. SCE – SERVICE ENTERANCE CONDUITS ARE TO BE ENCASED IN 2 INCHES OF CONCRETE WHEN ENTERING THE BUILDING OR SUBTERRANEAN GARAGE.
39. Provide local disconnects for all hardwired equipment that is not "within sight" of the source panel.



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40. Multiple raceways containing more than 3 current carrying conductors shall comply with [2016 CEC, 310.15(B)(2)(A)].
41. The identification of every circuit of a panel board and switchboard shall be legibly identified as to its clear, evident, and specific purpose or use and shall include sufficient detail to allow each circuit to be distinguished from all others. 2016 C.E.C 408.4 – Provide more detail on panel schedule circuit descriptions.
42. Elevated transformers will require structural review by building plan checker.
43. Transformer secondary tap conductors shall not exceed 10 feet in length.
44. Elevated transformers on above ceiling platforms will require Primary disconnect means above ceiling adjacent to transformer or lockout device at electrical panel transformer primary circuit breaker.
45. If a series rated system is to be installed, install series rated labeling per 2016 CEC.
46. Provide grounding and bonding for separately derived system per 250.30.
47. Provide bonding of pool equipment and equipotential bonding grid in/under paved or unpaved walking surfaces per 2016 CEC section 680.26 (B) and 680.26 (C) (b) at pool and spa perimeters.
48. All pool equipment room devices including wall GFCI receptacles shall be suitable for use in corrosive environment, weatherproof enclosures.
49. A single receptacle installed on an individual branch circuit shall have an ampere rating of not less than that of the branch circuit. Indicate the receptacle rating. (210.21(B)(1))
50. Provide receptacle outlets wherever cord connected equipment will be used. (210.50(B))
51. Where the disconnects are not provided within sight from the equipment it supplies, the switch or circuit breaker must include provisions for adding a lock, and these provisions must remain with the equipment. These locking provisions have to be part of the equipment, either inherent to the equipment design or as an accessory feature that can be installed on the equipment. [410.141(B), 422.31(B), 424.19, 440.14 Exception No. 1, 600.6(A)(2)(3), 620.51(A) Exception No. 1, 620.53, 620.55]
52. Standard nonlocking straight-blade receptacles in 120- and 250-volt configuration at wet/damp location are required to be listed weather-resistant type. [406.8(A)]
53. Luminaries that are recessed into insulated ceiling are required to be rated for insulation contact (“IC-rated”) so that insulation can be placed over them. (101)
54. Submit a separate electrical application form for the plan check review and approval of pool equipment shop drawings at least 60 days prior to the pool equipment installation.
55. Receptacles intended to supply shore power to boats shall be housed in marine power outlets listed as marina power outlets or listed for set locations, or shall be installed in listed enclosures. The integrity of the assembly shall not be affected when the receptacles are in use with any type of booted or nonbooted attachment plug/cap inserted. (555.19(A)(1))
56. Listed tamper-resistant receptacles shall be provided where replacements are made at receptacle outlets that are required to be tamper-resistant elsewhere in this Code. (406.4(D)(5))
57. All nonlocking type, 125V, 15- and 20-ampere receptacles located in guest rooms and guest suites shall be listed tamper-resistant receptacles. (406.13)

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58. In all child care facilities, all nonlocking type, 125V, 15- and 20-ampere receptacles shall be listed tamper-resistant receptacles. (406.14)
59. All switchboards supplied by a feeder in other than one- or two-family dwellings shall be marked as to the device or requirement where the power supply originates. (408.4)
60. Transformers, other than Class 2 or Class 3, shall have a disconnecting means located either in sight of the transformer or in a remote location, the disconnecting means shall be lockable, and the location shall be field marked on the transformer. (450.14)
61. Listed manufactured wiring systems containing unlisted flexible metal conduit of non-circular cross section or trade sizes smaller than permitted by 348.20(A), or both, provided the wiring systems are supplied with fittings and conductors at the time of manufacture. (604.6) exception No.3 to (2)
62. Where an individual branch circuit supplies car lighting, a receptacle(s), and a ventilation motor not exceeding 2-hp, the disconnecting means required by 620.53 shall be permitted to comply with 430.109(C). (620.53) exception
63. Outlets supplying pool pump motors connected to single-phase, 120 volt through 240 volt branch circuits whether by receptacle or by direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel. (680.21)(C)
64. For existing installed luminaries without disconnecting means, at the time a ballast is replaced, a disconnecting means shall be installed. (410.130.G)
65. Busway shall be permitted to be extended vertically through dry floors if totally enclosed (unventilated) where passing through and for a minimum distance of 6ft above the floor to provide adequate protection from physical damage (368.12(C)(2)(a)).
66. Where vertical riser penetrates two or more dry floors, a minimum 4-in high curb shall be installed around all floor openings for riser busways to prevent liquids from entering of the floor opening. Electrical equipment shall be located so that it will not be damaged by liquids that are retained by the curb (368.12(C)(2)(b)).
67. A separate submittal and permit is required from the Fire Department for the generator review and approval.