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POLICY INTENT NOTICE **PIN: 70**

SUBJECT

Electrical Coordination

Effective: 08/12/2021
Revised: 10/17/2023

PURPOSE

The purpose of this Policy Intent Notice (PIN) is to clarify the Office of Statewide Hospital Planning and Development (OSHPD) policy for the enforcement of overcurrent protective device (OCPD) coordination requirements on new and existing electrical systems.

BACKGROUND

The IEEE Recommended Practice for Electrical Power Systems in Commercial Buildings, commonly known as the (Gray Book) is published by the Institute of Electrical and Electronics Engineers (IEEE) and addresses the topic of Selective Coordination in Section 9.7 as follows:

"The major objective of the designer of an electric power system is to design a system so that faults will be removed in the shortest period of time possible, while maintaining a high degree of service continuity. The goals of maximum protection and service continuity can most closely be realized by the proper selection and adjustment of high-speed protective devices."

The California Electrical Code takes this a step further and requires that essential branch OCPD's be "coordinated" for the period of time that a faults duration exceeds 0.1 seconds, and requires "selective coordination" for OCPD's associated with elevators, and fire pumps installed in campus-style complexes.

Designing a coordinated electrical distribution system requires proper selection and configuration of circuit breakers and fuses in an electrical system to localize outages caused by an overcurrent condition. When done correctly, only the overcurrent protective device directly upstream of the overcurrent conditions will open clearing the overcurrent condition. All other OCPD's upstream of this OCPD will stay closed allowing the remaining electrical system to continue to be energized and operational.

In Figure 1, circuit breakers are selected and configured so they will coordinate with each other. A short circuit in the conductors feeding utilization equipment number 5 will only open circuit breaker F. Circuit breaker A upstream of circuit breaker F will remain closed so the outage is localized to the utilization equipment number 5. All other equipment remains energized.

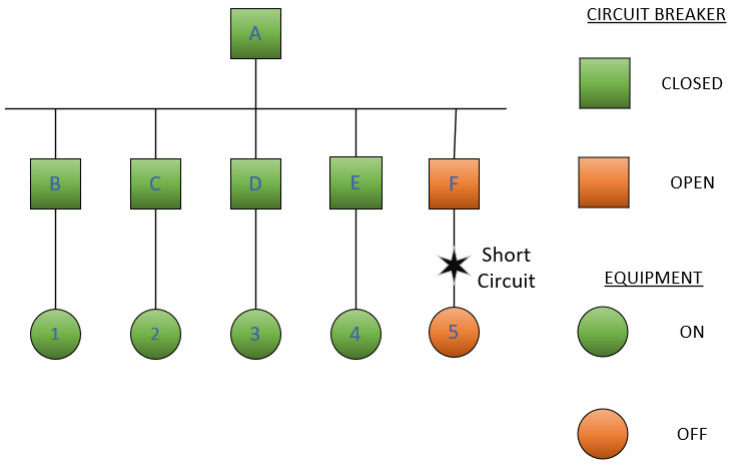

Figure 1 – Example of Coordinated Electrical System

In Figure 2, the circuit breakers are not coordinated. A short circuit in the conductors feeding utilization equipment number 5 will open circuit breakers A and F causing a loss of power to all of the utilization equipment downstream of circuit breaker A.

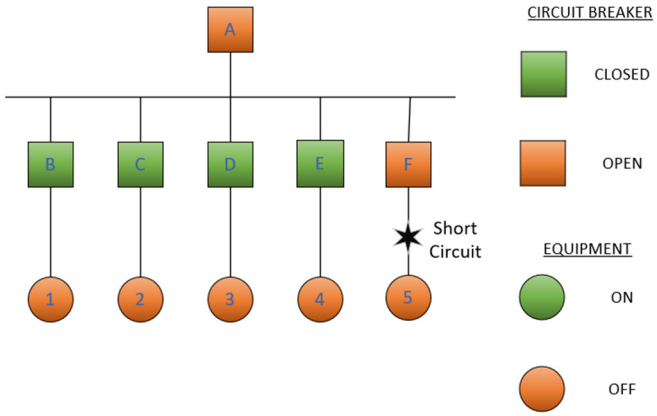

Figure 2 – Example of Non-Coordinated Electrical System

CODE REFERENCES

The following are partial code references from the California Building Standards Code, Title 24, 2022 California Electrical Code, Part 3, that address coordination requirements of OCPD's for health care facilities: (Note the application is added and underlined text represents emphasis.)

- **100 Definitions.**

Coordination, Selective (Selective Coordination). - Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of OCPDs and their ratings or settings for the full range of available overcurrents, from overload to the available fault current, and for the full range of OCPD opening times associated with those overcurrents. (CMP-10) (See Figure 4)

Coordination. [OSHPD 1, 2, 3, 4 & 5] *- Localization of an over current condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of OCPDs devices and their ratings or settings utilizing the 0.10 second level of the OCPD from the time current curve as the basis for the lower limit of the calculation method. (See Figure 3)*

Overcurrent Protective Device (OCPD) - A device capable of providing protection for service, feeder, and branch circuits and equipment over the full range of overcurrents between its rated current and its interrupting rating. Such devices are provided with interrupting ratings appropriate for the intended use but no less than 5000 amperes. (CMP-10) (Examples: Circuit Breakers, Fuses)

- **517.31(G) Coordination.** Overcurrent protective devices serving the essential electrical system shall be coordinated for the period of time that a fault's duration extends beyond 0.1 second.

- **620.62 Selective Coordination.** Where more than one driving machine (elevator) disconnecting means is supplied by the same source, the overcurrent protective devices in each disconnecting means shall be selectively coordinated with any other supply side overcurrent protective devices.

- **695.3(C)(3) Selective Coordination.** Overcurrent protective device(s) (for fire pump feeds in multibuilding campus-style complexes) shall be selectively coordinated with all supply side overcurrent protective device(s).

- **700.32 Selective Coordination.** Emergency system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.

- **701.32 Selective Coordination.** Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.

COORDINATION VERIFICATION

Design and verification of electrical system coordination can be accomplished in a few ways. One option is to use manufactures published coordination tables. For more complicated electrical systems, a coordination study is typically performed with computer software. The coordination study models the electrical system and develops single line diagrams, time-current curves of OCPD's, recommended adjustable circuit breaker settings, and available fault currents. The time-current curves graphically represent the overcurrent operational function of each OCPD with respect to time. The coordination study uses these time-current curves to perform an organized time-current study of all OCPD's from the power source to the utilization equipment to determine device selection (manufacturer and model number) and settings for adjustable OCPD's so the electric system will coordinate (See Figures 3 and 4). In order to correctly model the system, the utility fault current contribution, cable sizes, lengths and configurations, OCPD's, generators and transformers must be used. Since the electrical equipment specifications typically list multiple acceptable manufacturers and allows the contractor to make electrical equipment selection, the final coordination study is often completed during the construction phase. While it is acceptable to defer the coordination study to the construction phase, there still needs to be sufficient detail provided during the design phase for plan review engineers to be able to review and determine that the proposed design will be able to meet the coordination requirements.

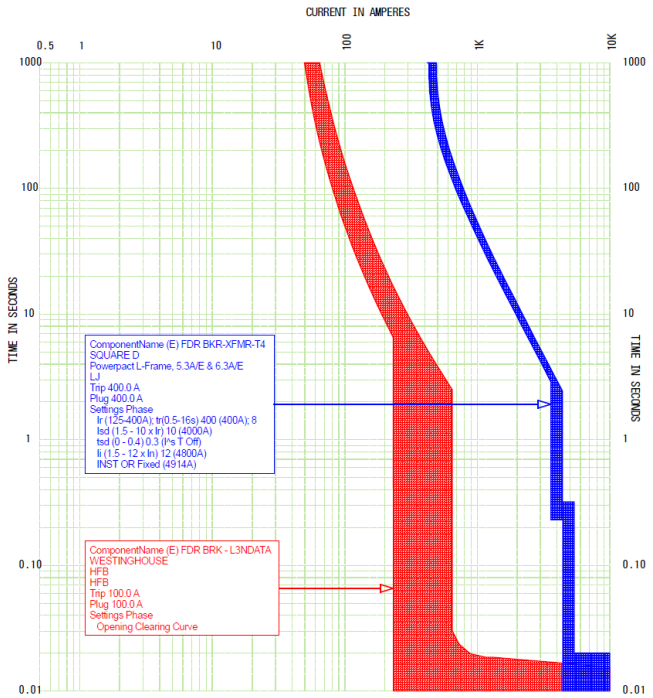

Figure 3 – Example of Time-Current Curves for 0.1 Second Coordination

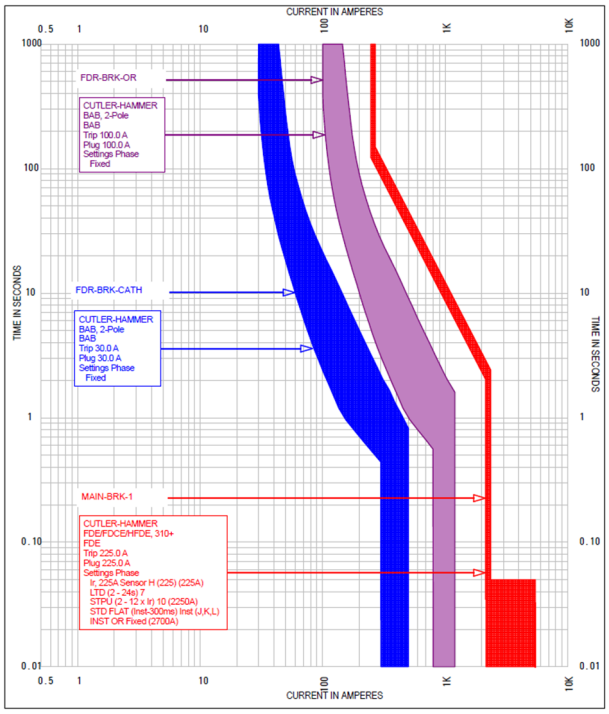

Figure 4 – Example of Time-Current Curves for Selective Coordination

POLICY

All new and repurposed existing OCPD's must coordinate with the new and existing electrical system as required by the *California Electrical Code* (CEC). This aligns with the electrical remodel flow chart in CAN 2-102.6 Remodel (Renovations, Alterations, Repairs) which requires all new elements of construction to comply with current code. It is the responsibility of the Electrical Engineer of Record (EEOR) to select OCPD's that meet the coordination requirements found in the CEC Articles 517, 620, 695, 700, and 701. The electrical plans must demonstrate that the electrical system will meet coordination requirements during plan review. A final coordination study demonstrating code compliance is required to be produced during plan review phase or during the construction phase as a deferred submittal. If the final coordination study is not submitted during plan review, a preliminary coordination study or a signed letter from the EEOR is required during plan review. The signed letter from the EEOR shall be included on the plans and state that the electrical system has been evaluated for coordination and the proposed electrical system design will be capable of meeting the coordination requirements of the CEC.

When there are changes to the electrical design during construction that affects overcurrent protection devices, an Amended Construction Document (ACD) shall be issued with the revised electrical plans and specifications. An updated coordination study will also need to be submitted to show code compliance of the final design.

PROCEDURE

A. ESSENTIAL ELECTRICAL SYSTEMS

OSHPD plan reviewers will evaluate OCPD coordination of the essential electrical system to ensure a code compliant design/installation:

1. The contract documents need to clearly identify OCPD's that require coordination.

2. There are three acceptable means of demonstrating coordination during plan review.

   OPTION 1 Provide a final coordination study demonstrating the new work meets the coordination requirements of the CEC, Article 517.31(G).

   OPTION 2 Provide manufacturer's coordination tables or a preliminary coordination study that demonstrates that new OCPD's shown in plans and specifications will meet the coordination requirement required by the CEC, Article 517.31(G). A final coordination study will be required to be submitted as a Deferred Submittal Item (DSI) during construction phase.

   OPTION 3 Provide a letter or note on the drawings signed by the EEOR stating that the essential electrical system has been evaluated for coordination and the essential electrical system will meet the coordination requirements of the CEC, Article 517.31(G). A final coordination study will be required to be submitted as a Deferred Submittal Item (DSI) during construction phase.

3. For projects where the final coordination study will be submitted during the construction phase, the coordination study shall be listed as a Deferred Approval Item on the project cover sheet.

4. OCPD's of hospitals and other health facilities Type 1 and Type 2 essential electrical systems must coordinate for the period of time that a fault's duration extends beyond 0.1 seconds. The scope of this requirement encompasses the normal source OCPD's supplying power to the transfer switches, the alternate power source OCPD's, and all OCPD's downstream of these devices. See Figure 5 for additional details.

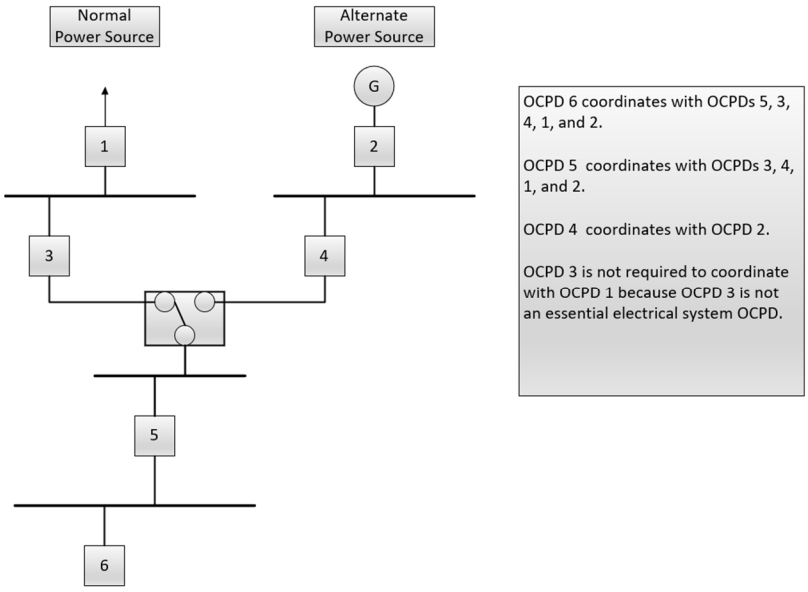

Figure 5 – Essential Electrical System Coordination

5. Second level ground-fault protection of equipment required by 517.17 must be selectively coordinated with the service ground-fault protection specified in 230.95 or feeder ground-fault protection in 215.10. Furthermore, the second level ground-fault protection must coordinate with downstream OCPD's on the essential electrical system for the period of time that a fault's duration extends beyond 0.1.

6. Normal and essential electrical systems OCPD's supplying an optional load transfer switch allowed in 517.31(B)(1) shall coordinate with upstream OCPD's. See Figure 6. The purpose of this requirement is to localize any optional load overcurrent outages to the optional branch so that the remaining essential electrical system remains energized. The remaining OCPD's downstream of the optional load transfer switch (i.e., OCPDs 5 and 6 in Figure 6) are not required to coordinate since they are supplying optional standby loads and are not subject to coordination requirements of the CEC.

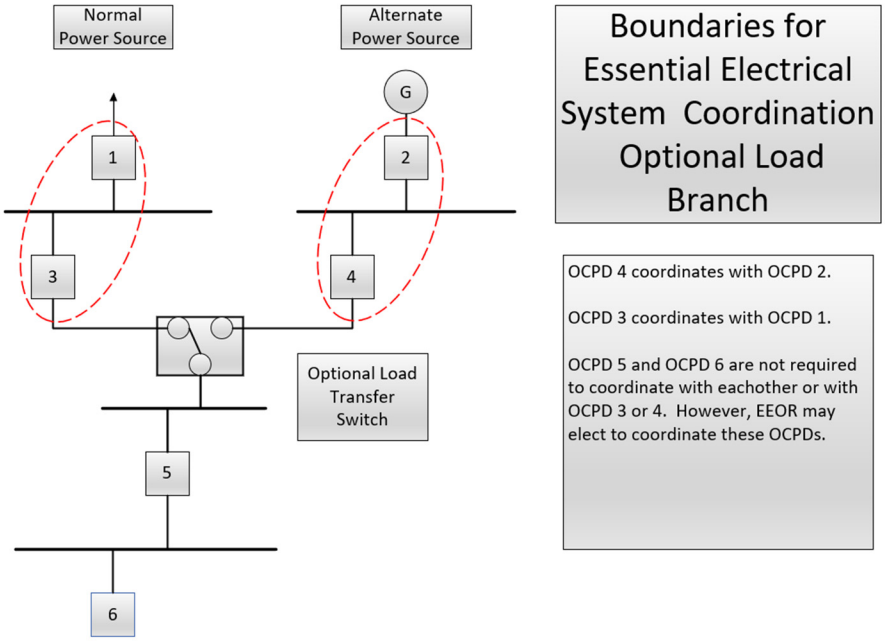

Figure 6 – Essential Electrical System Coordination – Optional Load Branch

7. Coordination is not required between two OCPD's located in series if no loads are connected in parallel with the downstream device. See 517.31(G) Exception No. 2. An example is a circuit breaker in series with a fused safety switch feeding an electrical motor. Another example is a panelboard's feeder breaker in series with the panelboard's main circuit breaker. The equipment that would lose power would be the same if either one or both of the overcurrent devices opened during an overcurrent condition. However, both of the OCPD's must coordinate with overcurrent devices located downstream of these devices. Also, the upper OCPD must coordinate with OCPD's upstream of this device.

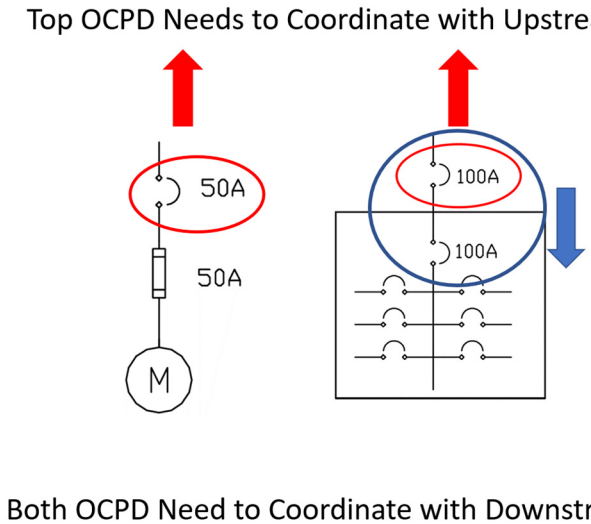

Figure 7 – CEC 517.31(G) Exception No. 2

8. Coordination is not required between transformer primary and secondary OCPD's as described in 517.31(G) Exception 1. However, both of these OCPD's must coordinate with OCPD's located downstream of these devices and the Primary OCPD must coordinate with OCPD's upstream of this device.

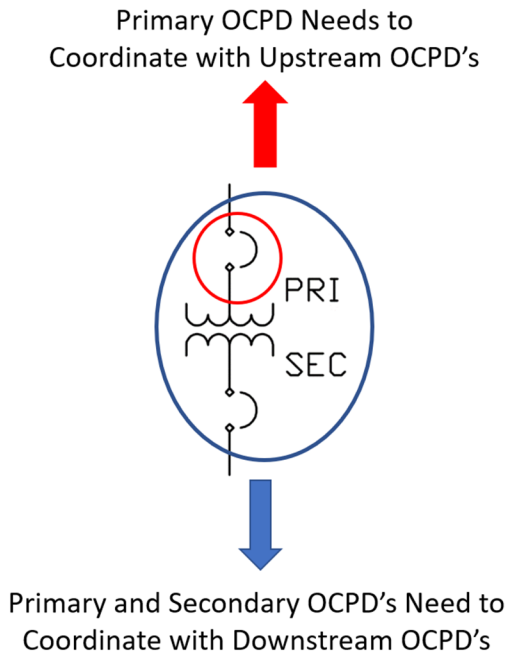

Figure 8 – CEC 517.31(G) Exception No. 1

9. OSHPD assumes that an existing essential electrical system met the applicable coordination requirements at the time of installation. OSHPD will only evaluate coordination of the existing system at the point of connection to new work. However, this does not relieve the electrical engineer of record of the responsibility in verifying the coordination upstream of OCPD's associated with the new work.

10. All new work where OCPD's are being added to an existing essential electrical system will require these OCPD's to coordinate with each other and with the existing OCPD's at the point of connection. See Figure 9. New work requiring coordination includes the installation of circuit breakers, fused disconnected switches, electrical panelboards, switchgear, switchboards, substations, motor control centers, and other equipment with OCPD's. It also includes the repurposing of spare circuit breakers and changing out of existing fuses to different sizes. (Note: Vendor supplied breakers in series shall not be required to coordinate: for example vendor supplied imaging panels with main and distribution breakers, the new breakers will need to coordinate with upstream devices, but do not need to coordinate with each other.)

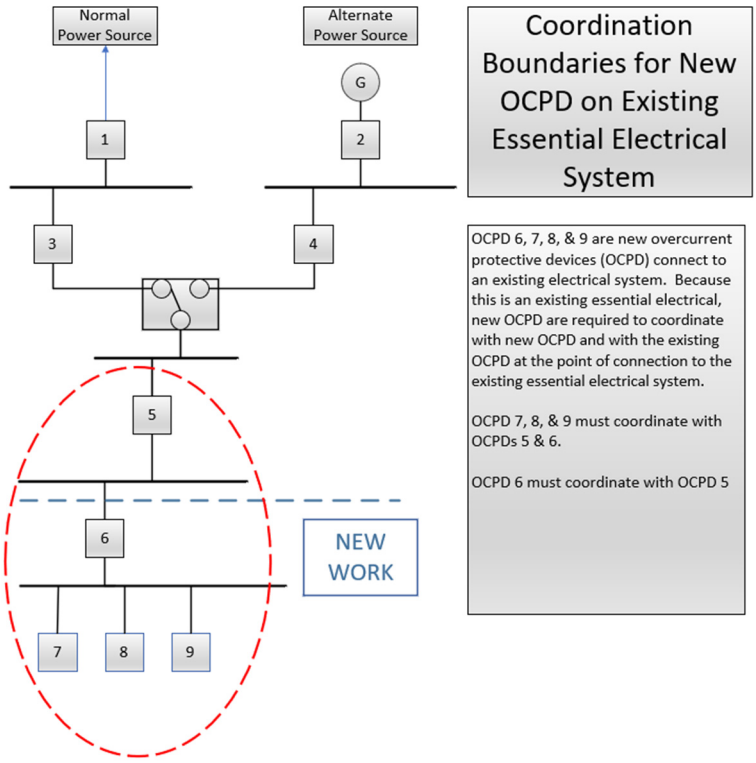

Figure 9 – OCPD Coordination for New Work on Existing Essential Electrical System

11. Replacement of electrical panelboards, switchgear, switchboards, substations, and motor control centers on the essential electrical system will require the equipment OCPD's to coordinate with each other and with the existing OCPD's at the point of connection. See Figure 10.

12. Coordination of the essential electrical system was introduced in the 2007 CEC. The replacement of individual OCPD's installed under prior editions of the CEC due to malfunction or age are not expected to coordinate and will not trigger a mandatory modernization to meet current coordination requirements as long as these OCPD's are the same type and electrical rating and are reconnected to existing loads previously fed by the OCPD to be replaced

13. Utilization equipment replaced with the same type of equipment will not require coordination to be evaluated if the equipment is reconnected to the same existing OCPD. Furthermore, it is acceptable to reduce the size of the existing branch circuit OCPD without requiring coordination to be reexamined if the OCPD size reduction is required by the new utilization equipment installation.

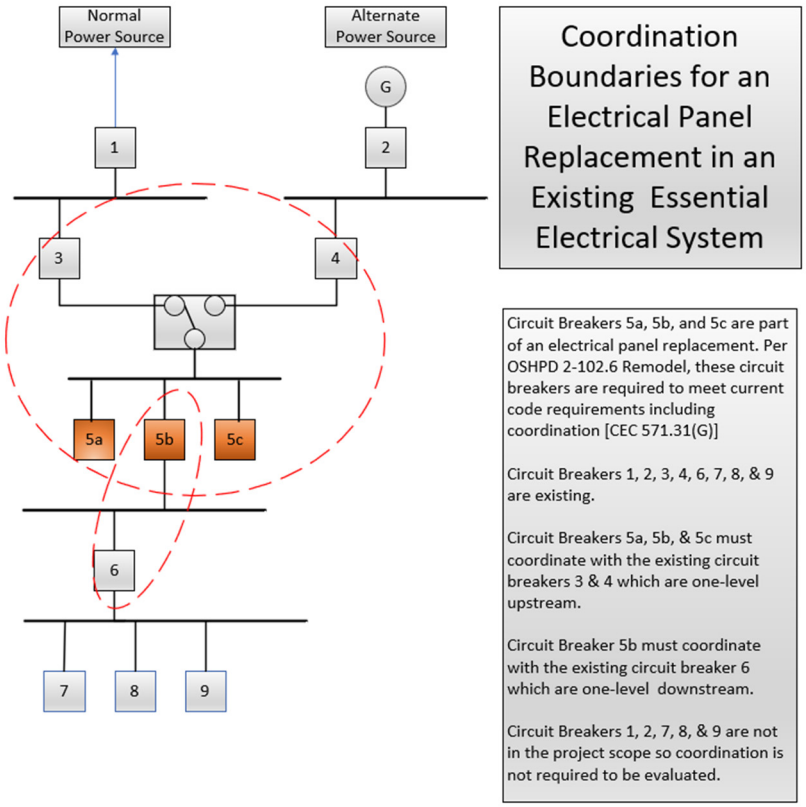

Figure 10 – OCPD Coordination for Replacement Electrical Panel

14. OCPD of a temporary generator shall coordinate with the OCPD's one level downstream. It is acceptable to match the size of OCPD in the existing permanent generator and not be required to evaluate coordination. Otherwise, coordination will need to be verified.

15. Item C-E2, The Inspection of Essential Electrical System Overcurrent Protection Device (OCPD) Selections and Settings shall be indicated as required on the OSHPD Testing, Inspection, Observation (TIO) form. This Electrical Inspection shall be required for projects with new essential electrical systems or new work on an existing essential electrical system.

16. The EEOR will be required to submit final verified reports in OSHPD Testing, Inspection, Observation (TIO) form, Section F.

B. EMERGENCY SYSTEMS AND LEGALLY REQUIRED STANDBY SYSTEMS

OSHPD plan reviewers will evaluate OCPD coordination of the emergency systems and legally required standby systems to ensure a code compliant design/installation:

1. These requirements do not apply to the CEC 517 Essential Electrical System for health care facilities. These might occur for non-healthcare buildings with healthcare spaces which install CEC 700 (Emergency Systems), or Healthcare facilities that install CEC 701 (Legally Required Standby Systems) in addition to the CEC 517 systems (which might occur at SNFs to meet new AB 2511 requirements (see OSHPD PIN 74 for more details).

2. The contract documents need to clearly identify OCPD's that require selective coordination.

3. There are three acceptable means of demonstrating coordination during plan review:

   OPTION 1 Provide a final coordination study demonstrating the new work meets the coordination requirements of the CEC, Article 700 and/or 701.

   OPTION 2 Provide manufacture's coordination tables, or a preliminary coordination study that demonstrates that new OCPD's shown in plans and specifications will meet the coordination requirement required by the CEC. Final coordination study will be required to be submitted as a Deferred Submittal Item (DSI) during construction phase.

   OPTION 3 Provide a letter or note on the drawings signed by the EEOR stating that the electrical system has been evaluated for coordination and the electrical system will meet the coordination requirements of the CEC, Article 700 and/or 701. A final coordination study will be required to be submitted as a Deferred Submittal Item (DSI) during construction phase.

4. When the final coordination study will be submitted during the construction phase, the coordination study shall be listed as a Deferred Approval Item on the project cover sheet.

5. OCPD's of emergency systems and legally required standby systems must selectively coordinate for the full range of available overcurrents, from overload to the available fault current, and for the full range of OCPD opening times associated with those overcurrents. This requirement includes the normal source OCPD's supplying power to the transfer switches, the emergency power source OCPD's, and all OCPD's downstream of these devices. See Figure 11 for additional details.

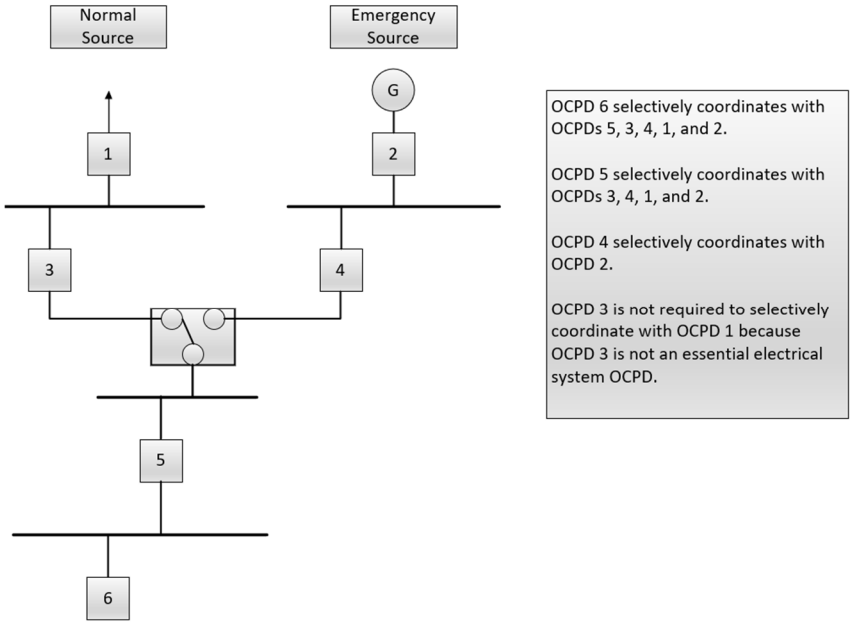

Figure 11 – Emergency System Selective Coordination

6. Service ground-fault protection of equipment required in 230.95 or feeder ground-fault protection of equipment required in 215.10 must coordinate with downstream OCPD's on the emergency system.

7. Selective coordination is not required between two OCPD's located in series if no loads are connected in parallel with the downstream device. See Exceptions in 700.32 and 701.27. An example is a circuit breaker in series with a fused safety switch feeding an electric motor. A second example is a panelboard's upstream feeder breaker in series with the panelboard's main circuit breaker. A third example would be transformer primary and secondary OCPD's. The equipment that would lose power would be the same if either one or both of the overcurrent devices opened during an overcurrent condition. However, both of the OCPD's must coordinate with overcurrent devices located downstream of these devices. Also, the upper OCPD must coordinate with OCPD's upstream of this device.

8. OSHPD assumes that an existing essential electrical system met the applicable coordination requirements at the time of installation. OSHPD will only evaluate coordination of the existing system at the point of connection to new work. However, this does not relieve the electrical engineer of record of the responsibility of verifying coordination upstream of OCPD's associated with the new work.

9. All new work where OCPD's are being added to an existing electrical essential system will require these OCPD's to coordinate with each other and with the existing overcurrent devices at the point of connection. New work requiring coordination includes the installation of electrical circuit breakers, fused disconnect switches, electrical panelboards, switchgears, switchboards, substations, motor control centers, and other equipment with OCPD's. It also includes the repurposing of spare circuit breakers and changing out of existing fuses to different sizes.

10. Replacement of electrical panelboards, switchgear, switchboards, substations, and motor control centers on the emergency or standby system will require the equipment OCPD's to coordinated with each other and with the existing OCPD's at the point of connection.

11. The requirement for coordination of the emergency and legally required standby systems was introduced in the 2007 CEC. The replacement of these OCPD's installed under prior editions of the CEC due to malfunction or age are not expected to coordinate and will not trigger a mandatory modernization to meet current coordination requirements as long as these OCPD's are the same type and electrical rating and reconnected to existing loads.

12. Utilization equipment replacement with the same type of equipment will not require coordination to be evaluated if equipment is reconnected to the same existing OCPD. Furthermore, it is acceptable to reduce the size of the existing OCPD without requiring coordination to be reexamined if the OCPD size reduction is required by the new utilization equipment installation.

13. OCPD of a temporary generator shall coordinate with the OCPD's one level downstream. It is acceptable to match the size of OCPD in the existing permanent generator and not be required to evaluate coordination. Otherwise, coordination will need to be verified.

14. An item shall be added to the electrical inspections form in section C. The Inspection of Emergency System and/or Legally Required Standby System Overcurrent Protection Device (OCPD) Selections and Settings shall be indicated as required on the OSHPD Testing, Inspection, Observation (TIO) form. This Electrical Inspection shall be required for projects with new emergency systems and/or new legally required standby systems or new work on existing emergency and/or legally required standby systems.

15. The EEOR will be required to submit final verified reports in OSHPD Testing, Inspection, Observation (TIO) form, Section F.

C. ELEVATORS

OSHPD plan reviewers will evaluate OCPD coordination of the elevators to ensure a code compliant design/installation:

1. The contract documents need to clearly identify OCPD's that require selective coordination.

2. There are three acceptable means of demonstrating that coordination during plan review:

   OPTION 1 Provide a final coordination study demonstrating the new machine disconnecting means meets the coordination requirements of the CEC 620.62.

   OPTION 2 Provide manufacture's coordination tables, or a preliminary coordination study demonstrating that new elevator disconnecting means shown in plans and specifications will meet the coordination requirement of the CEC 620.62. Final coordination study will be required to be submitted as a Deferred Submittal Item (DSI) during construction phase.

   OPTION 3 Provide a letter or note on the drawings signed by the EEOR stating that the electrical system has been evaluated for coordination and the electrical system will meet the coordination requirements of the CEC 620.62. Final coordination study will be required to be submitted as a Deferred Submittal Item (DSI) during construction phase.

3. When the final coordination study will be submitted during the construction phase, the coordination study shall be listed as a Deferred Approval Item on the project cover sheet.

4. OCPD's of elevators must selectively coordinate when more than one machine disconnecting means is supplied by a single feeder. OCPD's in each disconnecting means shall selectively coordinate with upstream feeder OCPD's for the full range of available overcurrents, from overload to the available fault current, and for the full range of OCPD. This selective coordination is required to prevent a fault condition at one machine from interrupting the power to other machine(s) supplied by the same feeder.

5. Installing or replacing machine disconnecting means supplied by a single feeder system will require the disconnecting means to selectively coordinate will all common upstream feeder OCPD's. See Figure 12.

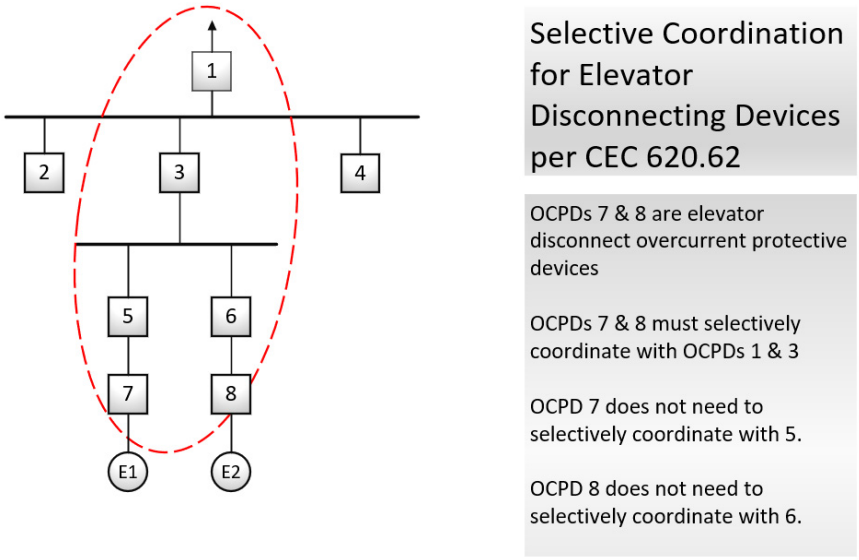

Figure 12 – Elevator Selective Coordination

6. Item C-E3, The Inspection of Elevator(s) Overcurrent Protection Device (OCPD) Selection(s) and Settings shall be indicated as required on the OSHPD Testing, Inspection, Observation (TIO) form. This Electrical Inspection shall be required for projects with elevators, dumbwaiters, escalators, moving walks, platform lifts, and stairway chairlifts electrical systems meeting the requirement of 620.60.

7. The EEOR will be required to submit final verified compliance reports in OSHPD Testing, Inspection, Observation (TIO) form, Section F.

D. FIRE PUMPS IN MULTIBUILDING CAMPUS-STYLE COMPLEXES

OSHPD plan reviewers will evaluate OCPD coordination of the fire pumps used in multibuilding campus-style complexes to ensure a code compliant design/installation:

1. All fire pumps powered by the essential electrical system must meet the essential electrical systems coordination requirements described above. In addition to essential electrical systems requirements, fire pumps installed in multibuilding campus-style complexes as descried in the CEC 695(C) must meet the selective coordination requirements describe in this section.

2. The contract documents need to clearly identify OCPD's that require selective coordination.

3. There are three acceptable means of demonstrating coordination during plan review:

   OPTION 1 Provide a final coordination study demonstrating the fire pump electrical system meets the coordination requirements of the CEC 695.3(C)(3).

   OPTION 2 Provide manufacture's coordination tables, or a preliminary coordination study that demonstrates that fire pump electrical system OCPD's shown in plans and specifications will meet the coordination requirement of the CEC

695.3(C)(3). A final coordination study will be required to be submitted as a Deferred Submittal Item (DSI) during construction phase.

OPTION 3 Provide a letter or note on the drawings signed by the EEOR stating that the electrical system has been evaluated for coordination and the electrical system will meet the coordination requirements of the CEC 695.3(C)(3). The plans need to clearly identify OCPD's that require selective coordination. A final coordination study will be required to be submitted as a Deferred Submittal Item (DSI) during construction phase.

4. When the final coordination study will be submitted during the construction phase, the coordination study shall be listed as a Deferred Approval Item on the project cover sheet.

5. OCPD's in each disconnecting means of fire pump systems used in multibuilding campus-style complexes must selectively coordinate with any other supply side OCPD's(s) per the CEC 695.3(C)(3). Selective coordination shall be for the full range of available overcurrents, from overload to the available fault current, and for the full range of OCPD opening times associated with those overcurrents. The scope this requirement encompasses all OCPD's that supply power to the fire pump.

6. Item C-E4, The Inspection of the Fire Pump Overcurrent Protection Device (OCPD) Selection and Settings shall be indicated as required on the OSHPD Testing, Inspection, Observation (TIO) form. This Electrical Inspection shall be required for projects with new work for new or refeeds to existing fire pumps installed at multibuilding campus-style complexes.

7. The EEOR will be required to submit final verified reports in OSHPD Testing, Inspection, Observation (TIO) form, Section F.

E. CONSTRUCTION

During construction, OSHPD expects the following to occur:

1. When the final coordination study is not submitted during plan review, the EEOR should submit the final coordination study as a Deferred Submittal Item (DSI) to the Office prior to the procurement of the electrical equipment.

2. Any material changes required to be made as a result of the final coordination study shall be documented and submitted to OSHPD with the final coordination study as an Amended Construction Document (ACD) for review by the Office.

3. Any material changes such as adding additional OCPD's or changing the values of OCPD's will require the final coordination study to be revised and submitted to the Office with the revised electrical plans as an Amended Construction Document (ACD) for review.

4. Field verification by contractor and IOR that all OCPD's match the equipment listed in the coordination study and adjustable circuit breakers are set to the settings listed in the coordination study.

5. The EEOR will be required to submit final verified compliance report in OSHPD Testing, Inspection, Observation (TIO) form, Section F verifying that the work is in compliance with the approved construction documents.

F. REVIEW of COORDINATION STUDY

1. Essential Electrical System: In order to be approvable, the coordination study should show no overlap of OCPD's time-current curves for the period of time that a fault's duration extends beyond 0.1 second. The exceptions would be transformer primary and secondary OCPD's and OCPD's that are in series if no loads are connected in parallel with the downstream device. [See CEC 517.31(G) Exceptions Numbers 1 and 2.] For parallel generators OCPD's, it is acceptable to use scaling factors based on the ratio of the impedances of the sources to adjust generator circuit breaker time-current curves. Furthermore, manufacturer coordination tables can be used in lieu of time current curves in the coordination study. The coordination study shall indicate manufacturers, model numbers, current ratings, and device settings for all OCPD's included in the study. It should include a summary page uniquely identifying the OCPD's covered by the coordination study and a statement declaring all OCPD's serving the essential electrical system are coordinated for the period of time that a faults duration extends beyond 0.1 seconds.

2. Emergency Systems and Legally Required Standby Systems: In order to be approvable, the coordination study should show no overlap of OCPD's time-current curves for full range of available overcurrents for emergency systems and legally required standby systems. The exceptions would be OCPD's that are in series. The coordination study shall indicate manufacturers, model numbers, current ratings, and device settings for all OCPD included in the study. A short circuit study for the system shall be provided with the coordination study showing the calculated fault currents used to demonstrate the system meets selective coordination requirements. The coordination study shall have a summary page to uniquely identify the OCPD's covered by the coordination study and a statement declaring all OCPD's serving the emergency systems and/or legally required standby systems are selectively coordinated for full range of available overcurrents.

3. Elevator Distribution Systems: In order to be approvable, the coordination study should show no overlap of OCPD's time-current curves for full range of available overcurrents for Elevator feeds. The coordination study shall indicate manufacturers, model numbers, current ratings, and device settings for all OCPD included in the study. A short circuit study for the system shall be provided with the coordination study showing the calculated fault currents used to demonstrate the system meets selective coordination requirements. Coordination study shall have a summary page to uniquely identify the OCPD's covered by the coordination study and a statement declaring that all OCPD's serving the Elevators are selectively coordinated for the full range of available overcurrents.

4. Multibuilding Campus-Style Complex Fire Pump Distribution Systems: OSHPD will expect to see no overlap of OCPD's time-current curves for full range of available overcurrents in order to demonstrate that overcurrent devices are selectively coordinated for fire pump electrical systems used in multibuilding campus-style complexes. The coordination study shall indicate manufacturers, model numbers, current ratings, and device settings for all OCPD included in the study. A short circuit study for the system shall be provided with the coordination study

showing the calculated fault currents used to demonstrate the system meets selective coordination requirements. Coordination study shall have a summary page with a statement declaring all OCPD's serving the fire pump are selectively coordinated for full range of available overcurrents.

G. EXAMPLES

All new OCPD's must be coordinated where required by the CEC. For new electrical work on existing electrical systems, this PIN aligns with CAN 2-102.6. The new elements of the electrical systems and point of connections to the existing electrical system must meet coordination requirements of the CEC. To aid in understanding OSHPD coordination policy, examples have been provided. The term "panel" as used herein is defined as any panelboard, switchboard, motor control center, distribution panelboard, etc.

Example A: Installation of New Circuit Breaker in an Existing Critical Branch Panel for New Electrical Utilization Equipment

A new 40 amp circuit breaker is being added to an existing critical branch PANEL CL3. PANEL CL3 is feed from a 100 amp feeder breaker. PANEL CL3 has a mix of existing branch circuit breakers ranging in value from 20 amp to 50 amp. See Figure 13. A coordination study is required demonstrating the new 40 amp circuit breaker will coordinate with existing upstream 100 amp feeder breaker since this is the point of connection to the existing essential electrical system. OSHPD will not require the coordination study to evaluate circuit breakers above the 100 amp circuit breaker feeding PANEL CL3, and it will not require coordination to be evaluated between the 100 amp circuit breaker and the existing circuit breakers in PANEL CL3.

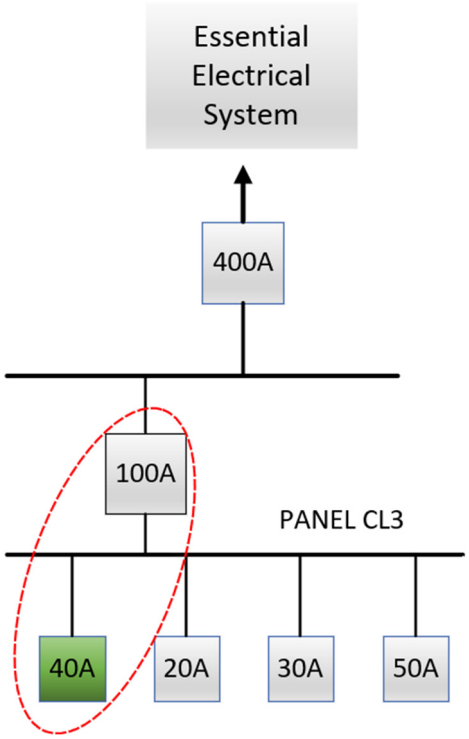

Figure 13 – Example A

Example B: Installation of New Subpanel, Fed from Existing Equipment Branch Panel
In this example, an existing equipment branch PANEL EH4 is fed by a 400 amp feeder circuit breaker. A new 200 amp breaker is added to PANEL EH4 to feed new subpanel PANEL EH5. PANEL EH5 has a 200 amp main circuit breaker, a 20 amp circuit breaker, a 30 amp circuit breaker, a 60 amp circuit breaker and a 100 amp circuit breaker. The coordination study would need to show coordination between:

- The 400 amp feeder breaker for PANEL EH4 and the new 200 amp circuit breaker in PANEL EH4.
- The new 200 amp circuit breaker in PANEL EH4 and new circuit breakers in PANEL EH5.
- The new 200 amp main circuit breaker in PANEL EH5 and all new circuit breakers in PANEL EH5 (20A, 30A, 60A and 100A.)

The new 200 amp circuit breaker in PANEL EH4 and the new 200 amp main circuit breaker in PANEL EH5 are in series, and not required to coordinate with each other per 517.31(G) Exception No. 2. OSHPD will not require the coordination study to evaluate circuit breakers above the 400 amp circuit breaker feeding PANEL EH4, and will not require coordination to be evaluated between the 400 amp circuit breaker and the existing circuit breakers in PANEL EH4.

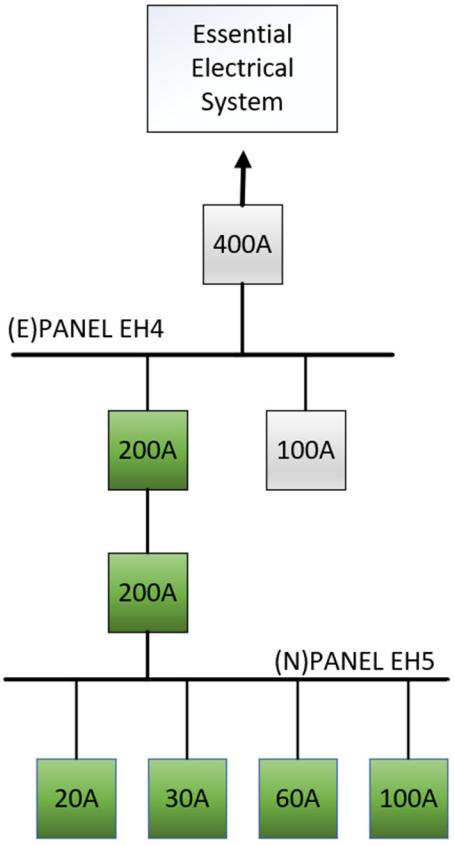

Figure 14 – Example B

Example C: Spare Circuit Breaker Used to Connect New Electrical Equipment
In this example, a spare circuit breaker is being used to supply power to a new subpanel or new utilization equipment. The spare breaker is treated the same as the new circuit breaker in Example A and B. This spare circuit breaker will need to coordinate with OCPD's upstream and downstream from the spare circuit breaker.

Example D: Replacement-in-Kind of Electrical Utilization Equipment
Utilization equipment is equipment that utilizes electrical energy for electronic, electrical mechanical, chemical, heating, lighting, or similar purposes. Examples of utilization equipment are appliances, luminaires, HVAC equipment, machinery, and medical equipment, to name a few.

- If the replaced utilization equipment is connected to the same existing electrical circuit and the OCPD remains unchanged, then coordination of OCPD supplying power to this utilization equipment does not need to be evaluated because it is the existing condition.
- If the replaced utilization equipment is connected to the same existing electrical circuit but the OCPD rating is reduced in size to match manufacturers installation instructions, then coordination of OCPD supplying power to this utilization equipment does not need to be evaluated because coordination would be equal or increased by this change.
- If the replaced utilization equipment is connected to the same existing electrical circuit but the OCPD is increased, then coordination of OCPD supplying power to the utilization equipment will be required as described in Example A.

Example E: Relocation of Electrical Equipment or Utilization Equipment
Coordination will not be required to be evaluated when existing equipment is relocated and reconnect to the same existing OCPD.

Coordination will be required when the relocated equipment is connected to a different OCPD. See Example A and Example C.

Example F: Upgrade Medical Equipment
Upgraded medical equipment will be treated the same as a Replacement-in-Kind Electrical Utilization Equipment as shown in Example D.

Example G: Installation of New Circuit Breaker in an Existing Emergency System Panel
A new or spare circuit breaker is being used to supply power to a new subpanel or new utilization equipment in an existing emergency system. This situation is very similar to Examples A and B. The only difference is that selective coordination is required. i.e., OCPD's must selectively coordinate for the full range of available overcurrents, from overload to the available fault current, and for the full range of OCPD opening times associated with those overcurrents.

Example H: Replacement of Elevator Disconnecting Means
When elevator disconnecting means is being replaced and more than one machine disconnecting means is supplied by a single feeder as described in the CEC 620.62, then new elevator disconnecting means must be selectively coordinated with the other supply side OCPD's.

Example I: Replacement of Overcurrent Protective Devices for Fire Pump Powered by Feeder Source in Multibuilding Campus-Style Complex
When OCPD's are being replaced for a fire pump powered by feeder source in multibuilding campus-style complex, OCPD's must be selectively coordinated with any other supply side OCPD's per the CEC 695.3(C)(3). It should be noted that this requirement does not apply to all fire pump installations.

Example J: Adding Overcurrent Protective Devices for any Fire Pump Fed by the Essential Electrical System
When an OCPD is being added for any fire pump powered by the Essential Electrical System, the OCPD is treated like any other essential electrical system load and only required to coordinate for the period of time that a fault's duration extends beyond 0.1 second per 517.31(G).

Original signed	10/17/2023
Chris Tokas	Date