INFORMATION SHEET

NO. E-05

DATE : June 25, 2024

CATEGORY : Electric Fire Pumps for High-Rise and Low-Rise Buildings

TITLE : Electric Fire Pump Installation Guidelines

PURPOSE : The purpose of this Information Sheet is to provide clarification of electrical code requirements for the installation of electric motor-driven fire pumps.

REFERENCES : 2022 California Electrical Code (CEC) (2020 NEC)
2022 California Building Code (CBC) Section 913 Fire Pumps
2022 California Fire Code (CFC) Section 913 & 914
2019 National Fire Protection Association (NFPA) 20 Standard for the Installation of Stationary Pumps for Fire Protection
2022 San Francisco Fire Department (SFFD) Administrative Bulletins: 3.01 Light Emitting Diode (LED) Annunciation Panels Fire Pump & Generator Supervision & 4.22 Design of Fire Pump Wiring Methods
2022-2023 PG&E Greenbook Section 5.6.3 Fire-Pump Connections

DISCUSSION : The following are interpretations of the California Electrical Code for specific features of electric motor-driven fire pump installations.

I. Supply Side Wiring Methods

Fire pump supply conductors installed ahead of a first Over Current Protection Device (OCPD) shall be installed as service entrance conductors and be encased in a minimum of 2” of concrete in accordance with CEC Article 230.6 (1) or (2). Where supply conductors are installed inside an electrical room and compliance with concrete encasement below the floor of the room is not possible, fire pump supply conductors shall be permitted, as overhead service entrance conductors, provided that the electrical room is constructed with a 2 hour fire rating and the conductors do not extend beyond the room.

II. Fire Pump Service Disconnecting Means, Location

The fire pump service disconnecting means shall be located sufficiently remote from other buildings or other fire pump sources disconnecting means in accordance with CEC Article 695.4(B)(3) Disconnecting Means. Since **“sufficiently remote”** is not defined, for the purposes of this section, **“sufficiently remote”** shall be a minimum of 6 ft. measured from the handle of the fire pump disconnecting means to the handle of the nearest adjacent disconnecting means. Where a minimum distance of 6 ft. is not attainable, the fire pump disconnecting means shall be separated from other disconnecting means by a Concrete Masonry Unit (CMU) wall, or equivalent as previously approved by the Authority Having Jurisdiction (AHJ), to prevent inadvertent disconnection of the fire pump service and to protect the service from any failure in adjacent equipment.

Department of Building Inspection - Electrical Inspection Division
49 South Van Ness Avenue, Suite 400 - San Francisco CA 94103
Office (628) 652-3450 – www.sfdbi.org

The wall shall extend horizontally a minimum of 1 ft. from the face of the equipment and extend vertically at least to the height of the equipment. Existing conditions shall be considered on a case by case basis.

III. Fire Pump Disconnecting Means, Monitoring

All fire pump disconnecting means supplied by an on site standby generator shall be monitored in the closed position by the building fire alarm system, in accordance with method (1) of CEC Article 695.4(B)(3) Disconnecting Means (e) Supervision.

Where the fire pump is supplied by a standby generator and the building either does not have a fire alarm system or the building has an existing fire alarm system incompatible with monitoring, method (2) of CEC Article 695.4(B)(3)(e) - an audible and visual signal at a constantly attended point - shall be used for the emergency supply fire pump disconnecting means. Where there is no constantly attended point in the building, method (3) (f) of CEC Article 695.4 (B) (3) Disconnecting Means may be used.

IV. Fire Pump Service Supplied from Grounded AC System

Whether “tapped” ahead of a grounded AC service, or supplied from a separate grounded utility supply, the fire pump service shall comply with CEC Article 250.24(A). The grounded conductor from the utility shall be installed at the service and connected to a grounding electrode system with a main bonding jumper. This applies whether the loads of the fire pump service require a grounded conductor or not.

V. Metered Fire Pump Services

A fire pump service shall have a disconnecting means within sight of the meter in compliance with PG&E’s Green Book Section 5.6.3 Fire Pump Connections. The fire pump service installation shall also have not more than one disconnecting means between the utility power source and the fire pump controller in accordance with CEC Article 695.4(B)(1).

VI. Wet Location

A Dedicated Fire Pump Room shall be considered a wet location in accordance with 2022 SFFD Administrative Bulletin 4.22. All wiring methods and materials installed in the fire pump room shall be suitable for use in a wet location.

VII. Redundant Fire Pump Systems

Shall be required for high-rise buildings having an occupied floor more than 200 feet above the lowest level of fire department vehicle access. Each fire pump system shall be capable of automatically supplying the required demand for the automatic sprinkler and standpipe systems. (2022 California Fire Code (CFC) 914.3.1.2.1 Fire Pumps)

Shall comply with all standards for these systems as outlined in the 2022 CBC Section 913 Fire Pumps, 2022 CFC Section 913 Fire Pumps & 914 Fire Protection Based on Special Detailed Requirements of Use and Occupancy, 2022 CEC Article 695 Fire Pumps.

All fire pump installations supplied by systems of more than 480 Volts, and all installations involving more than one fire pump shall have plans reviewed and approved by the San Francisco Department of Building Inspection, Plan Check Division and the Electrical Inspection Division, prior to installation.

VIII. 2022 CEC 695.5 Transformers: Disconnecting Means for a Dedicated Medium Voltage (12.47 kV) Transformer / Fire Pump Services with Redundant Fire Pumps

a) **Normal Power:** When a dedicated medium voltage (12.47kV) transformer sized per CEC Article 695.5(A) is required for the fire pump service with redundant fire pumps, the supply conductors from the 12.47kV service shall be tapped per the utility requirements, including the meter, to the primary OCPD at the fire pump service transformer. The primary OCPD shall be sized based on the Locked Rotor Current (LRC) of the fire pump and pressure maintenance (jockey) pump, and the Full Load Current (FLC) of the associated fire pump accessory equipment in accordance with CEC Article 695.4(B)(2)(a)(1) & 695.5(B). Secondary overcurrent protection shall not be permitted. Non-automatic switches or non-fused disconnects, lockable in the closed position, shall be installed between the fire pump service transformer secondary conductors and each fire pump controller for maintenance purposes.

b) **Generator Power:** 2022 CEC 695.4 (B)(3) Disconnecting Means (b) Features and Location (On-Site Standby Generator). Where redundant fire pumps are required the disconnecting means from the on-site standby generator, shall be one of the following:

1) When a Single Supervised OCPD and feeder from the generator are used for the redundant fire pumps, the feeder shall terminate in an individual supervised non-automatic switch or non-fused disconnect, for each fire pump, before the fire pump controller.

2) When two supervised OCPD's and feeders from the generator are used for the redundant fire pumps the feeders shall terminate in the individual fire pump controllers.

IX. 2022 CEC 695.4 (B)(3) Disconnecting Means for High-Rise Buildings with Redundant Fire Pumps

a) **Normal Power**: Where redundant fire pumps are required, and where a separate fire pump service is tapped ahead of the main switchboard OCPD, per utility requirements, the supply conductors shall be tapped between the main switchboard meter and the main switchboard OCPD, or tapped before the main switchboard meter and metered at the fire pump switchboard. One main OCPD shall be installed for each fire pump at the fire pump switchboard, and each feeder shall be routed to the individual fire pump controllers.

b) **Generator Power**: Where redundant fire pumps are required the disconnecting means from the on-site standby generator shall be one of the following:

1) When a single supervised OCPD and feeder from the generator are used for the redundant fire pumps, the feeder shall terminate in an individual supervised non-automatic switches, for each fire pump, before the fire pump controller.

2) When two supervised OCPD's and feeders from the generator are used for the redundant fire pumps the feeders shall terminate in the individual fire pump controllers.

X. Power and Control Wiring

2022 CEC 695.6 Power Wiring

Power circuits and wiring methods shall comply with the requirements in CEC 695.6(A) through (J), and as permitted in CEC 230.90(A), Exception No. 4; 230.94, Exception No. 4; 240.13; 230.208; 240.4(A); and 430.31.

695.6(A)(2) Feeders

Fire pump supply conductors on the load side of the final disconnecting means and overcurrent devices permitted by CEC 695.4(B), or conductors that connect directly to an on-site standby generator, shall comply with all of the following:

(1) Independent Routing. The conductors shall be kept entirely independent of all other wiring.

(2) Associated Fire Pump Loads. The conductors shall supply only loads that are directly associated with the fire pump system.

(3) Protection from Potential Damage. The conductors shall be protected from potential damage by fire, structural failure, or operational accident.

(4) Inside of a Building. Where routed through a building, the conductors shall be protected from fire for two hours using one of the following methods:

a. The cable or raceway is encased in a minimum 50 mm (2 in.) of concrete.

b. The cable or raceway is a listed fire-resistive cable system.

Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196-2017, Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables.

Note No. 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.

c. The cable or raceway is a listed electrical circuit protective system.

Note No. 1: Electrical circuit protective systems could include, but are not limited to, thermal barriers or a protective shaft and are tested in accordance with UL 1724, Fire Tests for Electrical Circuit Protection Systems.

Note No. 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

Exception to 695.6(A)(2)(4): The supply conductors located in the electrical equipment room where they originate and in the fire pump room shall not be required to have the minimum two hour fire separation or fire-resistance rating unless otherwise required by 700.10(D) of this code.

2022 CEC 695.14(F) Generator Control Wiring Methods

Control conductors installed between the fire pump power transfer switch and the standby generator supplying the fire pump during normal power loss shall be kept entirely independent of all other wiring. The integrity of the generator remote start circuit shall be monitored for broken, disconnected, or shorted wires. Loss of integrity shall start the generator(s)

Note No.1: See NFPA 20 2019, Standard for the Installation of Stationary Pumps for Fire Protection, Section 3.3.7.2, for more information on fault-tolerant external control circuits.

The control conductors shall be protected to resist potential damage by fire or structural failure.

Where routed through a building, the conductors shall be protected from fire for two hours using one of the following methods:

(1) The cable or raceway is encased in a minimum 50 mm (2 in.) of concrete.

(2) The cable or raceway is a listed fire-resistive cable system.

Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196-2017,
Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables.

Note No. 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.

(3) The cable or raceway is protected by a listed electrical circuit protective system

Note No. 1: Electrical circuit protective systems could include, but are not limited to, thermal barriers or a protective shaft and are tested in accordance with UL 1724, Fire Tests for Electrical Circuit Protection Systems.

Note No. 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

OTHER CONDITIONS:

Other conditions will be evaluated on a case-by-case basis by the Supervisor or Manager. Pre-application meeting or approval of AB-005 Procedures for Approval of Local Equivalencies is required.

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Patrick O'Riordan, C.B.O., Director
Department of Building Inspection

Date

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