



The Power Sheet

Electrical

Consulting Engineer
Edition

FIRE PUMP CONTROL

INTRODUCTION

Fire Pumps and Fire Pump Control is an important part of the life/safety system. So important, the National Electric Code (NEC) devotes an entire article (Article 695) to the subject. The 1996 NEC was revised to mirror the National Fire Protection Code (NFPA) 20. This standard deals with the installation, testing, and performance of stationary fire pumps. Note that NEC and NFPA codes do not apply to one and two family dwellings.

PRODUCT OFFERING

Cutler-Hammer offers a full line of fire pump control equipment, all listed under NFPA and UL.

The product line includes:

- Electric Fire Pump Control
- Diesel Fire Pump Control
- Medium Voltage Fire Pump Controllers
- Transfer Switches Rated for Fire Pumps
- Jockey Pump Controllers
- Alarm Panels
- Reduced Voltage Fire Pump Starters

NATIONAL ELECTRIC CODE

As stated above, the National Electric Code (NEC) addresses only the electrical requirements for the fire pump system. Specifically, the NEC only addresses the fire pump electric power source (both utility and emergency power) and the control equipment dedicated to the fire pump.

The NEC *does not* address the pumps themselves nor the hydraulics needed by the wet fire suppression system.

Several highlights of the NEC requirements follow:

- Fire pumps are required to have emergency power
- Fire pumps and pump controllers require a 2-hour fire rated enclosure
- Fire pump electrical feed conductors shall be located outside the building or in the equivalent of 1 hour rated enclosure, such as concrete.
- The pump room conduit must be run in either rigid, intermediate, or liquid tight conduit
- The voltage drop must be less than 15%
- The upstream fuses/breakers will remain closed during total locked rotor current of the facility or the fire pump equipment (which ever is supplying power to the fire suppression system).
- Conductors are sized for 125% to the sum of all fire pumps, *plus* jockey pumps, and *plus* control equipment (included in the wet fire suppression system)
- Reduced voltage starting of fire pumps *is* recommended
- Jockey pumps are *not* required to be on emergency power
- Automatic transfer switches used in fire suppression applications *must* be UL rated for fire pump use.

Please note, the above is a brief summary NEC fire pump requirement and are not intended as an in-depth understanding of the NEC.

CHECK OUT the EATON ELECTRICAL FIRE PUMP CONTROL WEBSITE at WWW.CHFIRE.COM

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JOCKEY PUMPS

Typically, a wet fire suppression system utilizes two pumps: one fire pump delivers large volumes of water to the fire system. The second pump, known as a jockey pump, maintains water pressure to wet fire system, to ready the system in a fire event.

The main pump is activated on sudden pressure loss triggered when fire suppression sprinkler heads open causing a water to pressure drop. This pressure switch energizes the pump.

Jockey pumps supply a high pressure and low flow to wet fire suppression systems. The jockey pump keeps the fire system pressurized to a normal, system ready pressure. Normal plumbing systems leak and will bleed down. The jockey pump energizes on a low pressure and de-energizes on a high pressure. This pump normally cycles on and off.

REMOTE MONITORING REQUIREMENTS

If the pump room is not constantly attended, audible and visual alarms are required at permanently monitored locations, meaning constantly attended. NFPA 20 requires three alarm points are needed to meet the requirements of the NFPA.

These alarms are:

1. Controller has initiated a pump start
2. Phase loss on the line-side of the motor contactor
3. Phase reversal on the line-side of the motor contactor

GENERAL REQUIREMENTS

NFPA 20 outlines the requirements of a wet fire suppression system. The fire pump controllers, however, are listed under UL 508, which defines industrial control devices used for motor control.

In typical applications, electric motors have interlocks in control circuits that prevent energization under situation that may damage the motor or create an unsafe condition. Broken wires, short circuits, motor winding overheating, and motor overload protection are examples of interlocks that prevent motors from starting in *non-fire pump* applications.

In fire pump control applications, the above interlocking is **not** used. The underlying philosophy is a fire pump **must** start and run in the event of a fire. The consequences of not running the fire pump (loss of life and property damage) far outweigh operating and damaging the motor.

Below are differences between fire pump control and standard motor control:

- Circuit failure (open or short) cannot prevent pump operation
- Remote “STOP” pushbuttons are not allowed
- Over current sensors must be non-thermal
- All protective devices cannot affect the reset time for restart
- Under voltage, phase-loss, lock-out relays that prevent motor starting are not allowed
- Remote contacts used for starting the pump are normally closed (fail to energize pump)
- Controller must have an emergency **RUN** handle

POWER TRANSFER SWITCHES

Often a transfer switch are incorporated into the design of the fire suppression system to assure that electrical power is available should the utility service be interrupted.

Controller/ATS arrangements must comply with NFPA 20, Section 7-8.2.3. Each fire pump shall have its own dedicated transfer switch where a transfer switch is required. The owner must be able to show start wires between the generator and the controller, requiring separate feeds direct to the controller. Below are general transfer switch requirements for fire pump applications:

- Undervoltage sensing at 85% minimum power feed cannot come from the generator; meaning, a distribution panel and then the controller cannot come from another upstream transfer switch.
- Transfer switches suitable for available short circuit currents at both the normal and alternate input terminals.

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- Transfer switches must be electrically operated and mechanically held. The transfer switch horsepower rating is greater than the motor HP or be rated for not less than 115% FLA.
- Means for safe manual operation of the transfer switch shall be provided.
- Phase Reversal Sensing on normal Supply
- Frequency Sensing on one ungrounded conductor is required
- Two visible indicators shall be provided to externally indicate the power source to which the fire pump controller is connected
- Means must be provided to delay retransfer from the alternate source to normal until the normal source is stabilized. Time delay shall be automatically bypassed if the alternate source fails

- Means shall be provided to prevent higher than normal inrush currents when transferring the motor from one source to the other
- Transfer switches must **NOT** have integral short circuit or over current protection

Arrangement I is a listed combination of fire pump controller and transfer switch as shown in Figure 1. The transfer switch is housed in a barriered compartment of the controller or as a separate enclosure attached to the controller and marked “Fire Pump Power Transfer Switch”. An isolation switch complying with 7-4.2, located within the transfer enclosure must be provided ahead of the alternate input terminals of the transfer switch.

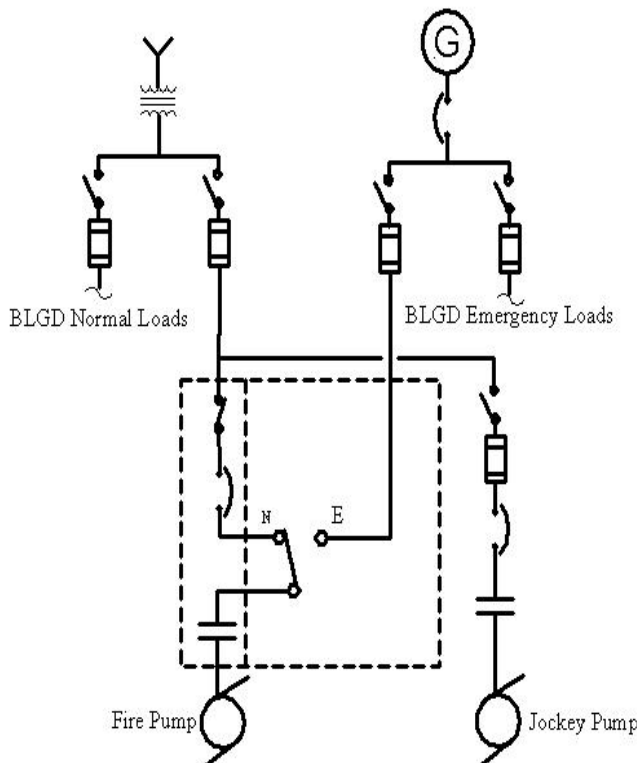


FIGURE 1—Arrangement I Fire pump Controller with Integrated Transfer Switch

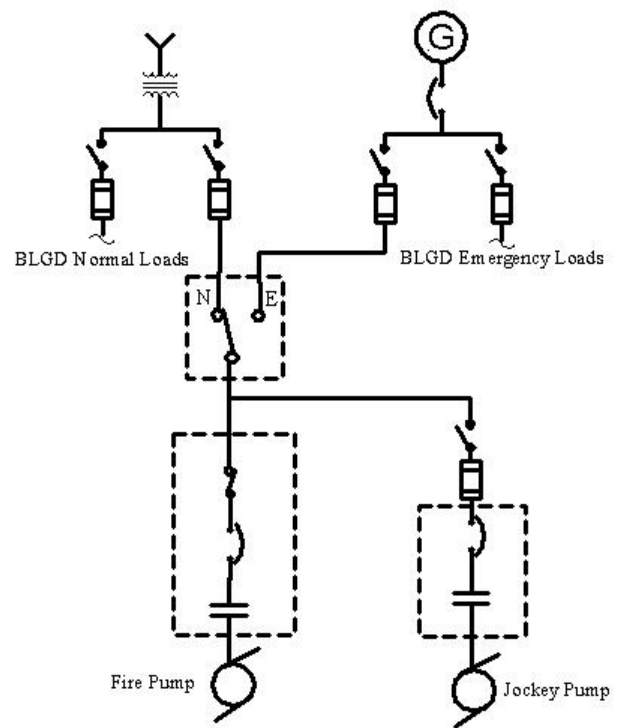


FIGURE 2—Arrangement II Fire pump Controller with Separate Transfer Switch

Figure 2 shows a typical fire pump controller with a *separate* transfer switch classified under NFPA as Arrangement II. As shown, this arrangement uses more individual devices and generally is used where large horsepower pumps are required and integrating the transfer switch and controller are impractical.

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BLACK-OUT BUSTER SWITCHBOARD

Below is the new Cutler-Hammer “**Black-Out Buster**” switchboard.

The switchboard is designed for facilities that benefit from back-up power generation but the added cost of a permanent generator cannot be justified.

A “Quick-Connect” panel is included for connection to a portable generator without the need for time consuming mechanical/crimped lug connections and cable prepara-

tion. Local generator rental are available within hours from FABCO-RENTS and the connection can be made in minutes rather than hours.

The switchboard includes:

- Main Breaker
- Generator Breaker
- Kirk-Key Interlock
- Quick-Connect Panel (Shown Below)



AVAILABLE AMPERAGES

800 A	1200 A
1600 A	2000 A
2500A	