

DON'T STOP?

EMERGENCY STOP (E-stop) Systems

Providing Compliant Disconnects for Fueling Dispensers

Details from the dispenser manufacturers do not depict the installation of dispenser data disconnects. The manufacturers rely on their customers' installers to be familiar with the applicable codes. The installers rely on the installation documents. So the installation of an Emergency Stop and Service Disconnect system compliant with NEC 514.11 and 514.13 has "fallen between the cracks."

The majority of fueling stations built to date are constructed with an emergency stop system that is improperly installed, and does not meet National Electrical Code (NEC) Articles 514.11 (Circuit Disconnects) or 514.13 (Provisions for Maintenance and Service of Dispensing Equipment). These improperly installed systems present a safety hazard to customers and service technicians and are a liability to the facility.

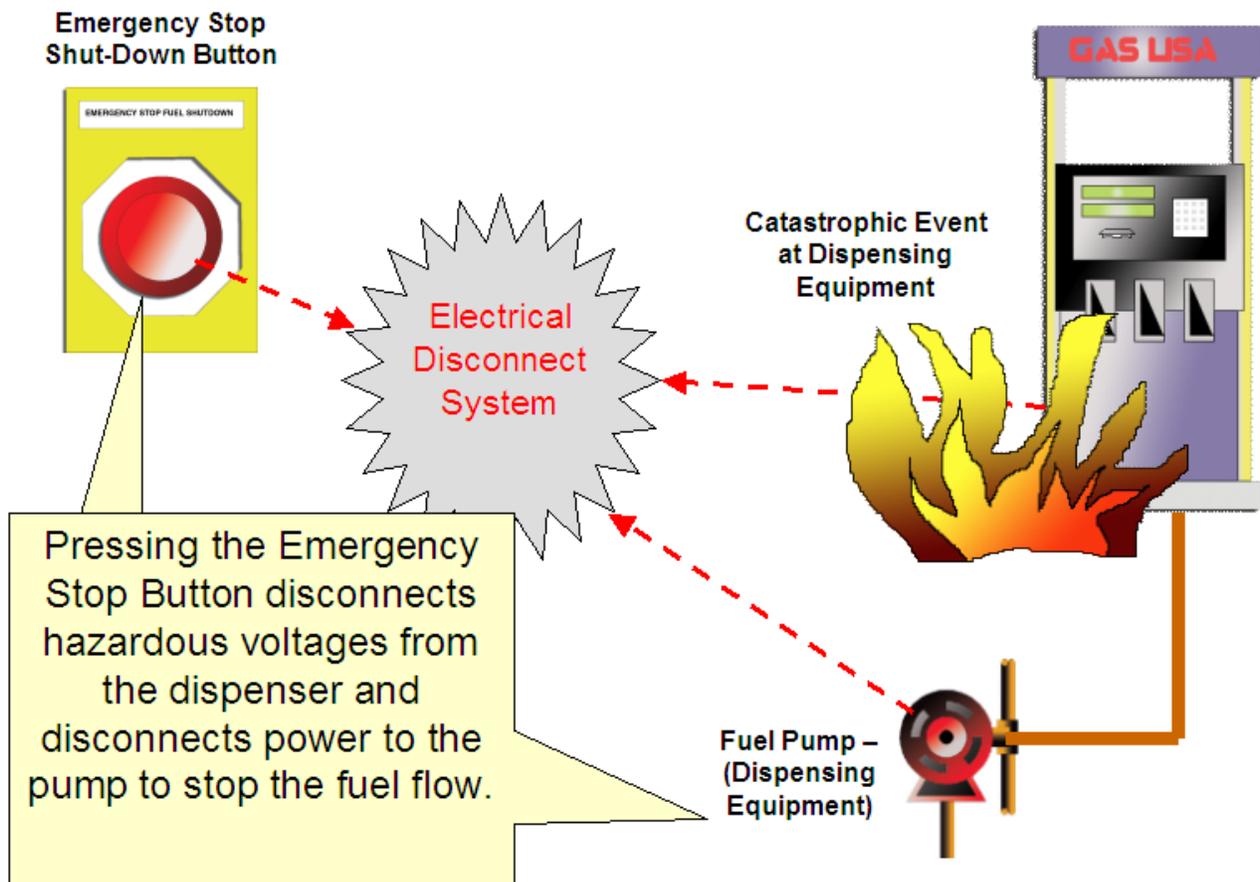


The “EMERGENCY STOP” (E-stop) system at a gas station is a safety system installed to safeguard persons and property against the potential of a shock or fire.

An E-stop system is an electrical disconnect system that is designed to isolate hazardous voltage circuits. These specific circuits are defined in NEC 514.11 and 514.13 as “**Each circuit leading to or through dispensing equipment...**” The source of these voltages include, but are not limited to, circuits providing power to the gasoline dispenser, dispenser data communication, intercom systems and credit card data circuits. As technology evolves, features such as “marketing at the pump,” require additional circuits for television monitors. The circuits for dispensers, monitors, intercom systems and other features and equipment discussed above **are not** intrinsically safe circuits.

When a critical situation occurs, requiring the activation of the E-stop system, the system must “**disconnect simultaneously from the source of supply, all conductors of the circuits...**” as stated in article 514.11 of the NEC. By disconnecting the individual wires or conductors from the “source of supply,” the path in the circuits needed for the voltage to travel has been physically eliminated. The resulting gap or space also eliminates a path for any capacitance, residual or stored energy, reducing the chance of fire.

Figure 1: Expected Effect of a Fueling Dispenser Emergency Stop and Disconnect System



It is also important that all voltages are removed to eliminate risk of ignition and the potential for an electrical shock when a service person works on a fuel dispenser or other equipment. According to Article 514.13, **“each dispensing device shall be provided with a means to remove all external voltage sources, including feedback, during periods of maintenance and service of the dispensing equipment.”** The means for removing the voltages for servicing should be part of the same “Emergency Stop” electrical disconnect system to reduce confusion and eliminate the need for redundant systems.

While equipment such as dispensers seems to have become more sophisticated, the dispenser’s hardware, wiring, and structure have changed very little. Systems installed today are done very much in the same way as they were 20 years ago. This is evident when inspecting a variety of installations that were constructed over a period of time and with different combinations of equipment. The problems and violations are consistent.

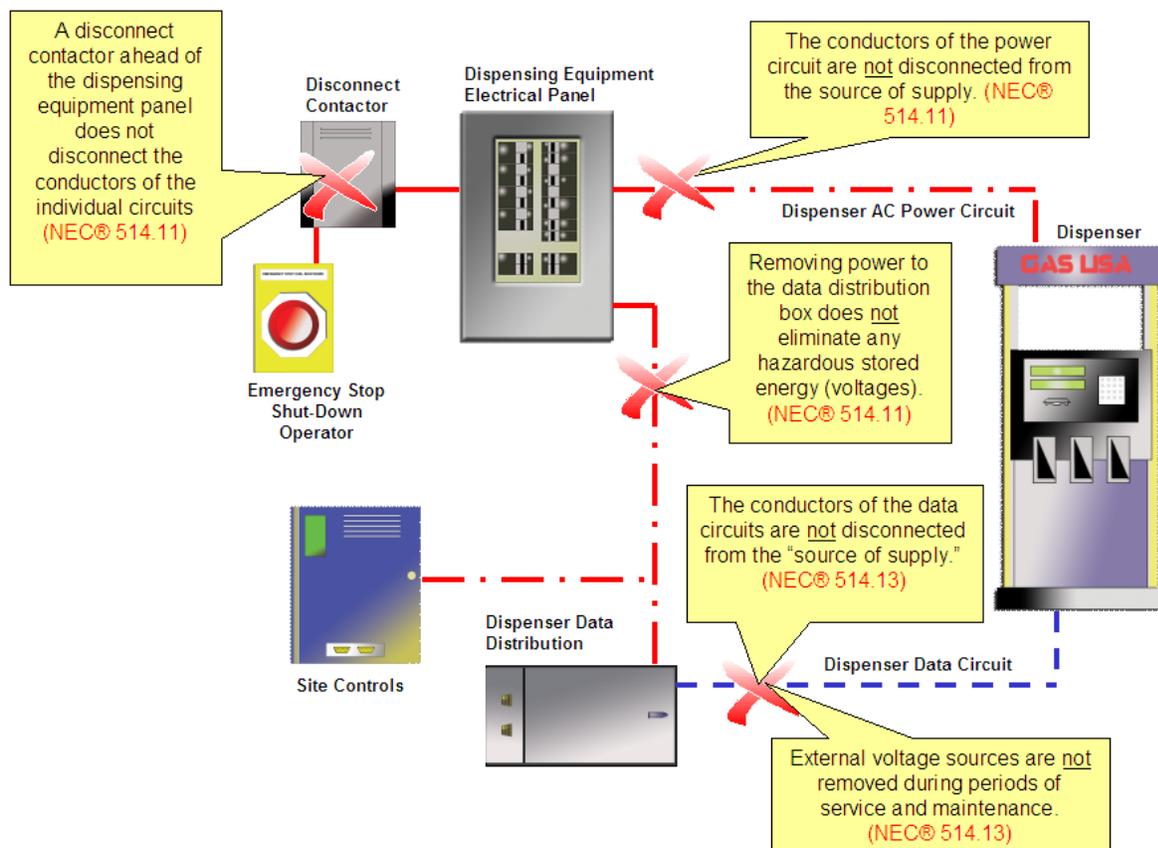
The problem?

While sites may have an emergency stop button, the system that it controls does not meet the current safety requirements defined in national safety codes, such as the “National Electrical Code®” even though these codes have been adopted by most local state, county and municipal governments as a recognized minimum safety code.

The NFPA (National Fire Protection Association) codes do not impose different requirements for low voltage data circuits from AC power circuits, therefore a circuit of **any voltage** must meet the requirements of circuit disconnects. (The NEC is a part of the NFPA codes.)

Figure 2 is an example of the typical system that has been installed for years. This system does not comply with the requirements of adopted NFPA (National Fire Protection Association) codes.

Figure 2: A Typical Non-Compliant, Commonly Installed Emergency Stop System



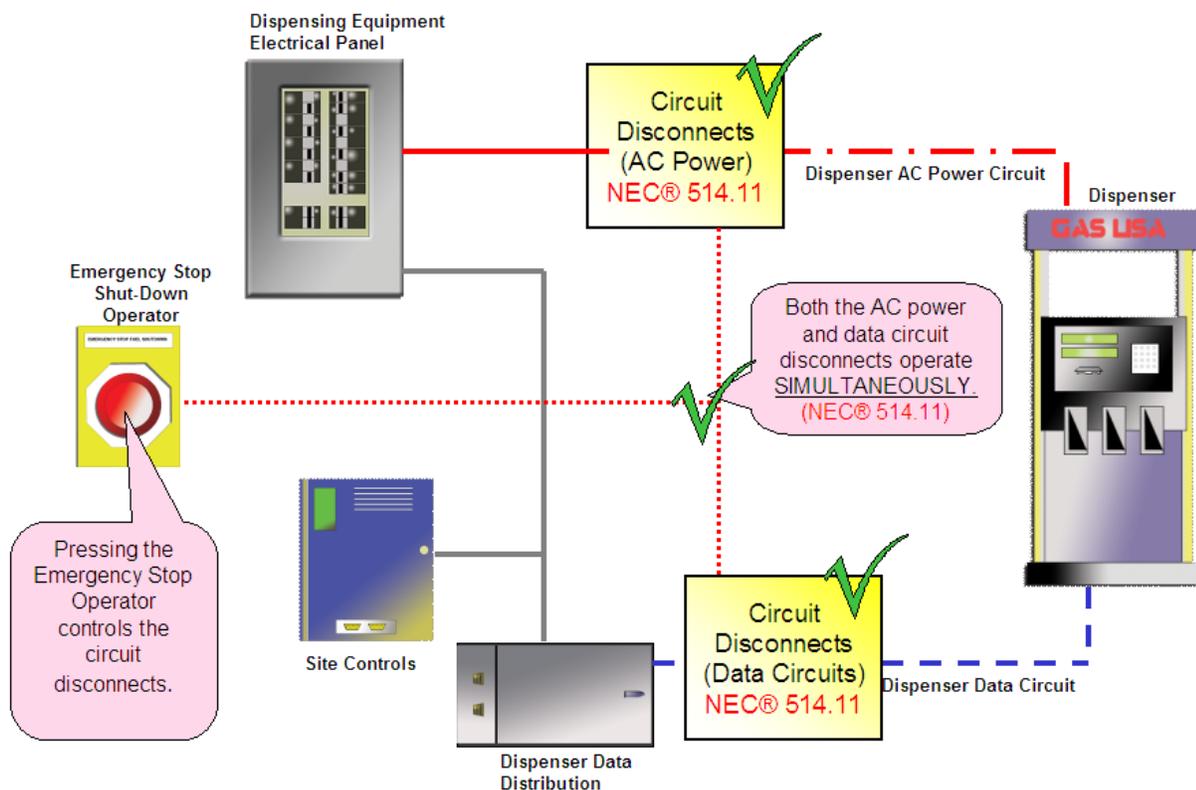
When analyzing the E-stop system it is important to consider the disconnecting requirements for emergency and servicing events. NEC 514.11 details the requirements for emergency stop circuit disconnects, while NEC 514.13 defines the requirements for periods of service and maintenance. Failing to meet these requirements means that required safeguards have not been met.

The emergency stop disconnect system depicted in Figure 2 is based on the premise that a single disconnect or contactor installed ahead of the electrical panel powering the dispensing equipment meets the requirements of the adopted codes. This is incorrect as this system does not **“disconnect simultaneously from the source of supply, all conductors of the circuits...”** as stated in the NEC.

A single contactor connected before the dispenser equipment panel may remove AC power from the dispensing equipment but it does not meet the requirements of disconnecting the conductors of the circuits leading to the dispensing equipment. By disconnecting the individual power conductors leading to the dispensing equipment, total isolation from faults in the system is provided.

In order to meet the NFPA code requirements of provisions for service and maintenance of dispensing equipment, provisions for disconnecting both the AC power and low voltage circuits are provided. Figure 3 shows an engineered emergency stop and disconnect system that meets the requirements of NFPA/NEC codes by providing both emergency stop disconnection and service disconnection of all conductors for both AC power and low voltage circuits. To provide the required separation of the potential energy of the data circuits, circuit disconnect controls have been added to the conductors of the circuits leading to the dispensing equipment. In this system AC power controls are installed in the individual circuit conductors. Constructed, as a system, to allow for the individual control of the disconnects, a service technician can properly isolate external voltages from the piece of dispensing equipment that is being serviced. This reduces the possibility of hazardous voltages igniting fuel vapors or causing an electrical shock.

Figure 3: A Properly Engineered Emergency Stop and Disconnect System for Fueling Dispensers



Requirements for emergency E-stop as well as for periods of service and maintenance must be addressed during the design and installation of the petroleum fuel dispensing system. It is important to note that an in-depth understanding of national and local adopted codes is a must, as well as the equipment manufacturers' installation instructions.

While equipment such as dispensers seems to have become more sophisticated, the need for safety systems is even more important to safeguard persons and property against the potential of a shock or fire hazard. Power Integrity Corporation provides an engineered UL (Underwriters Laboratories) listed Fueling Dispenser Emergency Stop and Dispenser Wiring Disconnect™ System that is compatible with today's dispensers and equipment.

