



Electrical Equipment Operations by Unqualified Personnel

TECHNICAL BULLETIN — 016

Introduction

Are unqualified workers allowed to operate electrical equipment such as disconnect switches, circuit breakers, and panel breakers? Cadick Corporation (CC) frequently is asked what regulations and standard practices have to say about this question.

This position paper provides the answers that we give to this question and others. We also explain our reasoning for our answers. Cadick Corporation has one, overriding principle that we always apply when we consult with our clients:

The first, last, and only important consideration is the safety of personnel.

Approaching exposed energized conductors

Both OSHA and NFPA 70E are quite clear in requiring that only qualified persons may approach exposed energized conductors. In doing such work the qualified person must wear appropriate personal protective equipment (PPE) and must use electrical safety related work practices. Such work is referred to as *energized work*.

The use of the term *exposed energized conductors* is perhaps an unfortunate choice of words since it implies that electrical hazards will only exist if the conductors are exposed. This is *unequivocally not true*. The hazards of electricity – as they are classically listed – include electrical shock, electrical arc, and electrical blast. More recent references include others such as acoustic and toxic gasses.

We believe that the correct requirement should be that *only qualified persons may perform work that may expose them to any of the electrical hazards*.

Operating switchgear and other electrical equipment

Electrical equipment built before the late 1990s is not arc-resistant. This means that, although it may be well built, it was not specifically designed to contain the explosive effects of a major electrical arcing event. In the late 1990s, a new standard in electrical equipment was developed that specifies equipment be designed to contain and redirect the effects of the worst-case electrical arc. Not all equipment is designed to this standard.

Failures of electrical equipment most frequently occur when the gear is being manipulated in some way. By manipulations we mean opening or closing breakers, racking breakers in or out, opening switches, installing or removing motor starters and other such work.

When an electrical failure occurs in non-arc resistant switchgear one or all of the following events can occur:

1. The hot plasma and arcing products can be released in virtually every direction.
2. The explosive force of the blast can cause the equipment to literally fly apart creating extreme hazards from panel doors, molten material, fragmented metal, and hardware.
3. The metallic portions of the gear can become energized via direct or indirect (such as through the conductive plasma cloud) methods.

Clearly, anyone that is operating such electrical equipment is exposed to the hazards of electricity.

Recommended rules for operating electrical equipment

Cadick Corporation recommends our clients employ the following rules pertaining to equipment operation:

1. Only qualified persons should be allowed to operate electrical equipment. Note that OSHA defines a qualified person as *“One who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved.”*
2. During the time that the equipment is being operated, the qualified worker must wear complete PPE including the following:
 - a. Flame resistant clothing rated for the arc-energy as determined by an arc-flash study for that location.
 - b. Electrical insulating gloves rated for the maximum voltage found in the gear being operated. Leather protectors should be worn over the rubber gloves.
3. During the time that the equipment is being operated the qualified worker must use all appropriate safety related work practices including the following:
 - a. Do not stand directly in front of the cubicle or panel containing the equipment (breaker) being operated. Stand to the side of the cubicle or panel.
 - b. Stand as close to the front of the gear as possible during the operation.
 - c. Look away from the gear, take a deep breath immediately before the equipment is operated, hold it until the operation has finished and move in the direction that gets you clear of any arc or blast.
 - d. Listen closely for any sounds that may indicate an imminent failure.

Conclusion

Note that the requirements provided in this paper are a minimum set of guidelines. A specific set of procedures should be developed by each company for their specific needs. However, all of the items mentioned in this paper should be included.