



Electrical Safety - Arc Flash Protection

INTRODUCTION

Of the two major types of electrical hazards generally recognized, the better known is the "Shock hazard". Also known, but with far less awareness as a threat in the workplace and level of incidence, is the "Arc flash hazard".

Canada does not have yet a standard that corresponds to the NFPA 70E "Standard for Electrical Safety Requirements for Employee Workplaces". Does this imply that there are no duties and requirements for employers at this time? Clearly not. Recent federal legislation modifying the *Criminal Code of Canada* was enacted. Bill C-45 affects occupational health and safety, and reinforces established provincial acts (OHSA), addressing the duties and responsibilities of employers and mandating protection of workers. One of the possible measures to comply with the requirements is to adopt the safe work practices outlined in NFPA 70E.

Arc Flash Exposure

Arc flash occurs when an electric current passes through the air between conductors. It is best described as a short circuit through the air. Capable of temperatures as high as 20,000 °C, an electric arc is accompanied by a vast destructive force in the form of concentrated energy radiating outward from the arc, with plasma, molten metal and pressure waves. The potential for harm to the human body is enormous if a worker is within reach of the arc effects. This could happen when work is performed at or near electrically live parts under exceptional circumstances, such as diagnostic live tests, and when de-energizing would introduce an increased hazard.

SAFE ELECTRICAL WORK PRACTICES

The NFPA 70E standard provides guidance to the process of protecting against flash hazards. In particular and most importantly, the first practice is establishing a safe working condition (de-energizing equipment). In addition, a Flash Hazard Analysis should be performed for all equipment where live work is likely to take place (even the action of opening a lever for disconnecting), such as panelboards and switchboards, fused disconnects, switchgear, motor control centers, or industrial control panels. This analysis will provide relevant data to establish the likely incident energy and the flash protection boundary. In turn, this information serves the purpose of selecting appropriate personnel protective equipment (PPE) to perform the required task.

RESOURCES

The NFPA 70E standard can be used for Flash Hazard Analysis through tables and guidelines. More detailed data can be obtained using IEEE 1584, *Guide for Performing Arc-Flash Hazard Calculations*.

The process will not be complete without the follow-up steps of labelling the equipment, training personnel in electrical safety and arc flash hazards, and obtaining the range of PPE required for the equipment.

This process can be readily performed by large organizations or those with in-house expertise. Others that don't have the time or expertise can contract a third party to take them through the full (or parts) of the process. In the absence of a Canadian standard, and given the importance of protecting against the serious consequences of arc flash hazard, commercial and industrial users can utilize NFPA 70E to reduce the exposure and protect against arc flash hazard.

PERSONAL SAFETY TIPS

Outlets

Check for outlets that have loose-fitting plugs, which can overheat and lead to fire. Replace any missing or broken wall plates. Make sure there are safety covers on all unused outlets that are accessible to children.

Appliances

If an appliance repeatedly blows a fuse, trips a circuit breaker or if it has given you a shock, unplug it and have it repaired or replaced.

Never place a halogen floor lamp where it could come in contact with draperies, clothing or other combustible materials.

Water and Electricity Don't Mix

Don't leave plugged-in appliances where they might fall in contact with water. If a plugged-in appliance falls into water, NEVER reach in to pull it out - even if it's turned off. First turn off the power source at the panel board and then unplug the appliance. If you have an appliance that has gotten wet, don't use it until it has been checked by a qualified repair person.

Taking electricity for granted ??? Could be fatal

Electrical contacts can kill

FACT: A plant employee received an electrical shock and burns to both hands due to improper lockout procedures.

FACT: One worker was killed and two seriously injured when they rolled their scaffold into a high voltage conductor.

Lesser Known Proverb

Change is inevitable - except from a vending machine.

HSP Employee Profile



David Garcia, P. Eng.
Electrical Engineer
dgarcia@hsp.ca

David has over 25 years experience as an electrical engineer in various industries including pulp and paper, chemical and glass manufacturing. He has carried out all aspects of electrical engineering, design and project management, in areas including control systems and automation, power distribution systems and instrumentation. He has spent the last 12 years providing services in a consulting environment.

SAFETY SLOGANS

Plug into electrical safety

Look Up. Stay Clear. Stay Alive.



Project Profile

Installation of On-machine Induction Heaters Process Modification

The project, requiring multi-disciplinary coordination and careful timing of events, entailed:

- Construction of a new electrical room to house a new substation, resolving the additional power requirements while improving area distribution.
- Construction of an air handling facility to support cooling and moisture removal from the paper sheet.
- Retrofitting an electrical distribution system in the area to service a multi-zone control across the paper machine width.
- Fitting the induction heater structure in a congested process area, while minimizing the machine downtime.

HSP provided the preliminary engineering, detailed engineering, construction bid specification, and supplemented the commissioning team of the client to bring this project to its conclusion.

Installation of Outdoor Load Centre

This project consisted of the replacement, as a result of electrical failure, of a complete substation consisting of a transformer and load centre in a new building. The following services were provided:

- Initial assessment of failure, cable testing and report on conditions and requirements.
- Design of distribution system, specification and approval of proposed equipment.
- Structural design of pad and building to house the load centre.
- System power analysis and coordination of the area serviced by this load centre.
- Project support through construction and energization of new equipment.

HSP provided the project management, engineering services for detailed design of facility, construction instructions, equipment approval, and supplemented the commissioning team of the client to bring this project to conclusion.

HSP Inc.

Engineering and Environmental Services

Please send correspondence to:
103 Warner Drive
Long Sault, ON K0C 1P0
Phone: 613-932-3289
Fax: 613-937-0125
Email: engineering@hsp.ca
Web Site: www.hsp.ca

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**103 Warner Dr.
Long Sault, Ontario
K0C 1P0**

TO:

HSP Topics

by David Gordon

Letter of Appreciation

Late last fall, HSP received a letter of appreciation from the Stormont County Fair board for our support of the ball tournament held each year during their annual fair on Labour Day weekend. Each year, we provide large size tournament schedules, prepared on AutoCad, which are used to display game times and game results throughout the tournament.

Lesser Known Proverb:

The 50-50-90 rule: Anytime you have a 50-50 chance of getting something right, there's a 90% probability that you'll get it wrong.
