

LEARNING ABOUT ARC FLASH AND SHOCK

By Cindy Chan



(PHOTO BY SAMARA FUNK.)

Terry Becker (pictured) says shock is more common than arc flash.

It comes as no surprise that people should be careful when working with portable cord- and plug-connected electrical equipment or when close to overhead power lines – otherwise, they may

experience an unpleasant shock and possibly be electrocuted.

A seasoned professional in the world of electrical safety, Terry Becker, who hails from Calgary, Alta., is shining some light on the facts of arc flash and shock safety. Becker, an engineer, senior management consultant and electrical safety expert of his company Electrical Safety Program Solutions Inc. (ESPS), says that it's important to differentiate the two electrical hazards of arc flash and shock because the former doesn't happen quite as often as the latter.

"The industry is fixated on arc flash, and unfortunately an electric shock hazard is where most electrical workers are getting injured," Becker clarifies.

According to the CSA Z462 Workplace Electrical Safety Standard, an arc flash is "a dangerous condition associ-

ated with the possible release of energy caused by an electric arc."

"An arc flash can occur when there's an abnormal condition on the energized electrical equipment. An arcing fault can be created if the voltage is high enough. The sustained arcing fault will quickly evolve into an arc flash resulting in an explosive release of harmful energy," Becker says. "The big problem is the heat that is released; an arc flash coming out of electrical equipment has a plasma cloud of heat that can burn an electrical worker."

The primary hazard of an arc flash event is heat, sequentially burning electrical workers. The ultraviolet light and infrared light can also cause damage to their eyes, and the noise from the event can cause hearing damage. The heat will melt the electrical equipment, and there is also an arc blast pressure released as copper turns into vapor. According to Becker, the solid copper vaporizes, expanding 67,000 times, creating a pressure wave.

"Only an electrician and other task-qualified workers should be exposed to an arc flash," Becker says. "These trades perform energized troubleshooting and diagnostic work tasks."

Becker says an arcing fault is a smaller version of "a lightning bolt that travels through air from a high-voltage charge in the clouds that dissipates to earth."

Electrical current flows from a higher voltage to a place with no or low voltage where it discharges. However, when electricians create an arc and the voltage is high enough, the arc is sustained and becomes an arc flash event.

An advertisement for EECOL Electric. At the top left is the EECOL logo, which consists of a stylized 'E' inside a circle followed by the text 'EECOL ELECTRIC'. To the right of the logo is the text 'YOUR COMPLETE ELECTRICAL SUPPLIER'. Below this is a paragraph of text: 'EECOL has the best selection in the industry. The most knowledgeable people. From Wire to Lighting, Data, Security/CCTV and Safety Equipment, to a full range of Utility and Automation products, EECOL has what you need to make your job easier.' Below the text is a grid of images showing various electrical products like light bulbs, switches, and tools. To the right of the grid is a large, detailed image of a futuristic robot. At the bottom left of the advertisement is the text 'VISIT US TODAY' followed by a list of locations: Winnipeg, Brandon, Thompson, The Pas, Flin Flon, Winkler, Thunder Bay, Dryden, Kenora, and Red Lake. At the bottom left is the website 'www.eecol.com'.

“The electrons get out of the wire, and when they get out of the wire and flow through air, it’s not normal,” Becker explains, adding that the electrons change state from becoming useful energy in a wire to potentially harmful energy in the form of the arc flash event.

As long as the electrical workers follow appropriate work practices as outlined in the CSA Z462 Workplace Electrical Safety Standard and wear protective clothing called arc-rated clothing, arc flash events should not occur. If they do, the burn would be limited to second degree or curable.

Unlike arc flash events, shocks are far more common in causing injury to electricians and non-electrical workers. Becker says it’s more dangerous than an arc flash event because for low voltage – which is anything less than 750 volts – the injury is invisible; we may not see any visible injury on the outside of the body.

“Electricians can be shocked when they go into energized electrical equip-

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ment with their bare hands when there are exposed conductors and circuit parts with voltage as low as 120 volts,” Becker says. “They can make inadvertent movement with their hands when they get too close or make contact and there’s voltage present, they will get shocked. It’s an invisible injury – the current flows through our body. The victim would feel pain but you wouldn’t see any injury.”

However, if the voltage is higher, it can cause thermal injury and, as a result, tissue damage.

“The electric current can cause a burn to tissue internally and externally,” Becker says.

However, Becker insists that all workers can reduce the risk of electric shock by ensuring they use pre-inspected cord- and plug-connected electrical equipment, extension cords and use ground fault circuit interrupters (GFCIs) when required.

“An electrician that has to open up energized electrical equipment for the purposes of maintenance must be protected from both shock and arc flash,” Becker says.

For more information on arc flash and shock safety, visit www.esps.ca and www.arcflash-training.ca. ❖



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