

AN ANNEX PUBLISHING & PRINTING INC. PUBLICATION • VOLUME 48 • ISSUE 1

# Electrical Business

JANUARY 2012

You are?  
So are we.

We're all on page 5.

# Safety is as Safety does!

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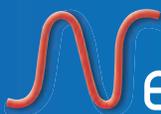
### ■ Also in this issue...

- The A to Z of an Electrical Safety Program
- Use of approved electrical equipment
- The value of PPE testing documentation

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One of the struggles ... is combating the belief that energy is a fixed cost.

## You cannot manage what you do not measure

That was an important takeaway from Energy 2011 “A Lean and Green Future: Making Energy Visible” conference.

The Canadian Industrial Program for Energy Conservation (CIPEC)—in partnership with Canadian Manufacturers & Exporters (CME) and NRCan—recently brought together leading Canadian energy experts, industry leaders and energy efficiency suppliers to share best practices and explore the new frontiers in industrial energy efficiency at Energy 2011.

One particular session that sticks out in my mind was “Making Energy Performance Visible through Energy Management Information Systems” or EMIS. Delivered by Peter Bassett of Energy Performance Services Canada and Pat Burke, electrical systems coordinator with Flakeboard, this presentation taught delegates how an EMIS can help make energy performance visible so that people at different levels of a company can make informed energy management decisions, and take effective action to systematically create value for your firm and enhance your competitiveness.

Burke discussed his challenges and successes with implementing a proactive EMIS at Flakeboard’s St. Stephen plant, and made sure to credit Efficiency NB for helping Flakeboard get the ball rolling.

Flakeboard’s EMIS at St. Stephen collects data in real time on a host of variables, such as the product being manufactured at that specific moment. Burke learned, for example, that lighting alone was costing the facility

\$260,000 annually, making the argument for a \$210,000 lighting retrofit a no-brainer. He learned that, sometimes, proactive energy management means leaving machinery On rather than turning it Off.

Counter-intuitive, you would think, but sometimes true.

And unless you measure, you cannot manage.

Flakeboard was recognized with a CIPEC Leadership Award at Energy 2011 for deploying a fully integrated EMIS, which helped them reduce peak demand by 1.2 MW in 2011, saving them \$250,000 annually on energy costs. All this was achieved because of the important lesson Burke learned: you cannot manage what you do not measure.

One of the struggles I learned about when someone is trying to be proactive about managing energy consumption is combating the belief that energy is a fixed cost. In reality, we know energy consumption is anything but, hence the conference mantra “Making Energy Visible” because, as Burke pointed out, technology is pointless without a well-run program. And a well-run program has to have everyone’s buy-in... from the mechanical room to the boardroom.

And one more thing: Burke mentioned how difficult it was finding knowledgeable energy management consultants. I smell opportunity... do you? **EB**

*Anthony Caplan*



On the cover and page 16

### The A to Z of an Electrical Safety Program

Let’s review an example Electrical Safety Program framework and identify where you may have fallen short. We will identify a project-based approach for executing the development of an ESP... from A to Z. (Photo courtesy ESPS.)

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In just three years, CSA Z462 “Workplace electrical safety” has had a significant impact on the Canadian electrical industry. So what changes can we expect when the second edition arrives this month?



### 12 The value of testing documentation a.k.a. “Do you know where your arc flash suit has been?”

You have completed the hazard identification and risk assessment procedure as outlined in CSA Z462 but, in the process of deploying the appropriate PPE, you should be aware of the required testing documentation. Otherwise, how do you know the PPE will perform as expected?



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**Hubbell Canada signs strategic agreement with Cavet Technologies**

Hubbell Canada LP ([www.hubbellonline.com](http://www.hubbellonline.com)) has signed a strategic agreement with Cavet Technologies ([www.cavettech.com](http://www.cavettech.com)) to sell the latter's LumiSmart ILC. Developed for the commercial and industrial markets, LumiSmart ILC is purpose-built to reduce "power being consumed by existing and installed fluorescent lighting systems".

"Being a good steward of the environment is good for business," said Debbie Drozda, director of sales & marketing, lighting, for Hubbell Canada LP. "Cavet's LumiSmart complements our overall green business strategy and our sustainable lighting solutions offered through our GreenWise program." LumiSmart is suitable for office buildings, industrial spaces, healthcare facilities, retail, parking garages, etc.

# Electrical Business

January 2012 • Volume 48 • Issue 1

ELECTRICAL BUSINESS is the magazine of Canada's electrical community. It reports on the news and publishes articles in a manner that is informative and constructive.

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Published by Annex Publishing & Printing Inc.  
222 Edward Street, Aurora, ON L4G 1W6  
Phone: (905) 727-0077 • Fax: (905) 727-0017

PUBLICATION MAIL AGREEMENT #40065710  
RETURN UNDELIVERABLE CANADIAN ADDRESSES  
TO CIRCULATION DEPT.  
P.O. Box 530, Simcoe ON N3Y 4N5  
e-mail - [kthomson@annexweb.com](mailto:kthomson@annexweb.com)

United States Second Class Postage Paid at Lewiston, NY  
(USPS-741-470) US POSTMASTER: Send address changes to  
ELECTRICAL BUSINESS, P.O. Box 8145, Lewiston, NY 14092

Printed in Canada  
ISSN 0013-4244

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**SUBSCRIPTION RATES:**  
Canada: Single issue \$7.00 • Ten issues: \$35.00 (includes tax)  
USA: \$59.00 (US) and International: \$75.00 (US) per year

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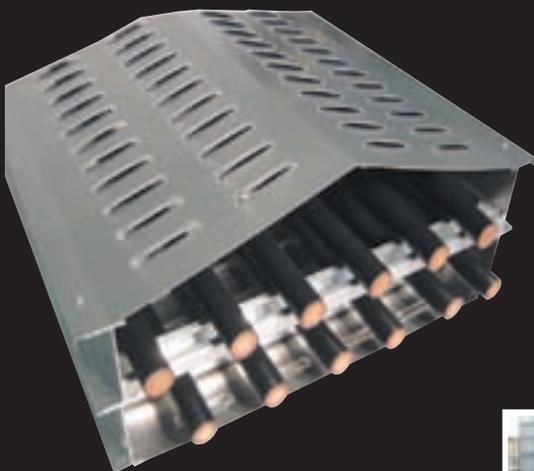
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**ABB invests in a utility-scale concentrating PV solar power company**



ABB ([www.abb.com](http://www.abb.com)), a global power and automation technology group, will invest about \$20 million as part of a \$35-million financial round for a “substantial” minority stake in California-based GreenVolts ([www.greenvolts.com](http://www.greenvolts.com)), a provider of turnkey concentrating photovoltaic (CPV) systems.

Through the investment, ABB gains access to GreenVolts’ proprietary technology and can now offer turnkey solutions for CPV power plants in addition to its current capabilities in solar thermal and conventional PV power plants.

GreenVolts’ CPV system is more efficient than traditional photovoltaic and thin-film modules, says ABB. By optimizing and integrating components such as proprietary optics and tracking technology into a complete system, explains ABB, GreenVolts delivers energy yields that can be 30-40% higher than traditional panel-based systems.

“The technology combines simplicity and precision with unmatched performance, fast installation, easy operation and low cost of production,” said Peter Leupp, head of ABB’s Power Systems division. “Our extensive footprint, which covers all key solar markets in the world, will help us to make this technology globally accessible.”

GreenVolts solar systems are designed to meet the operational requirements of a range of applications for utilities and industries, as well as commercial, agricultural and public sector customers.

**Sonepar Canada acquiring Dixon Electric**

Sonepar Canada ([www.soneparcanada.com](http://www.soneparcanada.com)) is acquiring Dixon Electric ([www.dixonelectric.ca](http://www.dixonelectric.ca)), a full-line electrical distributor in Northern Ontario. The acquisition is scheduled to be completed by January 2012.

“Dixon Electric shares Sonepar Canada’s core values and is an ideal addition to our community

of businesses,” said Francois Anquetil, president and managing director of Sonepar Canada. “We look forward to further strengthening our professional relationships and portfolios in Ontario, while also continuing to lead the way in the field of electrical distribution in Canada.”

With offices in Sudbury, Timmins,

Sault Ste Marie and North Bay, Dixon provides a complete line of electrical products, specialized services and customer support. It has been in business for over 50 years and has developed into a company focused on supporting the local mining and forestry industry.

“Dixon Electric has a proven track record over the past 50 years

of servicing the electrical industry with reputable products and excellent customer service”, said Anquetil, “We are pleased to welcome Dixon Electric to the Sonepar Canada family”.

Dixon Electric will join Sonepar Canada’s Ontario division, consisting of Gescan, Osso Electric, Sesco and Texcan.

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**Charges laid against Wal-Mart and supervisor after young worker electrocuted**

WorkSafeNB has reported that on January 5, 2011, 17-year-old Patrick Desjardins died from an electrical shock he received while using a floor buffer that had been plugged into a standard 110-volt power source. He was working on a wet floor at the Wal-Mart store in Grand Falls, N.B.

WorkSafeNB has issued several orders against

Wal-Mart, including: an order to take all reasonable precautions to protect its employees; to ensure that electrical equipment is suitable for its intended use and that it is installed, maintained, modified and operated in accordance with the manufacturer's specifications; and, to ensure that a tool is of good quality, is inspected, maintained and repaired by a competent person and is stored in a proper area. WorkSafeNB laid seven charges against Wal-Mart, saying it failed to ensure:

- Health and safety of employees by allowing the use of an inappropriate floor polisher and a faulty extension cord in the garage area;
- Employees complied with specific requirements when using a tool;
- Garage was inspected by the employer at least once a month to identify any risks to the health and safety of the employees;
- A tool (a floor polisher) was inspected before use and repaired or replaced if necessary and was maintained in proper working condition;
- Employees were instructed to use a tool (a floor polisher) only for the specific purpose for which it was designed;
- An electric power-operated hand tool (a floor polisher) is tested for the effectiveness of the double insulation or bonding to ground before each use by a continuity tester or ground fault circuit interrupter; and
- Electrical equipment is suitable for its use and that it is maintained and modified in accordance with the manufacturer's specifications by permitting the use of a faulty extension cord in the garage area of the store.

Additionally, WorkSafeNB laid two charges against a supervisor, which include:

- Failure to ensure the health and safety of employees by allowing the use of an inappropriate floor polisher and a faulty extension cord in the garage area, and
- Failure to acquaint an employee with any hazards in connection with the use of a tool or machine, namely a floor polisher.

The case is now before the courts.

**Hazard Alert: S&C overhead pole-top style SMD-20 fuse mountings**

S&C Electric ([www.sandc.com](http://www.sandc.com)) says that polymer insulator furnished on certain S&C overhead pole-top style SMD-20 fuse mountings may fracture when the fuse is opened with an S&C Loadbuster loadbreak tool. Should this occur, the unsupported upper portion of the insulator could—depending on the utility's construction practices—make contact with an energized conductor, resulting in electrical arcing.

Only single-insulator mountings furnished with a polymer (not a porcelain) insulator are potentially subject to this issue. They include the following catalogue numbers:

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S&C says all mountings manufactured in 2011 are potentially susceptible to this issue. The company says it is continuing its investigation to determine whether a larger manufacturing date range is affected. Once a date range has been identified, a second letter will be issued with its findings.

For further information, contact David Moore, customer service manager, at david.moore@sandc.com or (416) 249-9171 ext. 3314.

**Electricity industry must hire now says Electricity Sector Council**

There are tens of thousands of skilled and soon-to-be skilled workers; this industry must hire to continue delivering reliable electricity to Canadian homes and businesses to meet our economy's energy needs. This is among the revelations and conclusions stemming from the Electricity Sector Council's (ESC's) "Power in Motion" (2011) Labour Market Information (LMI) study, which reveals/contains:

- 45,000 new skilled workers are needed over next five years.
- Data on 30 critical electricity occupations with key information from 89 employer organizations and 47 post-secondary institutions in 140 labour markets.
- A new LMI model which forecasts future labour market trends for each occupation.
- The electricity and renewables sector's competitive advantages and an action plan.
- How united action can maximize limited resources and make the most effective use of labour markets.

These workers will be refurbishing our aging legacy infrastructure, building and operating the next-generation infrastructure (enabling the transition to renewable resources), and replacing a rising wave of experienced retirees, says ESC.

Projections from 2011 to 2016 focus on the need to attract immigrants and workers from other industries. Other employers, though, are looking for the same workers such as engineers, technicians and technologists, and skilled trades with five or more years of experience. Electricity and renewable sector employers looking for these candidates will face stiff competition.

Program partners whose early support made the undertaking of this study possible include: ATCO Electric; Horizon Utilities Corp.; ATCO Power; Hydro One Inc.; Battle River Rural Electrification

Association; Hydro Ottawa; BC Hydro; Nalcor Energy; City of New Westminster Electricity Utility; Ontario Power Generation; NB Power; St. Thomas Energy Services; ENMAX Corp.; Toronto Hydro Corp.; FortisBC; Yukon Energy; Alberta Electric System Operator; Guelph Hydro Electric Systems Inc.

The 2011 LMI Report will be available for purchase January 31. Email info@brightfutures.ca to purchase a copy. **EB**

**ORGANIZATIONAL NEWS**

*Nathalie Pilon, President, Thomas & Betts Canada, announces the following organizational changes:*

**Reg Clark - Retirement**



After close to 40 years of dedicated service at Thomas & Betts, Reg Clark, Vice President, Industrial, will retire on February 1<sup>st</sup>, 2012.

Reg started at Thomas & Betts in 1972 as a Sales Representative for the Atlantic Region and, after many promotions, he was appointed Vice President, Industrial in 1992. He successfully managed Thomas & Betts' industrial business and was actively involved in the electrical industry in Canada throughout his career. In 2005, Reg was honoured with the prestigious "Tom Torokvei" Independent Electrical Distributors (IED) Recognition Award for exceptional support and leadership.

We would like to thank Reg for his exceptional contribution and dedication to Thomas & Betts and wish him a wonderful retirement. He will be missed.

**David Tracey, Vice President, Industrial**



Effective February 1<sup>st</sup>, David Tracey will take over as Vice President, Industrial, responsible for overseeing all Thomas & Betts sales activities in the industrial market in Canada. During his 29 years of service with Thomas & Betts, Dave has held many positions in sales and marketing including Regional Sales Manager, Atlantic Region.

Dave will be based in our Mississauga, Ontario offices and can be reached at **905.858.2525**.

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# What's new in the second edition of "The Standard of Choice": CSA Z462?

Daniel Roberts

What impact has the first edition of CSA Z462, "Workplace Electrical Safety Standard", had on the electrical industry? According to the Alberta Occupational Health & Safety Code (2009), "for some employers, Z462 is becoming the standard of choice... an industry best practice".

WorkSafe BC guidelines, meantime, indicate that "employers may find CSA Standard Z462 to be valuable in assisting them in the creation of appropriate written safe work procedures, determining the hazards, and the necessary protection".

And when the Province of Newfoundland & Labrador revised its electrical safety regulations in 2009, it instituted a requirement for employers to implement an electrical safety program that is based on a "standard acceptable to the minister"—a statement considered by many to refer to CSA Z462.

And, last but not least, with sales in excess of 10,000 units, CSA Z462 has become the best-selling CSA standard after the Canadian Electrical Code.



Charred remains of "flame-resistant" raingear on the left versus intact "arc-rated" raingear on the right. A worker wearing the yellow raincoat would have received serious, if not life-threatening, injuries. The lining of the "arc-rated" raingear is intact and undamaged. A worker wearing this raincoat would have been protected.

There's no doubt about it: in just three years, CSA Z462 has had a significant impact on the Canadian electrical industry. So what changes can we expect to see when the second edition of Z462 arrives in January 2012?

## Worker safety training and audits

How often should workers receive electrical safety training? The current edition requires worker re-training at intervals sufficient to maintain an appropriate level of

awareness, or more frequently when evidence indicates otherwise. The 2012 Z462 edition will specify that re-training intervals must not exceed three years. It is hoped that this will ensure that employee training remains current with the changes that occur every three years in Z462.

How does an employer know that the training he provides is effective or being implemented? A new requirement to audit field work will enable employers to identify deficiencies in training, procedures or the employee's work habits. Regular field audits will enable employers to implement appropriate corrective actions and provide evidence of due diligence.

## What about direct current?

The electrical safety-related work practices in the current edition of CSA Z462 primarily address alternating current (AC), not direct current (DC). This gap has been addressed with both new and added requirements specific to DC. A new DC shock protection approach boundary Table has been added to supplement the existing AC table. Annex D, where various arc flash energy and boundary calculation methods for AC are found, was revised to include a calculation method for DC.

Finally, for those who like to use the Hazard/Risk Category method

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to determine arc flash personal protective equipment (PPE) requirements, a Table was added for DC equipment.

### New personal protective equipment (PPE) tables

If your organization has taken the plunge and is performing (or has contracted someone to perform) engineering calculations to determine potential arc flash energy exposures, how do you go about selecting the appropriate arc flash PPE? A Table has been added to Annex H that identifies the appropriate arc flash PPE based on potential arc flash energy exposure levels.

Why was a new table needed? Most people currently attempt to use the Hazard/Risk Category PPE Table 5 to identify arc flash PPE requirements. However, this approach is problematic, as this Table was not designed for that purpose. For example, most people assume that Hazard/Risk Category 0 refers to incident energy level between 0 and 1.2 calories/cm<sup>2</sup>, but nowhere does Z462 indicate this to be so.

In fact, there is no relationship whatsoever between Hazard/Risk Category 0 and any level of incident energy. Hazard/Risk Category 0 actually refers to the risk, or likelihood, of an arc flash incident as being “extremely low”.

### Clearer, more consistent terminology

“What’s in a name?” asked Shakespeare. While a rose by any other name may smell as sweet, clear and consistent technical terminology avoids confusion and provides a common platform for discussion and communication of electrical hazards and risk.

Three important revisions to terminology are:

- “arc-rated”
- “hazard” and “risk”
- “arc flash boundary”

For decades, the terms “flame-resistant” (FR) and “arc-rated” have been used interchangeably when referring to arc flash personal protective equipment. While all arc-rated PPE is flame resistant, not all FR material is, or can be, arc rated. To address this potentially fatal confusion between FR PPE and arc-rated PPE, the next edition of Z462 will consistently use the term “arc-rated” when referring to arc flash PPE.

The current standard frequently refers to “hazard” and “risk” as

though the terms were synonymous, but they are not. A hazard is a source of harm; risk is the combination of the likelihood of the occurrence of harm and the severity of that harm. Hazards are identified and eliminated, while risks are assessed and controlled.

In the next edition of Z462 (with the exception of the Hazard/Risk

Category method), the use of these two terms will align with internationally accepted standards on risk management. Annex F, Hazard Identification and Risk Assessment, has been completely rewritten, and is an excellent introduction to electrical hazard identification and risk assessment.

With more than 10,000 units sold, CSA Z462 is now the best-selling GSA standard after the Canadian Electrical Code.



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The term “arc flash protection boundary” has been revised to “arc flash boundary”. This may seem like a subtle, almost meaningless revision; however, as defined, an individual standing at the arc flash boundary can potentially receive a second-degree skin burn on unprotected skin. By deleting the word “protection” from the term, it is hoped that awareness is created that a serious burn injury is possible at or close to the arc flash boundary unless a worker is wearing the appropriate personal protective equipment.

How often should workers receive electrical safety training? One change of the 2012 edition will specify that re-training intervals must not exceed 3 years.



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#### Revised Hazard/Risk Category tables

The Hazard/Risk Category method was devised as a simple, quick method to identify arc flash PPE requirements for those that did not have the ability to perform arc flash calculations.

When the worker or employer knows the short-circuit current and fault clearing time, they could use this “short-hand” method (provided these two pieces of information did not exceed the Hazard/Risk Category Table parameters). This was an important yet often-overlooked detail because the parameters were buried in fine print notes at the end of the Table. These parameters have been moved into the Table itself in the hope they will not be ignored.

Additionally, Hazard/Risk Category Table parameters were used to calculate an arc flash boundary for each section of the table. This is an important addition because the provision for “default” 4-foot arc flash boundary for low-voltage equipment was deleted. This “default” boundary had limiting parameters that were also usually ignored. The arc flash boundary will now be the distance at which incident energy is  $1.2 \text{ cal/cm}^2$ .

If your company has already created an electrical safety program using CSA Z462 (2008 edition), you will find it fairly easy to update your program requirements to the 2012 edition. If your company has yet to establish an electrical safety program, CSA Z462 2012 is a great place to start. **EB**

*Daniel Roberts is the national safety manager for Schneider Electric Canada, Services & Projects Division. He serves as a technical committee member on the Canadian Electrical Code Part I, CSA Z1001 OHS Training Standard, and CSA Z1002 OHS Risk Management Standard technical committees. He is vice-chair of the CSA Z462 Workplace Electrical Safety technical committee. He can be contacted at [daniel.roberts@ca.schneider-electric.com](mailto:daniel.roberts@ca.schneider-electric.com).*



Dave Smith |

## Entering indoor substations

### Part seven

(At the end of Part 6 “Entering indoor substations” in November 2011, Dave explained the importance of knowing escape routes in case of emergency, how to use a fire extinguisher [and knowing which type you’re using], differentiating between high- and low-voltage switchgear, etc.)

**A**lways know where you are to any machine in relation with your body! As you move into the substation, keep your hands and arms close and your body away from the covers of the switchgear. All new switchgear has microprocessor and digital relays, but there are still many substations loaded with electromagnetic relays, and bumping or hitting these—or slamming a door—can cause a substation to trip, so make sure you stay away from the equipment.

You may be there to change the filters in an air-conditioning unit or check a fire alarm. You may be there to collect data from the instrument panel on the switchgear. If you’re going to work in the substation above the equipment, then understand that, should you fall off your stepladder and bump the equipment, it may cause sensitive equipment to trip out.

In many substations, fire alarm systems are located directly above switchgear, and a fire alarm technician has to lean over or step on the equipment. The difficulty there is that you could shake and trigger something and cause the system to shut down.

When you’re in a substation, you want to be there for as little time as possible. There have been instances where the protective gear—the circuit breakers—have tried to clear a fault, failed to do so, and suddenly there’s an explosion in the switchgear. Understand that most installed switchgear is not arc-resistant.

In the last 10 years, new stations have increasingly been built with arc-resistant switchgear, meaning they’re built heavier; doors are heavier, hinges are heavier, with baffles on the top of the switchgear directing any explosion upward.

But when the gear is not arc-resistant, it falls into a grey area. What do you do when the incident energy behind the door is 35 calories (that’s a Category 4 exposure)? What does the door do for you? In an explosion, the door will bulge. The door will blow open under a bigger explosion; and, when the explosion is big enough, it will blow the door off its hinges.

But it is ridiculous to expect you to wear a

When you’re in a substation, you want to be there for as little time as possible...

Understand that most installed switchgear is not arc-resistant.

Category 4 flash suit simply because you’re in a substation. Common practise is this: when you are inside and the doors are closed with properly running equipment, then the Category 4 is behind the door. When you’re gathering data, reading an instrument, turning an ammeter or voltmeter dial (you know... minimally invasive actions), then you do not require Category 4 clothing.

But, when you are actually operating the equipment, you are at greater risk. At this point it becomes a judgement call. Were a big explosion to happen, a non-arc-resistant door would be blown off its hinges. You would be exposed to 35 calories of incident energy and, were you wearing clothing that is rated for less than that, your clothing could not protect you, and you’re on your way to the burn unit.

In CSA Z462 “Workplace Electrical Safety” and NFPA 70E “Standard for Electrical Safety in the Workplace”, the Task tables describe common tasks, the estimated Hazard/Risk Category (which directs you to minimum PPE required), and whether rubber gloves or tools are required.

Hazard identification is Task based but risk assessment is subjective: is the equipment dirty or clean? Is it old or new? Is it well-maintained and clean, or neglected and contaminated? Is it dry or damp? You can see how subjective risk evaluation can be; however, it may cause you to increase the personal protective equipment (PPE) you are wearing... just to be on the safe side.

Until next time, be ready, be careful and be safe. © **EB**

*Canada Training Group has been providing consulting services to industry since 1980; Dave Smith, the president, can be reached at davesmith@canada-training-group.ca. At [www.canada-training-group.ca](http://www.canada-training-group.ca), you will find this article (and others) available to you. Feel free to use them to support your own safety program and other initiatives.*

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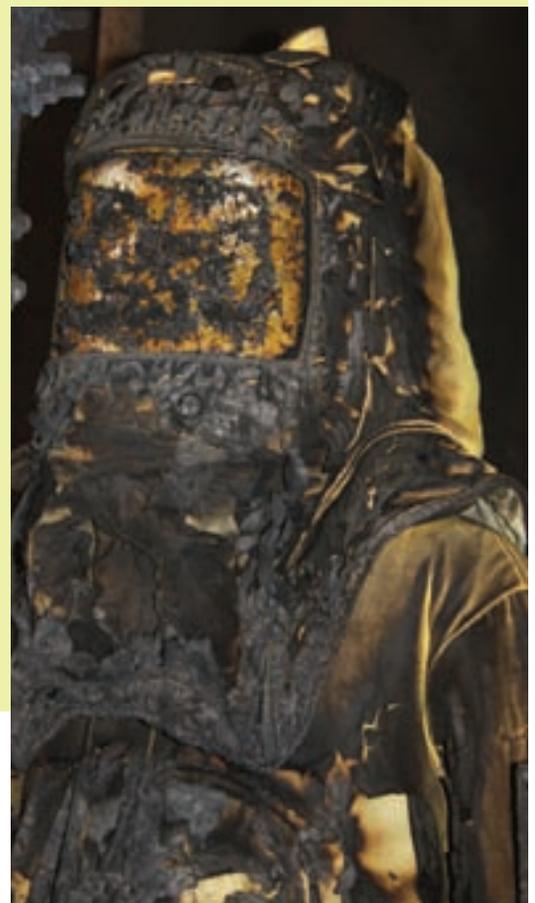
# Do you know where your arc flash suit has been?

## THE VALUE OF TESTING DOCUMENTATION

Jim Pollard

You have now completed the hazard identification and risk assessment procedure as outlined in CSA Z462. In the process of deploying the appropriate personal protective equipment (PPE), you should be aware of the required testing documentation. Otherwise, how do you know the PPE will perform as expected in the event of a catastrophic arc flash accident?

Electrical-specific PPE, such as arc-rated arc flash suits, coveralls and faceshields, can be managed effectively within your electrical safety program. The required testing and/or certification documentation for each PPE item shall be filed in the PPE section of your program, but where do you start? Who should be your first point of contact if you now find yourself having to backtrack and collect the documentation for arc-rated PPE you previously deployed?



### Where do you get started?

The answer to all of the above is the manufacturer or supplier of the finished product. Regardless of who manufactured the various components, it is the finished product manufacturer that is responsible for certifying the PPE item to such standards as ASTM F1506-10a "Standard Performance Specification for Flame Resistant Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards".

In most cases, the manufacturers of arc-rated apparel have never seen the inside of a testing laboratory. Instead, only the textile material or fabric component has been tested. This leaves many consumers questioning whether the arc-rated apparel currently being worn by their electrical workers will perform as expected with respect to closures, stitching, seams, etc., that could compromise the safety of the worker in the event of an arc flash accident.

ASTM F2621-06 "Standard Practice for Determining Response Characteristics and Design Integrity of Arc Rated Finished Products in an Electric Arc Exposure" was developed to satisfy the uncertainty of arc-rated PPE consumers and provide testing results for finished goods. However, this testing method is one of the industry's best-kept secrets, and is neither listed in CSA Z462-12 nor NFPA 70E-12. This testing documentation might be available from your PPE manufacturer, but it is the consumer's responsibility to require this as part of his tender specifications.

Do you value the safety of your worker's face and head as much as you do their body? The answer, of course, is Yes but, with respect to testing documentation, the head and face are the areas of your worker's body that are

most commonly overlooked. Arc-rated arc flash suit hoods and faceshields are tested as finished products. When ASTM F2178-08 "Standard Test Method for Determining the Arc Rating and Standard Specification for Face Protective Products" was first approved in 2002, this requirement changed the electrical-specific PPE industry forever.

Prior to the introduction of ASTM F2178, arc flash hoods with clear, non-arc-rated faceshields were being used. When evaluating arc flash suits (in lieu of having an ASTM F2621-06 test report for the finished product), the ASTM F2178-08 test report is only way of knowing whether your worker's face and head protective equipment has been tested.

In a perfect world, both the ASTM F2621-06 and ASTM F2178-08 test reports would be available for any arc flash suit. Understanding the arc-rated arc flash suit hood testing method is conducted using the finished product; the arc rating is a system value attributed to the protection provided from both the textile material and the hood window or faceshield. Even when the manufacturer of the arc flash suit uses the same fabric in the construction of all suit components (hood, coat, bib-overall, etc.) the arc rating of the hood is usually different.

It is extremely rare for the hood arc rating to match the performance of the suit material, and such an anomaly should raise a red flag for any consumer concerned about product compliance. ASTM F2178-08 is both a testing method and standard specification that includes requirements for the hood window to be impact-rated (high mass and high velocity) as per ANSI Z87.1-2010, and marked accordingly with a "+" symbol. Therefore, when your arc flash suit hood is compliant with ASTM F2178-08, the product will also provide high-impact protection.

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### Testing as per standards

At present, the electrical-specific PPE industry allows for self-certification to standards such as ASTM F1506-10a. For better or worse, PPE manufacturers are trusted when their labels read “Compliant with...” or “Meets...” the required standard(s). In the process of manufacturing apparel for use by electrical workers, manufacturers usually purchase the textile materials from various external sources.

At the very heart of any compliant arc-rated apparel will be a flame-resistant textile material that was tested at the Kinectrics laboratory by either the textile manufacturer or a testing consultant. These reputable sources will then provide the finished product manufacturer with testing documentation such as an ASTM F1959-06 Test Summary (“Standard Test Method for Determining the Arc Rating of Materials for Clothing”). This testing report is one of the many documents you should have on file for every item and/or system of arc-rated apparel currently in use by your electrical workers.

ASTM F1959-06 test reports are required for single-layer and multi-layer fabric systems; never add arc ratings without having the test report documenting the performance of the layered textile materials in the exact order in which your worker will wear the clothing system.

### Importance of documentation

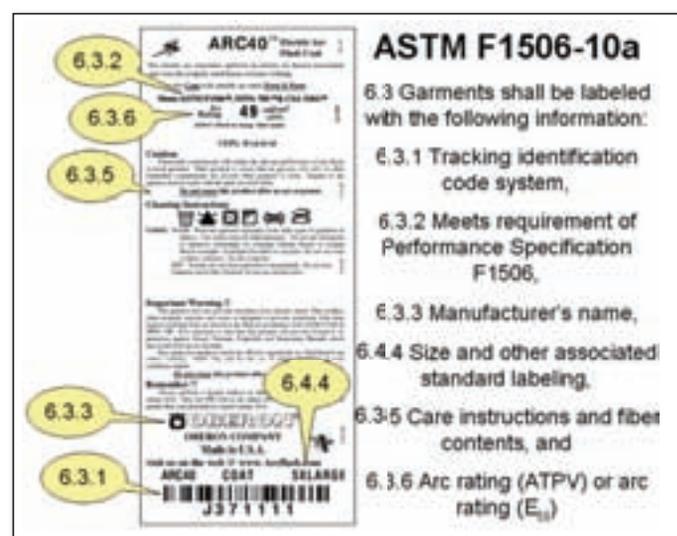
As the industry evolves and new versions of testing methods are released, it is important to keep your testing documentation records current. As an example, earlier versions of the ASTM F1959-06 test procedure did not address the double hump or ablation phenomenon when testing multi-layered fabric systems.

TABLE 1

STANDARD	DESCRIPTION	WHAT TO REQUEST
ASTM F1959-06	Fabric arc rating test	Laboratory testing documentation
ASTM F2178-08	Hood/shield combination test & performance criteria	Laboratory testing documentation
ASTM F2621-06	Finished product testing for arc-rated apparel	Laboratory testing documentation
ASTM F1506-10a	Performance specification for construction of garments	Statement of compliance on garment label
ANSI Z87.1-2010	High mass and high velocity test for impact strength (ANSI Z87.1+ is superior to CSA Z94.3). Visual light transmission (measurement of shield visible light transmittance)	Statement of compliance and/or 3rd-party laboratory testing documentation. Visible light spectral scan including data across all wavelengths from 400 nm to 760 nm.

Knowing that the textile material was tested—and having this documentation on file—is one step toward understanding your electrical-specific PPE. There are other ways to verify whether your arc-rated apparel meets ASTM F1506-10a, such as the garment label.

At their own expense, most consumers of electrical-specific PPE will not hire a testing consultant to verify compliance with the requirements of any specification. One easy, cost-effective way to evaluate product compliance is to understand the garment labelling requirements of ASTM F1506-10a:



Creating a garment label is the easiest part to constructing any arc-rated apparel, so when the label is not compliant, then buyer beware!

Table 1 summarizes the applicable testing and/or certification documentation required for arc-rated PPE.

Knowing where your arc flash suit has been requires that you have collected and filed all of the appropriate testing and/or certification documentation. Catalogues, websites and other forms of manufacturer marketing are not acceptable in lieu of actual documentation.

Product manufacturers, meantime, are required to provide compliance testing and certification documentation to the purchaser as per standards such as ASTM F2178. The safety of your electrical workers depend on your due diligence when selecting appropriate arc-rated PPE. Trust in any electrical-specific PPE manufacturer must be earned, and can only be demonstrated through testing documentation. **E3**

*Jim Pollard is the Canadian sales manager for the Oberon Company and a member of: CSA Z462 Technical Committee; Canadian subcommittee CSC/IEC/TC78 on Live Working; and ULC Committee on S801 and Live Working. He can be reached at [jpollard@oberoncompany.com](mailto:jpollard@oberoncompany.com).*



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# The A to Z of an Electrical Safety Program



Terry Becker, P.Eng.

**H**ave you implemented an Electrical Safety Program (ESP)? If you have, on what did you base the ESP's framework or Table of Contents? Did you consider applicable Occupational Health & Safety Management System standards (e.g. CSA Z1000 or ANSI Z10) for guidance on the content you should have developed in your Electrical Safety Program?

Do the requirements provided in the ESP you developed meet acceptable due diligence requirements? Have you audited your program documentation, or had it audited by a third-party subject matter expert?

This paper will review an example ESP framework and identify where you may have fallen short in developing your ESP. It will identify a project-based approach to execute the development of an Electrical Safety Program, A to Z.

## Effective due diligence to OH&S regulations

Effective due diligence against occupational health & safety codes, acts and regulations in Canada and the United States entails the development and implementation of a management system that allows for the identification and quantification of hazard and risk, and the implementation of appropriate preventive and protective control measures to mitigate or reduce risk to workers.

For electrical hazards, this management system is called an Electrical Safety Program (ESP). Based on Occupational Health & Safety Management System Standards, preventive and protective control measures must be prioritized in the following hierarchy:

1. Eliminate the hazard; de-energize is the first choice.
2. Substitute with other materials, processes or equipment.
3. Reduce the risk by design (e.g. engineering solutions, equipment solutions, “safety by design”, etc. Note: electrical equipment maintenance must be reviewed).
4. Use safer work systems that increase awareness of potential hazards (e.g. apply safeguards like signage, barriers, red tape to establish and Electrical Work Zone, etc.).
5. Implement administrative controls (e.g. training and procedures).

6. Use electrical-specific personal protective equipment (PPE) as a last line of defence, and ensure it is appropriately used and maintained.

In its framework, the ESP should identify preventive and protective control measures that will be deployed to eliminate or reduce risk of exposure to arc flash and shock to acceptable levels. The CSA Z462 workplace electrical safety standard provides a resource and tools to effectively implement a discipline-specific management system.

An ESP should have a structured framework (e.g. Table of Contents) consistent with the guidance provided in Occupational Health & Safety Management System Standards like CSA Z1000 or ANSI Z10. Some jurisdictions having authority (JHAs) may also provide guidance on their expectations, and may also provide a Worker’s Compensation Premium reduction if you have an overall, audited Occupational Health & Safety Management System in place.

In implementing an Electrical Safety Program, the electrical hazards of shock and arc flash must be identified, and processes and systems put into place to mitigate or reduce the risk level of exposure to electrical hazards for workers. An effective ESP is many things, such as a toolbox of resources to apply against eliminating or minimizing the electrical hazards or arc flash and shock.



You may have created a document(s) you feel provide effective due diligence, adequate documented direction and rules for electrical hazard management using applicable standards, like CSA Z462, but did you get it right? Is there room for improvement? Have you audited your Electrical Safety Program?

There may be gaps in your documentation tools, or you may have interpreted CSA Z462 incorrectly.



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# Example of Electrical Safety Program Table of Contents

## Electrical Safety Program

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Understanding whether the processes and systems deployed are working properly and effectively while ensuring workers are competent with them is critical to the success of the Electrical Safety Program and exhibiting appropriate due diligence. Did you include Electrical Incident Reporting, Emergency Response and auditing in your ESP's Table of Contents?

Have you interpreted the arc flash hazard analysis Table Method correctly? Have you properly addressed the specification and identification of electrical-specific PPE, tools & equipment, and covered off inventory and performance management? Have you provided risk assessment tools for your electrical workers within the Electrical Safety Program? Have you addressed electrical equipment maintenance requirements that would lead to ensuring incident energy is as low as possible; that the probability of an arcing fault even occurring is low, and that you can still use the Table Method?

If you have developed, or are considering developing an Electrical Safety Program, make sure you consider the framework requirements that comprise a management system for occupational health & safety. If you have missed categories and content, you may not be providing adequate direction to your workers, nor ensuring that you address such elements as incident reporting and investigation, electrical incident emergency response, and change management.

#### Take a project management approach

A project management approach is recommended for developing an Electrical Safety Program, A to Z (or more):

- A. Plan, Do, Check, Act. Do you have an execution plan (with a schedule), defined deliverables, and a budget approved by management? An ESP will justify and validate the money you have spent to-date, and make it easier to obtain budget funding through its life cycle.
- B. Do you have management commitment and leadership in place?
- C. Do you have a champion and ESP manager? Have you structured a formal ESP steering committee? Did you create an organization chart of your Electrical Safety Program?
- D. Did you define and document roles and responsibilities in the beginning of your ESP? It is critical that this get done, or else the ESP may fail.
- E. Did you review, with the electrical safety steering committee, specific policy requirements that will be defined in the ESP?
- F. Have you communicated to your workers with documented meetings or information bulletins what you will be doing to address arc flash and shock risk, and your policy with respect to CSA Z462 and energized electrical work? Remember, de-energizing is the first choice.
- G. Have you reviewed the work completed to date? Do you have a database of completed engineering arc flash studies? Do you have an inventory of the electrical-specific PPE, tools and equipment purchased to-date? Do you have a procurement specification for arc flash-protective clothing? Have you established a two-level arc-rated clothing system, and do you have consistent ATPV-rated (arc thermal protective value) arc flash suits?
- H. Do you have a specification for engineering arc flash hazard analysis studies so you—not the engineering consultant—control the scope and cost? You need to define the maximum working incident level target, mitigation target and the specification for the detailed Arc Flash & Shock Warning label. You need to control the installation of the label.
- I. Do you understand the arc flash performance of non-rated PPE, tools and equipment?
- J. Have you had all existing PPE, tools and equipment

tested to current acceptable frequencies? Do you understand the requirements for temporary protective grounds?

- K. Have you defined a training matrix for the roles in your Electrical Safety Program?
- L. Do you have documented training records for any arc flash and shock training workers have received to-date? Did supervisors attend? Did supervisors follow up with workers afterward to identify any required corrective actions?
- M. Have you addressed your Contract for Services and OH&S pre-qualification requirements with your electrical contractors? Have you addressed electrical safety via ISNetworld, CanQual, or PICs Auditing?
- N. Have you defined a specification for your detailed Arc Flash & Shock Warning label? Is it too late? As the employer, you—not the engineering consultant—must control the label.
- O. Have you reviewed, and do you understand, the “arc flash hazard”? Normal versus abnormal conditions; probability of an arcing fault occurring and risk related to the work task?
- P. Do you have a clear understanding of “hazard” versus “risk”?
- Q. Have you defined the limitations for rules for non-electrical workers with respect to energized electrical equipment, and normal versus abnormal conditions?
- R. Have you provided electrical hazard awareness training to your non-electrical workers?
- S. Do you have any written electrical safe work procedures?
- T. Have you defined your Working Alone policy for energized electrical work?
- U. Have you assessed the risk of arc blast and established a maximum working incident energy level? Has it been documented?
- V. Did you document your electrical incident reporting & management requirements?
- W. Have you covered off electrical incident emergency response in your Electrical Safety Program? Is it covered by the training you have provided to-date? Do you plan on having mock electrical incident exercises?
- X. If you already have an Electrical Safety Program, have you completed a formal internal audit?
- Y. Has the supervisor of the qualified electrical workers validated their electrical safety competency and followed up on corrective actions?
- Z. Have you measured the performance provided by all of the money and time you have

invested in arc flash and shock hazard management by having an audit completed? Did you prioritize corrective actions and implement them?

By ensuring you have a comprehensive Electrical Safety Program consistent with accepted Occupational Health & Safety Management System Standards and

CSA Z462, you will maximize your due diligence with respect to management of the electrical hazards of arc flash and shock. Have you covered all the elements A to Z? **EB**

*Terry Becker, P.Eng., is the owner of ESPS Electrical Safety Program Solutions Inc. (www.arcflash-training.ca), a provider of electrical safety consulting services and products based out of*

*Calgary, Alta. He has over 20 years of experience as an electrical engineer working in both engineering consulting and for large industrial oil & gas corporations. Terry is the first past vice-chair of the CSA Z462 Technical Committee, and a Professional Engineer in the provinces of Alberta, British Columbia and Ontario. He is also a member of IEEE, NFPA 70E, CSA, NFPA, CSSE, CanWEA and PMI.*

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## In high gear for cash neutral

Your industry is premised on cash flow. That cash flow starts with an owner atop the 'construction pyramid' and works its way, typically, to a general contractor, then to you as subcontractors, then onto subsubcontractors, suppliers and so on.

In today's construction market, you only get paid 90% of your invoices while you do work (10% statutory holdback); and you only get that last 10% well after you have completed your work.

You are being paid on 45+ day terms... if you're lucky!

60 days is becoming a norm in many instances (the old Ontario Mechanics Lien Act used to use 37 days as timing for registering liens). You are required to pay for your labour weekly or biweekly. You are required to pay suppliers net 30 days, and they entice you with 2% discounts when paid sooner. Owners and consultants, meantime, are becoming more aggressive on draws, and are in tune to front-end billing and over-billing.

With all of this, are you not financing your own work in an industry that is totally premised on cash flow? Does the foregoing not require you to be cash negative for the duration of a project? Isn't that counter-productive?

Obviously, none of the above helps with cash flow. The goal, then, is to become 'cash neutral', or as cash neutral as possible.

In the construction context, cash neutral means closing the gap between monies paid out for labour, services and materials and revenues received for the same labour, materials and services provided. When that gap is zero, you are truly cash neutral. A gap of 60+ days between expenditure and revenue is obviously cash negative, leaving you continuously funding your own work for successive 60+ day cycles.

You can to manage this risk contractually by trying to negotiate better payment terms and avoiding such hurdles as Pay When Paid clauses.

As part of a growing movement toward some degree of cash neutrality, the National Trade Contractors Coalition of Canada (NTCCC) has been advocating for something called Prompt Payment legislation at the federal and provincial levels.

Yet prompt payment legislation is not necessarily new; the Americans have had it for many years in what is known as US Code - Title 31: Money and Finance and, in particular, USC 3905 - Sec. 3905 Payment Provisions Relating to Construction Contracts. It mandates that, on U.S. government projects, when the flow of funds downward to trades and suppliers is not being achieved

*continued on page 21*



[www.arcflash-training.ca](http://www.arcflash-training.ca)

### Multi-Media State-of-the-Art Online Safety Training System

**Take control of the quality, consistency and cost of your arc flash and shock training for your electrical workers!!** Increase the frequency of training which will assist you in moving the training knowledge to electrical worker electrical safety competency. **Classroom training is expensive, can be inconsistent as you get different instructors provided by the vendor and not sustainable; you can only retrain every 3 to 5 years due to the high overall cost!!**

The Electrical Safety Training System (ESTS) is credible, high quality, affordable, impactful computer based training delivered over the internet or on standalone DVDs.

#### 3D Graphics, Videos and Narrated Content

Divided into 10 modules, the four-hour online training system covers the fundamentals of the electrical hazards of arc flash and shock. It uses 3D graphics, videos and narrated content to provide information on the dangers of arc flash and shock, and how to protect yourself. It provides information on how to analyze these electrical hazards and follow up on preventive and protective control measures.

#### CSA Z462 Training

Unique to the ESTS system is the 3D Virtual Electrical Workplace classroom, where the student will be able to apply learning in interactive scenarios about arc flash and shock and the application of the CSA Z462 Workplace electrical safety Standard.

Terry Becker, P.Eng., a CSA Z462 Technical Committee Voting Member and independent Electrical Safety Consultant, is the Subject Matter Expert and Visionary of the ESTS and advises that the training system is credible, high quality multi-media adult learning delivered online. Every worker can receive training.

Please call If you have your own LMS and would like to use the ESTS behind the firewall. Additionally if you want customized company Electrical Safety Program training the ESTS can be customized to suit your requirements.

**Single seat access is \$95.00 + GST.**

(bulk seat pricing is available upon request)

For more information, contact Terry Becker, P.Eng. at ESPS.

**ESPS Electrical Safety Program Solutions INC.**  
E-mail: [terry.becker@espsi.ca](mailto:terry.becker@espsi.ca)  
Telephone: 403.532.9050  
[www.esps.ca](http://www.esps.ca)



Circle 43 on Reader Service Card

**EB** from the legal desk**In high gear for cash neutral***continued from page 20*

in a timely manner (or at all), the government (and its agencies) as owner can treat the prime contractor as being in default and take action, such as withholding further payments.

In Ontario, prompt payment legislation was introduced in the provincial legislature on June 1, 2011, by MPP Dave Levac (Liberal: Brant).

Although drafting revisions have not yet been finalized for the proposed legislation, the basic provisions have included: a potential for striking down Pay When Paid provisions; its absolute restriction on the ability to contract out of the proposed legislation; a stated right to progress payments; the ability to suspend work for non-payment; and maximum amounts for such items as maintenance or performance holdbacks (not to exceed 5%), and when 50% of the work is performed (not to exceed 2.5%).

From a legal perspective, where does that leave you? When prompt payment legislation makes its way through the Ontario Legislature (and provided it receives Royal Assent), it will become law. It will apply to all construction contracts relating to work performed in Ontario. You and all contractors will need to abide by its requirements—including those provisions striking down Pay When Paid provisions, and those trying to limit the gap between expenditure and revenues, thereby making the flow of funds down through the construction pyramid a little more cash neutral. **EB**

*Dan Leduc is a partner at Norton Rose LLP and co-chair of the firm's Canadian Construction Law Practice Group. He is frequently called upon to advise and represent owners, engineers, subcontractors, suppliers and builders in such front-end services as contract review, tender issues and general construction matters, as well as in litigation and arbitration. Dan can be reached at (613) 780-1536 or dan.leduc@nortonrose.com.*

**Holophane expands GlasWerks LED luminaire line**

Holophane says it has combined “modern LED technology with traditional prismatic glass optics for aesthetics and maximum performance” with its new signature bowl and tear drop-shaped glass refractors—part of the GlasWerks LED line of lighting fixtures. Designed for energy efficiency and long-term performance, GlasWerks LED fixtures include multiple LED boards with symmetrical



or asymmetrical distribution and a choice of wattages. The luminaires may be arm- or pendant-mounted, and are offered with four additional cover styles: Bern, Hallbrook Extended, Vienna and Prague. GlasWerks

LED luminaires are CSA-listed as suitable for wet locations (up to 40°C ambient temperature), and incorporate IP66 optics and IP55 housings.

**HOLOPHANE**[www.holophane.com](http://www.holophane.com)

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## EB lighting products



### Acuity Brands' Lithonia Lighting launches STLED luminaire

Acuity Brands Inc. has expanded its LED indoor ambient lighting portfolio with the Lithonia Lighting STLED luminaire.

The STLED product features improved efficacy over the previous generation of surface-mounted products, says Acuity, adding that it delivers a high level of performance, design and user simplicity. STLED comes standard with full-range (0-10V) dimming.

**LITHONIA LIGHTING**  
[www.lithonia.com](http://www.lithonia.com)

### Halco dimmable ProLume GU24 CFLs



Halco Lighting Technologies has launched dimmable GU24 compact fluorescents in its

ProLume product line. According to the company, the bulbs remove the limitation of the switch-only operation of GU24-equipped

fixtures by operating with many commonly installed dimmers. They are designed to operate in higher-temperature environments typically found in IC-type recessed fixtures with GU24 bases, says Halco. The CFLs are available in wattages of 13, 18 and 23.

**HALCO LIGHTING TECHNOLOGIES**  
[www.halcolighting.com](http://www.halcolighting.com)

## EB products

### Schneider Electric DST2V electrical racking assembly

Schneider Electric's new closed-door electrical racking system for medium-voltage DST2V roll-in replacement 5kV/15kV 1200A circuit breakers allows racking of the circuit breaker at a distance from the arc-flash hazard boundary. According to Schneider, the manual/electrical racking mechanism is installed on the circuit breaker and is connected via the plug on the cell door; the door remains closed during the racking operation while the status of the breaker position is monitored from a pendant station (hand-held) at up to 50 feet away from the switchgear section. No storage space is required for the electrical racking system, adds the company.

**SCHNEIDER ELECTRIC**  
[www.schneider-electric.ca](http://www.schneider-electric.ca)

### GE Energy introduces EverGold Solar Duty disconnects



GE says it has streamlined and simplified the installation process for commercial photovoltaic (PV) disconnects with its EverGold Solar Duty disconnects. The 100A, 4-pole disconnect (600VDC) accepts up to four combiner box inputs (with the fourth pole reducing the total number of disconnects required), making it best-suited to medium and large commercial PV installations. The disconnects also feature oversized lugs, G90 corrosion-resistant enclosure construction, and built-in safety and security features.

**GE ENERGY**  
[www.ge-energy.com](http://www.ge-energy.com)

### Eaton launches PowerEdge mobile app for iPhone and iPad

Eaton introduced the PowerEdge mobile



application to provide consumers real-time access to its electrical catalogues, videos and training. The company's products can now be searched, selected and located directly from an Apple iPhone or iPad. The app features: the entire electrical product catalogue; the ability to search to find specific features or catalogue numbers; a video library with business overviews, training and expert interviews; a locator function that searches within a radius and product category to map the nearest Eaton channel partners, and more. You can download the 225MB app from the iTunes Store.

**EATON**  
[www.eaton.com](http://www.eaton.com)

### Ideal Industries combo head screwdriver #33-204



Ideal Industries describes its new combo head screwdriver (#33-204) as a "versatile, affordable screwdriver which fits virtually any fastener". The screwdriver's combo head tip is vapour-blasted and precision-machined to ensure full fastener engagement, says Ideal, boasting the tool features the most touch points against competing products, minimizing cam-out and stripping. Its cushioned-grip helps maximize comfort and minimize fatigue during prolonged use, while providing maximum turning power, continues Ideal.

**IDEAL INDUSTRIES**  
[www.idealindustries.com](http://www.idealindustries.com)

### Appleton unveils TMC2 and TMC2X cable glands

Appleton says its new TMC2 and TMC2X cable glands promise a better, faster and more cost-efficient way to connect jacketed metal-clad cables. The cable glands securely terminate interlocked/corrugated aluminum or steel armour-jacketed metal-clad cables (Type MC/MCHL), and continuous-welded armour cables (Type CLX or TECK) to form mechanical water-tight connections while providing ground continuity for cable armour.

**APPLETON**  
[www.appletonelec.com](http://www.appletonelec.com)

### Rittal TopTherm enclosure heaters



Rittal says it has succeeded in developing an enclosure heater that can create the optimal operating environment within enclosures for control equipment and switchgear while simultaneously meeting energy efficiency demands. The heaters use CFD (computational fluid dynamics) and PTC (positive temperature coefficient) technology to allow for better thermal output than previous solutions, says the company. Rittal adds features such as the double clamp-type terminal connection and the quick-assembly system help accelerate installation.

**RITTAL**  
[www.rittal.ca](http://www.rittal.ca)

### Cooper B-Line pre-assembled module clamps with WEEB washers

Cooper B-Line claims to make solar installations with Arista Monolithic racking systems even easier with WEEB grounding washers for portrait-orientation applications. The pre-assembled module clamps with WEEB washers quickly ground the photovoltaic (PV) modules to the racking



system, says the company, adding they offer a solid, gas-tight connection, and save time and material by eliminating the need to use separate ground lugs and copper wire.

**COOPER B-LINE**  
[www.cooperbline.com](http://www.cooperbline.com)

### Strattec offers 6-foot Bolt Cable Locks

Strattec Security Corp., an automotive lock and key manufacturer, offers 6-ft bolt cable locks featuring a pin and loop design to provide different length options. The locks are made from 1/4-in. coiled cable with 1/16-in. black vinyl coating, and are coil sprung for compact storage. They feature One-Key Lock Technology, which permanently programs the lock to the owner's vehicle's ignition key; thus, once the ignition key is inserted into the lock cylinder, spring-loaded plate tumblers move up and down until they are matched exactly to that key.

**STRATTEC SECURITY CORP.**  
[www.boltlock.com](http://www.boltlock.com)



### "Protecting Our Sight" safety DVD

ERI Safety Videos has released a safety training DVD entitled, "Protecting Our Sight", which discusses the protective devices and precautions you can use to prevent eye injury; the importance of assessing the hazards of each job task; and how to avoid common pitfalls that often lead to eye injury. Topics include: how the vision process works; types of eye injuries; employee responsibility to wear appropriate protection; and safety goggles, face shields and eye protection required for welding and laser operations.

**ELECTROLAB TRAINING SYSTEMS**  
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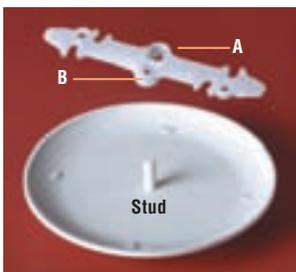
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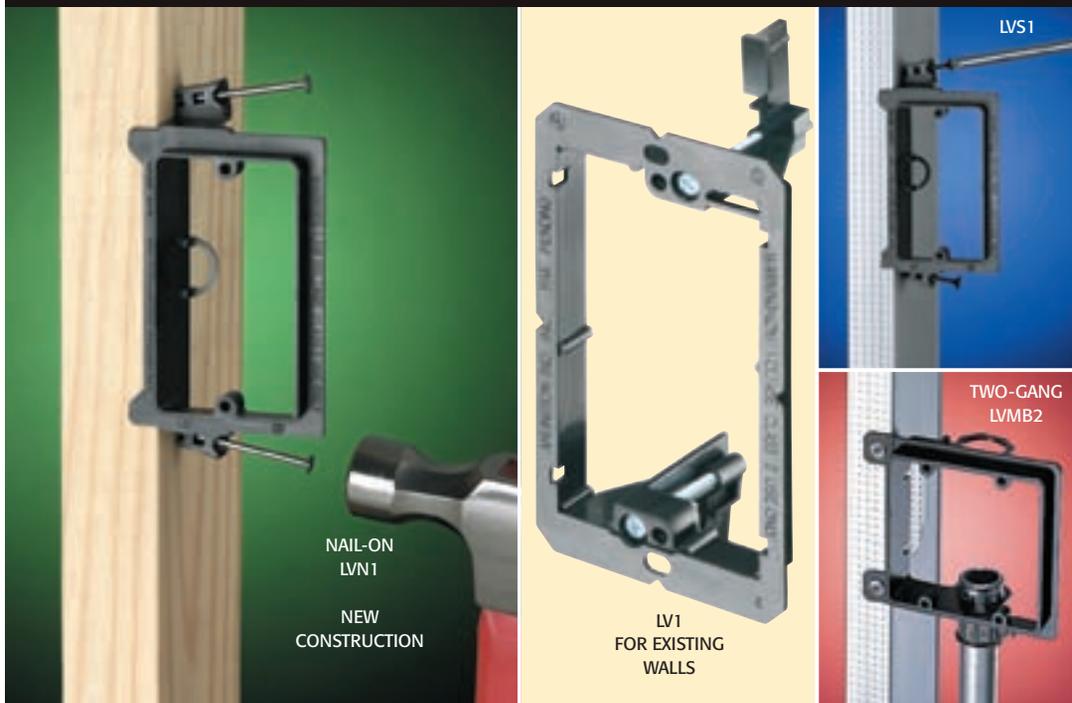
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• Covers most high hat cans

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 Visit [www.bicsi.org](http://www.bicsi.org)



**Electric Vehicles & Infrastructure Summit**  
**February 22-23**, Toronto, Ont.  
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Ottawa, Ont.  
 Visit [bit.ly/w59Hfv](http://bit.ly/w59Hfv)

**NETA PowerTest**  
*InterNational Electrical Testing Association*  
**February 27-March 1**,  
 Fort Worth, Texas  
 Visit [www.powertest.org](http://www.powertest.org)

**Electric West**  
**February 21-23**, Las Vegas, Nev.  
 Visit [www.electricshow.com](http://www.electricshow.com)

**CNA Conference & Trade Show**  
*Canadian Nuclear Association*  
**February 22-24**,

**ECAA 50th Anniversary Convention**  
*Electrical Contractors Association of Alberta*  
**March 2-12**, Cabo San Lucas, Baha California  
 Visit [www.ecaa.ab.ca](http://www.ecaa.ab.ca)



**IEEE IAS Electrical Safety, Technical and Mega Projects Workshop**  
**March 19-21**,  
 Edmonton, Alta.  
 Visit [www.ieee.org/estmp](http://www.ieee.org/estmp)



**AEL Electrical Learning Expo**  
*Alberta Electrical League*  
**March 22**, Grande Prairie, Alta.  
 Visit [www.elecleague.ab.ca/expo.aspx](http://www.elecleague.ab.ca/expo.aspx)



**Ontario Feed-In Tariff Forum**  
**April 3-4**, Toronto, Ont.  
 Visit [bit.ly/vgjkE7](http://bit.ly/vgjkE7)

**Light+Building**  
**April 15-20**, Frankfurt am Main, Germany  
 Visit [www.light-building.com](http://www.light-building.com)

**Energy Trade Fair**  
**April 23-27**, Hannover, Germany  
 Visit [www.hannovermesse.de/en/energy](http://www.hannovermesse.de/en/energy)

**A-D Electrical Supply Division - Spring Network Meeting**  
*Affiliated Distributors*  
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 Visit [www.adhq.com](http://www.adhq.com)

**BICSI Canadian Conference & Exhibition**  
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**IEEE PES Transmission & Distribution Conference & Exposition**  
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 Visit [www.ieeet-d.org](http://www.ieeet-d.org)

**CanSIA's Solar Ontario**  
*Canadian Solar Industries Association*  
**May 9-10**, Windsor, Ont.  
 Visit [www.cansia.ca](http://www.cansia.ca)



**Lightfair**  
**May 9-11**, Las Vegas, Nev.  
 Visit [www.lightfair.com](http://www.lightfair.com)



**Skills Canada National Competition**  
**May 13-16**, Edmonton, Alta.  
 Visit [www.skillscanada.com](http://www.skillscanada.com)

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**May 26**, Edmonton, Alta.  
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Emon.....	12	Nexans.....	1	Venture Lighting.....	24
Falvo Electrical Supply.....	25	Northern Cables.....	7		
FLIR Canada.....	6	Rogers.....	15		



# Use of approved electrical equipment

A key component of electrical safety in any installation is the requirement for the electrical equipment used to be formally “approved”. The main goal of the equipment approval process is to ensure that electrical equipment does not represent any undue hazard to people and property.

Undue hazard means that, under normal operating conditions, the approved electrical equipment should not represent any unnecessary or unwarranted risk of electrical shock, fire or explosion.

Certifying electrical equipment to recognized industry standards benefits both end users and manufacturers by confirming that electrical equipment is built according to common electrical safety characteristics. Local inspection authorities enforce the electrical equipment approval requirements throughout Canada.

In the Canadian Electrical Code (CEC) Section 0, we have a definition of what is meant by “approved”. Basically, it means that the electrical equipment has been certified by a certification organization accredited by the Standards Council of Canada (SCC) in accordance with the applicable CSA standards, or the electrical equipment conforms to the requirements of the regulatory authority.

The certification process requires the

manufacturer to submit the electrical equipment for examination and testing to a recognized certification organization. The equipment is certified only when it meets or exceeds all of the requirements listed in the standard. The standard can include quality as well as electrical equipment performance requirements.

The application of the certification organization’s label to the electrical equipment indicates formal approval. It is applied at the electrical equipment manufacturers’ plant. The certification service is available from a number of certification organizations, such as Canadian Standards Association (CSA), UL/cUL (Underwriters Laboratories/of Canada), MET Laboratories (MET), Intertek (ETL), TÜV SÜD America Inc. (TÜV) and a few others.

Another option for meeting the requirements of CEC Rule 2-024 “Use of approved equipment” involves approval by a recognized field evaluation (FE) agency. After examining the product and performing some mandatory tests, the field evaluation agency issues a report confirming the electrical equipment conforms to applicable standards and presents no undue hazard to persons or property. Some of the field evaluation agencies are CSA, ETL, TÜV and Ontario’s Electrical Safety Authority (esaFE) among others.



All electrical equipment bearing either the certification organization label or the field evaluation agency label meets the approval requirements of CEC Rule 2-024.

CEC Rule 2-026 “Powers of rejection” states that, even though the electrical equipment approval has previously been granted, the inspection authority may reject at any time any electrical equipment when it is substandard with respect to the sample on which approval was granted, or the conditions of use indicate that the equipment is unsuitable, or the terms of the approval agreement are not being carried out. Therefore, it is critical that the electrical equipment installer follow any installation instructions supplied with the equipment to satisfy the terms of the approval agreement.

When approval issues come up on the factory floor or on a construction site, it is good to know there are different options available for electrical equipment approval. The field evaluation option is best suited to small-volume, one-of-a-kind, custom-type electrical equipment. The cost or timing of the approval process can vary, but the electrical safety can never be compromised. **EB**

Questions and answers compiled by the Electrical Safety Authority | VISIT [WWW.ESASAFE.COM](http://WWW.ESASAFE.COM)

## Tackle The Code Conundrum... if you dare

Answers to this month's questions in February's Electrical Business.

How did you do with the last quiz? Are you a...

Master Electrician ? (3 of 3)  
Journeyman ? (2 of 3)  
Apprentice ? (1 of 3)  
Apprentice ? (1 of 3)

### Question 1

In dwelling units, the CEC requires no point along the floor line of any usable wall space to be more than \_\_\_ horizontally from a receptacle in that space.

- a) 1.0 m      c) 1.8 m
- b) 1.2 m      d) 3.6 m

### Question 2

The minimum size conduit required to contain 6 #6AWG T90 Nylon, 12 #14AWG TWU75 and 7 #12AWG TW75 is:

- a) 35 mm      c) 53 mm
- b) 41 mm      d) 78 mm

### Question 3

The maximum allowable ampacity for #6AWG T90 Nylon run in a conduit containing 6 #6AWG T90 Nylon, 12 #14AWG TWU75 and 7 #12AWG TW75 is:

- a) 65 A      c) 39 A
- b) 55 A      d) 33 A

### Answers to Code Conundrum EBMag December 2011

Q-1: The maximum voltage for a class 2 circuit is:  
d) 150 V. Rule 16-200

Q-2: At least one duplex receptacle shall be provided in a porch of a house.  
a) True. Rule 26-712(b)

Q-3: Receptacles are permitted to be mounted facing up in a kitchen counter.  
b) False. Rule 26-710(c)

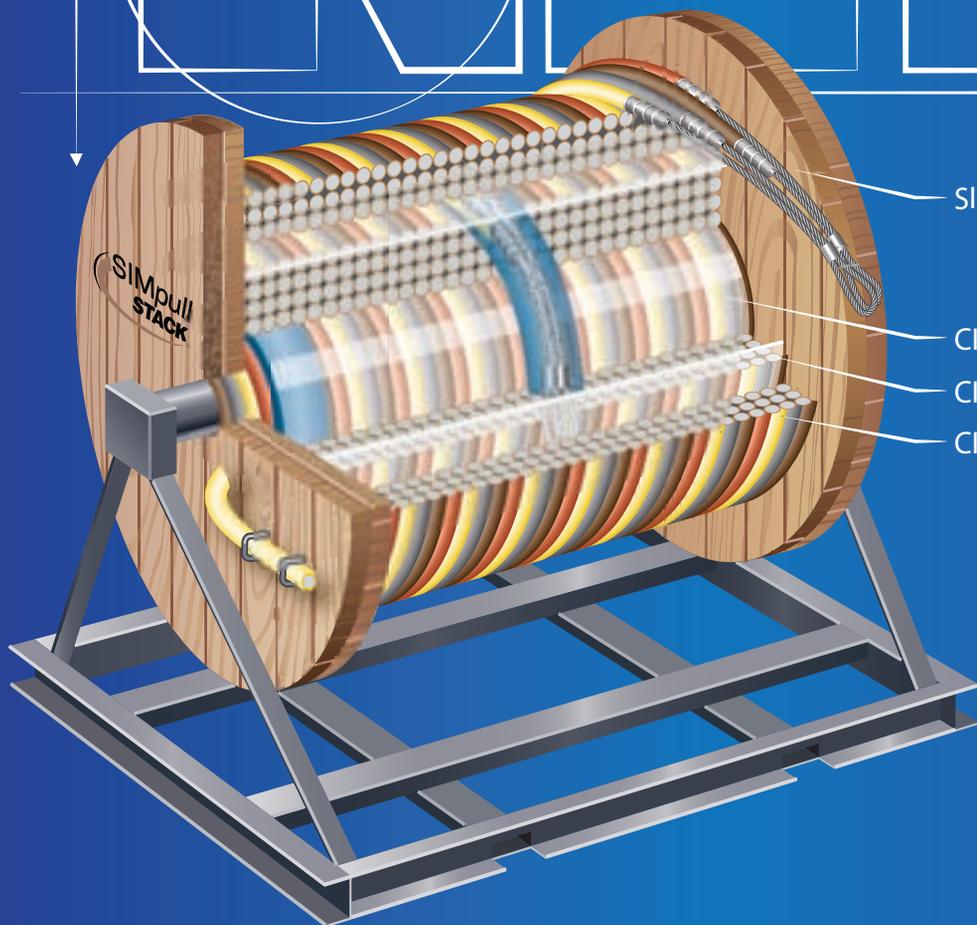
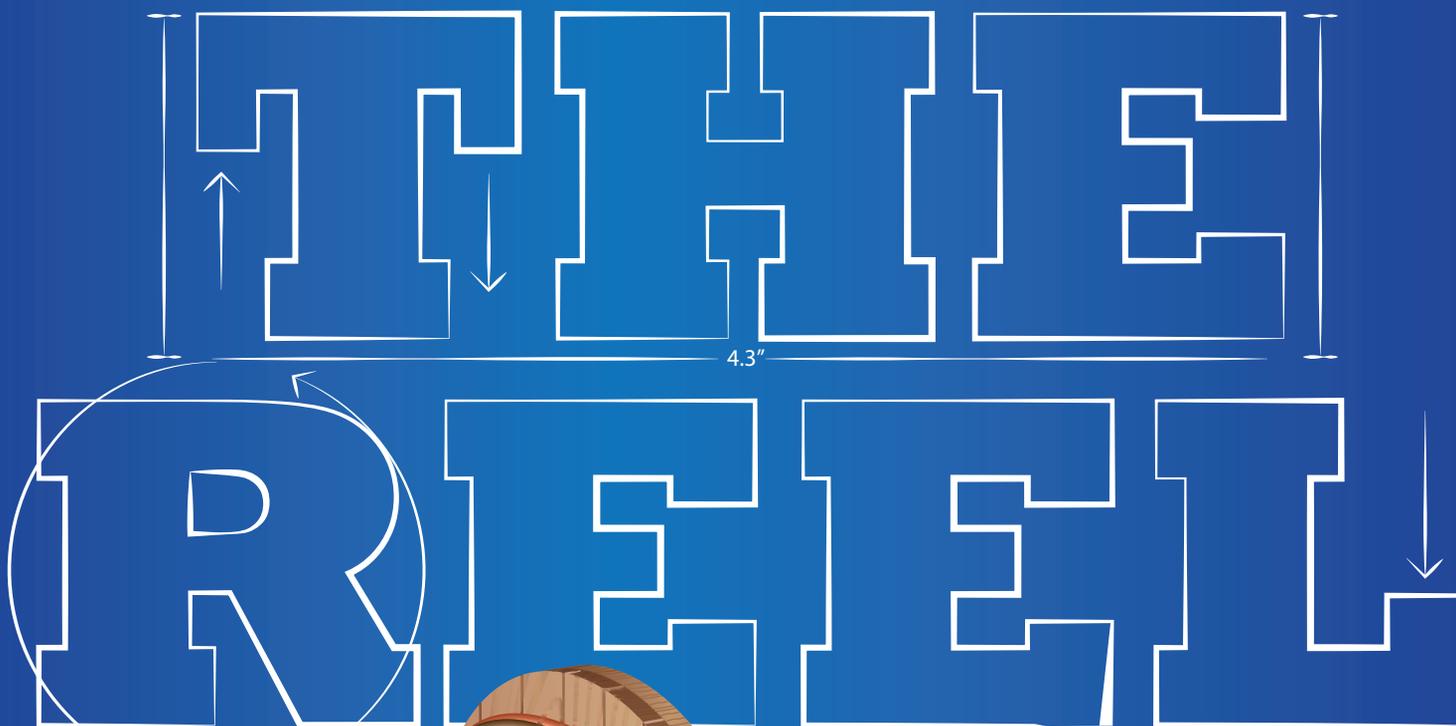
*Kris Paszkowiak is principal of CodeSafety Associates, a consulting firm serving the needs of the electrical industry. He holds a Master Electrician licence and has served numerous organizations over the years, including the Canadian Advisory Council on Electrical Safety, Committee on CE Code Part I and UL Electrical Council. E-mail CodeSafety Associates at kris.paszkowiak@codesafety.ca.*



There is a ton of additional information at [EBMag.com](http://EBMag.com), and be sure to follow our Tweets ([twitter.com/ebmag](https://twitter.com/ebmag)) to learn about web updates, live event reporting and more!



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