

Electrical Business

OCTOBER 2010



Aiming for effective system grounding

■ Also in this issue...

- Truly heavier-duty trucks (page 24)
- Airport's wireless security retrofit (page 26)
- Motor supply conductors are complicated (page 34)

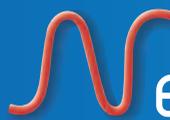
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page 33

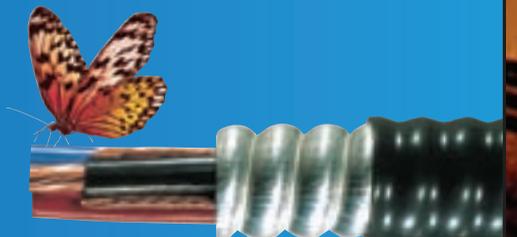
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With the exception of the person's signature on my paycheque, it's business as usual.

New owners, same mandate!

Years ago, I served as the editor of a magazine for American construction specifiers and architects/engineers. When I started at my post, there was skepticism from the readership; I was neither a specifier nor an A/E. There were many closed doors, and more than a few unanswered phone calls and emails.

Over time, doors started opening, more phone calls were returned, more emails answered. In short, I earned "porch-sittin' rights".

It's a term I learned from a contact of mine who had spent some time in the Southern States. It wasn't until he had spent a lot of time there that the residents felt comfortable enough to invite him up onto their porches, where they would sit together and chat over a beverage.

Porch-sittin' rights.

And my experience has been much the same in our electrical industry. Six years ago, I was the new kid on the block with zero porch-sittin' rights. Now, after golfing at the 10th annual EFC Federation Cup Charity Golf Tournament in August, I feel I've achieved that coveted goal. Rather than bumping into strangers and asking, "Who are you?", I'm now walking up to *colleagues* and asking, "How are you?".

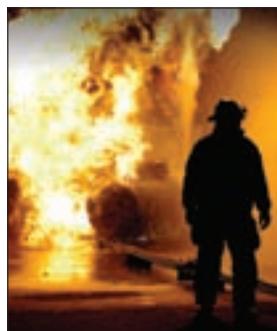
(Granted, there are still those I have yet to meet, and some people still mistakenly call me Andy, but you get the point.)

And because we now have mutual porch-sittin' rights, it's only fair to share the news (in case you haven't yet heard it): as of September 1, Electrical Business magazine was acquired from CLB Media Inc. by Annex Publishing & Printing, a business publisher based in Simcoe, Ont.

With the exception of the person's signature on my paycheque, and a couple of other, similar such nuances, it's business as usual. The EBMag team—John MacPherson, Scott Hoy and myself—are excited to join the Annex family, and look forward to continuing to execute our mandate of being the go-to industry resource for Canada's electrical community.

In the words of our new boss, Annex president and CEO Mike Fredericks, "This is one of the most exciting opportunities to appear in years. There are some marquee titles involved, some great new employees, and a significant amount of work for our press".

If you have any questions about the acquisition, feel free at any time to contact myself, or my teammates John and Scott. Meantime, I look forward to the next opportunity to chat on the porch—yours or mine. **EB**



On the cover and page 12

Effective system grounding to combat arcing faults

A common cause of losses and injuries in the workplace are undetected arcing faults that occur within a facility's electrical distribution system, yet a majority of industrial facilities experiencing arcing ground faults continue to operate without adequate ground fault protection.

Contents

18 Blown away: Good ventilation is a bathroom "must have"

When it comes to bathrooms, the last thing on the list of "must haves" is actually one of the most important: ventilation. Often an afterthought, it's time these fans took centre stage.

20 Outdoor lighting and human/animal factors: an industry opinion

NEMA Lighting Systems Division members have a significant concern with papers and other publications seeking to portray some or all types of outdoor lighting as threatening technologies, arguing that any discussion be based upon sound scientific evidence.

24 Truly heavier-duty trucks from Ford and Kenworth

Are you the kind of person who, when asked about heavy-duty trucks, start thinking about machines with axles rated for thousands of pounds? If so, these might be the trucks for you!

26 Airport's wireless security retrofit for TSA mandate cuts costs

When a recent Transportation Security Administration (TSA) mandate introduced new requirements for activity monitoring and identifying General Aviation (GA) personnel with unescorted airport access, Valdosta Regional Airport (VLD) found itself in an underfunded race against time to retrofit its access control/security system.

28 Taking the "LEED" on LEDs workshop

EBMag recently attended a workshop focused on LED lighting technology, held at the McMichael Canadian Art Collection, which not only employs the technology, but is gunning for Gold LEED certification.

DEPARTMENTS

page 18



page 20



page 24



page 28



- 4 Industry News
- 7 Personalities
- 10 It's Your Business
It's not how much you make;
it's how much you keep
- 11 Mind Your Safety
Politically correct is incorrect
- 25 Calendar
- 29 Products
- 34 Code File
Motor supply conductors...
they're complicated!
- 34 The Code Conundrum

Electrical Business Magazine gets Annex-ed!

As of midnight September 1, Electrical Business magazine was acquired from CLB Media Inc. by Annex Publishing & Printing, a business publisher based in Simcoe, Ont.

"We are looking to run [Electrical Business] on a go-forward basis," said Michael Fredericks, Annex president and CEO. He added that EBMag's location in Aurora, Ont., will remain unchanged for the next several months, and that there are no plans for changes in staff.

The EBMag team—John MacPherson, Scott Hoy and Anthony Capkun—are excited to join the Annex family, and look forward to continuing to execute our mandate of being the go-to industry resource for Canada's electrical community. Visit bit.ly/db0iA6 for the full story.

I-Gard partners with Westburne Electric Supply for Western Canada

I-Gard Corp. (www.i-gard.com) and Westburne Electric Supply (www.westburne.ca) have entered into a strategic partnership whereby, says I-Gard, customers in British Columbia and Alberta will have access to a range of its products "while ensuring process continuity supported by Westburne's outstanding service, expertise and strong local presence".

"We are delighted to sign this agreement and to [have] the opportunity to work with Westburne across Alberta and British Columbia at improving the reliability and safety of electrical systems," said Andrew Cochran, I-Gard president. "This agreement not only provides a win-win for both companies, but a win for electrical safety as we work together to reduce the number of arc flash injuries requiring medical attention and to providing a safer work environment."

Under the agreement, Westburne will stock and distribute I-Gard's products in British Columbia and Alberta. Westburne Electric Supply will begin offering I-Gard's product immediately, offering various off-the-shelf and customized solutions in the field of ground fault protection, arc flash mitigation and other applications geared toward making electrical systems safe and reliable.

Toronto District School Board recycles, IED Rewards donates

Earlier this year, IED Rewards (www.iedrewards.ca), Osram Sylvania (www.sylvania.com) and Paul Wolf Electric & Lighting Supply (www.paulwolf.com) presented the Toronto District School Board (TDSB) with a donation for its commitment to recycling.

Having taken part in the "Take Back the Light" program, the TDSB has recycled more than 180,000 lamps. This program is a fluorescent lamp recycling program that, says IED Rewards, helps "to reduce the nearly 30 million lamps that end up in Ontario landfills each year".

IED Rewards is a loyalty program available to customers that awards one point for every dollar spent at an IED distributor on participating suppliers' merchandise (both Osram Sylvania and Paul Wolf participate in the program).



(From left) Bill McCarroll, Paul Wolf Electric & Lighting Supply; Susan Wakutz, Toronto District School Board; Jim Milne, president of IED; Abbas Khan, president of Osram Sylvania Canada; and Rick Barlow, TDSB.

CSA and NETCO developing solar PV equipment personnel certification program

CSA Standards and the National Electrical Trade Council (NETCO)—the joint training arm of the Canadian Electrical Contractors Association (CECA) and IBEW First District-Canada—announced the development of a national, third-party, independent personnel certification program for construction electricians installing photovoltaic (PV) equipment in Canada.

"The CSA personnel certification program for Construction Electricians-Solar PV Systems is an excellent fit with CSA's growing portfolio of personnel certification programs in the area of safety and sustainability," said Stephen Brown, director, Energy, CSA Standards. "CSA welcomes the opportunity to work jointly with NETCO on this new program to help improve public safety and the environment through the

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We acknowledge the financial support of the Government of Canada through the Canada Periodical Fund (CPF) for our publishing activities.





“Through this new program, construction electricians will require only an additional 16 to 24 hours of training to safely and effectively install PV technology in its various applications,” said Phil Flemming, IBEW international VP and NETCO president. “We are confident that training providers will see the value of CSA Standards’ personnel

certification program and will align their curriculum in this area with CSA to best foster success.”

The development of the personnel certification program for Construction Electricians-Solar PV Systems Certified is expected to be completed by Summer 2011.

Visit tinyurl.com/23wczsf for CSA’s personnel certification programs.

development and measurement of specific worker ability criteria. The program will be well-balanced to address the needs of workers, industry, regulators, and the general public.”

The program, directed at journeyperson construction electricians, aims to help ensure the safe and effective installation of solar equipment and to reduce the risk of serious accident and injury, as well as promote energy efficiency and increased public confidence in PV installations.

The personnel certification program for Construction Electricians-Solar PV Systems is fully funded by NETCO on behalf of the electrical industry. It is the first program in Canada to offer a certification based on the tasks that qualified journeyperson construction electricians carry out in applying their skills to the installation of solar equipment, says NETCO. A journeyperson is a qualified and skilled person in a trade, and is allowed to train and act as a mentor to a registered apprentice.

“The credibility of NETCO’s overall National Solar Photovoltaic (PV) Strategy is enhanced by the fact that we engaged CSA Standards from the outset,” said Eryl Roberts, CECA executive secretary and NETCO treasurer. “This is a Made-in-Canada personnel certification program informed by the Canadian Electrical Code and the Interprovincial Standards Red Seal Program. It is based on NETCO’s assertion that solar installations should be performed by qualified electricians working for licensed contractors under electrical permits.”

CSA Standards’ PV personnel certification program will certify an individual’s knowledge by conducting an assessment against objectively identified criteria, then provide formal recognition. CSA Standards’ PV program will examine an individual’s measurable knowledge and skill, rather than qualification based programs that consider an individual’s education and general credentials.

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Getting set to mobilize the Mitsubishi i-MiEV all-electric vehicle on its journey across Canada in Cape Spear, Nfld., the easternmost point in North America. (Left to right) Koji Soga, president and CEO Mitsubishi Motor Sales of Canada; Jeff Krakowiak, VP and GM Canada for Electrical Sector Americas, Eaton Corp.; Tom Hann, City Councilor and chair of the St. John's Transportation Commission; Shawn Skinner, minister of the Department of Innovation, Trade and Rural Development, Government of Newfoundland and Labrador; and Brad Gushue, Olympic curling gold medalist.

Eaton EV charging station supporting Mitsubishi Clean Across Canada

Eaton Corp. (www.eaton.com/plugin) is supporting Mitsubishi Motor Sales of Canada's "Clean Across Canada" tour with a quick-charging station and other critical electric vehicle supply equipment (EVSE) product support. The clean energy initiative starts August 17 at Signal Hill in St. John's, Nfld., and ends September 13 in Vancouver, B.C.

"Eaton is pleased to utilize its leadership in sustainability, energy efficiency and power distribution during Mitsubishi's clean energy tour," said Tim Old, business unit manager, Electric Transportation Infrastructure, Eaton Corp. "This tour displays the efficiency and capability of plug-in vehicles and how quick-charging stations like Eaton's can be used to extend the range of electric vehicles and reduce driver's range anxiety."

Based on the Japanese i-Car platform (Mitsubishi's four-passenger electric car with zero tailpipe emissions), the i-MiEV (Mitsubishi Innovative Electric Vehicle), will leave on a 28-day, coast-to-coast tour that covers about 7500 kilometres. The "Clean Across Canada" tour will arrive in Vancouver for the Electric Vehicle 2010 Conference and Trade Show (September 13).

Eaton says its quick-charging system enables the i-MiEV vehicle to recharge swiftly before moving on to the next stop. Stops on the tour include Mitsubishi dealerships, electrical utilities and select Eaton locations across Canada.

Power networking at APPRO 2010

The 22nd Annual Canadian Power Conference (APPRO 2010) and 2010 Power Networking Centre is the "must attend" event for the power generation sector, says the Association of Power Producers of Ontario (APPRO). The event promises to deliver leading thinkers and penetrating insights spanning the spectrum of policy and business issues critical to succeeding in today's rapidly-changing power industry, and EBMag will be there!

The 2010 Power Networking Centre, meantime, features three days of prime networking opportunities with 80 leading-edge exhibits and over 1200 engaged industry attendees.

Join EBMag at the Metro Toronto Convention Centre for APPRO 2010 and get connected to the full spectrum of power generation in Ontario.

- Conference dates: Nov 16-17
- Power Networking Centre dates: Nov 15-17

Visit www.EBMag.com for more details.

Dow Wire and Cable raising prices on select items

Dow Wire & Cable will increase prices in the North and South America regions—effective October 1—on the following:

- low-density polyethylene (LDPE)-based specialty compounds, including flame-retardant and low smoke zero halogen (LSZH) products, will increase by \$0.19/lb.
- LDPE jacketing and elastomeric insulation grades will increase by \$0.12/lb.
- Selected general-purpose grades will increase by \$0.07/lb.

Further details will be made available to customers by Dow Wire & Cable (www.dowwireandcable.com) account executives.

Priority Wire and Cable coming into Canada

EBMag has learned that Priority Wire & Cable (Little Rock, Ark.) is coming to Canada. Dave Budgen has been named to head up the organization in Canada. He brings over 30 years of wire and cable experience to the job. Meantime, Priority will be establishing a head office and warehousing in the Mississauga, Ont., area, as well as a network of rep agencies across the country (more news on them as announced).

Privately held by owners Ken Hamilton and Jim Newman, Priority Wire and Cable (www.prioritywire.com) is a master distributor of wire and cable serving electrical, utility, telecom, mining and welding wholesale distributors. Incorporated in April 1993, Priority has already expanded to include sales offices and distribution centres in Houston, Texas, Baton Rouge, La., Chicago, Ill., Las Vegas, Nev., Philadelphia, Pa., Erlanger, Ky., and Virginia Beach, Va.

(Where Ontario is concerned, Priority will be rep'd by Roney Marketing, www.roneymk.com).

Snake Tray manufactures using only solar power

Snake Tray (www.snaketray.com) announced it has "officially gone off the



power grid"; with the photovoltaic panels atop the roof of its American factory, it now manufactures all of its products using solar energy. As such, Snake Tray claims is the first "carbon zero" manufacturer in the electrical industry.

Snake Tray expects to produce 100% of its load and 120% of its energy consumption annually. "We are committed to providing our customers with cost-effective green products for cable management and power distributions and, as a company, we want to practise green principles in the way we operate. This is a giant step toward achieving this goal," said Roger Jette, president of Snake Tray (in photo).

Sonepar Canada now a strategic distribution partner for Solar Semiconductor

Solar Semiconductor, a producer of photovoltaic (PV) products (www.solarsemiconductor.com), announced a strategic partnership with electrical distributor Sonepar (soneparcanada.com). This partnership, says Solar, will enable contractors and installers to supply solar PV kits meeting the Ontario Domestic content requirement.

"We have been growing rapidly in recent years in the solar business and will continue that growth in the coming years," said David Rycroft, vice-president at Sonepar Canada. "It is essential for Sonepar that we have a stable supplier of high-quality modules, whose growth plans and product roadmap align well with our own development plans and requirements."

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IED and electrical customers support our troops with Tim Hortons



Electrical customers and IED Rewards (www.iedrewards.ca) supported Canadian Troops overseas this year with the help of Tim Horton's. Since December 2009, a "Support our Troops" \$10 Tim Horton's gift card was added to the IED Rewards online catalogue. The gift card had always been a prize favourite, according to IED, and they took it even further this year.

IED Rewards offered the opportunity for customers to donate that \$10 gift card rather than receive it, and match every donation to "double the positive impact of their customers' generosity".

Nearly 170 gift cards were donated with enclosed thank you notes from one of the customers who made the donation, all of which were sent to Canadian Troops stationed in Afghanistan.

"We wanted to offer this donation in order to say 'Thank You' for everything that the Canadian Troops are doing for us," said IED president Jim Milne. "It's wonderful to see the support we received."



Lennart Jonsson

Eaton Corp. (www.eaton.com) has named **Lennart Jonsson** executive VP and chief technology officer (CTO) for the enterprise, reporting to **Alexander M. Cutler**, chair and CEO, who said "[Jonsson] has proven himself an outstanding leader as chief technology officer for our Electrical Sector". He

will focus on building organizational capability in the company's technology and engineering functions to "support fast-paced development of innovative power management products and services". Jonsson joined Eaton with the **Powerware** acquisition in 2004 and served as the senior engineering manager responsible for the development of all power quality products globally until he was named VP technology and CTO for the Electrical Group in 2007.

Standard Products (www.standardpro.com) has appointed/promoted **Zane Yakiwchuk, LC**, to the position of regional sales manager for Alberta. He is accredited by the National



Zane Yakiwchuk

Council on Qualifications for the Lighting Professions (NCQLP) and is a member of the Illuminating Engineering Society (IES). Zane can be reached at (403) 479-5729. The company also

welcomed **Randy Browning** to the British Columbia sales team. He has 10 years of experience in the electrical industry, specializing in the utility market prior to joining Standard. He will be responsible for the Fraser Valley territory, and can be contacted at (604) 945-4550. The company has



Randy Browning

also appointed **Sebastien Giroux** as sales rep to the Quebec region sales team, which is responsible for the South Shore region of Montreal. He's been in the industry for seven years, and is familiar with the industrial and institutional markets. Giroux can be reached at (514) 342-1199.



Sebastien Giroux

The Electrical Apparatus Service Association (EASA, www.easa.com) introduced its international officers for the 2010-2011 administrative year. Congratulations to **Sandi Howlett of Ainsworth Inc.** (Toronto, Ont.) who now serves as chair, and **Mike Dupuis of Monelco Ltd.** (Windsor, Ont.), who is serving on the executive committee.

Canadian Nic Maennling among IEC Thomas A Edison 2010 Laureates

Every year, IEC (International Electrotechnical Commission, www.iec.ch) honours the commitment and work of a select group of experts who, through their leadership and technical expertise, contribute to making technology-based products and systems safer, enabling the roll-out of innovations on a global scale and protecting the lives of millions from electric shocks and other hazards.

The IEC Thomas A. Edison Award—a newly created prize—is attributed to a maximum of nine persons who are currently managing a Technical Committee or Subcommittee in the IEC or one of the IEC Conformity Assessment Systems. Among the 2010 Thomas A. Edison Award Laureates is **Nic Maennling**, Secretary, IEC TC 89: Fire hazard testing (Independent Expert, Canada).

"Just like Edison in his day, experts working in IEC are often world-renowned in their area. They not only try to find safe and sometimes creative solutions to overcome challenges, but their work answers true global needs. They fulfil the role of technology enablers, sharing their knowledge so that others don't have to repeat mistakes or reinvent the wheel," says IEC.

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Registration is simple and quick. Set up your own personalized fundraising page here (tinyurl.com/2a6r5fd), then tell your colleagues, suppliers, manufactures, friends and family that you are hungry for change!

Learn more at www.EBMag.com.

Results of 3rd annual ORCGA Locate Rode



Photo courtesy Radiodetection.

The results are in from the third annual Ontario Regional Common Ground Alliance (ORCGA) Locate Rodeo, which was held in June. Organized by ORCGA, the Locate Rodeo is open to locate technicians throughout the province. Up to 40 technicians could compete to display their skills in locating.

"It was a challenging day in some wet weather with locators being tested to their limit," said Dean Stone, national sales manager for Radiodetection Canada, a gold sponsor of the event.

Competitions were held in gas, power, telecom and water categories. Competitors compete in one category of their choice. Their skills are put to the test at two different sites, and the scores from both events are used to determine the winner. Each locator is allowed 12 minutes per event site.

A bonus event, the Locate from Hell (LFH), was open to all registered competitors. The Locate from Hell is just one site, and competitors have just three minutes to complete the locate. The division is judged on accuracy, but time is of the utmost importance (as it is very easy for a competitor to "time out" on the event). Now for the winners:

Power Division

- FIRST: Bo Kostashuk, Hydro One
- SECOND: Jason McFadden, Grafscan
- THIRD: Jamie Steenbergen, G-Tel

Telecom Division

- FIRST: Adam Irving, Promark-Telecon
- SECOND: Mike Prezioso, QX Locates
- THIRD: Rob Elkerton, G-Tel

Locate From Hell

- FIRST: Adam Irving, Promark-Telecon
- SECOND: Brian Petrie, Terra Discovery
- THIRD: Kevin Strange, Canadian Locators **EB**

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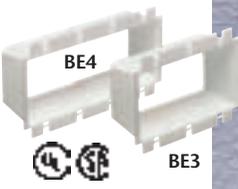
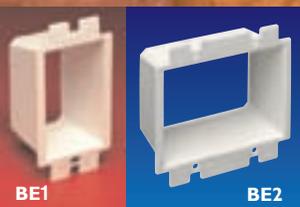
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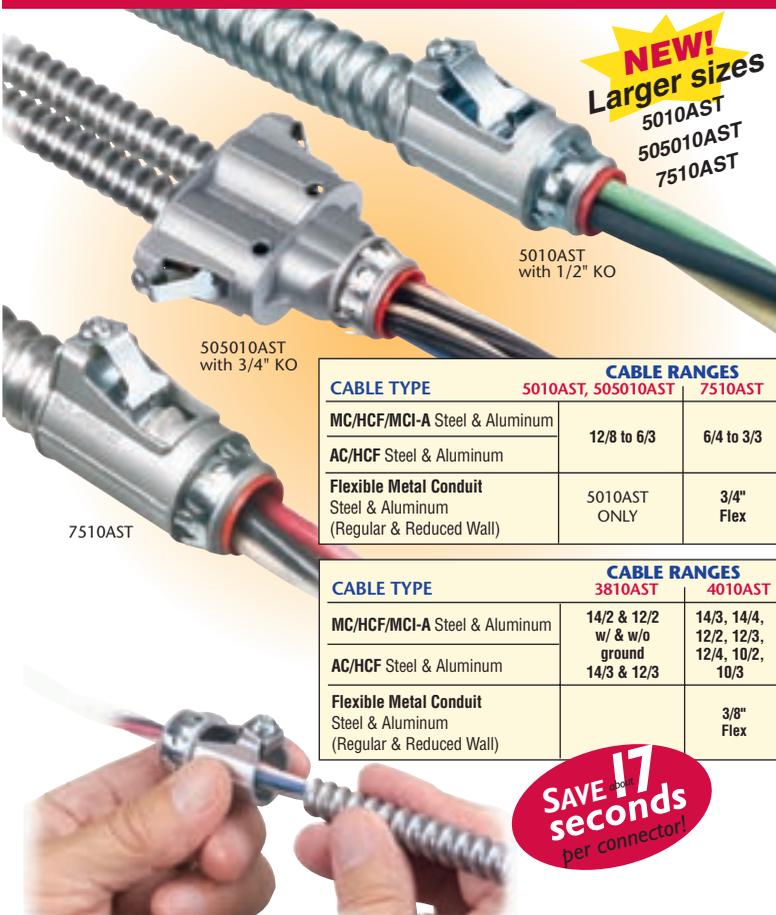


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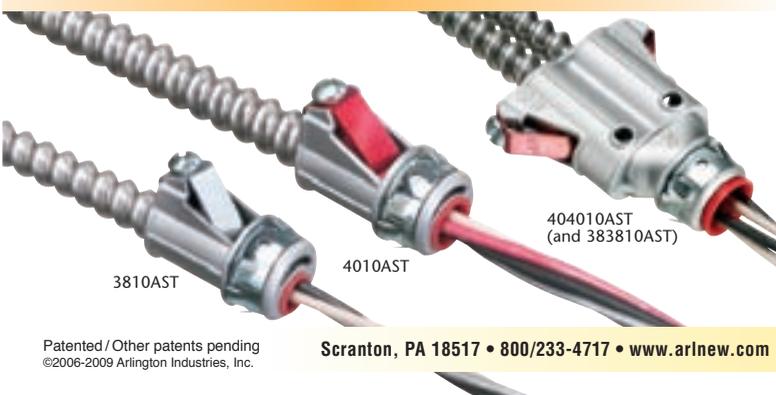
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Flexible Metal Conduit Steel & Aluminum (Regular & Reduced Wall)	5010AST ONLY	3/4" Flex

CABLE TYPE	CABLE RANGES	
	3810AST	4010AST
MC/HCF/MCI-A Steel & Aluminum	14/2 & 12/2 w/ & w/o ground	14/3, 14/4, 12/2, 12/3, 12/4, 10/2, 10/3
AC/HCF Steel & Aluminum	14/3 & 12/3	
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It's not how much you make; it's how much you keep

There's an old saying: It's not how much you make; it's how much you keep. And, in these tough times, it's more important than ever. Seizing this opportunity are a lot of people who sell booklets purporting to teach you all about the grants and interest-free loans available to you. Be warned: these booklets are generally of no value, and some have even been listed by the Better Business Bureau as scams.

Below I have listed some ways that can help businesses and individuals keep more of their hard-earned money. I have included URLs that worked at the time of writing. If you have difficulty finding the information, try using Google or contact me directly. Of course, before implementing any of these strategies, review them with your own accountant.

Employment Insurance Premium Reduction Program

Companies that provide certain short-term illness or benefits to employees can apply to have the employers' portion of EI premiums reduced from 1.4 times to 1.163 times the employees' premium. For 2010, this would equate to a maximum of \$177.12 per employee. For full details, check out tinyurl.com/2cg233w.

You need to renew your application each year (I don't believe they accept retrospective claims).

Gifts and Awards

You may provide gifts and awards (not cash or near cash) of up to \$500 per employee per year without it being a taxable benefit to them. A second amount of up to \$500 can be given for long service awards. For full details, visit tinyurl.com/mzkqz6 to download a PDF (then go to page 4).

Apprenticeship Grants for Apprentices & Apprenticeship Tax Credits for Employers

Here's some information you can pass along to your end users: this program is administered by Human Resources and Skills Development Canada and provides grants to apprentices within Red Seal trades and to employers. See the details at tinyurl.com/2c46ugw.

Apprenticeship Incentive Grant (AIG)

This is a \$1000 taxable cash grant available to apprentices registered in one of the designated Red Seal trades who complete the first or second year/level of (to a maximum of \$2000).

Apprenticeship Completion Grant (ACG)

This is a \$2000 taxable cash grant available to apprentices who complete their apprenticeship program and receive their journeyman certification in a designated Red Seal trade.

Also available is the *Tradesperson's Tools Deduction* that provides employed tradespersons with an annual deduction of up to \$500 to help cover the cost of new tools necessary to their trade. The deduction applies to the total cost of eligible tools that exceeds \$1000.

Tax credits for employers are also available. For employers who hire apprentices in the designated Red Seal trade, the Apprenticeship Job Creation Tax Credit is a non-refundable tax credit equal to 10% of the eligible salaries and wages payable to eligible apprentices in respect of employment after May 1, 2006. The maximum credit is \$2000 per year for each eligible apprentice.

Declaration of Conditions of Employment (T2200)

This is an excellent opportunity for your employees to claim business expenses, and there are numerous ways of using this process. Review this form in detail to see whether there is eligibility for each employee.

T4 income can sometimes be split between spouses, which is a much more realistic and safer approach than having so-called 'subcontractors'. Should CRA determine that someone should have been treated as an employee rather than a subcontractor, you could be opening to some very serious reassessments, penalties and interest. Review this form as an alternative to dealing with those kinds of subcontractors: tinyurl.com/2br2ohj.

Disability Tax Credit Certificate (T2201)

This is an allowance to be claimed on a personal tax return. A non-refundable tax credit is available when you or a family member is disabled for 12 months or more. In 2009, the federal amount was \$7196. Each province also has a provincial amount. You can make retrospective claims.

Individual Pension Plan

This is similar in many ways to an RRSP. However, if you want to shelter more funds than you would normally be able under an RRSP, this is certainly worth looking at. Talk to your financial advisor about this program. Also check to see whether there is a "past pension service" benefit. It could be very significant. **EB**

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Ron Coleman, a member of the Institute of Certified Management Consultants of British Columbia, just published his latest book, "Becoming Contractor of the Year", which teaches you how to make more money while having more fun. A noted speaker, he has completed many interfirm financial comparisons of groups of construction companies in Canada and the United States. Ron's numerous published education programs include a 36-hour business management course specifically designed for ECABC. Visit www.ronaldcoleman.ca.



Politically correct is incorrect

A huge fine, almost \$500,000, was recently levied against a major corporation because of a workplace death—a terrible end for a person, and one that continues to devastate the family. Huge fines against corporations are the typical judicial response to a workplace death yet, sadly, experience proves they have little long-term effect.

A corporation, after all, is a legal entity owned by absentee shareholders, created to allow a group of individuals to carry on business activities. Like a rock, a corporation is an inanimate thing—brought alive only by the presence of humans.

Half-a-million dollars sounds like a lot, but it's a drop in the bucket to a corporation with thousands of employees (and far less than mundane budgets, such as bathroom supplies). The result of such a fine is that this publicly traded corporation merely pays a little bit less to its shareholders, and the workplace tragedy would likely not have much effect on share price. As it is a publicly traded company, the fine is not money owed by the CEO or any senior, middle or junior manager. As in any other accepted loss in business, it is very unlikely for anyone to be fired because of it. It's just another write-off.

In this particular accident, one individual created a hazardous situation but did not mark nor barricade the hazard. Several other individuals actually encountered the hazard prior to the accident but were able to escape. They, too, never marked or barricaded the hazard.

I'm not arguing against the fine to the corporation (it does help keep them on their toes, and the appearance of justice appeals to the masses), but to exclude the ones who had the closest control over preventing the accident means this will continue to happen. So while it is politically correct to levy huge fines against corporations, it is not politically correct to levy huge fines against workers.

If workers knew they would be on the hook when they failed to do their duty, to be duly diligent, and someone died or was seriously injured, then it would not take long for before they started doing everything they possibly could to prevent accidents.

For instance, if I drive through a stop sign and kill a family, everyone would blame me—and rightfully so. If I removed a stop sign and someone else went through the unmarked intersection and killed a family, I would still be rightfully blamed.

But what if I see that someone has removed a stop sign and do nothing? If someone goes through the intersection and kills the family, I am still to blame (though I'm far enough removed from the incident that nothing would happen to me). And, finally, if I see an unmarked intersection, recognize the danger and realize that a stop sign should be installed, yet do nothing and someone dies, I should still be rightfully blamed (though,

again, nothing would happen to me).

It is this fourth level of involvement that our hazard-recognition processes attempt to address and were not implemented in the two instances prior to the workplace death. All three of these individuals—the one who created the hazard and the two who encountered it and escaped—have all been through dozens of safety meetings. Level Four thinking should be automatic but it's not, simply because we accept its absence.

In this death, a corporation paid a huge fine and the family and public vented at a legal entity. Until we vent our anger—and punishment—at those who can most directly prevent accidents and deaths, they will continue.

No matter how many statements we write into a safety program, nor how many times we hold safety meetings, there is nothing that gets a workers attention faster than fear of loss. Every student in every marketing class is taught that people respond to fear of loss. Many highly successful ads have caused consumers to buy immediately because they believed that, without it, they might lose something.

Wise woman have known for eons that the way to a man's heart is through his stomach, and it will be a wise judiciary that realizes that the way to results can be through an individual's wallet. Sure, some regular folks may lose thousands of dollars from their own bank accounts, but that's nothing compared to a family looking down the table at an empty chair at every get-together.

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

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Effective system grounding

Andrew Cochran

A leading US-based insurance company notes that, over a seven-year period, its clients reported 228 losses attributable to ground faults resulting in payments of \$180 million. There were 72 occurrences in the commercial sector, hotels, universities, hospitals and shopping malls at an average cost of \$830,000, and 156 occurrences in manufacturing locations, with an average cost of \$769,000.

At the same time, we have statistics from Cap Schell, a Chicago-based research and consulting firm that specializes in preventing workplace injuries and deaths, suggesting there are five to seven arc flash incidents per day in North America requiring hospitalization.

A review shows the impact of both direct and indirect costs. On the direct side are the costs associated with equipment repair and replacement, as well as the direct medical costs associated with injuries. On the indirect side we see the cost of business interruption in terms of unscheduled delays, employee training and redeployment, accident investigation, legal costs and possible fines, etc.

Quite often, the impact on business interruptions and the indirect costs significantly outweigh the direct. NFPA notes: "During the five-year period of 1994 through 1998, an estimated average of 16,900 reported industrial and manufacturing structure fires caused 18 civilian deaths, 556 civilian injuries, and \$789.6 million in direct property damage per year"—with electricity a major source of ignition. From this we can estimate that the average cost of equipment and property damage from an electrical fire is around \$46,700. And let's not downplay the significant human cost of electrical accidents!

Table 1

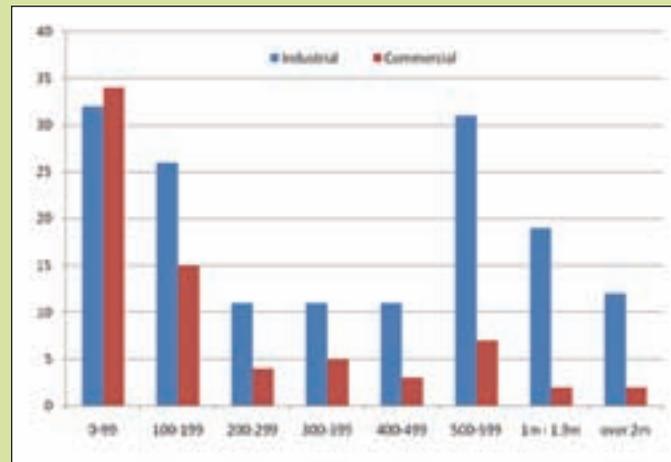


Table 2

SYSTEM PHASE-TO-PHASE VOLTAGE	ESTIMATED LET-THROUGH CURRENT VS. SYSTEM KVA CAPACITY WITHOUT SUPPRESSORS	ADDITIONAL CURRENT FOR EACH SET OF SUPPRESSORS
600	1A/2000 KVA	0.5A
2400	1A/1500 KVA	1.0A
4160	1A/1000 KVA	1.5A

Published data from Washington State notes that 350 workers were hospitalized for serious burn injuries occurring at work from September 2000 through December 2005. Of these, 30 (9%) were due to arc flash/blast explosions. Total workers' compensation costs associated with these 30 claims exceeded \$1.3 million, including reimbursement for almost 1800 days of lost work time. From this we can estimate that the indirect impact—in terms of personnel costs—for an electrical incident average \$43,000.

Business interruptions due to unscheduled downtime, repair, spoilage, etc., varies by industry, with per hour costs ranging from \$15,000/hr for automotive companies to \$24,000/hr for mining and metal companies to \$90,000/hr for airline reservation companies. When we add the equipment and property damage estimates to the personnel costs to the business interruption costs, then add possible fines and other indirect costs, it's easy to total in excess of \$500,000 per incident, which is right in line with the experience of the insurance company detailed above.

Figure 1

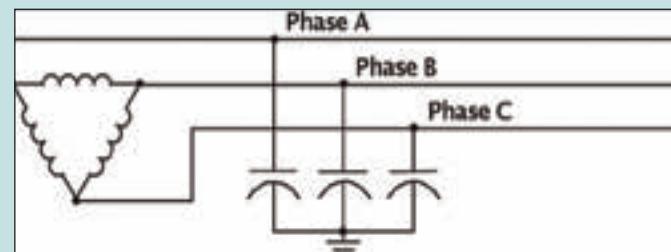


Figure 2

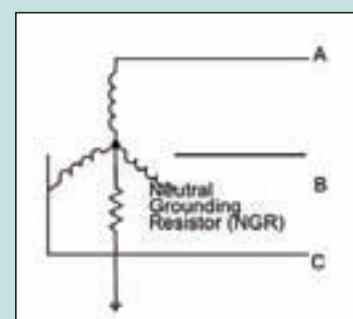
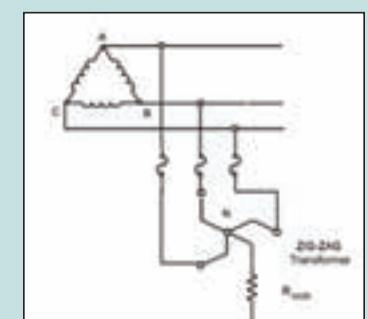


Figure 3



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Provides push button circuit disconnection

Arc Flash Chambers
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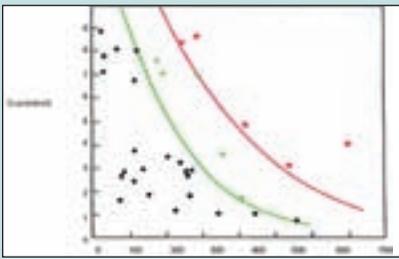
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Figure 4



What's to blame for all this?

A common cause of these losses and injuries are undetected arcing faults occurring within a facility's electrical distribution system. When an electrical system is grounded, there is an intentional connection of a phase or neutral conductor to earth for the purpose of controlling the voltage to earth, or ground, within predictable limits. It also provides for a flow of current that will allow detection of an unwanted connection between system conductors and ground (a ground fault). The root cause of this unwanted connection is often a result of insulation breakdown.

A lot of industrial facilities experiencing arcing ground faults continue to operate without adequate ground fault protection. These establishments typically operate an ungrounded or solidly grounded electrical distribution system—both of which have inherent disadvantages.

An ungrounded system is one in which there is no intentional connection between the conductors and earth. However, in any system, a capacitive coupling exists between the system conductors and the adjacent grounded surfaces. Consequently, the ungrounded system is, in reality, a "capacitively grounded system".

The reasoning behind the prevalence of ungrounded systems in many industrial facilities appears to be historical. Prior to the emergence of high resistance grounding in the late 1980s, the only choice when process continuity was required was an ungrounded system that allowed for the controlled shutdown for fault repairs at a convenient time, which was of tremendous value to continuous manufacturing processes as it reduced production losses, equipment damage and outages.

However, experiences with multiple failures due to arcing ground faults has resulted in a change in philosophy over the use of ungrounded systems, and this change is supported in by IEEE which, in IEEE 242 (1986) Section 7.2.5, offers the following perspective:

Ungrounded systems offer no advantage over high-resistance grounded systems in terms of continuity of service and have the

disadvantages of transient overvoltages, locating the first fault and burndowns from a second ground fault. For these reasons, they are being used less frequently today than high-resistance grounded systems

The reason for limiting the current by resistance grounding may be one or more of the following, as indicated in IEEE 142 (1991):

1. To reduce burning and melting effects in faulted electric equipment, such as switchgear, transformers, cables, and rotating machines.

2. To reduce mechanical stresses in circuits and apparatus carrying fault currents.
3. To reduce electric-shock hazards to personnel caused by stray ground-fault currents in the ground return path.
4. To reduce arc blast or flash hazard to personnel who may have accidentally caused or who happen to be in close proximity to the ground fault.
5. To reduce the momentary line-voltage dip occasioned by the occurrence and clearing of a ground fault.



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Figure 5

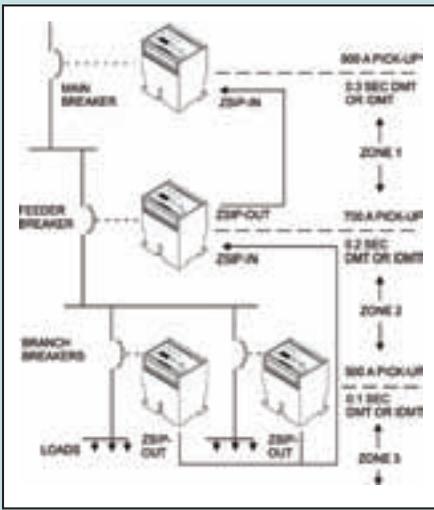
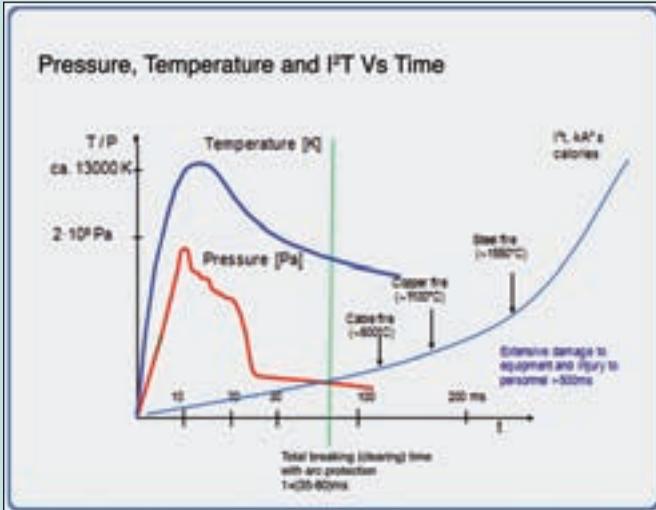


Figure 6



6. To secure control of transient overvoltages while at the same time avoiding the shutdown of a faulty circuit on the occurrence of the first ground fault.

The two major questions facing the contractor when a customer wishes to upgrade and receive the benefits of resistance grounding are: "How do I size the grounding resistor?" and "Where do I make the connection?"

The resistor must be sized to ensure the ground fault current limit is greater than the system's total capacitance-to-ground charging current. If not, then transient over-voltages can occur. The charging current of a system can be calculated by summing the zero-sequence capacitance or determining capacitive reactance of all the cable and equipment connected

to the system. When it is impractical to measure the system charging current, the "Rule of Thumb" method may be used (Figure 1).

There is no performance downside to having ground let-through current of 5 amps, even on a smaller 480V system with only 0.5 amps charging current. It is critical to have the charging current more than 0.5 amps, and it can be up to 5 amps. It is unlikely that a 480V system would have a charging current larger than 5 amps. This only occurs when a customer has added line-to-ground capacitance for, say, surge suppression.

The next step is usually connecting the current-limiting resistor into the system. (Converting the system will not affect the metering or relaying already in place.)

On a wye-connected system, the neutral grounding resistor is connected between the wye-point of the transformer and ground as shown in Figure 2. On a delta-connected system, an artificial neutral is required since no star point exists; this can be achieved by using a zig-zag transformer (Figure 3).

The most common commercial and industrial grounding method in North America is solidly grounding and, with this method, the neutral points have been intentionally connected to earth with a conductor having no intentional impedance. This partially reduces the problem of transient over-voltages associated with ungrounded systems (as was the primary reason for the growth of this option from the 1970s onward). However, this grounding method has the highest incident level of arc flash events and electrical fires.

While solidly grounded systems are an improvement over ungrounded systems, and accelerate the location of faults, they lack the current-limiting ability of resistance grounding and the extra protection this provides.

The solidly grounded system has the highest probability of escalating into a phase-to-phase or three-phase arcing fault, particularly for 480V and 600V systems. A safety hazard exists for solidly grounded systems from the severe flash, arc burning and blast hazard from any phase-to-ground fault.

The damage resulting from an arc depends on the arcing current and time and, of these two factors, time is the most easily controlled.



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The key to mitigating the arc hazard is to address the primary factors of time and fault current available. The latter can be addressed by installing a neutral grounding resistor (NGR) into the circuit and limiting the fault current anywhere from a 500 amps to 2000 amps (depending on the system).

NGRs are similar to fuses in that they do nothing until something in the system goes wrong. Then, like fuses, they protect personnel and equipment from damage. Ground fault relays trip breakers and limit how long a fault lasts based on current. NGRs limit fault magnitude.

To improve coordination between resistors and relays, and to avoid loss of protection, many NGRs are now designed with integral combination ground fault and monitoring relays. In distribution systems employing resistance grounding, the relay protects against ground faults and abnormal conditions in the path between system and ground possibly caused by loose or improper connections, corrosion, foreign objects or missing or compromised ground wires.

NGRs limit the maximum fault current to a value that will not damage generating, distribution or other associated equipment in the power system, yet allow sufficient flow of fault current to operate protective relays to clear the fault.

To ensure sufficient fault current is available to positively actuate the overcurrent relay, and that the fault current does not decrease by more than 20% between ambient and the full operating temperature, it is recommended that the NGR element material to be specified to have a temperature coefficient not greater than 0.0002 ohms/C.

The element material is critical for ensuring an NGR's operating performance. The element material must be a special grade of electrical alloy with a low temperature coefficient of resistance. This prevents the resistance value from increasing significantly as the resistor operates through a wide temperature range. It also ensures a stable value of the fault current for proper metering and relaying.

Low-resistance grounding of the neutral limits the fault current to a high level (typically 50 amps or more) to operate protective fault clearing relays. These devices are then able to quickly clear the fault, usually within a few seconds.

The second option is to control the time component, since the arc flash hazard is quantified by the incident energy released in an arc flash,

and is proportional to the length of time the arcing fault persists; hence arc flash hazard can be reduced by lowering time delay settings of the ground fault overcurrent protective devices.

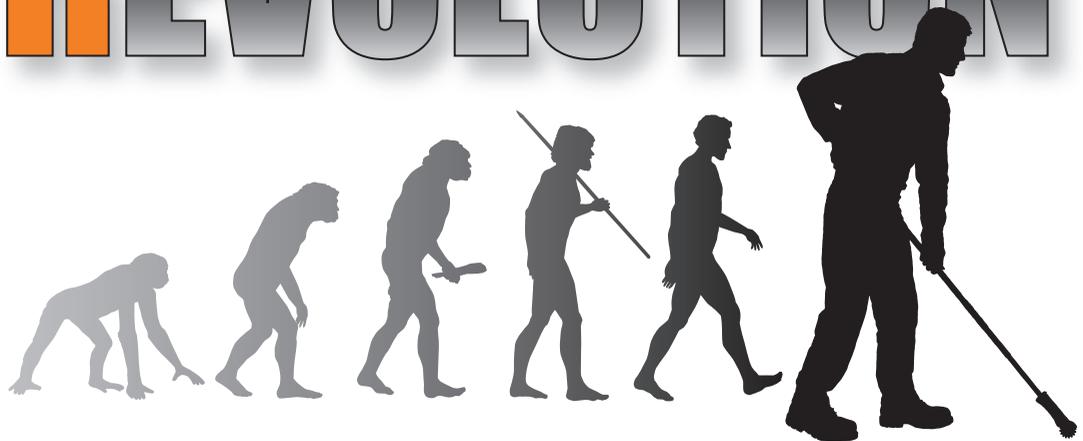
Continuity of service is important in many plants, and is maximized by time-current coordination of the ground fault devices. The drawback is that extra time delay is required on upstream protection devices. Arc flash safety now overrides service continuity on switchboards that require inspection while energized.

Zone Selective Interlocking (ZSI), also known as Zone Selective Instantaneous Protection (ZSIP), offers

an excellent solution to this problem. It improves arc flash safety upstream in the plant distribution system without affecting service continuity. ZSI is applied both to phase overcurrent devices (on the short-time protection function) and ground fault protective devices. It is available on electronic trip units and relays of circuit breakers.

With ZSI, a breaker sensing a fault will trip with no intentional time delay unless it receives a restraint signal from the breaker immediately downstream; when so restrained, the breaker will wait to time out before tripping. The downstream breaker only sends

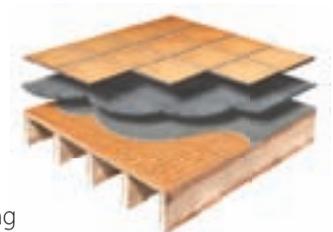
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a restraint signal upstream when it also senses the fault, i.e. only faults located downstream of both breakers. For the fault at point Y, the sub-feeder breaker will restrain the feeder breaker; and the feeder breaker will restrain the main breaker. Hence, the main and feeder will wait to time out. Meantime, the sub-feeder breaker clears the fault.

ZSI has been available for decades, but has not been widely used because time-current coordination was deemed safe enough; damage upstream in the distribution system was a tolerable trade-off. However, the push today for increased arc flash safety means that

shorter trip times will be used. The cost of the ZSI twisted pair control wiring between switchboards, panelboards, and motor control centres will now be considered a worthwhile investment because it improves arc flash safety without compromising service continuity.

The final option for solidly grounded systems is to employ optical arc detection technology. An arc is accompanied by radiation in the form of light, sound and heat and, as such, the presence of an arc can be detected by analyzing visible light, sound waves and temperature change.

To avoid erroneous trips, it is normal to use a short-circuit current detector along with one of the aforementioned arc indicators, and the most common pairing in North America is current and light.

The burning of the arc heats up the ambient air causing it to expand and create a measurable increase in pressure inside the switchgear. In Europe, it has become common practice to use the combination of light and pressure as positive indicators of an arc. The pressure sensor has an operating time between 8ms and 18ms and, when combined with a circuit breaker with an operating time between 35ms and 50ms, we have achieved our goal of 100ms or less.

However, many older circuit breakers operate closer to 80ms, and these require pairing with faster arc detection devices. Arcs produce light at intensity levels exceeding 20,000 lux. This can be detected through special optical sensors connected to a relay system that has a typical operating time under 1ms and is the fastest arc flash detection technology currently available. The operating time is independent of the fault current magnitude, since any current detector elements are used only to supervise the optical system.

With optical arc protection technology installed, the relay operating time is essentially negligible compared to the circuit breaker operating time, and the cost is fairly low since current transformers are only needed on the main breakers. Again, if we sum up the circuit breaker operating time and the optical arc detection time we are well below the goal of 100ms regardless of the age and speed of the circuit breaker and have mitigated the damage to a more reasonable level.

One concern often discussed is the possibility of nuisance tripping caused by light sources that may not be an arc or may be a simple switching load. The safeguard approach is to employ a second measurement criterion before providing a trip signal, and this can be thermal (as noted above), current or pressure.

The combined use of high-resistance grounding with its ability to prohibit fault escalation; the use ZSIP to eliminate the delays associated with time and current coordination; and arc mitigation technology combine to form an effective engineered approach to minimizing the impact of ground faults and arc flash hazard, thereby establishing an effective and safe electrical grounding system. **EB**

Andy Cochran is the president of I-Gard Corp., a developer and manufacturer of products that protect power equipment and the people who use them. Visit www.i-gard.com.

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Blown away

Good ventilation is a bathroom “must have”

Val Maloney

Brilliant lighting, glistening new tile, state of the art fixtures... forgetting something? When it comes to bathrooms, the last thing on your list of “must-haves”—ventilation—is actually one of the most important. Often an afterthought because of its unseen nature, ventilation experts such as Digby Campbell, regional sales manager of ventilation with Panasonic Canada Inc. in Mississauga, Ont., insist the time is now for designers and bathroom experts to step up and be the cheerleaders for these fans.

The need to pay attention to installing proper mechanical ventilation has increased over the years because homes are being built more airtight, thus losing their natural ventilation, says Campbell. “There is no leakage... moisture and odour stay indoors,” says Kathie Perry, director of marketing for Fantech in Sarasota, Fla. “If you have a good vent you get the steam out of the house efficiently without damaging the bathroom.” Perry also mentions the popularity of high-moisture appliances such as steam and multi-head showers in the bathroom as another major reason to keep ventilation in mind when working on a bathroom.

While homes have been losing natural ventilation because of their tighter construction, the bathrooms in them have also gotten larger, says John Harper, member of the board of directors and chairman of the engineering committee with the Home Ventilation Institute (HVI). He is getting used to seeing more than one room in the space; for instance, a stall for the commode and another for the shower or tub, as is frequently



seen in Europe and becoming more commonplace here. “It is not uncommon today to see a bathroom that is 15-20 ft x 10 ft and, in that situation, you need what I call spot ventilation,” he says. This means using a smaller fan for each of the applications rather than one big one.

The consequences of not utilizing proper ventilation in a bathroom can mean more serious problems for the home and its occupants than just unpleasant odours. Additional issues can range from mould and mildew on surfaces of the bathroom to damage to the actual structure of the home (depending on the severity of the problem and how long it is left, says Perry). “From the manufacturer side, we like to say that ventilation is insurance for your fixture, grout, tile,” says Campbell. “A bathroom that is ventilated properly should last longer than one that isn’t.”

Despite the ramifications and the fact that ventilation is mandatory in all Canadian bathrooms, Campbell says a study by the Canada Mortgage Housing Corporation (CMHC) discovered many existing systems are inadequate. The main problems they found in Canadian homes were ventilation systems that were too noisy, thus unlikely to be used, or ones that don’t move enough air and aren’t energy efficient because of issues like the use of high-wattage bulbs.

Guidelines are available to help you avoid these pitfalls and get the best ventilation system for your customer. The Home Ventilation Institute, for example, has developed a set of codes for ventilation that are recognized by the National Building Code of Canada, says John Harper a member of HVI’s board of directors and chair of the engineering committee for the institute. The codes were developed using simulated bathrooms in HVI labs, using moisture and tracer gas simulating odours to test and compare fans. The main guideline, says Harper, is that a system should provide eight air changes per hour, or about one cubic foot per minute per foot of floor area (1 cfm/sf). So, an 8 x 10-ft bathroom would require an 80 cfm fan to ventilate the area. Information including comparisons between various ventilators and frequently asked questions (FAQs) can be found on HVI’s website at www.hvi.org.

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The main difference between ventilating a bathroom and a kitchen is what you are taking out of the air, says John Harper, member of the board of directors and chair of the engineering committee with the Home Ventilation Institute. With bathrooms, you are removing moisture, but in kitchens (where you are cooking with oil and other potentially flammable substances) it is an entirely different approach.

The general rule for ventilating a kitchen with a typical four-burner stove is to use a 100 cfm range hood, says Harper. When you are working with larger units, such as stoves that include a barbeque in the middle of two sets of burners, you should consult the manufacturer for the amount of ventilation needed.

The height of the range hood is determined by both the height of the person cooking and the size of the cabinets above the unit, says Harper. As a general rule, a range hood should sit about 24 in. to 30 in. above the stove, so that it's not too high that it doesn't capture the smoke, nor too low that it gets in the way of creating culinary masterpieces. Someone who is smaller in stature could have the hood around 24 in., while a taller cook should install it around 30 in. above the stove.

The amount of noise a range hood makes is measured in *sones* and it's rating is marked on the unit. Harper explains: "If you buy a cheap range hood, you won't have to look at it twice to make sure it is working. They're pretty noisy". As a guideline, 1 sone is the noise generated by a quiet refrigerator. Two sones is considered to be fairly quiet for a range hood. The more air the unit has to move, the noisier it is going to be.

Once you have the basics of what a ventilation system should be doing, the next step, says Campbell, is deciding the configuration the fan will have. It is important to the efficiency of the machine to ensure the system is a controlled process rather than simply occupancy-driven (so there is time after the occupant has left the room to complete the exhaust cycle and make needed changes before it turns Off). Campbell recommends setting the system to stay on for 20 minutes to one hour after the occupant has left the room. To be more energy efficient, the system should run at a higher setting when occupied than during the controlled turn-off time when it switches down to a lower rate of movement.

Having different occupied and unoccupied settings are the tip of the iceberg when it comes to the extras with which ventilation systems can come equipped. Campbell says a popular feature on one of his company's fans is the ability to also heat the room while the system is On. The fan can shoot about 5000 btu of heat into the area while ventilating, which helps ease the shock of stepping out of a warm shower into an ice-cold bathroom (something with which many Canadians are familiar in the dead of winter).

As an area that is often an afterthought, it is not

surprising that most consumers don't know very much about ventilation, says Harper. A well-informed professional can help customers make the right ventilation decisions when building or renovating a bathroom.

"The consumer typically looks at other things for the house, such as carpets, cabinets... things that are seen and that they think are more important," he says. "But bathroom ventilation should be right up there with all these other needs that should be addressed in home construction." **EB**

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Outdoor lighting and human/animal factors: an industry opinion

NEMA Lighting Systems Division

Outdoor electric lighting provides many obvious and accepted benefits to society, including the ability to safely travel on roadways, facilitate commerce, enable outdoor activities such as recreation, provide for the lighting of architecture and landmarks, and provide for social and personal security.

NEMA Lighting Systems Division members have a significant concern with papers and other publications that seek to portray some or all types of outdoor lighting as threatening technologies. These publications all too often appear to be aimed at sensationalism rather than a fully informed public discourse about outdoor lighting. The views of the Lighting Systems Division

manufacturers are shaped by the cardinal principle that, regardless of the issue, public policy that relates to technical issues should always be based on sound scientific evidence and not built upon hearsay or conjecture.

Factors influencing NEMA's point of view

NEMA Lighting Systems Division members share the same fundamental concerns as many do regarding the need for energy conservation, night sky preservation, potential ecological impacts of outdoor lighting, and the growing body of research that seeks to understand and explain the interplay of the light-dark circadian cycle with human and animal health.



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NEMA Lighting Systems Division members support ongoing efforts by various agencies and movements to minimize the amount of outdoor electric lighting needed to achieve functionality and specifically to reduce unnecessary stray light, including the likelihood of light trespass, nighttime sky glow, and excess energy consumption associated with inefficient lighting. NEMA lighting manufacturing companies are committed to providing improved lighting solutions that help achieve these objectives. For instance, members of NEMA's Lighting Systems Division have been actively working on the development of the International Dark-Sky Association Model Lighting Ordinance to promote quality lighting standards for municipalities. NEMA members are also actively working in collaboration with the Illuminating Engineering Society of North America (IESNA) Roadway Lighting Committee regarding this general topic. Many NEMA members have been aggressive in developing and promoting the types of outdoor lighting products and practices that are endorsed or recommended by many other groups, including sharp cutoff luminaires and lighting controls. NEMA members also support the adoption of sensible generic outdoor lighting ordinances and specific requirements that are sometimes tailored to localities that have particular concerns, such as disruption of sea turtle habitats.

Collaborative activity among interested parties based on sound scientific evidence is the best way to achieve future outdoor lighting changes that will benefit global climate, ecology, astronomy, and, potentially, human health.

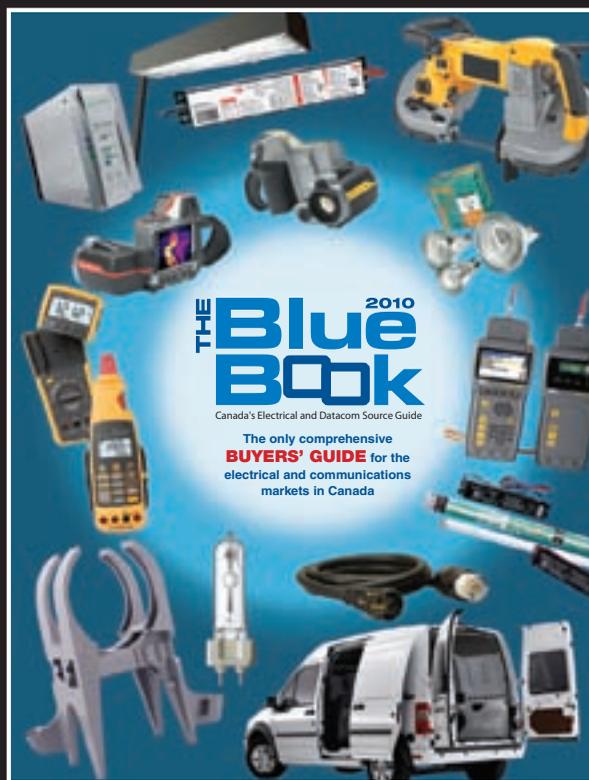
Several of the subjects pertinent to the issue of light and its effects on the day/night cycle in humans and animals are scientifically complex and are not yet fully understood even by the scientific community such that specific technical recommendations, particularly regarding outdoor light source spectral content, cannot yet be developed much less pro-pounded. Too many current efforts to establish a technical requirement regarding spectral content are based on scientific questions that are not yet understood. NEMA Lighting Systems Division members contend that technical recommendations that have the potential to impact lighting products, emerging technologies, outdoor lighting design and architectural practices, lighting codes, and legislation must be based on

expert consensus and sound science after full scientific discourse and peer review. By definition, sound science must include adequate replication of results and the validation of theories and hypotheses in the form of supporting measurements and data—not simply in a laboratory environment, but under real-world field conditions. Only in this manner can sufficiently detailed technical and mathematical relationships be developed that can form the basis of actionable practices and standards.

Some proposals oversimplify the ecological

tradeoffs that are inherent with any proposal to limit outdoor lighting to a certain correlated colour temperature (CCT). Such recommendations do not recognize the ironies of such a spectrum choice, for instance that Red light purportedly may disturb certain bird migrations while Blue light distracts sea turtles. How is such a trade-off to be reconciled between species? The topic of lighting color is complex and involves many factors beyond CCT. Thus, promoting specific CCTs to advance a particular policy about outdoor lighting may have unintended

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consequences on overall lighting quality and other concerns of public policy such as safety and security.

Any proposed program should be based on sound scientific study. If not, it is not a legitimate proposal.

Outdoor lighting products, technologies, and practices have a long tradition of being strongly grounded in sound engineering practices driven by the careful measurement and processing of data. This tradition must continue, especially if future technical recommendations are expected to credibly drive change in how outdoor lighting is practiced, how emerging technologies such as solid state lighting are treated, and how future product offerings are configured.

NEMA Lighting Systems Division members fully support many of these outdoor lighting recommendations currently being advocated by various groups:

- use of light control options such as motion sensing, time-of-night dimming, and stepped power switching (including an appropriate use of complete shutoff for some applications)
- luminaire shielding to curtail excessive uplight, glare, and light trespass -limiting illumination to the specific task or targeted area
- designing for the minimum light levels and connected power load necessary for the task.

However, NEMA Lighting Systems Division members cannot accept recommendations that outdoor lighting systems minimize use of light sources with a CCT above some arbitrary level. Such an approach is technically incorrect and, ultimately, too simplistic. For example, light sources with higher CCT tend to have more power in the short wavelength region, which in turn can improve human reaction time at very low light levels. In certain outdoor applications, depriving people of higher CCT sources could limit the potential for improved safety and security. The interrelationship among light levels, spectral power distribution, and application type is highly complex and cannot be relegated to restrictions within one simple metric.

As stated previously, there are several well-respected organizations

attempting to address these issues. IESNA, the professional society representing lighting engineers, has organized numerous forums for the presentation and discussion of information and collected data from a wide range of researchers and laboratories. Yet there is [still no] consensus within IESNA on these matters. This demonstrates the need for additional research and more scientific study. More studies must be conducted and scientific data must be collected in order for industry to establish agreed upon corresponding actions. Conjecture and precautionary measures based on what is not known are not enough and have the potential to do more harm than good if their impact cannot be accurately estimated.

Surely a more informed discussion is necessary.

NEMA welcomes the opportunity to work with various lighting organizations to prioritize and drive projects to further research this area. We are committed to improving light at night based on factual data and scientific conclusions. This is an extremely important subject to the NEMA lighting members and urgently deserves attention. **EB**

This position statement, LSD 55-2010, was prepared by NEMA's Lighting Systems Division, National Electrical Manufacturers Association (www.nema.org).

The requirements or guidelines presented in this document, a NEMA Lighting Systems Division white paper, are considered technically sound at the time they are approved for publication. They are not a substitute for a product seller's or user's own judgment with respect to the particular product discussed, and NEMA does not undertake to guarantee the performance of any individual manufacturer's products by virtue of this document or guide. Thus, NEMA expressly disclaims any responsibility for damages arising from the use, application, or reliance by others on the information contained in these white papers, standards, or guidelines.

The opinions expressed in this statement represent the consensus views of the member companies of the Lighting Systems Division of the National Electrical Manufacturers Association. The members of the Lighting Systems Division manufacture indoor and outdoor lamps, which include: incandescent, fluorescent, light-emitting diode, and solid state lamps, lighting fixtures and lamp ballasts.

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“Our new axle rating for the Kenworth T370 broadens our commitment to support medium-duty vocational applications, such as fuel hauler, dump, mixer, utility, service truck and others, which require a heavier front axle to get the job done,” said Gary Moore, Kenworth assistant general manager for marketing and sales.

The new 16,000-lb rating includes taperleaf springs, a choice of single- or dual-steering gears, and up to 315 series tires.

Ford F-650 and F-750

The Ford (www.ford.ca) F-650 and F-750 Super Duty are tough Class 6 and 7 commercial trucks that, despite their commercial truck design, deliver styling, comfort and convenience features. XL and XLT trims are offered.

F-650 and F-750 customers can order the vehicle exactly as they need it, with a choice of three cab configurations—Regular Cab, four-door SuperCab and four-door Crew Cab—each with a variety of seating choices. There are 38 wheelbase choices, allowing the trucks to be easily upfitted across a spectrum of body types.

Customers can also choose from nine different frames including, says Ford, one of the strongest-rated frames in its class (120,000 psi and 3,580,000 RBM). An array of rear axles includes two- and single-speed axles with driver-controlled locking differentials. There are five multi-leaf and five air suspensions from which to choose; air suspension is offered on all models—with or without air brakes—and 10 fuel tank combinations are available.

Each of these design elements, and others, has been packaged to allow for maximum fuel capacity and ground clearance for given applications, especially those requiring clear frame rails for skirted bodies. Ford also offers a low-profile cab, suitable for height-restricted applications.

Diverse offerings make for eight distinct model options, each with a variety of cabs and wheelbases. F-650 is available as a Pro Loader with a kick-up or straight frame, but also as a standard straight-frame truck. F-750 and F-750S (severe service) come in straight-frame versions rated for up to 120,000 psi.

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is a direct-injection, 32-valve, 6.0-L Power Stroke diesel with four power ranges, generating up to 230 hp and 620 lb-ft of torque. Other offerings include a 3126 Caterpillar 7.2-L diesel with up to 300 hp and 860 lb-ft of torque, and a 5.9-L Cummins ISB diesel engine with up to 260 hp and 660 lb-ft of torque.

The F-650/F-750 has a heavy-duty braking system (hydraulic system standard), and both hydraulic and air brakes have a standard four-wheel ABS.

The F-650/F-750 is offered in two trims. The XL includes solar-tinted glass, chrome front bumper, chrome grille, halogen headlamps, stainless exterior mirrors, assist handles, power point, interior lamp, AM/FM radio, speed control, tilt steering, intermittent wipers, anti-lock brakes and dual batteries. The XLT trim adds air-conditioning, power windows and door locks, and more. Options include a front frame extension, power take-off provision and vertical exhaust system, among others. **EB**



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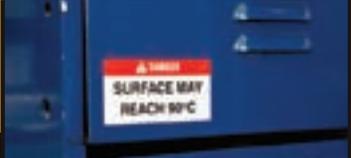
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SD09142



Tim Register, facility manager, Valdosta Regional Airport, Valdosta, Ga., views various areas of the facility with the new security system's CCTV cameras that can be viewed simultaneously on one screen.

Tim Register checks out a remote distribution box behind the scenes of the airport's new Matrix Systems' access control system.

PHOTOS COURTESY MATRIX SYSTEMS

Airport's wireless security retrofit for TSA mandate cuts costs

When a recent Transportation Security Administration (TSA) mandate introduced new requirements for activity monitoring and identifying General Aviation (GA) personnel with unescorted airport access, Valdosta Regional Airport (VLD) found itself in an underfunded race against time to retrofit its access control/security system.

Like most Class-3 airports, VLD was not only

underfunded, but its GA clientele was infuriated at TSA's December 2008 mandate, Security Directive (SD) 1542-08G, which is directed mainly toward GA areas at commercial service airports. After eight years of successful post-9/11 security measures for commercial aviation, the TSA is now tightening security in other airport areas (such as GA) with mandatory background checks and ID media issuances to all pilot and

personnel with unescorted access to airport operations areas. The 62-year-old, Valdosta, Ga.-based facility, which is owned by the Valdosta-Lowndes County Airport Authority, averages three daily flight operations by commercial carrier Atlantic Southeast Airlines (ASA) and more than 30,000 GA operations annually.

After the mandate's enactment, Patti Clark, Ph.D., executive director and airport manager, spent several months searching for affordable new access control and ID equipment while simultaneously holding town hall meetings for her angered GA community. "Our meetings were intense," noted Clark, "they made the national healthcare town halls in the summer of 2009 look like birthday parties. Our GA clientele tended to direct their anger at the messenger instead of the message, and many threatened to take their business to other airports. The threats of these actions were a grave concern to me."

While the challenge seemed insurmountable at the onset for the 800-acre airport, creative ideas from an access control/security provider combined with cutting-edge wireless technology helped make the security retrofit affordable and fast-track the installation in an effort to avoid TSA fines.

Matrix Systems, a Dayton, Ohio-based turnkey access control and security solutions provider submitted the winning bid, suggesting wireless technology for helping connect the



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(Left to right) Tim Register and Patti Clark, executive director and airport manager, check a new ID card on a card reader of the recently installed access control system.

different from those used by weather, runway landing instrumentation and other common airport technologies.

Wireless also provided a cost-effective transmission solution to the project's Bosch Security Systems-North America, Fairport, N.Y., 12 CCTV and digital video recording (DVR) equipment. CCTV typically requires a bandwidth in excess of what Cat 5 ethernet networks offer. Therefore, the mesh wireless system's capability of transmitting broadband CCTV data circumvented the need of hard-wiring costs associated

with providing additional bandwidth capacity.

The solution consisted of a building controller, seven Matrix System Gateways (MSG), 12 reader control modules (RCM), and 12 proximity/PIN code/LCD readout card readers, which required little additional wiring because installers used VLD's existing Cat 5 ethernet cable where available.

The hardware and software used is a completely scalable, open-architecture access control/security system that will help VLD maintain a state-of-the-art operation well into the 21st century, Clark believes.



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The ALXW building mounted luminaire is an LED solution that delivers superior uniformity, high CRI, increased vertical footcandles with zero uplight. Designed to operate in applications with ambient temperatures of 40°C while exceeding 50,000 hours life. The ALXW generates 40% energy savings over HID technology and also provides a contemporary aesthetic and matches the look of the ALX area luminaire.



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- Simple operation, unlimited control



D6M LED

The D6M series is a family of high-performance downlights with clean aesthetics and a low-glare, uniform light distribution. The D6M design provides a structurally sound housing that is as robust and long-lasting as the LED source inside for virtually no maintenance.



www.acuitybrands.com

geographically separated GA airport operations with VLD's main terminal more than 1000 yards away.

Implementing the wireless network solution saved VLD tens of thousands of dollars. The wireless mesh technology solution also fast-tracked the project and facilitated coordination with TSA to avoid non-compliance actions. The Matrix installation team set up a ClearSite Communications VR42 Series wireless system—consisting of five antennae, seven IP controllers and one base antennae—in just one day, versus the several months required in trenching and hard-wiring a perimeter system on such a sprawling property.

Other than cost and ease of installation, there were additional benefits to the wireless mesh system that made it a perfect solution for the TSA mandates. It operates on a closed security platform, was developed exclusively for security applications, complies with Advanced Encryption Standard (AES) and uses dedicated, custom-configured serial interface connections to prohibit potential external breaches.

Clark, who has 30 years of aviation management experience ranging from operations, maintenance and logistics to environmental protection, initially had reservations about the compatibility of wireless technology operating within an airport operation. Interference has not been an issue, however, because VLD's wireless mesh system uses a frequency spectrum that's far

Additional savings came from the strategy to combine the server, security workstation and badge production into one unified source. For example, embedded into the access control software is Frontier Imaging, which is compatible with the DCP-360i badge printer by Digital Identification Solutions LLC (DIS-USA), Greenville, S.C., and avoids the expense of interfacing additional software.

This integration feature also helped fast-track the project because Tina Castleberry, VLD's operations coordinator and security workstation operator, was able to comply with TSA guidelines by producing over 400 ID badges in four days during the second week of the project—even though the entire access control installation wasn't completed until three weeks later.

Despite the significant savings and the shortened timeline due to the wireless solution, when it came to funding the security retrofit, Clark used some creativity. VLD had already appropriated \$60,000 to routinely improve security before SD 1542-08G was enacted. When it was evident more was needed, Clark requested local authorities to allocate funds for the shortfall from a Special Purpose Local Options Sales Tax (SPLOST) for the remainder of the retrofit costs.

Even though VLD needed to come up with smart solutions to help fund the SD 1542-08G initiative, another project benefit was providing Clark an opportunity to retire its outdated PIN door locks in turn for what ClearSite Communications president, Knight Hamalian, calls "one of the most cutting-edge airport security combinations of wireless, state-of-the-art access control equipment and CCTV in the nation".

Admittedly, the prior access control system of PIN code doors was not as secure as today's system because, Clark suspects, some authorized users most likely shared PIN codes with unauthorized personnel—not maliciously, but out of convenience.

"Once you hand out a key (which can be duplicated) or a PIN code, you lose control," explains Clark. "Now we can account for everyone and their activities because they must use ID badges that we monitor and record through the Frontier software."

Other past costs associated with the old system, such as contractors working in secure areas, are no longer applicable. Contracting work was always escorted and personally monitored throughout the work's completion by one of Clark's limited staff of four people. Now contractors are unescorted because they're vetted through TSA and issued temporary badges, which are monitored through the Frontier software.

While the SD 1542-08G mandate was initially very unpopular among VLD's GA customers, there have been no complaints. Instead, there has been plenty of appreciation for the increased security, according to Clark.

Longstanding tenants that initially threatened to relocate to other airports have stayed, and VLD is even attracting new customers. "Because of our state-of-the-art access control and security, we've had many private pilots and businesses calling to relocate their aircraft to our facility from less secure airports," concluded Clark. **EB**

Innovation and conservation don't just describe LEDs

TAKING THE "LEED" ON LED WORKSHOP



Gillian Marsh

While at first glance the McMichael Canadian Art Collection may seem like an unusual location for an energy-efficient lighting strategies and solutions workshop, with the help of PowerStream and Osram Sylvania, it is safe to say the opposite.

EBMag recently attended the "Taking the 'LEED' on LEDs" workshop at McMichael's, where the gallery's entrance aimed the spotlight on new light emitting diode (LED) lighting systems.

With the workshop themed around innovation, the gallery fit the subject to a tee—not only through its current use of LED technology but as the first art institution in North America to use this type of lighting in gallery spaces. As the facility is aiming to achieve LEED (Leadership in Energy and Environmental Design) gold certification from the Canada Green Building Council (CaGBC).

The workshop began with welcome and introductions from Milan Bolkovic, executive VP of renewable generation and conservation for PowerStream, followed by presentations from experts of PowerStream and Osram Sylvania.

John Sherin, manager of conservation and demand management at PowerStream, began the set of presentations, discussing the utility's three main incentive programs: the Electricity Retrofit Incentive Program (ERIP); Power-Saving Blitz; and Data Centre Program. He explained these programs will be enhanced

with Ontario Power Authority starting January 1, 2011, adding that "everyone here is an innovator or wants to be innovators; [its] all about conservation".

Stefanie Josephson, sales development manager for Osram, discussing a list of new LED product technologies, and how each compared to other forms of lighting. She also mentioned a company program for sustainability called "Global Care" that involves continued funding for future research within the company.

Osram's Ed Evans then went into greater detail about LEDs—advantages and disadvantages. He expects 50% of all lighting globally to transition to LED in the next 10 years. He also went into the changes in the McMichael's, explaining that the gallery will see a return on its lighting investment in less than 16 months (generating over \$400 in savings through the life of one PAR30).

Evans also discussed heating issues with LED lamps; when the core is damaged, the bulb will experience failure (which is considered anything less than 70% of its full lighting output).

Katerina Atanassova, chief curator at the McMichael Canadian Art Collection, thanked the speakers and both companies for their contributions and assistance with the gallery. She explained that the use LED technologies has allowed for better design space, for colours to render better, for art to be seen more easily, and for the lack of heat (which can damage artwork).

As the presentations closed, attendees were invited to tour the gallery. As we walked down the hallways through exhibition rooms, every once in a while someone would put up their hand to ensure no heat was radiating from the bulbs. The lighting not only helps to preserve the art, but it brought out every bit of texture from the acrylic and oil paints on the canvas.

Who knew lighting could be so artistic? **EB**

Standard Products AccuColor MR16 halogen lamps

Standard's new AccuColor MR16 halogen lamps promise a consistent, crisp white light output and high CRI (Colour Rendering Index); a "special" interior and exterior coating ensures the reflector remains stable. Standard says the AccuColor halogens have a life of 6000 hours, and are 30% more energy efficient and brighter than a regular MR16 halogen (for which they are a direct replacement, using the same transformer). Available in 20W, 35W and 50W, the lamps' UV-filtered glass aims to minimize merchandise fading and discoloration.

STANDARD PRODUCTS
www.standardpro.com

Hubbell Lighting launches site and brochure for education market

Hubbell Lighting has published an Education Solutions website for engineers, lighting designers, facilities managers and education board members to better educate them on the myriad of functions requiring different lighting solutions. The site features some of the Hubbell solutions for indoor, outdoor, sports, lighting control, life safety and retrofit/upgrade applications for the K-12 to post-secondary markets. As an added resource, visitors can download Hubbell's 32-page "Education Specification Guide", which provides an overview of applications and solutions.

HUBBELL LIGHTING'S EDUCATION SOLUTIONS
www.hubbellighting.com/markets/education

Juno combines Designer and Performance brands into new Indy

Juno Lighting Group has combined two of its lighting lines—the Designer and Performance series—under a single brand: Indy. Customers are now able to select products from either or both series, says Juno, including fixtures for downlighting, wall-washing and adjustable accent lighting applications. In addition, lamping options for a range of characteristics are also available, from LEDs to the latest

ceramic metal halide (cMH) and CFL products.

JUNO LIGHTING GROUP
www.junolightinggroup.com

BetaLED introduces LEDway SLM streetlight

BetaLED introduced the LEDway single light module (SLM) to its line of LEDway streetlight products, which are designed to "replace existing traditional cobrahead systems along residential streets". The new luminaire offers more than 90



lumens per watt and uses an LED chip package. The LEDway SLM streetlight can be configured with up to 60 LEDs, and features NanoOptic product technology. It is compatible with existing pole-mounting configurations, and can be mounted to a vertical or horizontal tenon for "increased flexibility". It is also IP-66 rated and UL, cUL, ENEC and CE compliant.

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Sharp enters lighting market with LED lamps

Sharp has entered the North American lighting market with LED PAR38 and PAR30 lamps for commercial and industrial applications. The four PAR38 LED lamps (DL-L20P3830A and DL-L16P3830A in Warm White, and DL-L20P3840A and DL-L16P3840A in Cool White) and three PAR30 LED



lamps (models DL-L12P3030A and DL-L12P3L30A in Warm White, and DL-L12P3040A in Cool White) promise long-lasting durability for traditional down-light applications. The LED PAR38 and PAR30 lamps promise high brightness, good colour rendering and "well-designed beam control". The PAR38s are available in some of the highest lumen levels in the industry, says Sharp, at 900, replacing a 75W halogen bulb (the actual wattages are 20W and 16W). The smaller PAR30 lamps offer 600 lumens, comparable to a 50W halogen,

says the company. (Note: unsure of availability in Canada at time of writing.)

SHARP ELECTRONICS CORP.
www.sharppusa.com

Cooper Lighting io lili 2x2 recessed LED indirect luminaire



Cooper Lighting has introduced the io lili, a 2x2 recessed LED indirect luminaire designed to replace comparable fluorescents for general lighting applications. Featuring a patent-pending organic reflector design, the luminaire promises soft, glare-free illumination without excessive brightness, and light levels compliant with IES standards. The LEDs are centrally located in a low-profile decorative pendant (light engine) that also serves as the heat sink. The LEDs are optically controlled to project light up into the organically shaped reflector. The luminaire produces a colour temperature of 3500K and features >80 CRI (Colour Rendering Index). It can be dimmed to 5% and has a projected average rated life of 50,000 hours at 70% of lamp lumen output.

COOPER LIGHTING
www.cooperlighting.com

Shat-R-Shield new ceramic discharge metal halide lamps



Shat-R-Shield, a manufacturer of shatter-resistant lamps, unveiled its new line of CDM (ceramic discharge metal halide) lamps, which are designed for direct retrofit applications. The four lamps promise a 20,000-hr operating life. The company says its 330W CDM lamp features an energy savings of 18% over a standard 400W quartz model. The lamps boast crisp white light, 100 lumens/watt and 90 CRI. The CDM lamps are offered in two bulb sizes (ED37 and ED28), two wattages (330W and 205W) and two finishes (clear and frosted), and are UL-EPH classified and NSF certified.

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Westinghouse expands CFLs with Kelvin wattage and style options



Westinghouse Lighting says it has expanded its CFL line to include a larger assortment of Kelvin options, a range of wattages and a wider selection of standard, candelabra and GU24

base CFLs for commercial, industrial and residential use. The revamped line features CFL twists that replace incandescents up to 420W. New Toughshell rubber-coated mini-twists can be used in a variety of applications; dimmable twist, reflector and decorative lamps dim to 20% of their light output. The series also includes T2 technology, a smaller-size CFL, making it easier to replace standard light bulbs. Westinghouse's complete CFL series contains household shapes, three-way, coloured, coated, decorative, reflector and aluminum reflector PAR specialty lamps.
WESTINGHOUSE LIGHTING CORP.
www.westinghouselighting.com

Standard Products CeraPro ceramic metal halide lamps



CeraPro by Standard is a new line of ceramic metal halide (cMH) lamps promising a combination of performance, reliability and energy savings. The lamps consume less energy and

generate less heat than equivalent halogens, says the company, boasting a higher CRI (Colour Rendering Index) and better lumen maintenance. This cMH line lasts 3 to 5 times longer than halogens, boasts Standard; the lamps employ a one-piece arc tube, and are available in various shapes and wattages.
STANDARD PRODUCTS
www.standardpro.com

Nora Lighting NHID-4 series of architectural CMH downlights



Nora Lighting introduced the NHID-4 series of architectural ceramic metal halide (cMH) downlights with interchangeable beam spreads. These fixtures are designed for commercial, retail, hospitality, etc., installations. They use T4, T6, PAR20 or GX10 MR16 cMH light sources, and measure 6 3/8-in. deep (housing). The series includes a steel-constructed plaster frame, two adjustable universal mounting brackets, and electronic ballast and thermal protector. A selection of 4-in. HID cMH die-cast trims are available, with adjustable options (90° vertical and 359° rotation). The NHID-4T4 series of HID reflectors offer 15°, 23° or 32° beam spreads in 20W, 39W or 70W. All units are cUL listed for damp locations.

NORA LIGHTING
www.noralighting.com

High-Lites Weathergard series of LED exit signs

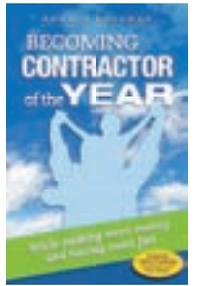
High-Lites introduced the Weathergard series of AC and emergency LED exit signs for use in severe environments (cold, damp and wet areas). The Weathergard models feature: a wraparound clear polycarbonate sign enclosure and die-cast aluminum frame; a corrosion resistant, neoprene-gasketed construction with stainless-steel hardware; a high-intensity LED illumination; a wall, ceiling, end- and pendant-mounting hardware; a directional removable chevron; and come in your choice of black, gray, white or brushed finishes with matching canopies. The Emergency models feature: a 120/277VAC field-selectable power inputs; a automatic switching and charging circuit; a nickel cadmium battery; a 24-hour battery recharge cycle; a -40oC to 45oC operating temperature; an AC lockout feature; a Laser-Pen activated and manual test switches; and a LED AC-on indicator light. Other available options include: self-diagnostic circuitry, fire panel interface, audio-visual alarms, 2-circuit input and special wording.



HIGH-LITES
www.highliteslighting.com

Becoming Contractor of the Year

Ron Coleman has published a new book entitled "Becoming Contractor of the Year (while making more money and having more fun)". It follows the transformation of a contractor named Dave, who went from "doing okay" to becoming Contractor of the Year. The book goes through the same steps undertaken by Dave, including: developing the right mindset; analyzing your numbers; and executing change. Also included are helpful appendices containing worksheets and more. Contractor associations are encouraged to buy and promote this book for the advantage of their membership, says Coleman, and to raise funds for the organization: it is available at special quantity discounts.



RON COLEMAN
www.ronaldcoleman.ca

Milwaukee introduces 8 Piece screwdriver set



As part of its new line of hand tools, Milwaukee Electric Tool Corp. introduced the 8 Piece screwdriver set.

Similar to the 11-in-1 screwdriver, this set features patented ECX bits that, says the company, "perfectly fit the hybrid specialty screws users often encounter in electrical boxes, conduit couplers, outlets and other common jobsite fixtures". For additional durability, a steel top was added and the shaft is made of shock-resistant steel. Also included is a wire stripper and wire bending hole that fits up to 12-ga wires.

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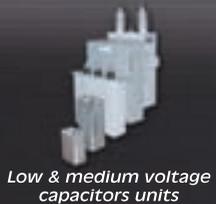
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Federal Signal ATEX IEC product line
Federal Signal has unveiled three new lines specifically designed and engineered to meet international safety standards. The ATEX/IEC-rated products include three new status indicators, three new dual-function beacons, plus a trio of newly designed call points. The intrinsically safe status indicator

line includes an LED visual signal, a high-output audible device, and an indicator combining LED visual and audible functions in a single unit. The audible signal supports maximum output of 100dBa, low-current draw and multi-voltage operation. Shock- and vibration-resistant visual signals spotlight high-intensity LEDs designed for extended service

life in tandem with Fresnel lenses for focused light, while offering both low-power consumption and low in-rush. All indicators are ATEX and IECEx rated for Zone 0, and FM approved for Class 1, Division 1 and Zone 0. Federal's flameproof industrial beacon line has been expanded to include sounder/strobe and sounder/LED combination units, as well as a dual-strobe signal. The three new Zone 1 call points include the Break Glass, Push Button and Tool Reset models. All three are ATEX and IECEx rated for Zone 1, 2, 21 and 22 as well as IP66.

FEDERAL SIGNAL CORP.
www.federal-signal-indust.com

Ideal upgrades Tuff-Grip PRO fish tape



Ideal Industries Inc. announced two major upgrades to its Tuff-Grip PRO fish tape. The first is that the Tuff-Grip PRO is now available with laser-etched versions of Ideal Blued Steel and stainless steel tapes, which can be purchased separately or bought pre-installed. The permanent laser-etched 1-in. increments on the tape "enable electricians to accurately and instantly measure conduit length, always letting the user know how much tape they have left to pay out". And, because they are etched, the measurements will never rub off with wear. The second upgrade is a new vertical grip that features a large hand opening for use with bulky gloves, and promises less strain on the wrist. Called Speed-Grip, Ideal says the new grip "achieves a faster payout and rewind than traditional handle designs".

IDEAL INDUSTRIES
www.idealindustries.ca

EasyHeat publishes heating cable catalogue

EasyHeat, a business unit of Emerson Industrial Automation, published a new catalogue showcasing its full line of pipe tracing, roof and gutter deicing, snow melting, floor warming and thermal storage products for residential and commercial buildings. Of note is EasyHeat's Freeze Free self-regulating pipe heating cable, which automatically varies its heat output with changes in ambient temperature, or the SnoMelter system, which comes in standard and custom mat sizes.

EASYHEAT
www.easyheat.com

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ADVERTISER INDEX

ADVERTISER.....	PAGE	ADVERTISER.....	PAGE
Acuity Brands.....	27	Hubbell Lighting.....	22
APPrO.....	32	Hubbell Wiring.....	16
Arlington Industries.....	9	Ideal Industries.....	14
Brady Canada.....	25	IED Limited Partnership.....	36
Britech Corp.....	33	Ipex Inc.....	13
Canada Training Group.....	11,33	Nexans.....	1
Chess Controls.....	12	Northern Cables.....	7
CSA.....	34	Power Survey.....	31
Eaton.....	35	Raylew Power Systems.....	33
Falvo Electrical Supply Ltd.....	33	RC Lighting.....	29
Flextherm.....	15	Schneider Electric.....	10
Flir Systems.....	19	Smart Grid.....	26
Fluke Electronics.....	33	Standard Products.....	2
Ford Motor Co Canada.....	23	Stanpro Lighting Systems.....	20
GE Consumer & Industrial.....	17	Thomas & Betts.....	1,5,11
Hammond Manufacturing.....	18	Ultrasave.....	30
Hammond Power Solutions.....	6	Venture Lighting.....	8

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Motor supply conductors... they're complicated!

It's Complicated. You've probably seen this witty movie about divorce. Motor wiring rules are complicated, too, but not nearly as amusing as the movie.

When wiring is installed directly into a motor terminal box, Rule 28-104 tells us that the minimum conductor insulation temperature must conform to the motor's insulation class. Rule 28-104 refers us to Table 37, which provides conductor insulation specifications for motor classes A, B, F and H. Motors are further divided into two categories, totally enclosed non-ventilated and all the rest.

The motor nameplate identifies its insulation class, and whether it's totally enclosed non-ventilated (TENV) or another type. According to Table 37, the minimum conductor insulation should be 75C for an insulation Class B motor, except for a TENV motor, where 90C insulated wiring should be provided.

But wait, there are further complications. For wiring insulation greater than 75C,

Rule 28-104 demands that wiring between the motor and its termination point (switch, motor starter, etc.), must be at least 1.2 m in length and the point of connection must not be closer than 600 mm to the motor. And for motors 100 hp and greater, the conductor termination point must be located at least 1.2 m from the motor.

But we're not through yet! Table 37 gives us conductor insulation temperature values for ambient temperatures only up to 30C. For ambients greater than 30C, the rule requires that we add the difference between the expected ambient temperature and 30C to the conductor's temperature rating as determined from Table 37. When the expected ambient temperature at the motor location is 40C, and then we must add 10C to the conductor data derived from Table 37.

Yet one more thing: except for Class A motors, Rule 28-104 requires that motor supply conductor ampacities be based on their 75C insulation ratings. In other words, even

though higher insulation temperatures have been selected, this rule specifies that minimum conductor ampacities must be based on the lower ampacities provided by the 75 C columns of Tables 1 to 4.

Moving right along, Rule 28-106 and Table 27 remind us that there are two additional types of motors: continuous-duty service and non-continuous-duty service. Continuous duty service applies to motors that run continuously, loaded or unloaded. The minimum conductor ampacity for a continuous-duty service motor must be no less than 125% of the motor's full load amperes. Table D16 lists minimum motor conductor ampacities for motors up to 500 full load amperes.

Non-continuous-duty service describes motors that don't run continuously (i.e. elevator motor). Table 27 separates the classifications for non-continuous-duty service further into short time, intermittent, periodic and varying duty, along with examples for the various categories. The table further breaks down duty service into four duty cycles: 5-min., 15-min., 30- and 60-min. and continuous. Minimum conductor ampacities are based on service duty classification, expected rated operating cycles and calculated as a percentage of the motor's nameplate current rating.

I think you will agree, it's complicated. **EB**

Les Stoch is president of L. Stoch & Associates, specialists in quality management/engineering services. He is a member of PEO, OEL and LAEI, and develops and delivers electrical code and technical workshops for Dalhousie University. He also developed the Master Electrician training program and exam (Ontario) for the Electrical Contractor Registration Agency. Visit L. Stoch & Associates online at www.lstoch.ca.



Questions and answers compiled by the Electrical Safety Authority | VISIT WWW.ESASAFE.COM

Tackle The Code Conundrum... if you dare

Answers to this month's questions in November'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)
- Plumber ?! (0 of 3)

Question 1

Where high-voltage sign cables are installed in non-metallic conduit, the separation of the conduit from conducting or combustible material shall be at least [] mm for installations operating at 100Hz or less.

- a) 25 mm c) 38 mm
- b) 32 mm d) 50 mm

Question 2

For apparatus requiring a 120V branch circuit fused at 30A or less, a plug and receptacle of proper size shall be permitted to serve as a disconnecting means for X-ray or computerized tomography equipment.

- a) True
- b) False

Question 3

Wireway is permitted to be used as a wiring method in a storage battery room.

- a) True
- b) False

Answers to Code Conundrum EBMag September 2010

Q-1: [] is a flexible polymeric sleeve intended to enclose luminous tube sign GTO cable operating at not more than 7500 volts-to-ground and intended to be installed within an approved raceway.

GTO Sleeving. Rule 34-002.

Q-2: Conductors in the high-voltage circuits of X-ray equipment shall be of the [] type.

a) Shockproof. Subrule 52-004(3). Section 0 of the code defines shockproof as follows: Shockproof (as applied to X-ray and high-frequency equipment)—such equipment is guarded with grounded metal so that no person can come into contact with any live part.

Q-3: Where a surface extension is made from an existing outlet of concealed wiring, a [] shall be mounted over the original box, and electrically/mechanically secured to it.

d) Box or an extension ring. Subrule 12-3026(1).



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Z1006 – Management of Work in Confined Spaces

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