

AN ANNEX PUBLISHING & PRINTING INC. PUBLICATION • VOLUME 49 • ISSUE 5

# Electrical Business

MAY 2013



### ■ Also in this issue...

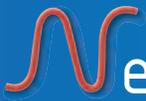
- Eye safety on-the-job
- Grid-scale battery technologies
- Choosing a generator

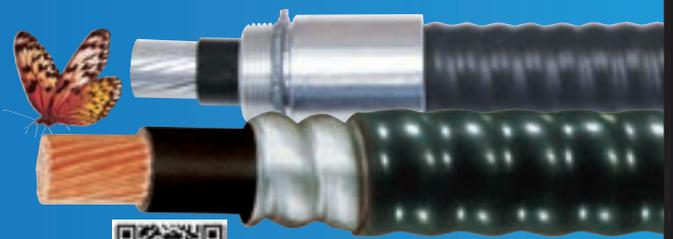
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conduit to enter the Box in a flat and straight path. Installed together, the Floor Box and Stand accommodates the different rebar and post-tensioned cable heights and slab depths found from job-site to job-site.

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typical electrical raceway. Now contractors can install RW cables instead of the more expensive TECK cables required with the use of HDPE pipe.

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## EPR Kit Adapters make Duct repairs quick & easy!



New Adapters for our EPR Conduit Repair Kits allow contractors to repair a broken section of DB-II duct while leaving the cables inside and restoring the duct to its original form. The

pre-cut adapters easily open around existing cabling to make repairs quickly and effectively, reducing end-user downtime and complaints, and saving contractors time, labour and money.

## The Perfect Expansion Fitting for Short Runs!



The One Piece Expansion Joint (OPEJ) is designed to accommodate thermal expansion and contraction on shorter runs of PVC Conduit. The efficient design of

the One Piece Expansion Joint provides fast trouble-free installation and will ensure the owner receives a secure and appealing installation that will last the life of the system.



## Meet and learn from Canada's finest at PIT

This is a great opportunity to network with some of Canada's top manufacturers, not to mention learn from and meet some of Canada's top electrical professionals.

I often use this space to discuss issues and events going on in industry, but this time I'm using it to plug something the EBMag team is working on: our Partners in Training (PIT) 2014 events—specifically, the Halifax and Toronto installments in June and October that focus on electrical maintenance and reliability, with a healthy dose of electrical safety thrown in for good measure!



Of particular note is our association partner, the Excellence in Manufacturing Consortium (EMC). This unique not-for-profit organization is dedicated to helping manufacturers grow and become more competitive at home and around the world.

It does this by: supporting both grassroot and online manufacturing networks, which are connected regionally, provincially and nationally; creating peer-to-peer relationships among manufacturers, industry stakeholders and government; providing advanced manufacturing expertise, comprehensive services, training and other resources; and fostering a mindset of continuous improvement and the sharing of ideas and best practices.

Ultimately, EMC wants to foster the creation, retention and expansion of skilled manufacturing jobs here in Canada—a goal I am sure we all support. And, in Dartmouth and Toronto, local EMC representatives will conduct a panel discussion around the challenges they face in their facilities regarding electrical maintenance and reliability.

This is a great opportunity to network with some of Canada's top manufacturers, not to mention learn from and meet some of Canada's top electrical professionals, such as Terry Becker, Jim Pollard and John Salmon, and organizations such as Electrical Safety Authority, Nova Scotia Power, Fluke, UE Systems and more who are sponsoring, speaking, exhibiting... or any combination thereof.

Please visit the Partners in Training website [www.partnersintraining.ca](http://www.partnersintraining.ca) to learn more, and to check for regular updates. I truly hope to see you there. **EB**

*Anthony Caplan*



COVER ILLUSTRATION BY SCOTT PAGE

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### Emergency response: methods of release

As an electrical worker, you want to ensure everyone around you knows how to effectively rescue you.

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## 9 Grid-scale battery technologies for energy storage are failing us

The growing use of solar and wind power in the United States is making the on-demand delivery of electricity more challenging. To provide more flexibility in managing the grid, researchers have begun developing new batteries and other large-scale storage devices.



## 12 Eye safety on-the-job

Are you doing all you can to avoid eye injury at work? An estimated 30,000 Canadians incur an eye injury from being around electricity in the workplace annually.



## 14 The importance of knowledgeable electrical maintenance

In this article, Glen Brown, PSE, CET, recalls a recent industrial plant shutdown. "It became even clearer to me as a technical person that our job is never done; that industry's need for quality technical maintenance personnel is as important as ever," he says.



## 18 Celebrating sustainable agriculture at Harborview Farms

Harborview Farms has completed a 200kW solar panel installation—one example of what the Hill family is doing to embrace and exemplify responsible farming practices that benefit the environment, the community and future generations.



## 19 Choosing a generator? Consider your options

Generator purchases for commercial or industrial sites are anything but straightforward. Is this a short-term or one-time need? Has it been remanufactured or is it all original? If the genny is used, how old is it? Here are some decision-making tips for when you make an acquisition.



## 22 Using existing infloor ducts as a pathway to wire and cable retrofit

Infloor ducts—even those predating World War II—are still viable wire and cable management systems that represent a cost-effective pathway to retrofit or upgrade power, data, communications and audio/video.

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**CAF warns of potential digital gap in skilled trades**

The Canadian Apprenticeship Forum (CAF, www.caf-fca.org) concludes technology is having a profound impact on the nature of the skilled trades, apprenticeship training and journeyman skills requirements.

Based on a series of interviews with employers and trainers, a CAF report suggests computer literacy is increasingly a prerequisite of employment, meaning a digital gap will become as important as the literacy gap over the next decade.

“The Impact of Technology on Apprenticeship” shares insights into the challenges identified by apprenticeship stakeholders, including a lack of policy framework and the increasing reliance on online learning programs developed in the States, which often overlook Canadian standards, such as Red Seal.

“It is clear that digital skills will have a big impact on worker and workplace productivity,” said Sarah Watts-Rynard, CAF executive director. “The introduction of increasingly high-tech equipment and machinery requires skilled tradespeople to have competencies well beyond hands-on mechanical

skills. We are also seeing the learning environment itself changing, requiring apprentices to interact with technology as part of their training process.”

The report notes the emergence of online learning, 3-D technology and simulation as an integrated part of apprenticeship technical training. Journeymen also rely on technology on worksites. In construction and manufacturing trades, skilled tradespeople often use tablets and mobile devices to call up schematics, codes and work orders.

“We have heard for decades that technology can help workers be safer, faster and more accurate,” said Watts-Rynard, “but it’s important to remember that technology requires another facet to the learning process and it doesn’t always come automatically, even to younger workers: technical upgrades require skills upgrades.”

The non-profit Canadian Apprenticeship Forum aims to connect Canada’s apprenticeship community. Participants work to support “vibrant and innovative” apprenticeship systems and policies with a view to developing a highly skilled, inclusive and mobile skilled trades workforce.

**OCS promotes youth training with \$20,000 Hammer Heads donation**

The Ontario Construction Secretariat (OCS, www.iciconstruction.com) announced a \$20,000 donation to the Central Ontario Building Trades Hammer Heads program, saying it felt the donation would aid in its day-to-day operations.

“The program, which offers at-risk youth an opportunity to become skilled in the construction trades, is important to building a strong, sustainable construction industry,” said OCS.

Delivered by the Central Ontario Building Trades and supported by several unionized training facilities around the Greater Toronto Area (GTA), the 12-week skills development programs offer skill- and employment-based training within the

construction industry to youth from under-resourced neighbourhoods in the community. The program offers safety training in the construction industry, leadership and mentoring during progression in the program and a path to a work-based apprenticeship.

“The apprentices working in the Hammer Head program fill a great need in our industry,” said Sean Strickland, CEO of OCS. “Helping get at-risk youth employable skills will benefit them for a lifetime and lay the foundation for a stable life. Raising a family, becoming a productive member of society—are things all of these kids strive to do, and the Hammer Heads program allows them to achieve them.”

“We are grateful for the support we have received from the Ontario Construction Secretariat,” said James St. John, business manager of the Central Ontario Building Trades and director of the Hammer Heads program. “Our program enables participants to not only gain the experience and confidence necessary to successfully obtain an apprenticeship in the construction trades, but it is also a starting point for a meaningful career.”

**Nedco recycles over a million lamps through Take Back the Light**

Take Back the Light (TBTL)—a program of the Recycling Council of Ontario (RCO)—congratulates Nedco (www.nedco.ca) for recycling over 1 million lamps through TBTL.

“It is very gratifying when our business activities support such important aspects of our every day existence. Our staff work very hard for our customers and can confidently tell their children that they make a meaningful contribution to their future and to the well-being of the planet,” said Bob Arbuckle, director of Energy Services, Nedco, adding, “Responsible sustainability will continue to have increasing importance and weigh heavier in business decisions in the future.”

Recycling over a million lamps means that Nedco’s efforts have kept over 36.4 kg of mercury from entering the environment, as well as 349,450 kg of glass, 4363 kg of metals and 5478 kg of phosphor.

“We congratulate Nedco for achieving this impressive milestone. By demonstrating such leadership, they have not only made a meaningful impact towards protecting our health and the

environment, but they have also helped their customers operate more sustainably,” said Sarah Mills, program manager for Take Back the Light.

**Warning! Counterfeit UL mark on medium base lampholder**

UL (www.ul.com) is warning consumers, retailers and manufacturers that a medium base lampholder bears a counterfeit UL mark for Canada and the United States. It has not been evaluated by UL to the appropriate standards for safety. It is unknown whether this lampholder complies with UL safety requirements.

The medium base lampholder with the counterfeit UL mark is similar to the UL listed lampholder, says UL, but the authorized lampholder is marked with the model number “RS-1908A”. The lampholder marked with a counterfeit mark does not provide the required model designation on the lampholder body.

Besides the counterfeit mark, the lampholder reads:

LISTED RUI CHENG 250V 660W

Manufacturers of UL-certified products that have used this lampholder are advised to Contact UL.

**Electrical Business**

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**Get ready for the biggest show east of Montreal: MEET 2014**



The MEET Show (Mechanical Electrical Electronic Technology) is set to open in Moncton, May 7-8, 2014 and, as always, EBMag will be there! This biennial event attracts exhibitors from all over Canada and the States, displaying the very latest equipment available to industry.

MEET has proved itself one of the top industry events in Canada, and organizers are excited to launch more than a year in advance to make it even better. Acting as a comprehensive marketplace, this show gives industry professionals the unique opportunity to see electrical and mechanical companies from across North America under one roof.

MEET is the largest trade event east of Montreal, say organizers; the LAST EDITION welcomed over 5000 professionals.

In addition to the wide-ranging exhibits, MEET is pleased to present the exciting Skills Canada NB Competition, which will showcase the electrical, plumbing installations and refrigeration & air-conditioning portions of the Skills Canada NB Competitions.

The MEET Show is owned and sponsored by four associations: ASHRAE NB-PEI Chapter, CIPH (Canadian Institute of Plumbing & Heating), Electro-Federation Canada (EFC) and IES (Illuminating Engineering Society), who will be presenting an informative seminar program relevant to the industries they represent.

Visit [www.meetshow.ca](http://www.meetshow.ca).

**Norfolk Power sold voluntarily to Hydro One for \$93 million**

Norfolk County just announced it has sold Norfolk Power Inc. to Hydro One Inc. ([www.hydroone.com](http://www.hydroone.com)) for \$93 million. Norfolk Power is the county's holding company for Norfolk Power Distribution Inc., its electricity distributor, and Norfolk Energy Inc., its telecom company.

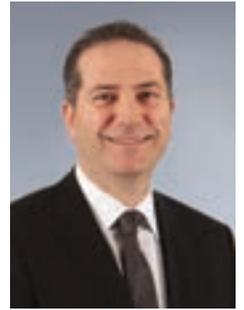
"Hydro One is excited to be welcoming new customers and new employees to our company," said Carmine Marcello, president and CEO, Hydro One Inc. (in photo). "We're proud that Norfolk County selected our bid from the many received. We're committed to delivering great service for Norfolk's customers

and making a valuable contribution to the local economy."

The sale now must receive final approval from the Ontario Energy Board (OEB), which is expected over the summer. Highlights of the deal include:

- All Norfolk Power employees will transfer to Hydro One after the sale and continue to have jobs.

- Hydro One will move 30 new jobs to Norfolk County over three years as it restructures its regional operations.
- Hydro One will maintain the Victoria Street office for three years and continue to use its existing facilities in Simcoe, while additional physical space needs and options are reviewed.



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**Your input needed on Electrical & Utility Safety Rules**

As part of a regular five-year review process, Ontario's Infrastructure Health & Safety Association (IHSA, [www.ihsa.ca](http://www.ihsa.ca)) is initiating a review of the 2009 Electrical Utility Safety Rules (EUSR), and seeks stakeholder input.

IHSA is hosting several input sessions across Ontario to allow the EUSR users to share experiences and provide feedback about the rule book. Ideally, the association would like to see at least:

- 2-4 reps from organizations with 50 or fewer workers
- 2-4 reps from organizations with 50-200 workers
- 4-6 reps from organizations with 400+ workers

These representatives should be competent in the application and use of the EUSR, and should speak for electrical workers who use the EUSR in their daily operations. (This is neither a training nor tutorial session, and should not be considered a course.) The half-day sessions will allow the electrical community to attend and provide feedback so IHSA can better understand industry needs.

**Helukabel opens new Canadian sales & distribution facility**



Helukabel, a manufacturer of cable, wire and cable accessories, has expanded its North American operations with the opening of its Helukabel Canada HQ, which will house Canadian corporate, sales and warehousing/distribution operations ([www.helukabel.ca](http://www.helukabel.ca)).

"Canada's continued industrial and renewable energy expansion made adding a domestic distribution centre a logical choice to further enhance our services to the market," said Alex Kanouni, general manager of Helukabel Canada. "Being centrally located in the Greater Toronto Area allows us to reach the entire country within a few business days."

The new facility is located at: 3620B Laird Road, Unit 4, Mississauga, ON L5L 5Z7.

"We look forward to providing even more cabling expertise in an effort to assist Canada's future growth in such sectors as automated industrial manufacturing, food and beverage packaging, and renewable energy generation," Kanouni continued.

The main telephone and customer service telephone and fax numbers are (289) 444-5040 and (289) 444-5041, respectively, and the sales department can be reached at [sales@helukabel.ca](mailto:sales@helukabel.ca).



**Recall! Fire hazard with Lighting Science Group LED bulbs**

The Consumer Product Safety Commission (CPSC) says Lighting Science Group ([www.lsgc.com](http://www.lsgc.com)) is recalling about 554,000 120V LED bulbs—sold as 6W or 8W bulbs—that were marketed under the brand names Definity, EcoSmart, Sylvania and Westinghouse due to fire hazard.

Lighting Science Group is aware of 68 incidents of product failures, eight of which were accompanied by visible smoke or fire conditions. The incidents include damage to light sockets, melted fixtures, burned rugs/carpet/floors, damage to a circuit and to a lamp. There have been no reports of personal injuries.

The model numbers A19, G25 and R20/PAR20 are found on the packaging and on the light-coloured circular neck above the base of the bulb where the date code is also printed. The date code reflects the week and year of manufacture; for example, date code L4010 was produced during the 40th week of 2010. The date codes listed below may have the letters "CH" or "MX" at the end. For example, date code L4010 can also appear as L4010CH or L4010MX. The date codes are: L4010, L4110, L4210, L4310, L4410, L4510, L4610, L4710, L4810, L4910, L5010, L5110, L5210, L0111, L0211, L0311, L0411, L0511, L0611, L0711, L0811, L0911, L1011, L1111

The units involved were manufactured by Citizen Electronics and Lighting Science Group in China (with a small number of products having final assembly in Florida or Mexico). They were sold at various retailers, including hardware and lighting and electrical supply stores.

Consumers should immediately remove the bulbs from sockets and lamps and contact Lighting Science Group for replacement bulbs. Contact Lighting Science Group at (855) 574-2533 from 0900 to 1800 ET Monday through Friday.

**Wire theft forces BC Hydro to shut down community of Ditidaht**

BC Hydro ([www.bchydro.com](http://www.bchydro.com)) crews were forced to de-energize the village of Ditidaht on Vancouver Island on March 15 after a substantial wire theft in the community made electrical distribution equipment unsafe for local residents.

BC Hydro received a call from a resident in the area about the safety of the nearby distribution equipment. After an investigation by crews, it was discovered that copper grounding wire had been stolen from about 300 utility poles along a remote 62-km section of line between China Creek and Ditidaht.

This is an example, says the utility, of

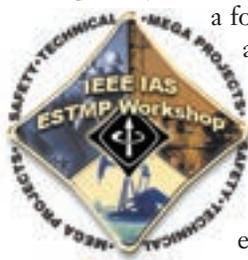


how metal theft not only affects public safety, but can significantly impact the reliability of the electrical system.

BC Hydro is also working with the Port Alberni RCMP as it conducts an investigation into the theft. If you have any information about this crime, contact Crime Stoppers at (800) 222-TIPS.

**Call for Papers! Electrical Safety, Technical & Mega Projects Workshop 2014**

The IEEE IAS Electrical Safety, Technical & Mega Projects (ESTMP) Workshop provides a forum for exchanging and advancing industry knowledge in the areas of safety, engineering design and system reliability of electrical systems and technologies for the execution of Mega Projects, and it has issued a Call for Papers for the 2014 event, being held March 3-5 in Calgary, Alta.



The workshop is not a training course, but a forum for exchanging ideas and practical experiences involving knowledge, safe work practices, philosophies, electrical technology and mega projects experience that are changing the electrical discipline in industry. The

target audience includes electrical professionals involved in:

- Facilities construction, operation and maintenance
- Facilities and process design
- Engineering services
- Training and continuing education
- Regulations, codes and standards
- Forensics and risk management
- Temporary power
- Human error and human factors
- Project management and engineering
- Safety
- Contractors

The workshop's focus is to share innovative concepts, successes as well as lessons learned in the areas of: 1) advancing state-of-the-art knowledge and best practices; 2) stimulating innovation to create the next generation of technology; and 3) design and implementation of mega projects. Visit [tinyurl.com/czbncgb](http://tinyurl.com/czbncgb) to download the form.



**Hilti celebrates 50 years of doing business in Canada**

Hilti ([www.hilti.ca](http://www.hilti.ca)) celebrates 50 years in Canada this year, saying it owes this growth to its “loyal customers in the construction industry”. Congratulations!

“For 50 years we have been committed to providing our customers with innovative, quality products,” said Avi Kahn, GM of Hilti Canada Corp. “We continue to be committed, and opened new Hilti centres and a service centre in 2012 to better serve our customers.”

Since the first Hilti Centre opening in the early 1960s, the network has grown to include the corporate headquarters for Hilti Canada Corp., 25 Hilti Centres, three distribution centres, and two service centres across the country. What was one employee in 1962 has grown to almost 400 team members throughout Canada.

Hilti commemorated its 50th anniversary of doing business in Canada with a special celebration for its employees. More than 350 team members from across Canada were invited to a gala at The Fairmont Royal York in Toronto.

**Free e-learning on occupational health & safety for Nova Scotia**

As part of its new workplace safety strategy, the Government of Nova Scotia has partnered with the Canadian Centre for Occupational Health and Safety (CCOHS, [www.ccohs.ca](http://www.ccohs.ca)) to provide its citizens free access to CCOHS’ e-learning courses on topics of occupational health and safety.

“In addition to our many free resources, including telephone and email Inquiries service, hundreds of fact sheets, articles and podcasts, CCOHS is pleased that workers in Nova Scotia will have access to a variety of free e-learning courses, as well,” said Steve Horvath, CCOHS president and CEO.

Nova Scotians can choose from over 60 free e-learning courses, with topics ranging from confined space management and hazard identification to ladder safety and emergency response planning.

**Help plan EHRC’s Conference and Inaugural Awards Gala!**

Electricity Human Resources Canada (EHRC, formerly Electricity Sector Council, [www.electricityhr.ca](http://www.electricityhr.ca)) is finalizing the details of its Conference and Inaugural Awards Gala, November 6-7 in Toronto, and they want your feedback!

Take the survey, which only takes a few minutes to fill out, at [www.surveymonkey.com/s/B9QP2TQ](http://www.surveymonkey.com/s/B9QP2TQ).

The 2013 EHRC Conference is the national conference dedicated to the electricity and renewable energy industry workforce. The two-day national conference is attended by employers, labour, education and government reps working for and with the sector. The aim of the conference is “to connect, convene and inspire the industry”.

New this year is EHRC’s Awards Gala taking place on the evening of November 6. This evening will celebrate achievements and give national recognition to the champions making a positive and tangible impact on the workforce.

**Global Wind Organization accredits Siemens for its safety training**



Siemens Energy ([www.siemens.com](http://www.siemens.com)) has been granted certification by the Global Wind Organization (GWO) for its training facilities in Denmark, Germany, the United Kingdom and the States. This certificate, says the company, empowers Siemens to educate and train wind energy workers according to the highest industry standards for basic safety training.

GWO is a coalition of players in the wind energy market, including turbine manufacturers, owners and utilities. Its aim is to ensure personnel working in the wind energy sector are trained to a risk-based safety level to face the challenges related to that particular workplace, says Siemens. The organization has developed an international standard for basic safety training that covers: first aid, manual handling, fire awareness, working at heights and, for offshore workers, sea survival.

“This official accreditation from the GWO is a testament to the high priority Siemens places on safety and safety training, particularly within the fast-moving wind and wind service industry,” said Tim Holt, CEO of Service Renewables, Siemens Energy. “Safety is a top priority at Siemens, fully integrated into the mindset of our wind service operations. Our commitment to meeting the industry’s highest standards ensures our employees and our customers are receiving the very best in safety training at all our locations worldwide.”

Siemens’ wind training centres were originally created to enhance the skills of company employees. Having obtained GWO certification, Siemens’ basic safety training is now open to subcontractors and customers as well. **EB**

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Katharine Crowe

**Pascale Daviau**, vice-president of marketing for **Thomas & Betts Canada** ([www.tnb.ca](http://www.tnb.ca)), recently announced a few appointments in the organization involving **Jean-Marc Myette** and **Katharine Crowe**. Myette is now the director of market development, and is responsible for developing strategies for key Canadian vertical markets. He will be based at the company's Canadian HQ in Saint-Jean-sur-Richelieu, Que., and can be reached at [jean.marc.myette@tnb.com](mailto:jean.marc.myette@tnb.com) or (450) 347-5318 ext. 6710. Myette most recently served as business unit manager for the All-Struct division.

After close to 20 years of collaboration with T&B as head of her own advertising and communications firm, Crowe joins the company as director of marketing communications. She will also be based at the company's Canadian HQ in Saint-Jean-sur-Richelieu, and can be reached at [katharine.crowe@tnb.com](mailto:katharine.crowe@tnb.com) or (450) 347.5318 ext. 6883.

**Marc Chenier** has been appointed to the position of general manager of Sherbrooke, Que.-based **Dettson Industries Inc.**—a subsidiary of **Group Ouellet Canada Inc.** ([www.ouellet.com](http://www.ouellet.com)) that manufactures residential and light-commercial heating products. Chenier has been with Dettson for two years as the sales & marketing manager, which included supervising R&D activities. Meantime, **Jacques Guerard Jr.** has been appointed regional sales manager for Quebec, where he will manage a team of six sales reps and oversee business development. Finally, **Sandra Tomassi** has been appointed sales rep for Ontario. She will deal with distributors and contractors, and oversee business development initiatives.

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**Britech Corp.** ([www.britech.ca](http://www.britech.ca))—a provider of engineered and standard heating cables, mats and controls—has appointed **Design Concepts Ltd.** to represent its lineup of electrical heating cables and controls in Alberta. Design Concepts Ltd. is an independent rep that has served the electrical industry for the past 23 years. Its management and staff include Terry and Blake Ellestad, and Shirley Neelin.



Design Concepts Ltd.



Greg Palese

**Klein Tools** ([www.kleintools.com](http://www.kleintools.com)) has named **Greg Palese** as vice-president of marketing, a newly created position, where is responsible for growing the brand globally. He will also partner with product development and sales to define opportunities, and develop business plans to support company objectives. Palese comes to Klein from Lowe's Home Improvement, where he managed the Kobalt Tools brand.



Jeff Walters

**Eye Lighting International** ([www.eyelighting.com](http://www.eyelighting.com)) has named **Jeff Walters** director, controls technology, where he will be responsible for the design of wired and wireless controls, including hardware, firmware and software. "As Eye Lighting strengthens its position as a premium lighting solutions provider, expanding into lighting and energy-saving controls was a natural progression as our company grows," said **Tom Salpietra**, president and COO, Eye Lighting. The company says Walters possesses decades of experience, an extensive background in photo control design, and numerous accomplishments and patents to his credit.



Tom Salter

**Shat-R-Shield** ([www.shatrshield.com](http://www.shatrshield.com)) welcomed **Tom Salter** as its new vice-president of marketing. Salter spent the last 15 years in various engineering, business development and marketing roles at **Cree**. In his role, he is responsible for leading the team in expanding existing product lines, as well as introducing products that will allow help the company tap into new markets.

**David Seeger**, president of **JMC Steel Group**, announced the reorganization of JMC Steel Group's commercial and operation groups into distinct business units by product lines. As a result, **Jim**

**Hays** is now president of **Wheatland Tube's** ([www.wheatland.com](http://www.wheatland.com)) Electrical, Fence and Mechanical Tube Business, as well as the Fittings Business. Before assuming this position, Hays served as vice-president marketing & business development for the JMC Steel Group. Prior to that, he served as global VP Electrical & Infrastructure for Atkore International (formerly Allied Tube).



Benjamin Stammen

**Independence LED Lighting** ([www.independenced.com](http://www.independenced.com)) has hired **Benjamin Stammen** as director of international business development. Stammen has more than 17 years of experience in the lighting industry. He worked for five years in Belgium and 12 years as managing director in Hungary for Massive Lighting, where he developed and led a factory with more than 700 employees and 2000 contractors. His addition to the Independence team comes shortly after the company filed patents for its LED tubes in 40 countries, including Canada.



Amer Maleh

**Amer Maleh** has been appointed global accounts manager for **Feelux Lighting** ([www.feeluxlighting.com](http://www.feeluxlighting.com)), a manufacturer of linear T5 and LED architectural and commercial indoor lighting systems. Maleh will be responsible for the creation of sales and business development through retail accounts, brand merchants, national account distributors and store fixture manufacturers.

**Cliff Backman**, vice-president of **Franklin Empire Inc.** ([www.feinc.com](http://www.feinc.com)), announced the appointment of **Sean Bernard** to the position of contractor sales manager, GTA (Greater Toronto Area). Sean will head up the contractor/construction sales force assigned to the four GTA branch locations. His market focus will be electrical contractors and property management. Prior to this, Sean served in contractor sales at Philips/Canlyte. **EB**

# Grid-scale battery technologies for energy storage are failing us

Mark Shwartz

Americans take electrical power for granted whenever they flip on a light switch. But the growing use of solar and wind power in the United States makes the on-demand delivery of electricity more challenging.

A key problem is that the U.S. electrical grid has virtually no storage capacity, so grid operators can't stockpile surplus clean energy and deliver it at night, or when the wind isn't blowing.

To provide more flexibility in managing the grid, researchers have begun developing new batteries and other large-scale storage devices. But the fossil fuel required to build these technologies could negate some of the environmental benefits of installing new solar and wind farms, according to Stanford University scientists.

"We calculated how much energy it will cost society to build storage on future power grids that are heavily supplied by renewable resources," said Charles Barnhart, a postdoctoral fellow at Stanford's Global Climate and Energy Project (GCEP) and lead author of the study. "It turns out that that grid storage is energetically expensive, and some technologies, like lead-acid batteries, will require more energy to build and maintain than others."

The results are published in a recent online edition of the journal *Energy & Environmental Science*.

Most of the electricity produced in the United States comes from coal- and natural gas-fired power plants. Only about 3% is generated

from wind, solar, hydroelectric and other renewable sources. The Stanford study considers a future U.S. grid where up to 80% of the electricity comes from renewables.

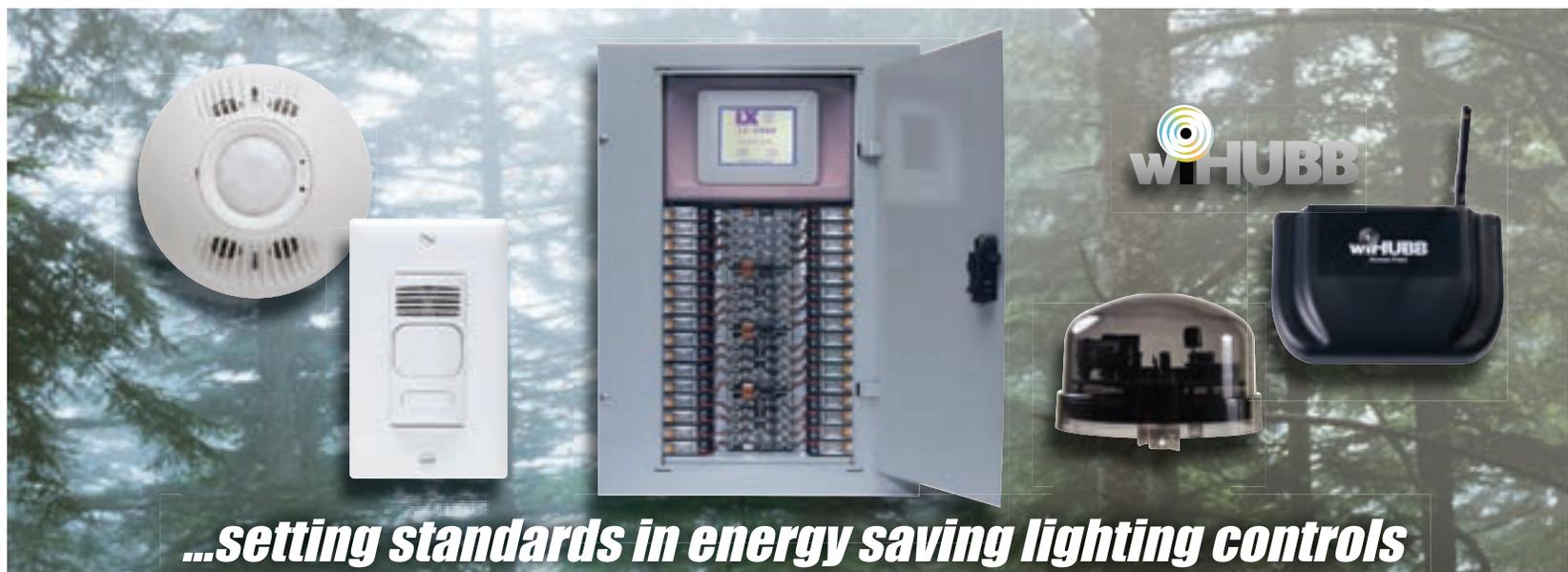
"Wind and solar power show great potential as low-carbon sources of electricity, but they depend on the weather," said co-author Sally Benson, a research professor of energy resource engineering at Stanford and the director of GCEP.

"As the percentage of electricity from these sources increases, grid operators will need energy storage to help balance supply with demand. To our knowledge, this study is the first to actually quantify the energetic costs of grid-scale storage over time."

## Pumped hydro

The total storage capacity of the U.S. grid is less than 1%, according to Barnhart. What little capacity there is comes from pumped hydroelectric storage—a clean, renewable technology. Here's how it works: when demand is low, surplus electricity is used to pump water to a reservoir behind a dam. When demand is high, the water is released through turbines that generate electricity.

For the Stanford study, Barnhart and Benson compared the amount of energy required to build a pumped hydro facility with the energetic cost of producing five promising battery technologies: lead-acid, lithium-ion, sodium-sulphur, vanadium-redox and zinc-bromine.



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“Our first step was to calculate the cradle-to-gate embodied energy,” Barnhart said. “That’s the total amount of energy required to build and deliver the technology—from the extraction of raw materials, such as lithium and lead, to the manufacture and installation of the finished device.”

To determine the amount of energy required to build each of the five battery technologies, Barnhart relied on data collected by Argonne National Laboratory and other sources. The data revealed that all five batteries have high embodied-energy costs compared with pumped hydroelectric storage.

“This is somewhat intuitive, because battery technologies are made out of metals, sometimes rare metals, which take a lot of energy to acquire and purify,” Barnhart said. “Whereas a pumped hydro facility is made of air, water and dirt. It’s basically a hole in the ground with a reinforced concrete dam.”

After determining the embodied energy required to build each storage technology, Barnhart’s next step was to calculate the energetic cost of maintaining the technology over a 30-year timescale. “Ideally, an energy storage technology should last several decades,” he said. “Otherwise, you’ll have to acquire more materials, rebuild the technology and transport it. All of those things cost energy. So the longer it lasts, the less energy it will consume over time as a cost to society.”

To quantify the long-term energetic costs, Barnhart and Benson came up with a new mathematical formula they dubbed ESOI, or ‘energy stored on investment’. “ESOI is the amount of energy that can be stored by a technology, divided by the amount of energy required to build that technology,” Barnhart said. “The higher the ESOI value, the better the storage technology is energetically.”

When Barnhart crunched the numbers, the results were clear. “We determined that a pumped hydro facility has an ESOI value of 210,” he said. “That means it can store 210 times more energy over its lifetime than the amount of energy that was required to build it.”

The five battery technologies fared much worse. Lithium-ion batteries were the best performers, with an ESOI value of 10. Lead-acid batteries had an ESOI value of 2, the lowest in the study. “That means a conventional lead-acid battery can only store twice as much energy as was needed to build it,” Barnhart said. “So using the kind of lead-acid batteries available today to provide storage for the worldwide power grid is impractical.”

“A basic conservative principal: the longer something lasts, the less energy you’re going to use. You can buy a really well-made pair of boots that will last five years, or a shoddy pair that will last only one.”

#### Improved cycle life

The best way to reduce a battery’s long-term energetic costs, he said, would be to improve its cycle life; that is, increase the number of times the battery can charge and discharge energy over its lifetime. “Pumped hydro storage can achieve more than 25,000 cycles,” Barnhart said. “That means it can deliver clean energy on demand for 30 years or more. It would be fantastic if batteries could achieve the same cycle life.”

None of the conventional battery technologies featured in the study has reached that level. Lithium-ion is the best at 6000 cycles, while lead-acid technology is at the bottom, achieving a mere 700 cycles.

“The most effective way a storage technology can become less energy-intensive over time is to increase its cycle life,” Benson said. “Most battery research today focuses on improving the storage or power capacity. These qualities are very important for electric vehicles and portable electronics, but not for storing energy on the grid. Based on our ESOI calculations, grid-scale battery research should focus on extending cycle life by a factor of 3 to 10.”

In addition to energetic costs, Barnhart and Benson also calculated the material costs of building these grid-scale storage technologies.

“In general, we found that the material constraints aren’t as limiting as the energetic constraints,” Barnhart said. “It appears that there are plenty of materials in the earth to build energy storage. There are exceptions, such as cobalt, which is used in some lithium-ion technologies, and vanadium, the key component of vanadium-redox flow batteries.”

Pumped hydro storage faces another set of challenges. “Pumped hydro is energetically quite cheap, but the number of geologic locations conducive to pumped hydro is dwindling, and those that remain have environmental sensitivities,” Barnhart said.

The study also assessed a promising technology called CAES, or ‘compressed air energy storage’. CAES works by pumping air at very high pressure into a massive cavern or aquifer, then releasing the compressed air through a turbine to generate electricity on demand. The Stanford team discovered that CAES has the fewest material constraints of all the technologies studied, as well as the highest ESOI value: 240. Two CAES facilities are operating today in Alabama and Germany.

#### Global warming impact

A primary goal of the study was to encourage the development of practical technologies that lower greenhouse emissions and curb global warming, Barnhart said. Coal- and natural gas-fired power plants are responsible for at least a third of those emissions, and replacing them with emissions-free technologies could have a dramatic impact, he added.

“There are a lot of benefits of electrical energy storage on the power grid,” he said. “It allows consumers to use power when they want to use it. It increases the amount of energy that we can use from wind and solar, which are good low-carbon sources.”

In November 2012, the U.S. Department of Energy launched the \$120-million Joint Centre for Energy Storage Research, a nationwide effort to develop efficient and reliable storage systems for the grid. The centre is led by Argonne National Laboratory in partnership with the SLAC National Accelerator Laboratory at Stanford, and a dozen other institutions and corporations. Part of the centre’s mission is to develop new battery architectures that improve performance and increase cycle life... a direction that Barnhart and Benson strongly support.

“I would like our study to be a call to arms for increasing the cycle life of electrical energy storage,” Barnhart said. “It’s really a basic conservative principal: the longer something lasts, the less energy you’re going to use. You can buy a really well-made pair of boots that will last five years, or a shoddy pair that will last only one.”

The study was supported by GCEP and its sponsors: ExxonMobil, GE, Schlumberger and DuPont. 

*Mark Shwartz is with the Precourt Institute for Energy, Stanford University.*

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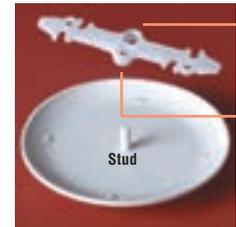
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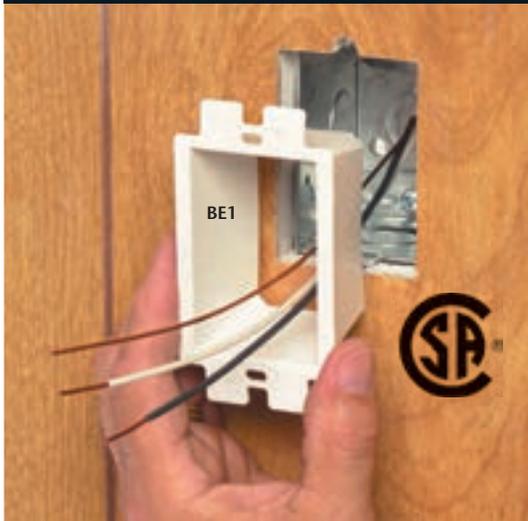
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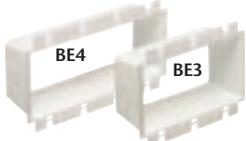
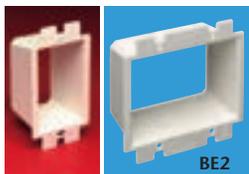
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# EYE SAFETY ON-THE-JOB

## Are you doing all you can to avoid eye injury at work?

According to recent studies, on-the-job eye injuries are more common than you might think, and the electrical industry isn't immune to the risk.

Last year, CNIB (Canadian National Institute for the Blind) researchers conducted a household survey on the incidence of eye injuries in Canada, and found that a staggering 2% of respondents (representing 720,000 Canadians) had sustained an eye injury in the previous year that required medical attention.

Alarmingly, more than a third of them happened in industrial workplaces—either in factories or construction settings.

What's more, according to OSHA (U.S. Occupational Safety & Health Administration), more than 300,000 people in the U.S. incur an eye injury from being around electricity in the workplace annually, which projects out to an incredible 30,000 Canadians each year.

"The worst part is that none of it has to happen, as 100% of all eye injuries can be avoided," insists Dr. Keith Gordon, CNIB vice-president of research. "Canadians need to take more care to protect their eyes from injury at work, especially in high-risk occupations like those in industrial settings."

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**"Canadians need to take more care to protect their eyes from injury at work, especially in high-risk occupations like those in industrial settings."**

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### **Taking the right precautions**

Luckily, says Gordon, there are many precautions Canadians can take to decrease these dangers on-the-job. Paramount among them are being aware of hazards in the workplace and consistently wearing proper protective eyewear approved by the Canadian Standards Association (CSA).

"Protective eyewear should be worn, not just most of the time, but every time eye injuries are a possibility," warns Gordon. "It could be the one time you don't wear it that something goes wrong."

Other ways of protecting your eyes in the workplace, says Gordon, include following workplace safety procedures and knowing the location of eyewash stations and First Aid equipment—as well as knowing how to use them.

### **Getting educated**

To help reduce the incidence of on-the-job eye injury in Canada and serve the growing demand for injury prevention education in the workplace, CNIB has developed an Eye Safety Program (ESP).

The Eye Safety Program focuses on eye injury prevention in the workplace, but also at home and during play. Through this education-based partnership initiative (for which proceeds are directed back into CNIB's core vision rehabilitation programs and services), CNIB Eye Safety Program experts deliver workshops in the workplace that educate both employers and employees on how to protect themselves from eye injuries.

Facilitated through a combination of real-life stories, impactful visuals and interactive exercises, CNIB's Eye Safety Program is designed to build a culture of eye safety in the workplace while reducing the emotional scars and financial costs that result from eye injury.

"The goal is to resonate with the audience on a level that makes them consider the personal cost of eye injury and motivates them to be diligent about eye safety," says Gordon, adding, "It's amazing how far a little education goes in preventing eye injuries."

Eye safety training should be an integral part of all industrial safety training. To learn more about CNIB's Eye Safety Program, visit [www.cnib.ca/eyesafety](http://www.cnib.ca/eyesafety). 

*Article provided to Electrical Business Magazine by Canadian National Institute for the Blind (CNIB, [www.cnib.ca](http://www.cnib.ca)).*



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# The importance of knowledgeable electrical maintenance

Glen Brown

This one may be from the *Ripley's Believe it or Not* files, but it shows—and proves—the value of a knowledgeable technician with the confidence to believe in his equipment and his skills.



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During a recent industrial plant shutdown, it became even clearer to me as a technical person that our job is never done; that industry's need for quality technical maintenance personnel is as important as ever. During this project—in the late evening and after working a long, typical shutdown kind of day—one of our crew members discovered a unique insulation measurement: during a routine insulation resistance test on a 600V MCC, a short to ground was discovered... not uncommon, but not good nor easy to explain when the system was energized just moments before.

The crew left the cables directly connected to the MCC for testing, including the cables in the test, due to time constraints and the difficulty of removing the cables from the MCC and the main breaker feeding it. The test was conducted at 1000V with all the MCC loads open. The results showed an almost dead short to ground. Again, this was a concern, as the system was in service just prior to test with no indication of problems by the operations group.

No alterations were made to the system during the test procedure other than de-energizing the equipment and isolating the MCC loads. We re-checked the loads on the MCC to ensure all the disconnects were open and the main bus and cables were the only things involved in the test. Still unable to explain, we opened all of the upper compartments to ensure there were no additional connections to the bus that could affect our test results.

It appeared as though some resistively grounded load was connected to the system. Our suspicions were a load bank, heater or, possibly, a surge pack or artificial neutral. Night was upon us, and the client wanted the system put back into service (which is usually the case) and everyone wanted to go home.

It was difficult convincing the client there was a serious problem that deserved further investigation, since we had changed nothing and the system was energized just prior to testing. After some discussion, the client indicated he could get by without turning the unit area back on until the next day. Perfect! We could look at this problem with rested brains in the morning.

### Better sleep on it

We came in the next morning with the sense we were going to solve this problem with a fresh look. First step, sectionalize; remove all cabling to isolate the problem and determine whether it's with the MCC or cable system.

A DVOM (digital volt ohmmeter) was used to determine the value of resistance for this short circuit. It indicated a resistance value of about 5000Ω phase-to-phase, but we

were unable to get a reliable reading phase-to-ground, despite the short-circuit with the megger. Strange, to say the least. What could represent 5000Ω in an electrical power system? It simply did not represent any load to which we could relate.

We were all unsure as to what to do next; we could chase it down, or let it go. It did not feel right with me to just let it go, but the client needed to be made to understand this was something outside the norm. After some discussion, the client told us we must do everything we felt reasonable to try and find out what might be connected in the system that would cause such a strange reading.

Through further investigation we first discovered the breaker that was supposed to be feeding the MCC on which we were working was mislabelled. This feeder had, in fact, been labelled incorrectly for many years, and even senior staff was unaware of this deviation. Based on the operating voltage and arc flash hazard, the potential hazard here was obvious: were proper safety protocol not followed, the outcome could have been serious shock and/or burn and, potentially, death.

To not have reliable breaker designation and a reliable single-line drawing is beyond comprehension in a post-NFPA 70E/CSA Z463 world.

Then, problem No. 2: after a discussion the lead electrician, it was determined that a new MCC was installed to replace an old one some time in the past. We took a look at the MCC again and, when all the cables were removed, it was discovered there was a parallel feed at the MCC; only one set of three-phase cables connected at the MCC feeder breaker, but two sets of cables connected at the MCC... a real stretch for single-line clarity.

### Crisis-in-waiting

Next task: where did those other cables go? Once we had the task in hand, a brief search revealed the *energized* cable ends were buried in the ground inside the substation in a sand-filled area next to the 600V feeder breaker compartment! The extra parallel cables from the MCC were terminated at the MCC, but only one set was connected at the feeder breaker.

We could not determine how long the energized cable ends had been this way, but the site electrician figured at least three years (since the MCC install) and possibly much longer. The critical acknowledgement here is that, with these energized cables buried in the ground and the level of energy expended—as evidenced by the crystallization of the sand—a catastrophe was waiting to happen.

Luck was a significant factor here, as step and touch potential hazards were likely off the

To not have reliable breaker designation and a reliable single-line drawing is beyond comprehension in a post-NFPA 70E/CSA Z463 world.

charts, not to mention an imminent fault, had the conductivity to ground or phase been altered by a little moisture. I believe we earned our pay that day, as no one was hurt, and the techs involved in the investigation were successful in uncovering a bona fide problem.

Now, let's consider some potential payback by way of commercial consideration that everyone understands: money. Some quick math would say amps equals 600/5000 or 120 milliamps (1.732) at about 200 milliamps continuous 3-phase load or about 120 watts. This equates to, let's assume, 3 years or about 19,000 hours, give or take, 120 watts (19,000) is over 2 megawatt-hours. Simple math at about \$0.10/kWh is about \$228. This, assuming that the ground resistance value never changed with temperature or moisture levels or other seasonal variables.

Let's be real here and realize the 9vdc battery in the DVOM and a 600V 3-phase power source are not likely to yield similar reliable resistance values. Remember, the 1000V megger indicated a dead short. The real number could easily be 10 or 100 times this, but the consequences of an injury could have been thousands of times that amount. By all accounts, a job well done and a feather in the cap of the field service crew.

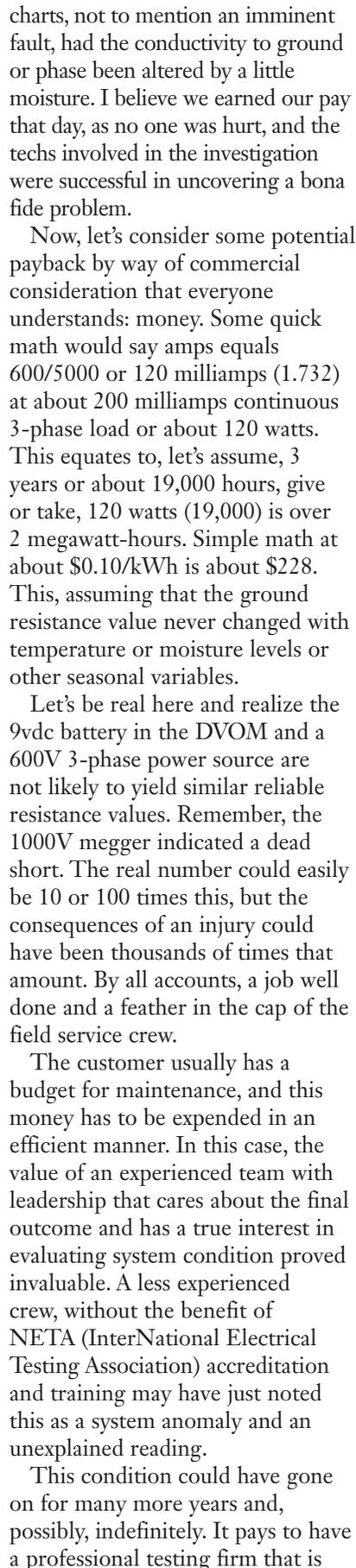
The customer usually has a budget for maintenance, and this money has to be expended in an efficient manner. In this case, the value of an experienced team with leadership that cares about the final outcome and has a true interest in evaluating system condition proved invaluable. A less experienced crew, without the benefit of NETA (InterNational Electrical Testing Association) accreditation and training may have just noted this as a system anomaly and an unexplained reading.

This condition could have gone on for many more years and, possibly, indefinitely. It pays to have a professional testing firm that is

experienced, knowledgeable and engaged in making your power system the best it can be. This is only a small example of system problems discovered and corrected during this shutdown. It was one of the most interesting and challenging, and was highly visible, as several annual shutdowns in the past had failed to raise any flags regarding the condition.

This type of work and dedication to our craft raises the bar and instills confidence in our clients regarding our abilities, not to mention guaranteed work for the foreseeable future. Finding these things is one of the reasons many of us are so dedicated to our field, and sharing with likewise dedicated professionals is a lot of fun. **EB**

*Glen Brown has been involved in the area of electrical maintenance and testing of electrical power systems for over 16 years. He is a power system electrician (PSE) and a certified electrical technologist (CET), and has learned his trade working with various larger NETA (InterNational Electrical Testing Association) firms in Western Canada. Recently, he has started his own personal services company, Rimac Technologies. He can be reached at rimactech@gmail.com.*



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# Emergency response: methods of release

## Part two

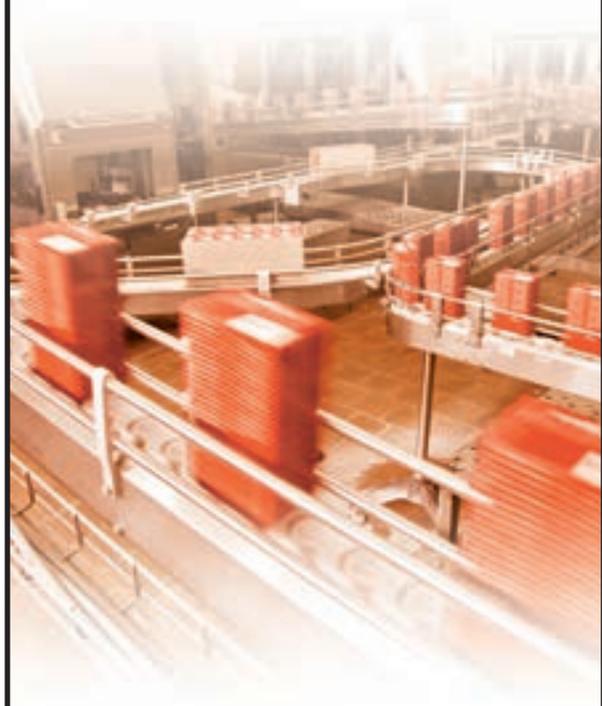
You must understand that a person's body is an extension of the electrical system, and you really have no idea what will happen when touching that person. Most workers are trained in hazardous gases and confined spaces; they know that, when someone is down and out in a confined space, they must not execute a rescue



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because it's dangerous—regardless of their excitation level.

The same thinking must be learned about a person in contact with an electrical system.

Electric hand tool electrocutions are rare nowadays but, before the 1971 introduction of double-insulated (DI)—and recent developments in battery-operated (BO) tools—they caused many deaths. When a person was holding a metal hand tool that became energized—and were grounded with the other hand—it would be very difficult to rescue this person, as they would be tightly clamped to both the energized tool and the ground point. In this case, swiftly unplugging the tool is the correct response.

Companies assume all their workers use DI or BO tools, but an audit will always discover angle grinders, recip saws and other metal tools. Contract workers, especially welders, are a concern during tool audits.

It is actually simple and inexpensive to have a tool and appliance tester set up at the tool crib to ensure all metal-cased electrical tools—drill presses, chop saws, etc.—are insulation-resistance (IR) tested at regular intervals. In 31 years, I have only come across one company that also sets aside one day a year for workers to bring in their personal tools to the plant to be IR tested.

As an electrical worker, you want to ensure everyone around you knows how to effectively rescue you.

I was teaching in a facility where a young student was pleased-as-punch because, a week prior, he had saved an electrician who was hung up in a panel. He said that, even though he had saved the man, the electrician was furious because the student smacked him with a 2x4 and broke the electrician's arm.

In your moment of need, you don't want the rescue plan to look like this:

- Grab nearest 2x4
- Hit victim really hard with 2x4

Instead, you want everyone around you to understand clearly how to properly perform an electrical rescue.

When you're in a substation, you should always know from where electricity is being fed, and the location of the main disconnects. You should also know the various voltage systems; for instance, an indoor substation could have 25kV, 15kV, 5kV, 600V, 480V and below. Most of these should be shown on a single-line diagram that is required to be prominently posted in the station. When you do not know what is there and where it is, you are not qualified to be in the station alone.

You should also know how to disconnect each of these systems; the single-line diagram will identify all the disconnect points, but will not provide their actual locations in the substation. You should always note where they are in case of an emergency.

When you're working in an electrical room with panels and MCCs, you should always know how to disconnect them. When you're working around a piece of machinery, you should know where to find the main disconnect.

Astute companies will have main disconnects clearly identified so that, should an electrical rescue have to be performed, any worker can quickly and immediately go to the source of power. They will also have electrical rescue hooks beside all panels.

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

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

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The 200kW solar array will power Harborview Farms' operations.



LARRY FRENCH/AP IMAGES FOR DUPONT

# Celebrating sustainable agriculture at **HARBORVIEW FARMS**



LARRY FRENCH/AP IMAGES FOR DUPONT

(Left to right) Earl 'Buddy' Hance, Maryland secretary of agriculture; Trey Hill, partner, Harborview Farms; John Chrosniak, director, North America, DuPont Crop Protection; and Richard Sossi, liaison for Maryland congressman Andy Harris.



PHOTO COURTESY OF HARBORVIEW FARMS.

Harborview Farms recently expanded its implementation of sustainable farming practices to include the use of 200kW of solar power.



LARRY FRENCH/AP IMAGES FOR DUPONT

Dr. Alexander Z. Bradley of DuPont Photovoltaic Solutions tests to identify DuPont Tedlar polyvinyl fluoride film in the 200kW solar array.

Harborview Farms—one of the largest agriculture operations in Maryland—recently celebrated the installation of a 200kW solar array with DuPont, its partner on several fronts. The 10,000+ acre farm employs cutting-edge management practices and key collaborations with DuPont Photovoltaic Solutions, DuPont Pioneer and DuPont Crop Protection to provide sustainable solutions for food, energy and environmental protection.

“Renewable energy is a fast-growing part of the global energy mix, and solar power in particular is more affordable today than ever before,” said David B. Miller, president, DuPont Electronics & Communications. “Solar power, together with sustainable farming practices [...] provides great potential to boost crop yields and energy savings for farmers.”

Harborview Farms is operated by Trey and Cheryl Hill with Trey's parents, Herman and Christy Hill. They produce corn, wheat and soybeans for the poultry industry of Delmarva, and the baking

industry of southeast Pennsylvania. In the winter, Harborview Farms features cover crops to improve soil quality and control erosion, including radishes and barley.

The mission of Harborview Farms includes sustainable agriculture, and the solar panel installation is just the latest example of what the Hill family is doing to embrace and exemplify responsible farming practices that benefit the environment, the community and future generations. Best management practices and integrated pest management are utilized fully to ensure optimum productivity and protection of the environment while contributing to the restoration of Chesapeake Bay.

The DuPont Tedlar polyvinyl fluoride (PVF) films specified as the solar panel backsheets aim to give the panels excellent protection against the elements beyond their expected 25-year lifetime.

“Sustainability requires partnerships,” said Trey Hill of Harborview Farms. “Our solar installation is just the next step toward the future of farming.” 

# CHOOSING A GENERATOR?

## *Consider your options*

Dave Vennie

Generator purchases for commercial or industrial sites are anything but straightforward. In addition to calculating power needs, companies must consider fuel type (usually natural gas or diesel), whether a new generator is appropriate or a used one will serve the purpose in a more cost-effective manner, and other variables.

All of these decisions impact performance and operating costs—sometimes substantially. Furthermore, purchasers should take not only immediate needs under consideration, but also their long-term goals as well as those of any client and/or project affected by the purchase.

As a company that buys, sells and rents generators, we've seen virtually every possible scenario in which a generator might be used, and we frequently consult with our clients to help them choose the equipment best for their needs. In this article, I'll share some of the decision-making tips we provide to our customers as they make an acquisition.

### Diesel or natural gas?

It used to be that the decision to purchase a diesel versus a natural gas generator was based mainly on cost and availability—natural gas generators can be much more expensive than diesel units, and they must be sited adjacent to a fuel source. However, current National Emissions Standards for Hazardous Air Pollutants (NESHAP) in the U.S.—and stipulations in government and commercial contracts that require compliance with these standards—are tipping the scale to natural gas for some generator users. Furthermore, natural gas is currently less expensive than diesel fuel and, for sites where natural gas is a byproduct (such as oil-drilling operations), it can be free.

Companies do not have to purchase a natural gas generator to enjoy the savings and emission reductions from natural gas. Diesel generators can be retrofitted with a bi-fuel system that enables operators to run on either fuel. Gas can be incorporated from a well-head or

delivered via a traditional pipeline. This solution provides ultimate flexibility where conditions may vary. For example, when a

generator is to be installed on a site near a source of hazardous air pollution (HAP) but later relocated to a different area where

emissions are not an issue and/or natural gas may not be readily available, a bi-fuel generator is an excellent compromise.




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When environmental sensitivity is an ongoing job requirement and gas is available, then a natural gas generator may be the best choice. These units generally also burn propane upon demand. Due to the differences in fuel costs, burning natural gas in a generator can shave 70% off the cost of fuel, reducing operating expenses significantly over the long haul.

Conversely, when natural gas is not available at a jobsite, a diesel generator may be the only logical option. When the site is subject to NESHAP regulations, companies have two choices: they can purchase a new, NESHAP-compliant generator, or they may be able to purchase a quality used generator exempt from NESHAP. This option can be an excellent cost-reduction strategy provided the purchasing firm is not working under contracts that stipulate specific emission standards.

### New or used?

Purchasing a new generator has other advantages, or course, not the least of which is the peace of mind (and warranty) that comes with new equipment. In addition to cost, the downside to purchasing a new generator (or recommending your client purchase one) is lead time. New generators can take six months or more to be delivered when ordered from the manufacturer. When lead-time is an issue, consider purchasing a new, surplus unit. These are new, never-before-installed units. They often come with a manufacturer's warranty (or the company who sells your generator may provide one), and can be installed immediately.

When price is a limiting factor, many companies opt for a used generator. A good-quality, used generator can cost up to 50% less than a comparable new one. The key to success when purchasing used is to ensure the unit has been fully tested and inspected, and was well maintained during its previous life. Some of the questions you should ask of the selling firm are:

- What is the date of manufacture and history of the generator? In what type of environment was it previously installed?
- What is the make and model? Manufacturer reputations vary quite a bit, and even within one manufacturer's line some models have proved more reliable than others. Also, some generator models excel in specific environments, such as marine, cold climates, underground, etc.
- How old is the genny? Does the company have copies of maintenance logs/reports or other proof the generator was properly maintained? What type of maintenance has the unit had, and are there any known issues? If so, were they repaired?
- How many hours of run-time does the generator register?
- Has the generator been remanufactured or is it all original?
- Does this generator have any time remaining on its manufacturer warranty? Does it come with a reseller's warranty?

## INSPECTION PROCESS, COMMENTS AND REPAIR CHECKLIST

Check When Passed:	ITEM COMPONENT OR PROCESS Visual/Walk Around:	EXPLAIN ACTION TAKEN/COMMENTS REQUIRED ON EVERY LINE
<input type="checkbox"/> yes	Walk around unit and clean up as needed.	
<input type="checkbox"/> yes	Ladders and fire equipment present? Quantity?	
<input type="checkbox"/> yes	Safety jacks present? Quantity?	
<input type="checkbox"/> yes	Visual inspection of generator & control panel.	
<input type="checkbox"/> yes	Operational inspection of frequency and voltage.	
<input type="checkbox"/> yes	Operational test of radiator louvers/vents – clear.	
<input type="checkbox"/> yes	Operation inspection of control panel meters.	
<input type="checkbox"/> yes	Document any excessive noise in engine or generator.	
<input type="checkbox"/> yes	Are Operation & Maintenance Manuals present?	
<input type="checkbox"/> yes	Are noise attenuation/insulation materials secure?	
<input type="checkbox"/> yes	Is container/enclosure intact?	
<input type="checkbox"/> yes	Paint job	
<input type="checkbox"/> yes	Level of rust	
<input type="checkbox"/> yes	Mounting	
<b>Cooling System:</b>		
<input type="checkbox"/> yes	Document overall condition of radiator/heat.	
<input type="checkbox"/> yes	Check and document entire cooling system for leaks.	
<input type="checkbox"/> yes	Head gasket (must not leak to pass).	
<input type="checkbox"/> yes	Jacket Water Pump (must not leak to pass).	
<input type="checkbox"/> yes	Separate circuit after cooler pump (must not leak to pass)	
<input type="checkbox"/> yes	Thermostatic valve (must work & not leak to pass).	
<input type="checkbox"/> yes	Thermostatic housing (must work & not leak to pass).	
<b>Fuel System:</b>		
<input type="checkbox"/> yes	Check all fuel lines for cracks, leaks, pliability, support.	
<input type="checkbox"/> yes	Fuel transfer pump (must not leak to pass).	
<input type="checkbox"/> yes	All fuel supply return lines (must not leak to pass).	
<input type="checkbox"/> yes	Hand priming pump (must not leak to pass).	
<input type="checkbox"/> yes	Filter base(s) (must not leak to pass).	
<input type="checkbox"/> yes	Document fuel pressure idle and rated RPM.	_____ Idle RPM Oil PSI _____ Rated RPM Oil PSI
<b>Lubrication System:</b>		
<input type="checkbox"/> yes	Document oil PSI after doing PM1 service below.	_____ Idle RPM Oil PSI _____ Rated RPM Oil PSI
<input type="checkbox"/> yes	Head to block joint (& spacer plate if applicable).	
<input type="checkbox"/> yes	Front/rear crank seals.	
<input type="checkbox"/> yes	Front cover and flywheel housing.	
<input type="checkbox"/> yes	All major castings (head, block, oil pan, etc.).	
<input type="checkbox"/> yes	Oil Cooler	
<input type="checkbox"/> yes	Turbocharger	
<b>Electronics &amp; Starting Systems:</b>		
<input type="checkbox"/> yes	Check battery, terminals, connections, cables and CCA's.	
<b>Intake &amp; Exhaust Systems:</b>		
<input type="checkbox"/> yes	Check air intake pipes, air filter & restriction gauge.	
<input type="checkbox"/> yes	Check exhaust cracks, leaks or smoke w/ engine running.	
<input type="checkbox"/> yes	Check exhaust manifold for oil or fuel slobbering.	
<input type="checkbox"/> yes	Check exhaust manifold if any broken hardware.	
<input type="checkbox"/> yes	Inspect turbo for excessive end play clearance.	
<input type="checkbox"/> yes	Inspect turbo for any seal leaks.	
<input type="checkbox"/> yes	Ensure waste gate functions properly.	

Buyers should ask generator resellers whether they use and ask to see checklists that ensure used equipment was properly inspected, and that any needed repairs were done or noted.

Rental generators come in a range of power configurations and can meet short-term power needs while enabling firms to thoroughly consider their long-term requirements.



## Immediate and long-range planning

Commercial or industrial generators—even used ones—are major capital purchases. Consequently, we counsel our clients to consider their options in light of not only the current situation, but future plans and contingencies. Following are some of the questions that might affect a company's purchase:

1. Is this a short-term or one-time need? If so, how often do you anticipate it recurring? For example, when you are supplying temporary power for a client's jobsite, how often do clients ask you to perform this service? If you purchased a generator, would you be able to sell temporary power service to clients on an ongoing basis to recoup your expenses?
2. Does your own business need a standby/emergency generator? When your business is in an area that experiences outages due to seasonal storms, calculate the number of days you have lost power and estimate how much business (and customer good will) you lose when power goes down. A generator might be able to serve in two capacities: you could use it on client jobs and, were a weather event to cause power outages at your office (which would also likely shut the jobsite down), you could use it at your own location.
3. Is your business and industry in a contraction or expansion cycle? When it's contracting, purchasing a popular generator model will make it easier should you have to sell the unit.

These questions (and others you'll likely develop) can help you decide whether you really need to purchase a generator or your project would be better served with a rental. Generally, when a project is expected to last fewer than six months, a rental may be more cost effective.

Rentals also have the advantage of being operating expenses rather than capital expenses. Depending on your situation and what other capital purchases you have made during the year, being able to expense the cost of a rental generator fully in the year it is used can be a powerful enticement. Finally, should you decide to rent a unit, ask your provider whether it will transition the unit from rental to purchase should you decide you want to keep it.

## Plan to succeed

In the final analysis, a company's choice of generator should be a well-considered strategic decision and not a knee-jerk reaction. We've encountered electrical contractors that usually rent generators for their clients' needs but, over time, realize that purchasing a generator sized to fit most jobs would be more cost

effective. Conversely, we've seen clients buy a generator because they anticipated landing a large contract that later fell through.

Our advice to clients—and you—is don't rush into anything. Consider all the possible angles and make a purchase that gives you the most benefit and flexibility. It's better to rent a generator for a month or two while you pinpoint

your current and future requirements than rush out and make an ill-considered purchase. **EB**

*Dave Vennie is vice-president of sales & engineering for Worldwide Power Products (WPP), which specializes in power generation equipment, including new and used engines and generator sets. Visit [www.wpowerproducts.com](http://www.wpowerproducts.com).*



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# Using existing infloor ducts as a pathway to wire and cable retrofit

Hanh Le and Jim Humphries

With the slow-down in new commercial office construction, renovation and retrofit of older facilities is an attractive option for owner-occupied and leased space. Many of these buildings contain infloor duct systems within their concrete floors, but building owners and facility managers may not be aware of the systems, or may assume the ducts are obsolete or inadequate for today's needs.

In fact, infloor ducts—even those predating World War II—are still viable wire and cable management systems that represent a cost-effective pathway to retrofit or upgrade power, data, communications and audio/video.

## What to look for

An infloor duct system consists of a series of distribution ducts, feeder ducts and, in some cases, junction boxes that run from the electrical closet and communications room under the floor of workspaces. These systems are encased in concrete and are not visible. What can be seen, however, are activations that lead from openings in the ducts, known as presets, to the surface of the floor where they house electrical receptacles and connections for telephone and other low-voltage systems.

Because infloor ducts are straight, the activations will appear in a line, though not necessarily perpendicular or parallel to walls. The activations may be flush with the floor but, in many older buildings, they are raised above the floor (these raised activations are often called 'tombstones'

and 'doghouses' after their distinctive shapes). When a system has a junction box, a square or circular cover plate will also be visible, though it may have a carpet insert, making it less obvious.

When a building has an existing infloor duct system, the chances are good it can continue to be used, either in its present form or with some cost-effective modifications.

## Upgrading existing systems

Although infloor ducts are very durable, many older systems may be limited by the volume of wires and cables within them. For example, it is not unusual to find discontinued telephone wiring that was never removed when newer cabling was installed. Removing unneeded wiring by pulling it out of the duct frees up space for new cabling. When the retrofit project includes a complete electrical and data upgrade, all older wires and cables can be easily removed.

While the ducts themselves will remain unchanged, a system renovation should include replacing outdated tombstones and doghouses with new, flush activations. These components—which are available in a variety of finishes—provide power as well as connections for voice, data and audio/video.

## Modifying or adding to a duct system

The spacing of activations along the ducts that was right for a building at the time of its construction may be inadequate for today's open-plan spaces and densely served workstations. When it comes to adding new activations, an existing duct

system is remarkably flexible because additional fittings can be added easily to existing ducts.

These components, known as aftersets, are installed by drilling the existing floor, making a new opening in the duct and installing the after-set with new activations and cover assemblies, thereby providing end users access to outlets, data jacks and A/V connectivity wherever such services are needed.

Installed duct systems can often be given additional cable capacity by using a trench feeder. These trench duct feeders are installed into new or existing power and data closets and can be used as high-capacity feeders for older, previously installed infloor ducts.

## Conclusions

Resurrecting an old existing infloor system is a great way to provide flexibility to a new office area, allowing the owner or tenant ease for moves, adds and changes (MACs) to an office or area requiring significant access to power, data and A/V.

A usable infloor system is also more attractive to potential tenants, and may be the deciding factor in leasing an office space because it allows them to place workstations and furniture in open or office spaces without concerns about access to services and the worry of having to engage in significant renovation. **EB**

*Hanh Le is a product marketing manager and Jim Humphries is a senior engineered products consultant for Legrand, North America.*



**GE Lumination BL Series LED luminaires play nice with USG Logix**

GE says its Lumination BL Series LED luminaires help free lighting professionals from the constraints of traditional T-grid ceiling designs. They were designed and tested specifically for the Logix ceiling system from USG, says GE, and are compatible with most other integrated ceiling systems. This gives designers the freedom to create ceilings with a clean, finished appearance, says the company, while retaining the functionality of a T-grid system for standard maintenance of HVAC, electrical and plumbing systems. Lumination BL Series LED luminaires promise up to 39% improved energy efficiency opposed to traditional fluorescent lighting, says GE, and are available in 4-ft and 5-ft lengths measuring 4-in or 6-in wide, and come prepared with adaptable mounting brackets for compatibility with different integrated ceiling systems.

**GE**  
[www.gelighting.com](http://www.gelighting.com)

**Hubbell announces Laredo LNC2-18LU LED wallpack**



Hubbell Lighting has added the LNC2-18LU to its Laredo LNC2 series. The Laredo LNC2 architectural LED wallpack is now available in a 45W configuration that delivers up to 3306 lumens and claims up to 85% energy savings over traditional metal halide sources. The wallpack is suited for both recessed box and surface conduit wiring, and is UL1598 listed for use in wet locations. Designed as a high performance wallpack for entry and perimeter applications, the Laredo LNC2 series has expanded to include multiple LED colour temperatures, additional distributions, expanded photocontrol options, additional finishes, and a larger lumen package.

**HUBBELL LIGHTING**  
[www.hubbellighting.com](http://www.hubbellighting.com)

**Lind releases LE1625LED and LE1725LED heavy-duty worklights**  
 Lind Equipment launched two new heavy-duty LED worklights: the LE1625LED and LE1725LED. These LED lights promise bright light that is equivalent to up to a 13W fluorescent bulb, and are built with a rubber handle and polycarbonate lens to ensure they



can withstand tough abuse. The LE1725LED is the premium model, with 2x4W LED chips, 25-ft cord and an extra LED on the end. This extra LED allows the light to be operated in both

worklight and flashlight modes. The LE1625LED is the value-priced model that boasts the heavy-duty durability of its cousin, but has a 1x4W LED chip. The LE1625LED is also available on a 40-ft cord reel (LE1640RLED), as is the LE1725LED (LE1740RLED).  
**LIND EQUIPMENT**  
[www.lindequipment.net](http://www.lindequipment.net)

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**VENTURE**  
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**Next-gen SureTrace identifies breakers and fuses, pinpoints opens and shorts**

Ideal Industries—a manufacturer and supplier of tools, connectors and testing products for the electrical and datacom trades—introduced its next-generation SureTrace circuit tracer, which helps electricians locate wires or cables behind walls, pinpoint opens/shorts, and identify fuses and breakers on both energized and de-energized circuits

from 0-600V AC/DC. SureTrace circuit tracers have four defined ranges that allow you to select the proper sensitivity for a specific job. Rather than blinking lights and beeps, its display provides a numeric value between 0 and 99, and a variable pitch/tone audible indication as fast-response tracing feedback, while its peak detector instantaneously registers signal strength. Another time-saving advantage, says Ideal, is that

handset signal communication is tuned tighter to reduce false signaling on noisy circuits.

**IDEAL INDUSTRIES**  
www.idealindustries.ca

**Knaack StorageMaster rolling work benches deliver jobsite mobility**



The new Knaack StorageMaster rolling work benches are available in different sizes and load capacities, with eight models to choose from, boasting super heavy-duty, professional-grade storage, coupled with convenient work surfaces for jobsites requiring mobility. Models 45, 47, 49 and 63 (mechanic's tool chest) have 6-in casters and 1,000-lb load capacities. Model 47 can also be customized with the user's choice of shelving and drawers. Heavy Duty (HD) rolling work benches models 58 and 59 take up to 2,650 lbs while providing almost 10-sf of work space. The Knaack War Wagon rolling work bench model 62 offers 13-sf of work surface, sitting on 8-in casters.

**KNAACK**  
www.knaack.com

**Try a paperless jobsite with new Boogie Board LCD eWriters**



Improv Electronics unveiled two new Boogie Board LCD eWriter models—Jot 4.5 and Sync 9.7—electronic paperless replacements for memo pads, notebooks, etc. All Boogie Board LCD eWriters use Reflex No Power LCD technology for their writing surface, and are made of shatterproof plastic. Of particular note is the Sync 9.7, which allows users to save hundreds of pages in SD memory then transfer files directly to a computer, tablet, smartphone or other mobile device instantly and wirelessly via Bluetooth. A Boogie Board Sync mobile app (Android and iOS devices) and free Virtual Desktop Companion (VDC) software will also be available for the Sync eWriter.

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# Rule 4-006 and the application of correction factors

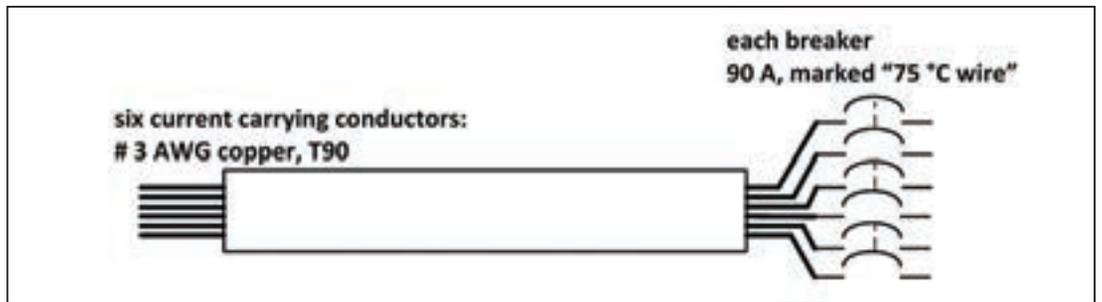
In my last column (“CEC Rule 4-006 and CSA product standards”, EBMag March 2013), we compared Rule 4-006 with the requirements under several product standards and focused on two issues: referencing Tables 1 and 3 in Subrule (1) and specifying 90C as a default when the equipment is not marked (Subrule [2]).

(It is worth noting that when using ampacities based on Tables 1 or 3 as permitted by the rule, ensure limiting the ampacities to 75C for temperature-sensitive equipment.)

Continuing our discussion on Rule 4-006 “Temperature limitations”, let’s analyze it in relation to the application of correction factors. Rule 4-006 does not prevent the use of conductors having a temperature rating (e.g. 90C) in excess of the equipment termination temperature (e.g. 75C), but it does require such conductors to have their installed ampacities limited to the equipment termination temperature (e.g. 75C). Hold on to that fact, as we dig into how to apply correction factors.

Let’s consider a typical scenario where conductors with an insulation temperature rating of 90C are terminating on equipment with a termination temperature rating of 75C, and there is a need to apply correction factors (Tables 5A, B, C or D) to these conductors. The stringent approach is to apply the correction factors to the 75C ampacity of the conductor. However, there is an alternative, *relaxed* approach that can be considered.

In Ontario, Bulletin 4-12 permits and clarifies this alternative approach; it permits applying the correction factors to the



90C ampacity of the conductor with the condition that the corrected ampacity is less than or equal to the 75C ampacity of the conductor. This approach complies with the intent of CEC Rule 4-006 and harmonizes with the NEC.

Therefore, when correction factors are applied to 90C-rated conductors terminating on equipment with a termination temperature rating of 75C, the installed ampacity of such conductors shall be the lesser of:

- the corrected 90C ampacity (e.g. Table 5C factors x 90C ampacity column of Table 2)
- the conductor 75C ampacity (e.g. 75C ampacity column of Table 2)

The rationale for this approach is that equipment marked with a termination temperature rating is tested with conductors rated at that temperature. When the installed ampacity of the conductor used does not exceed that with which the equipment is tested, there will be no impact on the ability to dissipate heat from the termination.

Let’s look at the numerical example shown in Figure 1:

- correction factor is 0.8 (Rule 4-004 and Table 5C for 6 conductors)

- ampacity of #3 AWG copper 90C conductor 115 A (Table 2, 90C column)
- the 90C corrected ampacity is  $115 \times 0.8 = 92A$
- compare the conductor ampacity at 75C with the 90C corrected ampacity
  - the conductor installed ampacity is 92A.
  - compliance with Rule 4-006 is based on the fact that the 90C corrected ampacity (92A) is less than 75C ampacity of the conductor (100A).

Note that when correction factors are applied to the 75C ampacity as per the stringent approach, the installed ampacity would be 80A ( $0.8 \times 100A$ ); the conductor size will then need to be larger to comply, or the overcurrent device will need to be changed. **EB**

*Nancy Hanna, P.Eng., is the engineering manager for Codes & Standards Department at Electrical Safety Authority (ESA) where, among other things, she participates in the development of bulletins, guidelines and technical communication concerning code interpretation and consistency issues. She is a LEED Accredited Professional, and is a member of several CSA TSCs for CEC Part 1, including Sections 24, 32, 46, 50 and 64. Nancy can be reached at nancy.hanna@electricalsafety.on.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 June'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

Pool reinforcing steel shall be bonded with a minimum of [ ] connections equally spaced around the perimeter.

- a) Two c) Four
- b) Three d) Six

### Question 2

The minimum bending radius for 50mm diameter lead covered high voltage cable is:

- a) 500 mm c) 750 mm
- b) 600 mm d) None of the above

### Question 3

For Class III, Division 1 locations, no ventilation is required where storage-battery charging equipment are located in separate rooms built with substantial non-combustible materials constructed so as to adequately exclude flyings or lint.

- a) True b) False

### Answers: EBMag April 2013

**Q-1:** Direct-current systems that are to be grounded shall have the grounding connections made at one or more supply stations but not at individual services or elsewhere on interior wiring.

- a) True. Ref. Rule 10-202.

**Q-2:** Flexible cords used in Class II, Division I shall have a separate bonding conductor not contained with the other conductors of the circuit.

- b) False. Ref. Rule 18-218.

**Q-3:** When it is necessary to climb an outdoor floodlighting pole to replace lamps, permanent climbing steps shall be provided and the lowest permanent step shall be not less than [ ] above locations accessible to unauthorized persons.

- d) 3.7m. Ref. Rule 30-1036.



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