AN ANNEX PUBLISHING & PRINTING INC. PUBLICATION • VOLUME 49 • ISSUE 6

Electrical Business

JUNE 2013

Do you comply with rule 12-516 ?

See page 5 for details.

Also in this issue…

- North America's first ever cablebus standard
- The 10 most common pricing mistakes
- Smart buildings use big data

Canada deserves a vibrant transformer industry

PM # 40065710

IPEX NEW PRODUCTS FROM IPEX ELECTRICAL SYSTEMS

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I remain gobsmacked at how quickly lighting technology seems to evolve.

The Future. Illuminated... at Lightfair 2013

It's been two years since I attended Lightfair International (a.k.a. LFI or just Lightfair) and, after attending this year's installment in Philadelphia, I remain gobsmacked at how quickly lighting technology seems to evolve.

If memory serves, I attended my first Lightfair in 2005. Back then, LED lighting was strictly for novelty purposes; the few exhibitors dabbling in LED lighting were sectioned off in their own little zone in the convention centre. Very little was known about LED technology (much less than today), and few were brave enough to give the emerging technology a whirl.

One of the biggest things back then were CFLs, which went on to command centre stage in the lighting industry for several years. It's amusing, now, to think back to just how *terrible* those early CFLs were! Their quality was inconsistent, the light they cast was, well, icky, and complaints soon started surfacing about the mercury they contained. Yet, back then, they were touted as *the* solution to all the world's lighting and energy problems.

Fast-forward to this year's Lightfair where, if you're not showcasing LED lighting at your booth, there must be something wrong with you... in fact, you may even be at the wrong show!

LED technology has come a long way, as both manufacturers and buyers have become more comfortable with the technology. They have a better grasp of its capabilities and limitations, and have come down in price significantly. (These days, a standard A19 LED bulb retails for about $25 whereas, several years ago, it would run you at least $60.) And the variety of LED bulbs and applications has expanded tremendously in just the last several years: chandelier, A19, GU10, PAR38, MR16, etc.

But here are a few exciting new things from this year's show. First, something called LEP (light emitting plasma) lighting. (Yes, just when you thought you knew LEDs, along come LEPs!) and, second, lighting for health. You'll learn more about LEP lighting when we do a formal wrap-up of Lightfair 2013 in an upcoming edition; for now, I just want to touch upon the latter.

My seatmate on the return flight had also been at Lightfair. He is an educator with a major lighting manufacturer and, when I asked him what really stood out for him at the show, he answered immediately and unequivocally: "Lighting for health". He explained that a lot of R&D—and a ton of excitement—is involved in studying and developing lighting technologies that impart physical and mental benefits to users.

What's great about these evolving technologies is that consumers need experts to help guide them in selection, purchase and installation, and that's where you come in... but only if you take the initiative to study and understand the technology. I encourage you to not only continue reading EBMag and visiting EBMag.com, but to venture out and see these technologies in action. EB

On the cover and page 10

Canada deserves a vibrant transformer industry

Once a thriving Canadian industry, transformer manufacturing has been challenged in recent years by increased competition from offshore players.

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With the new standard for cablebus C22.2 No. 273 scheduled for publication this September, here's what you need to know.

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22 Ongoing commissioning: two different strategies with great benefits
While building commissioning and re-commissioning have grown in popularity to answer the large demand of energy efficiency projects, ongoing and continuous maintenance is also growing in importance.

24 Buildings are using big data to get smart
Under increasing pressure to reduce energy costs, many organizations monitor building energy use by simply reviewing monthly utility bills, not by measuring or tracking actual energy use based on data. Read these tips to create a smarter building.

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$3 million donation supports George Brown College's Success at Work campaign

The George Brown College Foundation (www.georgebrown.ca) announced that Tridel Corp. (www.tridel.com) has donated $3 million to the college's Success at Work fundraising campaign (www.georgebrown.ca/successatwork), which will be directed toward renovating and repurposing learning spaces in the college's Centre for Construction and Engineering Technologies. In recognition of this donation, the college's construction management school will be named the Angelo Del Zotto School of Construction Management (Del Zotto serves as CEO and chair of the Tridel Group of Companies and Tridel Corp.).

"Tridel is a strong supporter of post-secondary education and has played a particularly impactful role encouraging young people entering the construction industry," said Anne Sado, college president.

Electrical Business

June 2013 • Volume 49 • Issue 6

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

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222 Edward Street, Aurora, Ontario L4G 1W6
Tel. 905-727-0077 • Fax 905-727-0017

Publication mail Agreement #40065710
Return Undeliverable Canadian Addresses to Circulation Department
P.O. Box 530, Simcoe, ON N3Y 4N5
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United States Second Class Postage paid at Lewiston, NY
(USPS-741-470) US POSTMASTER:
Send address changes to ELECTRICAL BUSINESS,
P.O. Box 8145, Lewiston, NY 14092

Printed in Canada
ISSN 0013-4244

CIRCULATION: Marie Weiler
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SUBSCRIPTION RATES:
Canada: Single issue $7.00
12 issues: $35.00 (includes tax)
USA: $59.00 (US)
International: $75.00 (US) per year

Occasionally, *Electrical Business* will mail information on behalf of industry-related groups whose products and services we believe may be of interest to you. If you prefer not to receive this information, please contact our circulation department in any of the four ways listed above.

We acknowledge the financial support of the Government of Canada through the Canada Periodical Fund of the Department of Canadian Heritage.
Canada

CCAB BPA WORLDWIDE BUSINESS

We did it! Tesla Wardenclyffe laboratory purchased for museum

Friends of Science East Inc. (dba "doing business as" Tesla Science Center at Wardenclyffe, www.teslasciencecenter.org) announced that it has completed the purchase of the last remaining laboratory of scientist, visionary and inventor Nikola Tesla in Shoreham, N.Y.

"This is a major milestone in our almost two-decade effort to save this historically and scientifically significant site. We have been pursuing this dream with confidence that we would eventually succeed," said Gene Genova, vice-president of the organization. "We are very excited to be able to finally set foot on the grounds where Tesla walked and worked."

Known as Wardenclyffe, the 15.69-acre laboratory site is where Tesla planned his wireless communications and energy transmission tower in the early 1900s. He was never able to complete the construction of the tower due to lack of funds. Check out this video: bit.ly/100ucLS.

At the end of August 2012, Friends of Science East Inc. partnered with online comic Matthew Inman (TheOatmeal.com) to hold an online crowdfunding campaign (bit.ly/100ujr0) on Indiegogo.com in which they were able to raise $1.37 million toward saving the Wardenclyffe site. Over 33,000 people from 108 countries contributed to the success of the campaign, which reached the $1 million mark in just over a week.

"Now begin the next important steps in raising the money needed to restore the historic laboratory," said Mary Daum, treasurer. "We estimate that we will need to raise about $10 million to create a science learning centre and museum worthy of Tesla and his legacy. We invite everyone who believes in science education and in recognizing Tesla for his many contributions to society to join in helping to make this dream a reality."

The organization plans several fundraising events in the future. See the website for more information.

Algoma Tubes fined $70K after workers burned by arc flash

Ontario's Ministry of Labour (MoL) reports Algoma Tubes Inc.—a manufacturer of steel pipe products based in Whitehorse, Yukon—has been fined $70,000 for a violation of the Occupational Health & Safety Act after two workers were injured.

On July 15, 2011, two workers employed as electrical maintenance technicians by Algoma Tubes at a facility located in Sault Ste. Marie were decommissioning an out-of-service motor control centre. A de-energized control cable that one of the workers was removing came into contact with a 480V energized panel. The resulting arc flash caused one of the workers to sustain burns to one hand and the other worker to suffer burns to the hand, forearm and face.

MoL investigated the incident and found that Algoma Tubes failed as an employer to ensure the workers used rubber gloves, mats, shields or other protective equipment and procedures adequate to ensure protection from electrical shock and burns while performing the work.

The company pleaded guilty. In addition to the $70,000 fine, the court imposed a 25% victim fine surcharge, which is credited to a provincial government fund to assist victims of crime.

Scott Millis burned for doing electrical work without a licence

On April 15, a Windsor, Ont.-handyman was convicted in court of charges related to performing electrical work illegally.

Scott Millis was found guilty on three counts of performing electrical work without an electrical contractor's licence. The total fine was $6000 for the violations plus a $1500 victim impact surcharge. Under Ontario Regulation 570/05, Licensing of Electrical Contractors and Master Electricians, only Licensed Electrical Contractors are permitted to contract to perform electrical work in Ontario.

"Unfortunately, there are unscrupulous players out there who present themselves as being able to do electrical work when they don't hold the appropriate licence and they don't follow the rules and regulations," said Doug Crawford, Electrical Safety Authority (ESA, www.esasafe.com)'s chief public safety officer.

Crawford also said anyone considering hiring someone to do electrical work should:

- Check to ensure the contractor holds a valid electrical contractor licence (search the database at www.esasafe.com).
- Confirm they are arranging the appropriate inspections from ESA.
- Call ESA at (877) 372-7233 should you suspect someone is misrepresenting themselves.

ESA reminds consumers of the requirement to ensure that anyone you hire to perform electrical work has a valid ECRA/ESA Electrical Contractor Licence. This will ensure that the Electrical Contractor you have hired: is fully insured; uses qualified electricians to perform the electrical work you require; will arrange for permits with ESA; can deliver an ESA Certificate of Inspection; can provide references; will prepare a written cost estimate of the work.

Horizon Utilities achieves Sustainable Electricity Company designation

The Canadian Electricity Association (CEA, www.electricity.ca) says Horizon Utilities (www.horizonutilities.com) is the first company in Canada to achieve Sustainable Electricity Company designation.

The designation—established by CEA for utilities across Canada and worldwide—requires utilities to commit to ISO 14001 standards on Environmental Management Systems and ISO 26000 guidelines on Social Responsibility. Companies must also pass a third-party external verification to validate the implementation of CEA brand criteria.

"This is a historic day for the Canadian electricity sector," said Jim Burpee, president and CEO of CEA. "I congratulate Horizon Utilities for attaining this brand designation based on internationally recognized standards."

"We're very honoured to be recognized by the CEA for our commitment to advancing sustainable business practices in our operations," added Max Cananzi, president and CEO of Horizon Utilities. "This is also validation of a strategy we introduced several years ago as part of our commitment to contributing to the sustainability of our communities."

Schneider's Xperience Efficiency to engage business, government & community leaders


Aaron Davis

Global energy management player Schneider Electric (www.schneider-electric.com) recently announced the Xperience Efficiency series of events (www.schneider-electric.com/xe/events/us) kicking off in June to collaborate and share knowledge with customers, partners and governments on how to solve energy and sustainability challenges.

"Efficiency isn't just for the eco-friendly crowd anymore. There are tangible benefits of an efficiency economy for cities, businesses and citizens of all types," said Aaron Davis, chief marketing officer, Schneider Electric (in photo). "By coming together, we can share knowledge and put a plan in place to drive change in cities, workplaces and other settings across the globe."

Xperience Efficiency 2013 will take place in the Washington, D.C., area from June 4-6 and Dallas, Texas, from June 18-20. It is a free event that takes on the demand drivers that are forcing change: economic and government rebalancing; urbanization; digitization; and sustainable resources. By looking at the latest integrated energy trends and sustainability solutions that will transform how we all work, learn, and play, Xperience Efficiency 2013 promises to show the future of efficiency.

Solutions will deliver energy management, energy access, and business process performance answers right across the energy chain, boasts Schneider, whether at home, work, across the grid, or in towns and cities. Participants will experience:

- More than 20 breakout sessions addressing market, industry and solution trends.
- Interactive marketplace, including developments in systems, solutions and technology.
- Experts from government, business, academia and industry.
- First-hand stories of companies experiencing efficiency today.

"We all have a role to play in ensuring a more efficient and sustainable economy and world," said Chris Curtis, president and CEO, Schneider North America Operations. "The technologies exist today to drive new levels of efficiency in all operations, and we want to be a leader in helping bring this collaboration together. Our Xperience Efficiency events will be a big part of this engagement and education."

Visit www.schneider-electric.com/xe/events/us to learn more about an Xperience Efficiency 2013 event near you, or to check out a free virtual event beginning June 5.

Construction Electrician among first trades to be aligned in Atlantic Canada

An initiative to create a common, regional approach to apprenticeship announced today by Atlantic premiers (www.cap-cpma.ca) promises "greater mobility and a stronger labour force that supports Atlantic Canada's growing economy". Through the Atlantic Workforce Partnership, Atlantic Canada aims to lead the nation in its approach to harmonize apprenticeship programs.

By aligning hours and training required to attain certification, apprentices have greater mobility to move forward in their careers, and Atlantic employers have access to the workforce they need. These improvements and other workforce initiatives should ensure students and apprentices have the support they need to be successful, and employers have access to the labour they need to grow their businesses.

As part of the Atlantic Workforce Partnership, the provinces will bring four trades affecting 20% of apprentices into alignment within the next 24 months. Premiers also identified a goal of harmonizing additional high-volume trades that meet key labour market demands, covering an additional 40% of apprentices in the following 24 months. Changes will be phased in starting in 2014.

Among the first four trades is Construction Electrician and Instrumentation Technician. In addition to work being done to align these trades, other supports for apprenticeship will include expanding alternative training delivery and building a common information technology platform.

The Atlantic Provinces will introduce measures that will support the use of apprentices on major projects and government operations. Furthermore, Atlantic governments will amend hiring practices to increase the number of apprentices within their own workforces.

IBEW and Edison Electric Institute honour lineworkers

The IBEW (www.ibew.org) and Edison Electric Institute (EEI, www.eei.org) recently saluted the men and women who keep electricity flowing to our homes and businesses.

Electrical lineworkers construct and maintain electric transmission and distribution facilities and, following outages, get the lights back on. This dedication to duty was never more on display, say EEI and IBEW, than during last fall, following Superstorm Sandy.

"More homes and businesses lost power as a result of Sandy than from any other storm in U.S. history—estimates are that 10 million customers were impacted," said EEI president Tom Kuhn. "The industry assembled a virtual army of 67,000 utility lineworkers and tree cutters, representing 80 companies from as far away as Canada, California, and Hawaii. They risked their lives working around the clock to complete the restoration process, which was extremely technical, time-consuming and dangerous."

In the States, congressman Phil Gingrey along with senators Johnny Isakson and Michael Bennet submitted resolutions in support of designating April 18, 2013, as National Linemen Appreciation Day (the Senate unanimously approved its resolution on April 10).

"Hurricanes, ice storms and other devastating natural disasters certainly put the spotlight on the nation's power lineworkers. We're grateful to these courageous, hardworking folks who deal with the dangers of electricity during these critical periods, as well as every working day," said IBEW president Ed Hill.

CSA to reference PEARL reconditioning standards in CSA Z463

Canadian Standards Association (CSA, www.csa.ca) has announced its decision to include the Professional Electrical Apparatus Recyclers League (PEARL, www.pearl1.org) electrical reconditioning, inspect and test standards in the CSA Z463 Guideline on Maintenance of Electrical Systems.

Due to be released later this year, Canada's new national electrical maintenance guideline will provide a concise set of documents that helps electrical system managers protect workers and property, as well as extend the life of electrical equipment.

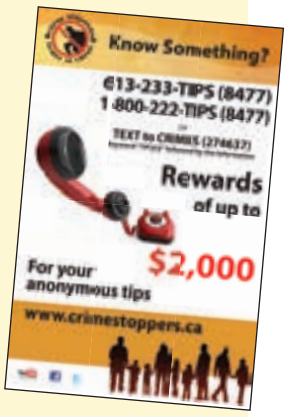
CSA officials said PEARL's Reconditioning standards will be an important reference for the final electrical maintenance guideline. PEARL's Reconditioning standards include technical guidance on the inspection, cleaning, reconditioning, testing, and documentation of industrial and commercial electrical equipment.

"With the addition of advice on equipment reconditioning and use of refurbished electrical equipment to CSA Z463, the PEARL Reconditioning standards were accepted as the best available standards in this specialized subject area," said Dave Shanahan, CSA Z463 project manager. "For this reason, the CSA Technical Committee agreed to reference these standards as recommended practice in the new guideline."

"CSA's consideration of PEARL's Reconditioning Standards underscores the importance of electrical maintenance," added PEARL president Malcom Frederick. "We are pleased to serve as a resource in the creation of this very important guideline."

The CSA Z463 electrical maintenance guideline follows the development of two other standards: CSA Z462 Workplace Electrical Safety (the Canadian equivalent of NFPA 70E) and CSA Z460 Control of Hazardous Energy and Other Methods (used for energy isolation and lockout).

Hydro Ottawa proud to fund Crime Stoppers rewards



Hydro Ottawa (www.hydroottawa.com) says it is proud to fund Crime Stoppers (www.crimestoppers.ca) rewards for tips that have helped shut down marijuana grow operations and stop the theft of power. National Capital Area Crime Stoppers provides cash rewards for those who anonymously provide information in order to help Ottawa police detect and solve crime.

"In all, Crime Stoppers has helped recover over $90 million worth of stolen property and illicit drugs since the program began locally in 1985," said Wayne Bissett, president of the National Capital Area Crime Stoppers.

In 2012, the tips program helped Ottawa Police seize 1264 marijuana plants, valued at more than $1.3 million. Eight charges were laid for possession for the purpose of trafficking and theft of electricity. Hydro Ottawa has reimbursed Crime Stoppers for the rewards paid relating to these cases.

"It is vital to protect citizens and our employees from the dangers of grow houses and their dangerous electrical wiring," said Bryce Conrad, Hydro Ottawa's president and CEO. "We are proud to continue working with Crime Stoppers, an organization dedicated to improving our community."

To report a tip anonymously and earn a reward of up to $2000, call Crime Stoppers at 800-222-8477 (TIPS) or text to CRIMES with the keyword "tip252".

Ontario launches saveONenergy program for Aboriginal communities

The Ontario Power Authority (OPA, www.powerauthority.on.ca) and First Nations Engineering Services (www.fnesl.ca) want to help Aboriginal communities reduce their electricity costs and consumption with the new saveONenergy Aboriginal Conservation Program (bit.ly/17HUfd6), the first of its kind in the province, they say.

According to OPA, the program provides customized conservation services designed to help remote and northern First Nation communities reduce their electricity consumption. It is also expected to create up to 30 clean energy jobs in select Aboriginal communities, such as program managers, community coordinators, canvassers and energy auditors.

"Our government is committed to ensuring Aboriginal peoples have access to the tools they need to succeed. This program will help Métis, urban Aboriginal peoples and First Nation communities manage electricity costs and conserve energy," said David Zimmer, minister of Aboriginal affairs. "I encourage all Aboriginal communities to learn more."

"Conservation will always be our first priority for Ontario's electricity system, because it's less costly than new generation and it helps consumers manage their electricity costs," said Colin Andersen, CEO of OPA. "We are pleased to be working closely with Ontario's First Nation and Métis communities to help them use energy efficiently and manage energy costs."

In the first year of the program, eight First Nation communities, including two remote communities, will be selected to implement conservation measures to meet their energy needs. All First Nation communities across Ontario are encouraged to apply. The Aboriginal Conservation Program will also provide Métis and urban Aboriginal peoples with support and information to more easily access province-wide conservation programs offered by local utilities, said OPA.

"Thanks to programs like this, Ontario is a North American conservation leader," added Bob Chiarelli, minister of energy. "The least expensive energy is the energy we don't use, and more Ontario families and businesses are embracing conservation and using electricity more efficiently."

Members in participating communities will have access to a certified energy auditor, and eligible businesses and facilities can receive assessments for their lighting and water-heating systems.

Manitoba aims to be among safest places to work in North America

Manitoba says it now has a new strategic action plan to prevent workplace injury and illness, and to better ensure every worker makes it home safely at the end of the day.

"This comprehensive strategy follows the province's most extensive review of injury and illness prevention in more than a decade, and doubles resources dedicated to injury and illness prevention," said Jennifer Howard, family services and labour minister. "It strengthens our safety and health laws, and will ensure employers are rewarded for practices that make their workplaces safer and healthier."

The Manitoba government's Five-Year Plan for Injury and Illness Prevention incorporates recommendations from three reports issued in early April as part of a wide-ranging review of workplace injury and illness prevention. The new strategy details include:

- doubling funding for prevention services,
- creating new requirements under the Workplace Safety & Health Act that more clearly define workers' legal rights, require mandatory orientation of new workers and provide stronger protection when a worker refuses unsafe work,
- investing in resources that will ensure every high school student has access to workplace health & safety information in the classroom or online, and materials to help parents prepare their children to know about their rights to a safe workplace when they start their first job,
- requiring mandatory safety orientation for new workers,
- providing a mobile safety lab to bring safety awareness training and tools to rural worksites, and
- creating a leadership team of business owners and executives to help inform and mentor other business owners.

"Dedicating more resources to prevention will help make Manitoba one of the safest places to work in North America," said Howard. "Enforcement is also an important part of injury prevention, and our safety and health laws will be among the strongest in the country. Safety and health officers will now have the tools needed to ensure compliance."

The minister also announced the Workers' Compensation Board of Manitoba will develop a strategy to eliminate claim suppression and inappropriate return-to-work practices, while ensuring employers that engage in genuine injury prevention are recognized and rewarded. That new strategy is expected in the fall of 2013.

RECALL - Overheating and fire hazards with Optimus Tower quartz heaters

The Consumer Product Safety Commission (CPSC) says Family Dollar Stores is recalling 19,640 Optimus Tower quartz heaters due to overheating and fire hazards. Family Dollar Stores has received 10 reports of overheating, including some reports of temperature knobs melting. The firm has not received reports of injury, fire or property damage.

Optimus Tower quartz heaters are portable electric tower heaters, standing about 10-in wide, 25-in tall and 9-in deep. The heaters have a white metal casing with a white plastic top, a wire cage protecting the heating elements and vent slits at the bottom. The front section of the top has the brand name Optimus, a power light, a caution light and two dials. One dial turns the heater On or Off and selects the power of either 750W or 1500W. The other control knob selects the heat range between High and Low. The rear section of the top has fire, high temperature and shock warnings and diagrams of the heater being used in 750W mode and 1500W mode. Model number "H-5232" is on a silver sticker on the bottom of the heater below the words "Optimus" and "Quartz Heater."

The affected units were sold exclusively at Family Dollar Stores from September 2012 through December 2012.

Consumers should stop using this product unless otherwise instructed. The heaters should be unplugged and returned to any Family Dollar Stores location for a full refund

Inquires can be directed to Family Dollar Stores at (800) 547-0359 from 8:30 a.m. to 5 p.m. Monday through Friday, or online at www.familydollar.com, then click on Product Recalls in the Help section at the bottom of the page.

GE opens new $1.5-million product introduction accelerator lab

Saying it will enable its engineers to design, develop and deliver new products faster than ever, GE announced the opening of its $1.5-million, 17,000-sf New Product Introduction (NPI) Accelerator Lab at the business' HQ in Plainville, Conn.

"From rapid-prototyping capabilities to shorten product-cycle time, to our tear-down area for conducting product comparison analysis, this new facility with state-of-the-art equipment enables our team to quickly troubleshoot design challenges, apply manufacturing processes and gain invaluable hands-on experience," said Paul Singer, senior executive of engineering for GE's Industrial Solutions business (www.geindustrial.com).

The lab features a team room, high-tech machine shop, product tear-down area and pilot-run production area. To celebrate the facility's opening, GE is hosting a Technology Day for local high school students, employees and media with a variety of activities to inspire "creative engineering and the spirit of innovation".

O'Neil Electric and Bartle & Gibson honoured at Affiliated Spring meeting

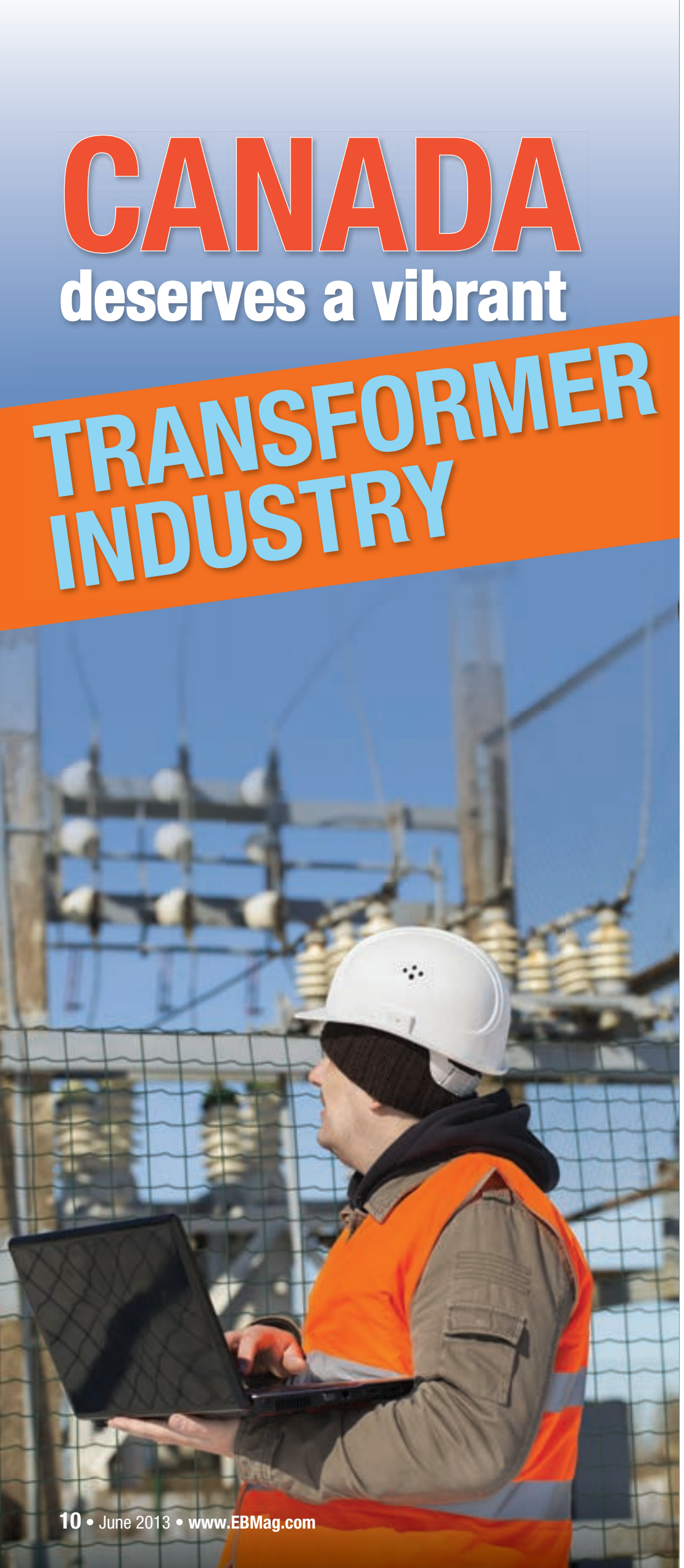
North American wholesale marketing group Affiliated Distributors (AD, www.adhq.com) recently held its annual Electrical Division Spring Network Meeting, and a couple of Canadian affiliates were recognized with awards for growth and participation:

- Highest Overall Participation: Bartle & Gibson (www.bartlegibson.com)
- Greatest Overall Growth in Remittances: O'Neil Electric Supply (www.oneilelectric.com)

Congratulations! AD also reminded delegates of the following upcoming 2013 events:

- AD Canada Electrical AGM, June 10-12 in Charlevoix, Que. EB WILL BE THERE!
- Clean Energy Summit, July 15-18 in Anaheim, Calif.
- Electrical Division North American Meeting, October 7-9 in National Harbor, Md. EB

CANADA deserves a vibrant TRANSFORMER INDUSTRY



Without transformers, electricity could not be produced and transmitted over long distances, nor would it power urban centres and industrial complexes. Once a thriving Canadian industry, transformer manufacturing has been challenged in recent years by increased competition from offshore players, with dumping margins close to 20% and a loss of skilled resources—mainly due to an aging workforce.

There are only a few Canadian-based power transformer manufacturers still operating in the country yet, with combined direct and indirect economic benefits, they remain an important contributor to the Canadian economy. Now, as new prospects for accelerated growth emerge, the time has come for all stakeholders to engage in solutions that will advance Canada's interests through a vibrant, sustainable transformer industry—an essential local pillar in a secure and reliable energy system.

Canada: a record of leadership

50 years ago, the transformer industry's health was at an all-time high, as utilities and industrial customers in Canada (and the U.S.) invested heavily in electrical infrastructure. During the expansionary period of the 1960s and 1970s, electrical equipment companies—including transformer manufacturers—experienced rapid growth and provided high-value jobs—especially in technical disciplines, such as transformer design, electrical and mechanical drafting.

There was a proliferation of engineers, technicians and trades involved in electrical wiring, high-voltage testing, machining, welding, and coil winding and insulation systems—many of whom immigrated to Canada from various parts of the world, including Britain, Europe and Asia. The influx of skills drove the development of local talent in engineering and manufacturing, and resulted in a critical mass of knowledge that not only advanced the Canadian grid system, but was recognized worldwide.

The world's first 735kV and 765kV power transformers were designed and manufactured in Canada. As the industry thrived, Canada's own expertise in transformer manufacturing and electromechanical design kept pace with the rest of the world.

Forces of transformation

The 1980s and 1990s brought difficult economic conditions, and North America's entire electrical industry restructured and downsized. Closures, mergers, acquisitions and relocation to other countries or jurisdictions were commonplace within various electrical/electronic sectors, including consumer electronics, appliances, motors, lighting, high- and low-voltage circuit breakers, and transformers.

As new growth opportunities emerged in South America and Asia, many companies chose to relocate skilled personnel and manufacturing plants, and supporting industries went to those same jurisdictions. However, a few other companies retained their local operations and continued to invest and grow during this down period.

After 2000, when demand for electricity and electrical products (including transformers) improved, these companies were then challenged to meet demand with their remaining knowledge capacity. The 2008 economic crisis tempered those pressures but, recently, growth opportunities have risen again. While a welcome development, such prospects have created a new dilemma on how domestic companies can ramp up to serve demand, and how they can be supported as they enter a new growth phase.

Current opportunities and threats

Investments to replace aging infrastructure, as well as heightened demand from red-hot resource-based industries, are now fuelling growth prospects for the transformer industry. In Canada alone, capital expenditures in new

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Economic Contributions	2011			2012		
(Millions $)	Direct	Indirect	Total	Direct	Indirect	Total
GDP	$169	$280	$449	$159	$263	$422
Total Economic Output	$534	$549	$1,083	$501	$515	$1,016
Total Canadian Payroll	$44	$43	$87	$41	$40	$81
Procured Canadian Goods and Services			$168			$189

electrical infrastructure, including transformers, are forecast to exceed $200 billion over the next 20 years, and total North American expenditures are forecast at 10 times that amount.

This growth is mainly attributed to service expansions in resource-based industries, new green co-generation initiatives, electrical infrastructure rebuilds and continuing PCB replacement programs. In addition, many transformers are approaching—and even exceeding—the end of their useful 25- to 30-year service lives. (It is not unusual to find transformers of 40 years and some approaching 70.)

A significant number of successful transformer 'life extension' programs have been employed over the past 20 years, but the reality is that, very shortly, this equipment will need to be replaced with more-efficient units built to the latest standards and smart grid features. Despite this promising outlook, the industry faces several constraints.

The deteriorated markets of the 1980s and 1990s stripped the North American transformer industry of technologies and technical expertise, as well as critical manufacturing jobs. Those now reside in countries that compete in North America with price levels difficult to match.

The loss of talent hampers the domestic industry's ability to staff up and meet rising demands. And, with the looming retirement of baby boomers, these conditions will only worsen. According to a 2008 Electrical Sector Council survey, over 74% of the industry's managers, 50% of its engineers and technicians and 54% of tradespeople are over 45.

What's more, dumping has become a critical issue, impeding the ability of companies who have stayed in North America to compete. Recently the U.S. Transformer Fair Trade Coalition supported the U.S. Department of Commerce's preliminary determination that imports of liquid dielectric large power transformers from Korea are being dumped in the United States at an average dumping margin found to be 29.93%.

Similarly, following complaints by two leading manufacturers in Canada, the Canadian Border Services Agency (CBSA) on October 22, 2012, determined that 100% of the subject goods imported from the Republic of Korea into Canada from October 1, 2010, to March 31, 2012, had been dumped at a weighted average dumping margin of 19.5%, causing injury to the domestic industry.

Despite these numerous threats to its sustainability, the transformer industry still managed to persevere, providing considerable benefit to the Canadian economy.

Returning value to Canada

While less visible to governments and consumers than the automotive or consumer electronics sectors, transformer manufacturers contribute substantially to Canada's economic well-being in terms of GDP, employment, capital and research investments, secondary industries, tax revenues and local charities.

These benefits include the equivalent of $1 billion in direct and indirect economic output, procurement of $189 million in Canadian goods and services, and generating $422 million in GDP. Canada's power transformer industry also spent $81 million in wages in 2012, employed 2800 skilled and tradespeople, and over 430 technical and engineering professionals in 11 manufacturing plants throughout Canada.

In addition to paying municipal, provincial and federal taxes, transformer manufacturers make annual contributions to local social, medical, arts and sports organizations, and charities. These tangible contributions cannot be matched through the importation of electrical transformers from offshore.

Alongside these tangible economic contributions, the transformer manufacturing industry provides many less quantifiable benefits as well. For example, it supplies ready access to local technical support, expertise, product supply and local transformer repair and other services. Access to technical consultations, familiarity with local codes and standards, knowledge, and local service and support under emergency conditions are intangible benefits that Canada's transformer industry provides to industrial companies and utilities.

Historically, the transformer industry has also acted as a primary catalyst in replenishing aging talent deficits, by offering local graduates high-paying, value-added jobs, thereby also supporting university and technical college educational programs. What's more, the industry actively participates in Canada's technical, industrial and business organizations. These include local trade groups, chambers of commerce, charities, professional associations, as well as technical committees of the Canadian Standards Association (CSA), Canadian Electrical Association (CEA), Electro-Federation Canada (EFC) and others.

Annual membership fees and technical contributions to the improvement of existing standards and development of new ones, including energy efficiency guidelines, help nurture these organizations and sustain their work for the betterment of the country.

A call for action

Given its value in terms of GDP, employment, services and intellectual capital, the case for supporting and further developing the transformer industry is compelling. To neglect its very pressing needs is to abandon its considerable benefits—both tangible and intangible—and place Canada at risk of total reliance on offshore producers (some in politically unstable countries) as a source of critical components for electrical supply systems.

This would be unwise at a time when the country needs more transformers to meet infrastructure requirements. For its part, without recognition of its value and support for its actions at home, the industry will be faced with reconsidering where future investment options ought to lie.

With good prospects for the industry's growth, the challenge is to invest in and support a home-grown industry that can capitalize on emerging opportunities, provide safe, reliable electrical transmission, return benefits to the Canadian economy, and bring social advantages to Canadians.

Taking on the challenge

Meeting that challenge will take action on several fronts:

- Government will need to be vigilant to unfair trade practices and supportive of industry's anti-dumping efforts.
- Publicly funded research and development programs will need to encourage reinvestment in the domestic industry.
- Utilities and other users of transformers can support the industry through supportive procurement policies.
- The industry will need to be more visible and demonstrate its strength and value.
- As business conditions strengthen, transformer manufacturers will need to invest in equipment and other initiatives to drive efficiency and competitiveness. The currency advantage is not likely to return any time soon.
- The talent deficit may be filled through collaborative action among government, industry and educational institutions. Training, scholarships such as the EFC Scholarship Foundation, mentoring programs and employment incentives can serve to reverse a troubling trend and create high-value jobs in Canada.

Transformers will always be essential to a dependable supply of electric power throughout the grid. When one considers their role in preserving the integrity of Canada's (and North America's) electrical grid, the strategic importance of a local supply of 'Quality Engineered and Made in Canada' transformers for Canada's electrical utilities and large industrials is clearly evident. Without it, we risk compromising the country's future expansion and electrical infrastructure regeneration. EB

This article is based on the paper "Transformers and the Electrical Grid System" © 2013 Electro-Federation Canada, a national not-for-profit association comprising three councils that, together, represent over 300 member companies that manufacture, distribute and service electrical, electronic and telecom products. The Electrical Council within EFC is the meeting place for over 200 companies involved in the manufacture, distribution and sale of electrical products, systems and components in Canada. The Power & Distribution Transformer Sections represent the interests of the leading oil-filled transformer manufacturers that supply the Canadian market.

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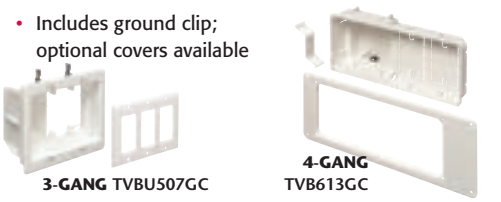

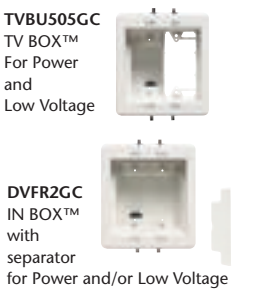

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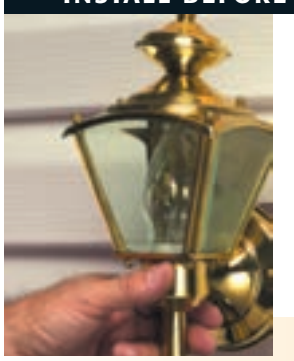

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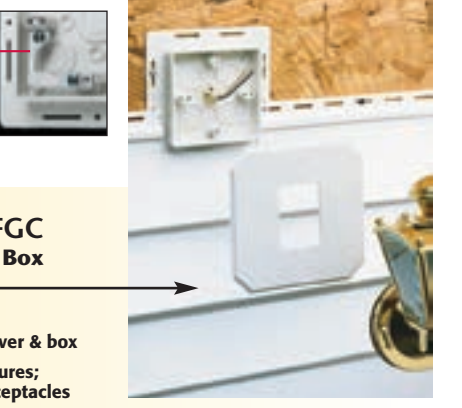
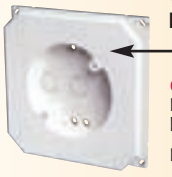


8141FGC Costs 20% Less than 8081FGC



8141FGC Fixture Box	VS	8081FGC Electrical Box
ONE-piece No extra cover to lose or store		TWO-pieces electrical cover & box
For light fixtures		For light fixtures; standard receptacles

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IN CASE YOU MISSED IT...

PHOTOS • EBMag checks out the MCEE Expo in Montreal, Que., which features leading players in the worlds of HVAC, electrical and lighting. Visit bit.ly/ZK3enP.

VIDEO • Masterack reveals SmartSpace lightweight, configurable storage systems. Visit bit.ly/10teW8p.

PHOTOS • See photos from Ontario Energy Network's (OEN's) April luncheon in Toronto, Ont. Visit bit.ly/11vKUmr.

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ECAO Annual Industry Conference
Electrical Contractors Association of Ontario
September 18-22,
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IAEI Canadian Section Conference
International Association of Electrical Inspectors
September 20-22, Saskatoon, Sask.
Visit www.iaei.org

60th IEEE IAS PCIC Annual Conference
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September 23-25, Chicago, Ill.
Visit ewh.ieee.org/soc/ias/pcic

Shutdowns & Turnarounds
A presentation of EBMag
September 24, Sudbury, Ont.
Visit www.partnersintraining.ca

Dave Smith

Emergency response: methods of release

Part three

There are also some situations where it is too risky to attempt a rescue and, in those unfortunate situations, you will live with the trauma that every accident witness has also had to live with.

Our electrical industry also needs to adopt concepts from the dangerous goods industry. In that industry, there is a detailed list of every hazardous material and a specific placard for it. We need to develop specific identifiers in the electrical industry for every voltage level, and put placards on every panel.

Enter into many indoor substations or electrical rooms and you will be faced with multiple sets of electrical, grey look-alike cabinets with nothing apparent to distinguish one voltage level from another. There will also be no indication of the main disconnect means other than a small plastic label.

I recommend the voltage of every system be prominently identified in the top centre of all accessible sides in 16-in. high letters, and the main disconnect door be identified with Fire Engine Red paint.

There are many ways that even experienced workers can find themselves in trouble. One of our senior instructors, Ed Rideout, relates a story in his class of an incident that happened when he was maintenance supervisor in a generating station. One of his electricians had de-energized, locked out and tagged a 5kV motor starter. He had gone around to the back of the switchgear and was at the back of the cubicle.

The electrician had the door off when Ed arrived and said, "You are in the wrong cubicle". His electrician said, "No, this is Number 2 pump," and Ed said, "No it is Number 1. It is the 7th cubicle from the end, and you have locked and tagged the 8th cubicle... I counted them".

As it turned out, the doors had been inadvertently mixed up during the last maintenance turnaround. This is why you number the concrete in front of your cubicles, and include the necessity to check them in your procedures.

When there is no apparent way to disconnect, you may have to remove the victim from the source of power; the ease with which you will be able to do this depends on how tightly the victim is clinging to it. Every one of us carries insulators on us. At low voltage, a leather belt whipped around someone's arm can be used to pull them away. Your shirt can be used in the same way to pull someone away.

Imagine right now that someone around you was hung up on a circuit: what could you use to release them while remaining safe yourself?

The reason that fire crews practice regularly is so that, when they encounter a fire, their practice has prepared them and actions become automatic. You need to do the same mentally for electrical accidents. Firefighters can run into a thousand different situations; their training is general so it can be applied to all situations. Prepare yourself and your workers as well.

We know that, in an electrical rescue, the victim is going to have a difference of potential across his body. Most likely, his body is between one live source and ground, and you will have to get them off the live source. An alternative may be to divert the current. When a person inadvertently has his hand stuck in a panel, the first natural reaction is to pull out, but were they to push in and ground their hand and arm, the current flow may be diverted.

Were someone accidently connected to a remote piece of equipment because of an internal insulation fault and a failure of the ground system to function properly, then finding a way to short the cabinet to ground with something as simple as a pry bar or crowbar may divert the current to ground and reduce the voltage across the victim.

There are also some situations where it is too risky to attempt a rescue and, in those unfortunate situations, you will live with the trauma that every accident witness has also had to live with. Hopefully, when you see an electrical accident and a victim needs to be released, following some of these suggestions may be of value.

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

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

Get ready for first-ever cablebus standard in North America

Steve Douglas

PHOTO COURTESY UNITED WIRE & CABLE

The new standard for cablebus C22.2 No. 273 is scheduled for publication by September of this year. This new standard will be the first for cablebus in North America. The committee includes the six major cablebus manufacturers in North America, two switchgear manufacturers, CSA and an IAEI (International Association of Electrical Inspectors) representative.

Cablebus is an assembly

Cablebus is an assembly of insulated conductors with fittings and conductor terminations in a completely enclosed, ventilated or non-ventilated protective metal housing. In most cases, cablebus will be approved by either certification or field evaluation, and is typically assembled at the point of installation from the components furnished by the cablebus manufacturer. Accompanying the cablebus, the manufacturer will provide installation instructions and drawings for the specific installation to facilitate:

a) system design
b) construction
c) firestop rating (where applicable)
d) weatherproof entrance fittings (where applicable)
e) bonding, conductor and shield terminations (where applicable)
f) grounding of shields (where applicable) and installation
g) inclusion of electrical detail of the conductor configuration, together with enclosure dimensions
h) specification of maximum allowable span support
i) vertical installations

Cablebus nameplate

To assist the electrical contractor and electrical inspector, the main nameplate will include:

a) the manufacturer's name, trademark or other descriptive marking by which the organization responsible for the product can be identified
b) the electrical ratings:
   - rated nominal voltage (Vrms or Vdc)
   - frequency in Hz
   - allowable ampacity (A) based on ambient temperature* of XX*C, and based on a maximum operating temperature of XX*C- short circuit current rating
   - number of phases (poles for DC)
   - 3-wire or 4-wire
   - Maximum continuous current rating _XX_A, when connected to a 100% continuous rated overcurrent device
   - Maximum continuous current rating _XX_A, when connected to a 80% continuous rated overcurrent device

** Note: the temperature is the maximum ambient temperature in which the equipment was designed to operate.*

c) the month and year of manufacture, at least, shall be marked on the cablebus system in a location accessible without the use of tools
d) the number of conductors and size per phase
e) as a minimum, the allowable ampacity (A) based on a maximum operating temperature of 75C shall be included on the nameplate

Cablebus is an assembly of insulated conductors with fittings and conductor terminations in a completely enclosed, ventilated or non-ventilated protective metal housing.

f) type of material, such as stainless steel (including the type), aluminum, etc., and, if carbon steel, Type 1 (hot-dip galvanized), Type 2 (mill galvanized) or Type 3 (electrodeposited zinc) as applicable. (If the manufacturer's catalogue number marked on the product would readily lead the user to the required information published by the manufacturer, this marking is not mandatory)
g) a warning label that reads, "Warning! Do not use as a walkway, ladder or support for personnel"
h) the design drawing number for the specific installation

Maximum continuous current rating

The maximum continuous current rating will assist in the application of Canadian Electrical Code (CEC) Rules 12-2260 and 8-104, and help provide consistency with respect to conductor loading. In addition to these nameplate markings, cablebus will be one of two classes corresponding with the Items (a) and (b) in CEC Rule 12-2252. CEC Part I Rule 12-2252 states:

- 12-2252 Use of cablebus (see Appendix B)

- Cablebus shall be permitted for use where

a) protection from contact with conductors is provided by design and construction of the enclosure; or
b) installation is intended in areas
   i) accessible only to authorized persons
   ii) isolated by elevation or by barriers; and
   iii) where qualified electrical maintenance personnel service the installation.

Class A cablebus is designed with protection from conductor contact provided by the design and construction of the enclosure. Class B cablebus is intended to be installed in areas accessible to authorized persons, isolated by elevation or by barriers, and where qualified electrical maintenance personnel service the installation. EB

This article was originally published as "Cablebus" in IAEI's January/February 2013 edition. Steve Douglas is presently the senior technical codes specialist for QPS Evaluation Services and the 2012–2013 international president of the International Association of Electrical Inspectors.

Mark Borkowski

The 10 most common pricing mistakes

Is it time to revaluate your pricing policies?

Dennis Brown is a partner at California-based Atenga Inc., a leading pricing authority to commercial and industrial companies worldwide. The company has resources and processes for improving clients' profits by optimizing prices and improving price performance. Their most surprising finding has been how often price optimization can raise prices and improves sales volumes at the same time.

I asked Dennis about price strategy. He said, "It is emerging as the most important resource for companies to increase their competitive advantage". The vast majority of companies have spent years achieving gains through cost-cutting, outsourcing, process re-engineering and the adoption of innovative technologies. However, the incremental benefits from these important activities are diminishing, and companies are looking at other areas for improving their business results.

Brown believes companies are looking to serve well-defined market segments with specialized products, messages, product variants and services, and earn superior profit margins while doing so. Savvy companies are implementing price optimization schemes and focusing on building their organizations to serve their most profitable customers. Many are seeing improvements by 'firing' their unprofitable customers.

Too many companies, however, use simplistic pricing processes, and some cannot even identify their most profitable products, product lines, customers or customer segments. This lack of information means too many management teams have their sales staff focusing the bulk of their time servicing the least profitable of their customers. Some companies even embrace policies and pricing strategies that drive away their best customers, then wonder why their profits are not growing.

Over the years, Brown has seen examples of good and bad pricing policies. Here is a list of 10 of the most common mistakes companies make when pricing their products and services.

1. Basing prices on costs, not customers' perception of value. Pricing based on costs invariably leads to prices that are too high or, quite often, too low.

2. Basing prices on 'the marketplace'. Management teams must find ways to differentiate their products or services to create additional value for specific market segments.

3. Attempting to achieve the same profit margin across different product lines. For any single product, profit is optimized when the price reflects the customer's willingness to pay.

4. Failing to segment customers. The value proposition for any product or service varies in different market segments, and price strategy should reflect that difference.

5. Holding prices at the same level for too long, ignoring changes in costs, competitive environment and customers' preferences. Most companies fear the uproar of a price change and put it off too long. Savvy companies acclimate their customers and their sales forces to frequent price changes.

6. Incentivizing salespeople on revenue generated, rather than on profits. Volume-based sales incentives create a drain on profits when salespeople are compensated to push volume at the lowest possible price.

7. Changing prices without forecasting competitors' reactions. Smart companies know enough about their competitors to predict their reactions and prepare for them.

8. Using insufficient resources to manage pricing practices. Cost, sales volume and price are the three basic variables that drive profit.

Savvy companies are focusing on building their organizations to serve their most profitable customers.

9. Failing to establish internal procedures to optimize prices. The hastily called 'price meeting' has become a regular occurrence; a last-minute meeting to set the final price for a new product or service.

10. Spending a disproportionate amount of time serving your least profitable customers. Most companies do not know who their most profitable customers are. Know your customers: 80% of a company's profits generally come from 20% of its customers. Failure to identify and focus on the 20% leaves companies undefended against wily competitors.

Brown thinks another big mistake is that "companies rely on salespeople and other customer-facing staff for intelligence about the value perceptions of their customers. Such people are an uncertain source because their information-gathering methodology is usually haphazard, and the information obtained thereby can be purely anecdotal".

Such information is neither precise nor quantifiable. A customer will rarely tell the complete truth to a salesperson, so any information the customer may volunteer will be biased—often to get the company to lower their prices.

Salespeople can readily identify those anecdotes that advance their interests (e.g. lower prices lead to higher sales, regardless of profitability) and those that operate against them. Savvy companies employ trained professionals to collect and analyze the data to identify and evaluate the value perceptions of their marketplace. Large companies have entire departments doing this full-time; smaller companies may outsource it to a specialist. EB

Mark Borkowski is president of Toronto-based Mercantile Mergers & Acquisitions Corp., and our new "It's Your Business" columnist. His company specializes in the sale of mid-market companies, with acquisition search representing a portion of its activity. Visit him at www.mercantilemergersacquisitions.com.

A GREAT START TO A BAD JOB IS A POOR ESTIMATE

A good estimate is more than just a list of materials

John F. Wiesel

During a recent estimating training course, my thoughts went back to a construction cartoon that I saw 30 years ago. It showed about six men in suits on a dock, waving good-bye and wishing good luck to a construction worker in a row boat. The boat was full of drawings and specs, but it had no oars!

This memory came back when I asked the class of middle-aged tradesmen what help, direction or training they were given to either manage a project or estimate one... and the answer was none.

The class was made up of two groups: small business owners and those who were transferred over to the estimating division of the company for which they worked. None had any formal training in estimating. Some could come up with some kind of take-off, but struggled with taking it further.

Over the years as a chief estimator and, later, while training estimators, I have heard the following comments:

- If you cannot look at a project and have a price on it in a day, you are not an estimator (you are a *questimator*).
- An estimate is a waste of time and company money (a bad estimate most certainly is).
- It is the estimator's job to get a project, whatever the cost; it is the project manager or foreman's job to make money on it. (Here is where the blame game comes in... no teamwork).
- If you do not leave anything out, or miss something, how do you expect to get the job? (A sure way to start a job on the wrong foot.)
- We will make it up on the extras (one of the biggest lies ever told).
- Take-off only what is shown on the drawings, quote the job as cheap as possible, forget about the specifications (you will read them when the shop drawings come back, all redlined!).
- Who reads the specs anyways? You only need them once you get the job (poor guy that has to do it by the specs).
- An estimator is only an office assistant, even though he is a tradesperson. He is not worth a tradesperson's wages (you get what you pay for).
- Price as many jobs as possible and you are bound to get one (usually the one you do not want or cannot do).
- Here's the biggest one in the electrical construction industry: if that company can do it for that price, we can do it lower because we are better! (Usually the price you chase is below your cost. You only fool yourself.)

Don't cheap out on estimating!

Years ago, the company with which I started out had a formal in-house training program for all estimators, foremen, project managers and superintendents. When I was brought in to estimate, I sat with a seasoned estimator for the first three weeks, and assisted in taking off a large project. I was walked through the take-off process, use of take-off sheets and labour units, pricing, obtaining special pricing from suppliers, recapping the job, then making out a proposal.

For the next four months I estimated projects and was walked through each stage of the estimate. It took me two more years to really develop into an estimator. When I moved to a larger company, they sent me on the Suderman estimating course, which was run by Peter Suderman. He gave us a faster and more accurate way to take-off a job, and gave us a better insight into what constituted labour hours and dollars, job costs, mark-up and profit. Even after that, it took me two years to really work my way into obtaining jobs that turned out well for the company.

What am I driving at here? Consider that most companies, unfortunately, do not provide any formal training for estimators. They feel that if a man can run a project, he can estimate one. Some feel that estimating a job properly is a waste of time. Shortcut the estimate, obtain the job, lose your shirt and hope you can get it back on extras or the next job. This is truly a losing formula.

Companies quote on jobs they have little chance of getting and, when they do, little chance of making any money. Time is spent

on an estimate, but the information gained from that exercise is generally not turned over to the person running the job. Just because someone is a good field electrician, foreman or even a project manager, it does not make him a good estimator.

A take-off of material is only the first part of an estimate; some can do a take-off, but only a few can put together a truly descent estimate. Most electricians do a take-off for material they need to do a job, but that's only the start of a longer process. It takes a few years, even as a seasoned estimator, to work your way into a new company. You're on a learning curve with regard to the capabilities of the company, their labour force and the type of work they do, as well as building up customer relations and confidence in yourself.

A great start to a bad job is a poor estimate. A good estimator is worth a good wage.

Do it properly. Do it right.

So where do we go from here? If you want to obtain good jobs that will pay your overhead and make you a profit—the reason everyone goes into business—you have to start with a good estimate. That will take someone who can do more than just a take-off. A trained and experienced estimator will take the time to read the specifications thoroughly, review the drawings and get a handle on the job. From there, an accurate take-off must be done; if you miss material, you miss labour, mark-up and profit.

There is a sequence to an estimate, and it takes time to do it properly:

- Take-off of fixtures, distribution equipment, special systems, distribution wiring, mechanical wiring, systems wiring and branch wiring.
- Prices, including special materials sent out to the distributors.
- Labouring the material. Some of the factors that must be taken into account here are the capabilities of the workforce, time of year the project is done, quality of the general contractor, size and location of the project, quality of design, job schedule, etc. Labour units in manuals and computer programs are general industry averages. This is what estimating is really about.
- The resulting labour hours need to be turned into dollars (do you know your true labour cost per hour).
- Job costs (related to that particular project).
- Mark-up (what it costs to run your company, even when you do not have any jobs).
- Profit (which is not a bad word... that's why everyone is in business).

From this you can see that a trained estimator is more than just a person who can make up a list of materials needed for a project. A good estimate is the start of a good job. EB

John F. Wiesel is president of Suderman Estimating Systems Inc. The company was started in the 1970s by Peter Suderman of Regina, Sask., who was trying to find a training course for his young estimators. In 2001, John Wiesel (who had taken Suderman's course, and had sent others), bought the company from Peter, and has taught it ever since across Canada. John also does consulting on various projects across Canada and overseas. Visit www.sudermanestimating.com.

Ongoing commissioning:
two different strategies with great benefits

Philip Desrochers

Building commissioning and re-commissioning are becoming a standard strategy for many building managers and owners. It started to grow in popularity over the last five years to answer the large demand of energy efficiency projects.

Although this kind of solution brings substantial improvements to the building systems, savings may not be maintained over time when management processes are not reinforced as well. This is why ongoing commissioning, or continuous commissioning, is growing in importance in the market.

Ongoing commissioning can be applied in two very different formats. It can either be fully implemented within the building management processes to allow the user to be independent, or it can be delivered as a service by a subcontractor. Here I explain both solutions' benefits and challenges.

Implemented ongoing commissioning

Implementing ongoing commissioning often involves changing the actual management culture of the local building operation team. It means the facility managers and maintenance employees adopt a continuous improvement approach in every daily activity to seriously improve energy savings and better manage operating costs. They use new implemented technology onsite to monitor their building and guide their decision-making process.

Challenges

Three main challenges reside in being fully independent with ongoing commissioning. The first one is obviously technology implementation within the team's actual toolbox. Companies selling the approach provide all the required technical support, installation services and coaching to successfully start the process. However, local management needs to establish the proper training program to make sure all the employees understand the tools they are going to use. It requires a good analysis of the team's knowledge and a plan on how to close the gaps.

The second challenge is to promote the continuous improvement culture and accelerate its adoption. Training the staff on a new technology is something simple enough to quickly generate benefits, but changing a management culture needs more time and discipline. When using ongoing commissioning, the team needs to change their thinking and open their management vision to new opportunities. It's with coaching and success sharing that each person will understand the value added of ongoing commissioning.

The last challenge is the end result of the two previous ones. In fact, training people and implementing procedures in a team overloaded with tasks is the true challenge. It is already hard to complete all the required work in maintenance and emergencies that it is often too hard to implement new methodologies and technology. This is why being independent in ongoing commissioning requires a good training, a strong team in place and clear targets.

Advantages

Implemented ongoing commissioning can generate enormous benefits. A team that uses ongoing commissioning as their own internal management strategies is definitely in front of the competition. With this continuous improvement culture, every team member acts as an analyst of the building systems and generates value added information for decision making. All this involvement simplifies improvement opportunities identification, and accelerates corrective action implementation because every member follows the same strategy and works to meet the same objective.

Another benefit of implementing ongoing commissioning onsite is to standardize the analysis at every management level. Using this approach reduces wasted time searching, analyzing and understanding the root cause of a problem. It also builds the team knowledge about the building systems, which enables to increase team productivity and reinforces building operations. Moreover, all team members speak the same language, which simplifies communication—one of the biggest challenges in any administration.

Remote commissioning

With today's technology, multiple services are available offsite, and a big part of ongoing commissioning can be done this way. Some companies in the industry are offering ongoing commissioning as a service, meaning that an external engineering team is looking at building systems with offsite connections.

Often called remote commissioning, this method generally involves a subcontractor (or a monitoring centre in large portfolios) who analyzes the building operations 24/7 and generates reports for the building managers. Most of the time, these reports include data about control systems and energy consumption with related corrective actions to improve overall building performances.

Challenges

Remote commissioning involves similar challenges as any other service supplied to the building management team. Security in data exchange is a good example. Many enterprises don't want to share business-related information to limit risks of improper usage. Obviously, remote commissioning deals with external connections to the building, but with the right system in place, all the information sharing is fully secured.

Using remote services also means more coordination and more communication with an external supplier. This increases the difficulty in communicating the problem details or a solution to a local team, but a big variety of tools like webcast, real-time image exchange or cloud database are available to simplify information-sharing within various communication channels.

Another challenge of remote commissioning is to use outsourced analysis in day-to-day operations. It is not always easy to quickly understand an analysis and start the action suggested by someone not necessarily aware of onsite emergencies and priorities. To minimize difficulties, the team can simply put into place prescheduled periods to revise priorities based on reports items each time the data arrives.

Advantages

Even though remote commissioning may seem riskier, it has many advantages to consider. Not having to implement and take ownership of new technologies means significant savings in time and training. In a service format, the overall cost of implementing ongoing commissioning can be spread over a longer term, reducing initial investments. This allows starting several projects at the same time, which is very useful when the team manages a portfolio of buildings.

When the building management team adopts the proper procedures to use the supplied data from each report, overall energy savings and productivity increase can be impressive. Working with a professional of remote commissioning on a frequent basis helps the team learn faster and access a standard level of analysis from the very beginning of the project. Basically, remote commissioning brings a new team player with a strong expertise to the table.

Which is best?

Both solutions are good: it all depends on the business strategy the building management team wants to undertake. On one hand, implementing ongoing commissioning is a longer-term solution that ensures a new level of performance within the team. It starts a culture of continuous improvement to create a new management philosophy based on waste elimination and opportunity identification that will keep going over time. It generally answers owners' objectives to reduce costs and increase the overall building value in a mid- to long-term investment.

On the other hand, remote commissioning allows easy access to ongoing commissioning benefits with fewer challenges on training. It enables the team to interact with experts and get solid, prioritized recommendations on what to do to increase building performance. Remote commissioning usually better fits short- to mid-term projects in which quick savings are targeted. Facility managers and building owners then need to first identify their goal, then decide on how they will use ongoing commissioning as their new management methodology. EB

Philip Desrochers leads the overall operations of ADMS Technologies Inc., which specializes in building management optimization. He holds a Bachelor's degree in Engineering from Montreal Polytechnique School of Engineering and can be reached at pdesrochers@adms-tech.com.

Buildings are using big data to get smart

John Longbottom

If worldwide energy use trends continue, Canadian organizations might need to call on the services of a building 'whisperer' sometime soon. The U.S. National Science and Technology Council estimates that commercial and residential buildings consume 1/3 of the world's energy.

In North America, for example, this translates to 72% of the electricity generation, 12% of the water use and 60% of non-industrial waste. Buildings are set to become the largest consumer of global energy by 2025—more than the transportation and industrial sectors combined.

Under increasing pressure to reduce energy costs, many organizations monitor building energy use by simply reviewing monthly utility bills and not, sadly, by listening to their buildings and measuring or tracking actual energy use based on data.

Why should we care?

Amazingly, up to 50% of energy and water in buildings is wasted. Each year buildings emit more harmful carbon dioxide (CO2) emissions into the environment than our cars. Like the average consumable product, a building has a life cycle that needs to be managed comprehensively, coordinating all aspects from design to demolition.

Smarter, more sustainable buildings can reduce energy consumption and CO2 emissions by 50% to 70%, and save 30% to 50% in water usage. Because energy typically accounts for 30% of a building's annual costs, savings through sustainability can also have a big impact on a company's bottom line.

In today's urban environment, we know that smarter buildings are the building blocks of smarter cities and, ultimately, a smarter planet. There is a tremendous opportunity for facilities managers to 'listen to' and make sense of facility data from lighting, heating, air-conditioning, manufacturing and computer usage by applying a real-time, analytic approach... regardless of a building's age.

Uncovering the data

There's no question the data exists. As a society, we are creating the equivalent of 2.5 quintillion bytes of data every day. This figure represents the collective output of every person, organization and instrumented thing, which has been likened to about half a billion HD movie downloads daily, or the equivalent of 57.5 billion 32GB iPads.

Collecting, managing and analyzing data gives intelligence and insight into energy, space and facilities management decisions. Buildings can interact with their occupants as well as the environment around them through the stream of information they generate, leading to more efficient and sustainable operations. These smarter buildings drive economic benefit, saving money as well as the environment.

Change is within our grasp. With the unprecedented proliferation of smart sensors and control systems over the last decade, many buildings now have the ability to measure, sense and see the exact condition of practically everything within them. But these systems often operate independently; understanding a building from a holistic point of view

requires collaboration between facilities and information technology organizations at new levels, and creates the need for new transformational skills in organizations or businesses.

These challenges also create new, exciting opportunities to interconnect and innovate the buildings in which we live, work and play.

The task ahead isn't about retrofitting. It's about looking at the data that already exists, understanding its relevance and using it in new ways. By using analytics to add a layer of intelligence, elements of a building (including temperature, electricity, ventilation, water, waste management, telecommunications and physical security) can now be integrated for better management, control, cost and energy savings.

In general, smarter buildings share the following five characteristics:

- they operate more cost-effectively by reducing energy and operating costs
- they use active and designed-in techniques to achieve reliability, efficiency and environmental responsibility
- they provide visibility, control and automation to building systems
- they maintain a safer, more secure workplace
- they communicate in real-time to supporting infrastructure, such as the smart grid and broadband

Collection and analysis

To achieve a smarter building approach, organizations must focus on input, collaboration and immediacy for success.

INPUT: Getting the input of the people who actually use the buildings can go a long way toward ensuring the projects are successful. Employees spend a lot of time in the buildings in which they work. They want to make them more environmentally friendly. Involving occupants in the process of creating a smart building lets companies tap into their everyday knowledge.

COLLABORATION: Buildings are woven together using complex systems from many different manufacturers. In smart buildings, those systems need to work together. Working with manufacturers or installation experts who understand the importance of collaboration will help ensure the success of smart building projects.

IMMEDIACY: Faced with rising pressures from stakeholders, governments and employees to cut costs and emissions, businesses cannot afford to wait, nor do they need to. It doesn't take huge investments to reap efficiency savings. The basic technology underpinning a smart building—sensors—has already been installed in most lighting, cooling and heating, and security systems through routine equipment upgrades or repairs during the past decade. Add higher-level analytics and these sensors aren't just tracking a specific device, they're getting insights into what's happening across a system, a building, or a campus, then and prompting action on that data.

The rise of smart meters and related systems are beginning to deliver more insight for building owners by providing more relevant information, in near real time. This advancement creates more transparency, helping building owners and tenants alike discover where savings can be had fastest, at the lowest cost.

Analytic software, for example, can process data from smart meters and identify vastly different savings opportunities: whether escalators were running when they shouldn't have; whether electric motors are overloaded and require service; or even to simply suggest behavioural changes that can save dollars, such as altering air-conditioning or heating settings at night.

Flexing data's muscle

At its corporate campus in Rochester, Minn., analysis of building operations data has helped IBM save 8% in annual energy costs. With 3.3 million square feet of mixed use space—including offices, labs and meeting spaces—IBM tracks information from over 300,000 data points in real time to make on-the-fly adjustments.

Many other organizations are already using new intelligent business management systems to help reduce water use by up to 30% and energy use by up to 40%, while reducing overall building maintenance costs by up to 30%. And it's not just about saving money: it's about saving what's inside the buildings, too. Some museums are using building data to help determine the very best environment for individual works of art based on temperature, humidity and other conditions, helping to ensure the ongoing preservation of priceless artifacts.

As smartphones become cheaper and more powerful, they play a key role in advancing smarter buildings. Celebrating their 40th anniversary this year, cell phones have evolved into advanced instruments able that act as mobile sensors, feeding data into these fast-evolving urban data services. Cellular communications also offers a flexible, low-cost infrastructure over which to deliver the very data services to the public just-in-time and precisely where they're most helpful.

Congestion mapping was one of the first such services to emerge, giving insight into traffic. Now, schools are making use of this new source of data as well. The Los Angeles Unified School District takes an innovative approach to building maintenance by arming its 700,000 students, teachers and other staffers with software that lets them easily snap a photo with their smartphone and have that information fed into the district's maintenance system where repair orders are prioritized and issued. Essentially, the solution allows the school district to crowdsource maintenance requests across its more than 14,000 buildings spread out over 710 square miles—and run more efficiently. During the first eight months, more than 750 reports were filed.

Whether it is protecting priceless works of art in France, empowering students and teachers to report on building maintenance needs via text in Los Angeles, or tracking, forecasting, simulating and optimizing energy use in New York K-12 public schools, smarter buildings technologies are helping organizations squeeze out inefficiencies and drive down a variety of costs, including energy.

The realities of the 21st century include scarcer resources, climate change and higher energy costs. Yet, as these examples illustrate, smarter buildings technologies can help us better manage our office buildings, museums, warehouses, factories, power plants, campuses, resorts, and even entire neighborhoods.

Buildings are talking and it's time for us to listen if we want to better support future societal and business growth. EB

John Longbottom leads IBM Canada's Smarter Cities program focused on developing and delivering emerging solutions that help cities solve pressing issues. The solutions are focused on multiple segments, including Buildings, Energy, Healthcare, Public Safety and more. John's 29 years at IBM span various roles in marketing, account management and strategy in IT services and technology.

John Eggleton has joined **Affiliated Distributors** (www.adhq.com)—a North American wholesale marketing group—as its new U.S. Electrical Division President. Eggleton comes to A-D after serving for 10 years as CEO of A-D's sister company, supplyFORCE. "John brings a great mix of leadership, humility, operational experience, sales and negotiation experience, managerial skills and customer care," said **Bill Weisberg**, A-D chair and CEO. "John's passion for the cause of independents and his collaborative team-oriented approach to business will be well received by our members and suppliers." "It's an honour to be joining such a great organization. In working closely with AD Team Members, Affiliates and Suppliers for the past 12 years, I have always admired the group's passion, initiative and results," said Eggleton. "**David Oldfather**'s nine-year tenure at the helm of the Electrical Division brought foundational stability and growth opportunities which will continue to flourish under John's leadership. We wish David the best in his future endeavours," added Weisberg.


John Eggleton

Venture Lighting International (www.venturelighting.com)—a player in metal halide lighting systems—announced the promotion of **Greg Guisso** to the position of director of sales and marketing in Canada. In his new role, Guisso is responsible for all aspects of **Venture Lighting Canada** (www.venturelighting.com/canada) channels as he transitions the management of the company's activity in Canada from **Forbes MacLean**, director of sales, industrial/commercial sector. Forbes will continue to expand his focus on industrial and commercial opportunities in the Americas. "Greg's 23 years of sales management experience in the Canadian electrical and lighting industry, his strong work ethic and his dedication to serving his customers has proven to us that he is the right choice to lead our ongoing efforts in this very important market," said **Ken Hawley**, vice-president of sales and marketing. Guisso joined Venture Lighting Canada in April 2008 and has been responsible for the establishment of the company's network of independent manufacturer representatives across Canada. Over the past five years, he has managed sales and marketing activities with the re-introduction of the Venture and Ballastronix brands in the Canadian distribution sector. "Forbes Maclean has done an outstanding job in leading the Canadian team for many years, and it is very important to us have a smooth transition in management leadership," said Hawley. "We couldn't be more pleased with Greg's performance, and he and Forbes will continue to have a close working relationship as this change is implemented."


Greg Guisso

Pat Haughey, general manager of **GE Lighting-Canada** (www.gelighting.com), announced the recent appointment of **Nabil Jacques Salem** to the position of field sales developer for the Quebec market. In this new role, Nabil is responsible for developing growth opportunities for GE Lighting products with end users and specifiers across all vertical market segments. Prior to this appointment, Nabil held the position of program manager at GE Lighting Solutions in Lachine, Que., where he was involved in providing LED solutions to the horticultural, traffic and rail segments.


Nabil Jacques Salem

Alex Ismail, president and CEO of **Honeywell Transportation Systems** (www.honeywell.com) will become president, Energy, Safety & Security (ESS)—a newly created leadership position that includes five businesses (Environmental and Combustion Controls, Life Safety, Security Group, Scanning & Mobility, and Sensing & Control) within Automation and Control Solutions (ACS). The businesses represent $8 billion, or about 50% of total 2012 ACS sales. Alex will report to **Roger Fradin**, president and CEO of ACS, and will remain an executive officer of the company until his official start date on May 20.


Alex Ismail

Tollgrade Communications Inc. (www.tollgrade.com), a provider of service assurance solutions to utilities and telecommunications providers, has promoted **Thomas J. Kolb** to chief operating officer (COO). As COO, Kolb will continue to report to **Ed Kennedy**, Tollgrade president and CEO, and provide strategic and operational leadership over all aspects of Tollgrade's broadband and smart grid business units, including product development, supply chain, services, customer support, marketing and sales. "Tom is uniquely qualified to drive operational excellence company-wide as we expand our presence and solution portfolios in the smart grid and broadband markets," said Kennedy. "I have tremendous confidence in Tom's ability to strengthen all aspects of our business as we continue to grow and expand." Kolb joined Tollgrade in 2008 as director of operations strategy and prior to appointment as COO, he served as VP of operations. "I look forward to expanding my contributions in helping lead the company and ensuring we continue to provide best-in-class products, services and support to our growing list of marquee customers," he added.

Epcor Utilities Inc. (www.epcor.com) has appointed **David Stevens** as the company's new president and CEO, replacing **Don Lowry**, who announced his intention to retire from the company by December 2013. Stevens is a 30-year veteran of the energy and utility industry, says Epcor, with over 20 years of experience in executive leadership. His most recent positions were as the top executive of major energy and utilities providers located in El Paso, Texas, and Seattle, Wash. As president and CEO of Epcor, Stevens assumes responsibility for leading the executive management team and overseeing all strategic, operational, financial and brand-building facets of the company's interests in Canada and the United States. Stevens assumes his responsibilities March 6, 2013. Lowry has agreed to remain with Epcor as a resource for the transition for as long as he is required. EB


David Stevens

Standard Products introduces new dimmable LED modules in three lengths

The new LED modules from Standard Products is now available in three lengths with 0-10V dimming capabilities. The plug-and-play modules are equipped with thermal pad to help ensure proper heat dissipation and a removable diffuser to customize for a more diffused and soft light output, says the company. They are suited for light fixture retrofits with an E26 base or PL base, and claim to minimize theft, maintenance and energy costs. The modules are in compliance with UL 1598C and CSA C22.2 no. 250.0-08 and no. B-79 as a LED retrofit kit, allowing on-site retrofit of existing fixtures.
STANDARD PRODUCTS
www.standardpro.com

GE and Cooledge Lighting team up to develop LED light sheets

GE Lighting has entered a joint-development agreement with Cooledge Lighting to develop a customized GE Lightech LED power-supply driver in Cooledge's full range of LED light sheet solutions, which debuted this week at LightFair International 2013. The agreement extends beyond the LED driver integration to include the development of high performance LED phosphors and LED solutions targeting commercial applications, including signage applications. Cooledge says its flexible LED light sheets are engineered to provide high-quality lighting utilizing a highly dense pattern of LEDs on a thin plastic substrate.
GE LIGHTING
www.gelighting.com
COOLEDGE LIGHTING
www.cooledgelighting.com

Shat-R-Shield offers new UV-blocking compact fluorescent lamps

At Lightfair 2013, Shat-R-Shield unveiled UV-blocking CFLs available in 2700K 4W, 14W, 19W and 23W mini-twist varieties. The company says UV light causes 40% of fading in furniture, fabrics and art, and the new CLFs block over 96% of UV under 395nm with lumen loss less than 4%. "Our UV-blocking CFLs will be the perfect lamp for people with Lupus or other photosensitivity issues," said Shat-R-Shield product development manager, Don Cattoni. "They are also ideal for areas such as museums with priceless paintings, an retail locations that need their fabric to appear as vibrant as possible." The company adds that its lamp coating will contain virtually all mercury, gla and phosphors should a lamp be acci dentally dropped or broken.
SHAT-R-SHIELD
www.shatrshield.com

ABB launches Emax 2 LV breaker for energy management and smart grid

ABB says its new Emax 2 is the first low-voltage circuit breaker with integrated energy management functions. Replacing existing traditional breakers with the Emax 2 breaker has the potential to achieve annual savings of 5.8 million MWh, boasts the company. Breakers like the Emax 2 are used where the protection and control of large amounts of energy are used in a low-voltage environment, such as industrial and commercial buildings, data centres and ships. To manage energy, the electricity supply to non-essential equipment is switched Off and back On again as soon as "acceptable" power levels are reached. Intelligent decision-making is achieved by a built-in controller and software that uses algorithms to decide when it is appropriate to switch the power while maintaining the overall functionality or productivity of the connected equipment. "Breakers provide one of the largest untapped opportunities in the electric system to achieve energy savings," said Tarak Mehta, head of ABB's low-voltage products division. "Breakers have been used to increase safety and protect electric circuits, but now—for the first time—we use them to save energy too."

ABB
www.abb.com

Je parle francais! Leviton launches French version of its website

Leviton unveiled French (and Spanish) versions of www.leviton.com, which will automatically update to synchronize with the English website. "The translation of Leviton.com is a process we've been undertaking for quite some time, ensuring that nearly every page on the website is translated properly into French and Spanish," explained David Keller, Leviton's senior director of e-Business. "Through the use of linguistics capabilities, Leviton has established a turnkey approach that automatically updates and maintains each version of the website once the U.S. version is updated."

LEVITON
www.leviton.com

World Dryer goes 'hands-in' with VMax vertical hand dryer

World Dryer Corp. unveiled its first 'hands-in' vertical hand dryer: the VMax, which promises a 25% wider hand-drying cavity than other vertical hand dryers on the market. Dry time is only 10 to 12 seconds, says the company, while using just 17% of the energy traditional hand dryers require. VMax also features a HEPA filter system with an odor-neutralizing tablet "for a fresher restroom environment", quiet operation for sound-sensitive areas, and an attached power cord. The hand dryer features antimicrobial technology that inhibits the growth of bacteria, mould and fungus.

WORLD DRYER
www.worlddryer.com

Rittal standardizes data centre design with RiMatrix S

Rittal says its RiMatrix S is the world's first concept for standardized data centre construction. It is based on pre-planned, pre-configured and coordinated data centre modules, which can be used for both new data centres and extensions to existing ones. RiMatrix S can be delivered within six weeks of ordering, says Rittal, and comprises the following standard components: a defined number of TS IT server and network racks, climate control, power supply and back-up, as well as monitoring functions. Together, they form a complete server module. To allow a higher packing density of the server and network components, Rittal has developed a new climate control system (zero-U-space cooling system a.k.a. ZUCS) for the RiMatrix S, completely implemented within a false floor.

RITTAL
www.rittal.ca

Eaton Power Xpert Insight lets you follow electrical system it evolves

Eaton says its Power Xpert Insight power and energy monitoring software will help customers reduce energy consumption, control costs and improve the reliability of their facilities. It provides the big picture on energy usage, efficiency and power quality, says the company, for facility, energy, information technology and healthcare managers. The software allows customers to view only the device information that they want to see, simplify alarm management, view energy usage and demand data, compare and trend data, and view a one-line representation of their electrical system. Additionally, Power Xpert Insight software is designed to be intuitive to update to provide an accurate picture of the electrical system as organizations evolve.

EATON
www.eaton.com

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Parallel conductors revisited

Les Stoch, P.Eng.

High-ampacity services and feeders are often installed with conductors in parallel to reduce pulling tensions, and for easier handling. I'm sure you are already aware that a long list of conditions comes with permission to parallel conductors. This article reviews the requirements of Rule 12-108 "Conductors in parallel" along with some significant changes for such installations now provided in the 2012 Canadian Electrical Code (CEC).

Rule 12-108 specifies that, except for neutrals, control and instrumentation circuits, parallel conductors must not be smaller than #1/0 AWG copper or aluminum. No doubt this requirement is designed to limit use of parallel conductors to such circumstances where this wiring method is truly needed. We already know the rule contains numerous precautions to ensure conductors in parallel are loaded as uniformly as possible to prevent unbalanced loading, overheating and subsequent failures.

To ensure conductors are loaded evenly, Rule 12-108 requires that parallel conductors must have the same characteristics, including identical sizes, types of insulation, methods of termination, wiring materials, lengths, orientation and without any inline splices. Appendix B shows us the required conductor configurations. These special arrangements are designed to minimize differences in inductive reactance and sharing of load currents. The wire and cable manufacturer should be consulted should it become necessary to employ conductor arrangements different from those given in Appendix B.

Furthermore, Rule 12-904 requires that, when parallel conductors are in cables or raceways, each cable or raceway must contain an equal number of conductors from each phase and the neutral. Each cable or raceway must also be of the same material and physical characteristics to ensure that conductor impedance differences are minimized. There are some very good reasons for this requirement. Should we, for example, attempt to install parallel conductors in different conduit types (e.g. PVC and steel), we would find unequal loading in the paralleled conductors for the reasons discussed above.

But now new challenges await us with changes to this rule. As you are by now aware, some of our earlier expectations are now being tested, as the 2012 CEC has made two important modifications to the above requirements:

1. Subrule(2) specifies that a single splice in each parallel conductor is permitted to meet the requirements of Rule 4-006 "Temperature limitation". You will recall that this rule requires that "where equipment is marked with a maximum termination temperature, the maximum allowable ampacity of the conductor shall be based on the corresponding temperature column from Tables 1, 2, 3 and 4".

   You will also recall that this rule applies to both ends of the conductor. For example, were we using 90C-rated wiring to connect to circuit breakers marked with a maximum 75C temperature rating, we would normally base our conductor ampacities on the 75C columns of Tables 1 to 4. However, this newly minted change also allows us to splice on a larger wire size to meet the maximum wiring connection temperatures specified by Rule 4-006, thereby permitting use of the 90C temperature rating. Although permissible, it's still not a great idea, as each splice is a potentially weak link.

2. Subrule(3) specifies that "in parallel sets, conductors of one phase, polarity or grounded circuit conductor shall not be required to have the same characteristics as those of another phase, polarity or grounded circuit conductor". This opens the door for parallel conductors of one phase to be of a different wire size, material (copper or aluminum), length, insulation type and termination method as long as the parallel conductors of each phase have the same characteristics. I suspect that this change was designed to make things easier for repairs rather than for the initial installations. EB

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Tackle The Code Conundrum... if you dare!

Answers to this month's questions in July'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

A swimming pool shall be permitted to be installed below an existing overhead 120/240 volt service conductor that supplies a residence provided the minimum vertical clearance of the lowest conductor is 4.5m above the surface of the pool water.

a) True **b)** False

Question 2

A submersible pump installed in a lake shall be protected by a ground fault circuit interrupter of the Class A type.

a) True **b)** False

Question 3

Wiring of an essential electrical system in a patient care area shall be permitted to occupy the same raceway as non-essential wiring.

a) True **b)** False

Answers: EBMag May 2013

Q-1: Pool reinforcing steel shall be bonded with a minimum of [___] connections equally spaced around the perimeter.

c) Four. Ref. Rule 68-058(2).

Q-2: The minimum bending radius for 50mm diameter lead covered high voltage cable is:

b) 600 mm. Ref. Rule 36-102, Table 15.

Q-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.

b) False. Ref. Rule 18-324.