APRIL 2016 || VOLUME 52 || ISSUE 4

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from the **EDITOR**

ANTHONY CAPKUN

Will your business give you the retirement you want?

Sell your business, buy your freedom… that was the driving message behind the recent webinar we hosted, presented by Ron Coleman, whose books include "Contractor of the Year" and "Exit Ready: crucial business tools for selling your construction business," not to mention 11 Gold Seal Programs for the Canadian Construction Association.

Our mandate, ultimately, is to help you succeed at business, but that success is not just measured by how efficiently you schedule work on-hand, estimate, use labour-saving practices, etc., but also by the work you *put into* your business to ensure it provides you with the retirement you want.

Ron's webinar made participants question whether they, as contractors, would be able to afford the lifestyles they want when they retire.

He cited statistics from a B.C. Construction Association survey, which shows 74% of contractors want to retire within 10 years, yet most (56%) have no retirement plan. 41% have an informal plan—which is better than nothing—and 3/4 of survey respondents (72%) want help.

35% of those same respondents expect to be out of the business in 5 years, with 39% expecting to be out within 5-10 years. With the exception of those who plan on simply winding down their businesses, a lot of contractors are going to come up for sale within the next 10 years—maybe even yours.

That means a lot of sellers in the market at the same time, and not as many buyers. To get a price that comes close to what you want for your business, you have to make sure your business stands out head and shoulders above the rest. So how do you do that?

First, set aside about 45 minutes to watch a free recording of Ron's webinar at tinyurl.com/zzqe6dm. This will help you put the wheels in motion.

Secondly, we have a new business columnist starting with us this month: Andrew Houston, the owner and founder of Profit for Contractors. A graduate of George Brown College, he became an industrial controls licensed electrician as well as an electronics engineering technologist, and ran his own business, so he knows something about being on the tools.

If there are other things you feel we should cover to help you succeed in your electrical business, drop me a line. EB

acapkun@annexweb.com

COVER PHOTO COURTESY GTAA

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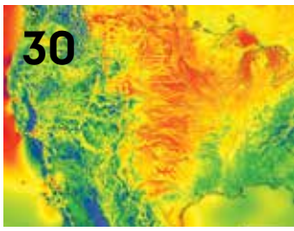

Bruno Ardito (photo), formerly general manager of **Beghelli Canada Inc.,** has joined **Vaughan Electrical Supply** as VP of operations. Vaughan also has a new lighting sales specialist, **Marco Ciraco**, who comes to the company from **Philips Lighting**.

ABB Electrification Products and **Thomas & Betts Canada** notes **David Tracey** (photo 1), VP of sales, T&B Industrial Products, responsible for Canadian sales in the MRO, OEM and renewable energy sectors, is now also responsible for the utility and airfield lighting sectors. And **André Boudreau** (photo 2), VP of sales, T&B Commercial, Retail & Emergency Lighting Products, has assumed responsibility for the strategic direction of ABB Control & Connection & Building Product sales.

Wesco International has appointed **Nelson Squires** to serve as group VP and general manager of its Canadian operations, **Wesco Distribution Canada LP** (www.wesco.ca). Squires joins Wesco from **Air Products & Chemicals Inc.** (Allentown, Pa.) where he served as VP & GM.

BICSI (www.bicsi.org) recently awarded **Peter Levoy** the Larry Romig Award "for his tireless efforts and commitment". The Larry G. Romig Committee Member of the Year award honours individuals for exemplary efforts and dedication within a BICSI committee. Levoy is chair of the BICSI Cares Committee.

Congratulations to **Schneider Electric Canada** employees who participated in the latest Tremblant 24h Ski, raising $80,450 in support of charities benefiting children. The event raised $2.6 million for Fondation Centre de cancérologie Charles-Bruneau, Ottawa Senators Foundation and La Fondation Tremblant.

Teresa Sarkesian is now president & CEO of **Ontario's Electricity Distributors Association** (EDA). **John Loucks** will continue as a member of the executive leadership team. Sarkesian joined EDA (eda-on.ca) in 2009 as VP of government and member affairs, and has led the Policy & Government Affairs Team over the past five years.

Ouellet Canada (www.ouellet.com) has appointed **Stephane Larocque** regional manager for Quebec and **Marc Turcotte** as a sales representative. Larocque was previously representing the Montreal area. The company says he will remain based there, covering the introduction of new products, and Turcotte will be responsible for business development in Eastern Quebec. EB

Visit EBMAG.COM *for the latest news, stories, products, videos, photo galleries and industry events.*

ARE YOU A PHILLIPS CABLES ALUMNUS? TIME FOR A REUNION!

An initiative is underway to celebrate the 20th anniversary of the closure of the Phillips Cables plant in Brockville, Ont. (which served as the company's primary facility) with a reunion for its alumni. The event is being held June 11, 2016, and is open to all individuals (and their partners) who were employed at Phillips Cables property. **For more information, visit phillipscablesreunion.weebly.com.**

ELECTRICAL BUSINESS

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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.

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Lumenpulse acquires Fluxwerx in $60-million deal

Lumenpulse (www.lumenpulse.com) has acquired British Columbia-based Fluxwerx Illumination Inc. for a "total initial consideration of $60 million".

Fluxwerx (fluxwerx.com) is a manufacturer of LED luminaires for the general lighting of commercial and institutional spaces.

Including Fluxwerx's 70 employees, Lumenpulse now has 584 employees worldwide, with corporate HQ in Montreal, Que.

EJTC subsidiary lands $50K to churn out EVSE-trained electricians

To support more electric vehicles, British Columbia is providing $50,000 to help certified electricians receive training in the installation and maintenance of EV charging stations.

Funding from the Clean Energy Vehicle (CEV) Program (www.cevforbc.ca) will be provided to EJTC Enterprises (E2Inc, ejtcenterprises.com)–a subsidiary of the Electrical Joint Training Committee (ejtc.org)–to subsidize course fees for participants in E2Inc's electric vehicle infrastructure training program (EVITP).

The EVITP (www.evitp.org) helps ensure quality and standardization of the installation of EV charging infrastructure, and supports the development of the workforce in the EV sector.

All Red Seal-certified electrical installers, inspectors and instructors are eligible for additional certification through EVITP. Course participants gain a broad-based knowledge of EV operation and maintenance, best practices in the safe and cost-effective installation of EV infrastructure, industry terminology and leading-edge technologies, utility policy and integration, and applicable CE Code standards and requirements.

For more, check out a video at tinyurl.com/jgsdzmy.

Siemens, NB Power and UNB spur smart grid innovation

PHOTO COURTESY SIEMENS CANADA.

"This partnership will support local businesses and entrepreneurs, while positioning New Brunswick as a centre of excellence to attract companies that want to develop and test smart grid technology," said Donald Arseneault, N.B.'s minister for energy and mines, speaking of the launch of a new testing platform "to drive innovation and support business ideas for development and export to world energy markets".

Founding partners Siemens Canada, NB Power and the University of New Brunswick (UNB) officially launched the Smart Grid Innovation Network (SGIN) earlier this year. Siemens Canada CEO Robert Hardt, NB Power CEO Gaetan Thomas and UNB VP of research David Burns were joined by local MP Matt DeCourcey representing ACOA (Atlantic Canada Opportunities Agency) and Arsenault for the announcement in Fredericton.

SGIN will offer businesses a venue to design, develop and test smart grid-related products and services. It will allow companies to test and adapt products using smart grid technology, enabling them to communicate with other products and respond to the demands of the electrical grid.

Lumen expands into Atlantic Canada with Dartmouth branch

PHOTO COURTESY SONEPAR CANADA.

Quebec-based distributorship Lumen (member of the Sonepar Canada family) has expanded into Atlantic Canada with the opening of a new Dartmouth, N.S., branch.

The 12,000-sf location is Lumen's 33rd, employing a team of five associates lead by regional director of Atlantic Canada, Mr. Shannon Fougere.

"This branch is service-oriented and will bring a sense of specialization that our customers have never encountered before," said Fougere. "The open concept this facility features is innovative and uncommon for an electrical branch in this area."

Lumen (www.lumen.ca) noted its next branch in Atlantic Canada will be in Moncton, scheduled for opening Summer 2016.

SaskPower and Kineticor launch new flare gas power project

In March, near Shaunavon, independent power producer Kineticor (kineticor.ca) brought a new flare gas power generation process into commercial operation, providing 1MW of electricity to the Saskatchewan power grid, which will purchased by SaskPower (www.saskpower.com) under a 20-year agreement.

The project was initiated with the launch of SaskPower's Flare Gas Power Generation Program, which was designed to help oil & gas operations reduce their environmental footprint by turning waste flare gas into usable electricity. It also represents a small additional revenue source for the operations. In addition, this project will allow further R&D into flare gas power technology.

Northwest Territories Power and Hay River take first step of franchise

Council for the Town of Hay River passed a motion to move forward with the next steps toward Northwest Territories Power Corp. (www.ntpc.com) acquiring the electrical distribution system and entering into a franchise agreement to distribute electricity to the town.

"After thoroughly reviewing the proposals, the NTPC proposal affords the town the best opportunity to reduce electricity rates within the community," said Mayor Brad Mapes.

The decision follows an RFP issued May 2015 regarding a franchise for the supply and distribution of electricity within the town.

"I'd like to assure all employees of the current franchisee that NTPC intends to offer them positions as part of the transition," said Emanuel DaRosa, NTPC president & CEO.

The agreement would take effect following the expiry of the existing agreement with Northland Utilities Ltd. (an ATCO and Denendeh company) in November.

AESO to develop & implement Alberta's renewables incentive program

The Government of Alberta has chosen the Alberta Electric System Operator (AESO) to develop and implement a renewable electricity incentive program to add additional renewable generation capacity into the province's electricity system.

For its part, the Canadian Wind Energy Association (CanWEA) issued a statement saying it is "pleased that the Alberta

PHOTO OF AESO OPERATIONS COURTESY AESO.

Government is moving quickly to act on its new renewable energy objectives by making a commitment to launch a competitive process to procure new renewable energy before the end of 2016, with a view to having projects in operation by 2019".

The first competition for new renewable electricity projects is expected late 2016 following approval from the government. The province has requested that AESO (www.aeso.ca) provide its recommendations on program design in May 2016.

B.C. refocusing Industry Training Authority with Bill 7

British Columbia has introduced several amendments to the Industry Training Authority Act that, it says, will enable the Industry Training Authority (ITA) to lead and deliver trades training in B.C. more effectively.

The introduction of Bill 7–the Industry Training Authority Amendment Act 2016–fulfils the government's commitments to refocus ITA (www.itabc.ca) as outlined in the B.C. Skills for Jobs Blueprint, says the province, and to implement the recommendations in Jessica McDonald's independent ITA review in 2014 (download the review at tinyurl.com/h7dqa8s).

The government says amendments to the act ensure ITA will continue to have the flexibility it needs to respond to skills and trades training priorities quickly and efficiently.

EXCLUSIVELY AT EBMAG.COM

Electrical Contractors Association of Ontario has moved to 10 Carlson Court (Suite 702) in Toronto, and we were happy to attend their Open House. See the photos at tinyurl.com/jdvwo6o.

From the everyday work vehicle to something more geared to hydro pole maintenance, you could be sure to find it at the annual Work Truck Show in Indianapolis, Ind. EBMag was there to bring you back the latest info for your office on wheels. See more: tinyurl.com/j9bdqwv.

Seneca College and Siemens Canada say they are helping Canadian manufacturing take a positive step in addressing the technical skills gap with the opening of Ontario's first Mechatronics Simulation & Demonstration Centre (MSDC). See the official launch here: tinyurl.com/jxyjmox.

For the latest industry news, reviews, products, stories and people in the electrical industry, go to **EBMAG.COM**

PHOTOS A. CAPKUN.

Torbram Electric Supply sets up in Winnipeg

PHOTO COURTESY TORBRAM ELECTRIC SUPPLY.

Winnipeg, Man. is the newest site for Torbram Electric Supply (www.torbramelectric.com).

"This marks our 66th location in Canada and our first location in Manitoba," said Andrew Dawes, general manager.

"This location features over 8000 sf of warehouse, a 3000-sf pipe yard and an on-site industrial controls specialist," added Sean Whittaker, the midwest group manager for Torbram. He noted the T.E.S. Advantage Program, which offers free delivery with no minimum order, is also available in Winnipeg.

SCC renews agreement with EU partners to reduce trade barriers

The European Committee for Electrotechnical Standardization (CENELEC) and the European Committee for Standardization (CEN) have renewed their Cooperation Agreement with the Standards Council of Canada (SCC).

SCC (www.scc.ca) is Canada's representative at the International Electrotechnical Commission (IEC, www.iec.ch) and International Standards Organization (ISO, www.iso.org), and a member of the International Accreditation Forum.

The three organizations have decided to maintain and build on their cooperation initiated in 2012, says SCC, which contributes to the removal of technical barriers to trade and, thereby, helps facilitate the trade of goods and services between Canada and Europe.

SCC, CENELEC and CEN (www.cencenelec.eu) signed their first

The signing ceremony in Brussels (January 2016). Seated: Elena Santiago Cid and John Walter. Standing (left to right): Francisco Verdera Mari, Hervé Gauthier, Sarah Penny, Kerstin Jorna, Daniel Costello (Canadian Ambassador to the European Union), Duncan De Lught, Alec Clark and Jean-Paul Vetsuypens.

PHOTO COURTESY CEN-CENELEC.

Cooperation Agreement in February 2012 with the aim of playing a constructive role in relation to the negotiations on a Comprehensive Economic & Trade Agreement between Canada and the EU (a.k.a. CETA). This Cooperation Agreement has provided a framework for the parties to exchange information and coordinate their activities in specific areas, such as Smart Energy Grids.

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SaskPower to double down on renewables by 2030

The minister responsible for SaskPower, Bill Boyd, joined the utility's president & CEO Mike Marsh to announce the corporation has set a target to double the percentage of renewable generation capacity in Saskatchewan by 2030.

Boyd explained this means an expansion of wind power augmented by other renewables–such as solar, biomass, geothermal and hydro–to go along with the Boundary Dam 3 carbon capture project and more natural gas generation.

To meet the target of up to 50%, the utility will move forward with procuring another 100MW of wind generation in 2016, and will develop up to 1600MW of new wind generation between 2019 and 2030.

SaskPower is planning to move forward with utility-scale solar power generation, with a competitive procurement beginning this year.

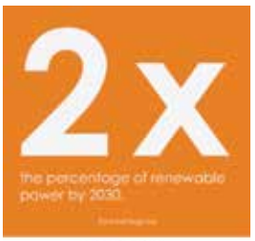

PHOTO COURTESY SASKPOWER

According to SaskPower, about 25% of Saskatchewan's generation capacity currently comes from renewable sources: 20% from hydro and 5% (220MW) from wind. Three new windpower projects already approved or in development will add another 207MW of generation by 2020.

Manitoba's 2016 action strategy to grow small businesses

Manitoba Finance Minister Greg Dewar recently announced the government (www.gov.mb.ca) is launching an action strategy to "cut red tape" and help grow small businesses.

"Small businesses are the backbone of our economy, driving economic growth and creating good jobs," Dewar said.

The strategy is focused on better communication and reporting regarding regulatory changes, as well as "more innovative approaches" to red tape reduction and advancing the adoption of the Manitoba Employers Council's (MEC) Best Practices in Regulation Making by provincial regulators.

Almost 98% of Manitoba's businesses are small ones, the province stated, representing about 24% of Manitoba's GDP and accounting for more than two-thirds of private-sector jobs.

Chris Tuan, professor of civil engineering at the University of Nebraska-Lincoln, stands on a slab of conductive concrete that can carry enough electrical current to melt ice during winter storms. PHOTO SCOTT SCHRAGE/UNIVERSITY COMMUNICATIONS.

Will conductive concrete kill the electric ice-melt market?

University of Nebraska-Lincoln professor of civil engineering Chris Tuan (above) has added a pinch of steel shavings and a dash of carbon particles to a concrete slab to create self-melting concrete.

Though the ingredients constitute just 20% of Tuan's otherwise standard concrete mixture, they conduct enough electricity to melt ice and snow in the worst winter storms while remaining safe to the touch.

Tuan's research team demonstrated the concrete's de-icing performance to the Federal Aviation Administration during a testing phase that ran through March 2016. If the FAA is satisfied with the results, Tuan says the administration will consider scaling up the tests by integrating the technology into the tarmac of a major U.S. airport.

In 2002, Tuan and the Nebraska Department of Roads made the 150-ft Roca Spur Bridge the world's first to incorporate conductive concrete.

The power required to thermally de-ice the Roca Spur Bridge during a three-day storm typically costs about $250–several times less than a truckload of chemicals, Tuan says.

See how it works in this video: tinyurl.com/j32ncec.

– With files from Scott Schrage, University Communications

Show EFC your marketing savvy in 2016 awards

Electro-Federation Canada has launched its 2016 Marketing Awards Program, and Electrical Business Magazine is proudly sponsoring the Customer Event/Tradeshow category.

"The EFC Marketing Awards is an opportunity for EFC members to share successes unique to the Canadian market," said EFC's John Jefkins, adding that the program provides industry recognition plus showcases innovation to the next generation of workers.

EFC MARKETING AWARDS PROGRAM

(CHECK OUT our video showcasing the 2015 winners, "ABB, Schneider, T&B, Stelpro have this in common" at tinyurl.com/npesp33).

The program recognizes excellence in the areas of corporate activity that contribute to organizational success in sales, marketing and branding. To enter, organizations must be current EFC members.

To learn more about the Customer Event/Tradeshow category sponsored by Electrical Business–along with the other available categories–and entry information, visit efcmarketingawards.fluidreview.com.

Don't delay. The application deadline is June 30, 2016. EB

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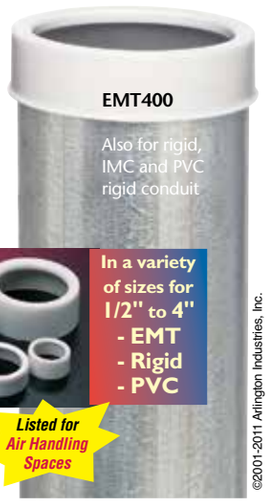

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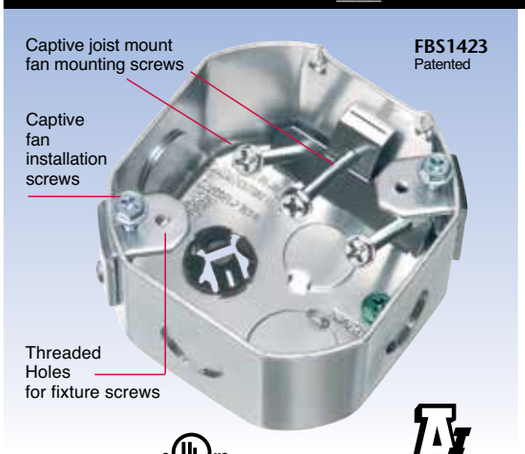

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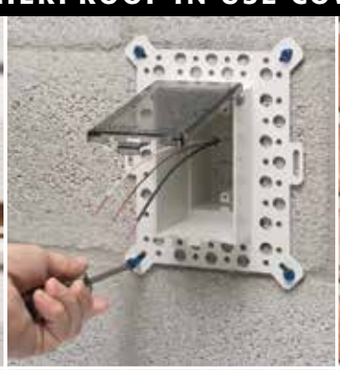

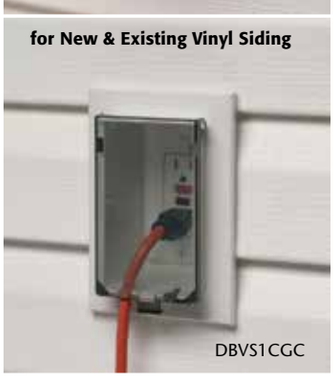

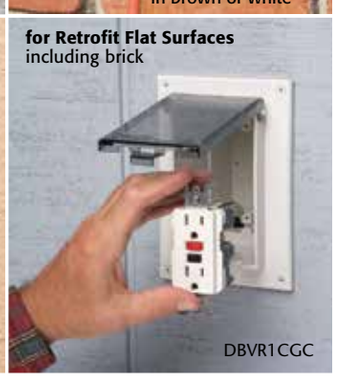

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STAR-BRIGHT LIGHTS FOR A PLACE THAT NEVER QUITS

Retrofit game changers at Toronto Pearson / BY RENÉE FRANCOEUR

"Lights out" is rarely an option at Toronto Pearson International Airport. That's why changing bulbs and retrofitting lighting fixtures is no small task, calling for thorough planning, says Carl Rodgers, manager of energy conservation at the Greater Toronto Airports Authority (GTAA).

"We are a 24-hour operation and very public-facing, so we have to be able to perform maintenance within tight windows and minimize traffic impacts," Rodgers explains.

Early in 2015 the airport embarked on Phase 1 of an intensive retrofit journey to replace 1000 metal halide fixtures with LEDs on the Arrivals and Service levels of Terminal 1 (known as the Curbside Project) as well as the lights on 20 high-mast poles (there are 10 MH heads per pole) along Hwy 409 leading in and out of the airport.

Rodgers says the projects were sparked by the need to provide visitors with "a better quality of light" and serve as an element of the airport's overall greenhouse gas reduction plan.

1000
MH fixtures being replaced.

20
pole lights being replaced.

"We want to save on our energy consumption and lower our GHG footprint, and so a tangible way we now do that is through energy-efficient lighting," Rodgers says, noting all new airport construction must have energy-efficient lighting installed. (Retrofits and targeting energy use are the tasks at-hand for current spaces.)

The decision to go into these capital projects meant examining safety, maintenance requirements and the lifecycle of the lighting products, as well as energy savings potential and the overall impact on customers.

Curbside Project

After various products were stationed throughout the Service Level at Terminal 1 for trial runs, which were then followed-up with stakeholder groups, a vetted procurement process selected Cree's 304 series LED parking structure luminaires for the Curbside job.

"We needed a product that had been tested, tried and true, as well as one that met several standards that would meet our bench test," Rodgers says. "We looked at preferred manufacturers' lists, too... We have high standards in airports and that really limits the product options."

Dark Sky-approved, the 304 lights range from 46W to 69W per new fixture and produce 7000 lumens. They are made from rugged die-cast and extruded aluminum components and feature centrally located drivers and aluminum heat sinks.

The Curbside product also had to work with the existing wiring system, Rodgers notes, so no additional wiring was required, other than attaching the existing wiring to the new fixtures.

"We ran the wires in the same spots and it worked out perfectly; we tried to use as much of the existing infrastructure as possible... and that's what helps, because everything is embedded right in," Rodgers says.

Installers did, however, have to add 'bird cages' around the bases of the lights to ensure small birds don't try to build nests up against the driver, which hangs down slightly from the mount.

The previous metal halides were being replaced every two years, causing shutdowns. Rodgers says he

▲ **The Arrivals platform at Terminal 1 is newly bedecked with LEDs emitting 7000 lumens each.** PHOTO COURTESY GTAA.

▲ **GTAA's Carl Rodgers says the airport is pleased with the LEDs and the lack of glare.** PHOTO R. FRANCOEUR.

▲ **Night-time driving along the 409 in Toronto is now a little different thanks to some changes with the high-masts.** PHOTO COURTESY GTAA.

doesn't expect to have to perform any maintenance for at least five years with the new 304s.

Hunter Electric (Vaughan, Ont.) was selected for the Curbside install, starting and finishing Phase 1 in the fall of last year. The contractor installed 366 fixtures on the Arrivals Level 1 of Terminal 1. (Phase 2—which will see the installation of the same LEDs on the Service Level of the terminal—has gone back to the procurement process for contracting, and is scheduled to wrap up by Q3 2016.)

2262
MWh/year in savings.

"Traffic management was the biggest challenge in this job," says Joe D'alessandro, who founded Hunter Electric with Mark Gentilucci. The work itself was elementary, he adds—"one came down, one went up"—but the location made things interesting.

"It wasn't a matter of moving from A to B. You had to leapfrog the worksite all over the place—A to G, back to D, then maybe E before back to B—based on the time of day and passengers projected. Everything was constantly changing so you have to be flexible," Gentilucci says. "It wasn't uncommon to get a call from one of our guys [telling us] they had to stop what they were doing because three flights just came in."

Communicating with GTAA staff on a daily (sometimes hourly) basis was key to the project's success, the men say.

Six crew members were pulling 7-hr to 10-hr days, with evening work when required, to meet the GTAA's deadline of the first week of December 2015. They were able to wrap up early, with the last LED going in at the end of November.

"It looks simple because you see just a bunch of guys on scissor lifts and zoom booms, but it's not for every contractor," Gentilucci says. "We've been fingerprinted and eye-scanned... [Pearson is] a high-security area, so there's a lot of energy that goes into getting the job done."

Hwy 409 Project

Similar processes were used to determine the product best suited for the retrofit on the beanstalk-like, high-mast poles along Hwy 409.

"With this one, we had very specific technical requirements as we weren't replacing the whole pole," Rodgers explains, "so we needed lights that would fit on the 'wagon wheel' we already have up there... and they had to be the right weight and specifications to suit the pole, too."

The winner among the various options was Eaton's McGraw-Edison Galleon LED luminaire, which comes with a 5-year warranty and promises a 60,000+hr rated life. At 421W, it has eight squares and produces 40,000 lumens. Using Eaton's AccuLED Optics system, the Galleon is 3G vibration rated, has an IP66-rated housing, an extruded aluminum driver enclosure and heavy-wall, die-cast aluminum end caps. It is designed to operate in ambient temperatures from -40°C to 40°C, with an optional 50°C high-ambient configuration. The proprietary circuit module is designed to withstand 10kV of transient line surge.

The new LED lights along Hwy 409 are Eaton's McGraw-Edison Galleon LED luminaires. PHOTO COURTESY EATON.

Cree's 304 series was selected for the Terminal 1 Curbside Project. PHOTO COURTESY CREE.

The Galleon decreases the load on the pole structure itself, as the LEDs are lighter than the previous lights, Rodgers adds.

Black & McDonald (Toronto, Ont.) was selected to manage this installation. To avoid aerial tools, a lowering device was used to bring the wagon wheel to ground level for retrofit. Crews changed nine of the fixtures by the end of 2015. Phase 2, currently underway, will see the final 11 switched over by Q2 2016.

Relamping to be better

With the problem of flickering metal halides largely in the past, Rodgers says the retrofits couldn't have worked out better.

He says there were few to no obstacles, other than the time it took to vet the products and contractors, adding that the feedback on the changes so far have been nothing but positive.

"We were able to increase the light uniformity on the floor [Curbside] and colour rendering index, providing a safer environment. There's no glare and less dark spots, we find, so it provides a level of comfort, too. That's been the big thing customers and our stakeholders notice: no glare."

On Hwy 409, the LEDs "dramatically" reduce light pollution as they "beam straight down versus spreading out and toward the sky," Rodgers notes. "You get a better amount of light on the road, creating a safer situation for drivers, and people who live near the 409 will not have their sightlines interrupted... we want to be good neighbours."

Both projects have been incentivized through Ontario's saveONenergy program (which helped with measurement verification and technical review). Combined, the two projects will save GTAA about 2262 MWh/year, Rodgers says: the Hwy 409 initiative will reduce energy output by 664.3 MWh/year and boasts a 5-year payback, while the Curbside job reduces about 1597 MWh/year and should see payback in two years.

Pearson is also undertaking a total overhaul of the interior lighting throughout Terminal 3 as part of bigger redevelopment over the next four years. And it doesn't end there: 2016 will also see the end of CFLs in the service tunnels under the runways.

"Our senior authority really understands the value of energy efficiency, and that's huge when it comes to being able to do projects like this," says Rodgers. EB

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IMPROVING WIND TURBINE RELIABILITY

The importance of reducing stress and improving uptime in a difficult-to-maintain system / RUSS J. TALLYEN

Given that maintenance for wind turbines involves the replacement of costly parts, as well as time-consuming and dangerous ascents of turbines up to 100-m tall, there is a constant focus within the industry on improving the reliability of these devices.

Though it is impossible to predict all of the necessary maintenance in any device, taking a few steps while building turbines and during routine maintenance can reduce the risk of unscheduled downtime and the associated costs.

Wind turbine systems

The system of power generation within a wind turbine is fairly simple. Wind turns the blades of a turbine which, in turn, rotate a slow-moving crankshaft. The motion of this shaft is amplified by a gearbox before being applied to a rapidly spinning generator. The generator produces power, which is applied to the slip ring and drawn off by carbon brushes in a brush-holder mounted near the slip ring. The resulting power is sent to the grid.

Operating time is key to effective power generation by wind turbines. Since wind is not constant, turbine operators strive to keep turbines spinning for more than 98% of the time during adequate-wind events. For this to be possible, all of the components of the turbine must be working properly. When the time, danger and difficulty in replacing components—nearly all of which are concentrated at the very top of a turbine—are factored, it becomes clear that long component service life is critical for effective power generation.

The carbon brushes resting on the slip ring are responsible for creating a brush film on the ring. Film conditions vary based on service conditions and brush grade. Excessively heavy films inhibit the transfer of current, while films that are too thin lead to slip ring damage. An ideal brush film allows the slip ring to continue spinning smoothly, without being damaged by the brushes, while effectively transferring power to the grid.

98%

The percentage of time operators strive to keep turbines spinning during adequate-wind events

Choosing a reliable gearbox

Gearboxes are the components that fail most often within wind turbine power generation systems. Choosing a reliable, appropriate gearbox for the turbine is, therefore, important for avoiding downtime. Because of this, performing adequate scheduled maintenance on the box—such as ensuring proper lubrication for the environmental conditions of the turbine—is a key step for improving reliability.

Wind turbines are often placed in some of the harshest conditions on the planet. Offshore wind farms, for example, must contend with the high salinity of sea air, while wind farms in desert conditions contend with the dry air containing abrasive sand, high temperatures and low wind speeds. Proper maintenance is especially important in these cases, as harsh environmental conditions wear down turbine components much faster than laboratory service conditions might indicate, especially when not maintained properly.

3 years

Service life of a suitable carbon brush

Selecting the correct brush grade

Carbon brushes are the least expensive component in a turbine system and one of the easiest to replace; however, they must be replaced the most frequently. A suitable brush can last up to three years and help to extend the service life of other components such as the slip ring.

On the flip side, unsuitable brushes can lead to drastically increased costs and unnecessary downtime. When an unsuitable grade of brush for the turbine's operating conditions is used, or worn brushes are left alone for too long, they can create additional wear on the slip ring, causing it to degrade or lose roundness and force early replacement.

Selecting the correct brush grade is, therefore, an important step in turbine upkeep. The brush grade required depends on the service conditions of each turbine.

Monitoring environmental conditions such as humidity, temperature and salinity—and consulting with an expert—can help turbine operators find the ideal brush grade for each installation. This leads to extended brush life as well as extended service life for slip rings and brush-holders.

Continued on page 18

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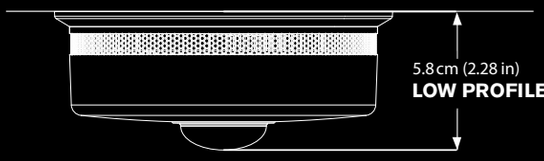

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CALIFORNIA'S PROPOSED LED COLOUR SPECS "GO TOO FAR"

U.S.-based National Electrical Manufacturers Association (NEMA, www.nema.org) says it has called on the California Energy Commission to "ensure that consumers have access to the most efficient, cost-effective, and preferred LED bulbs currently on the market" by nixing proposed California Energy Code (CEC) colour specs for LED bulbs.

"Neither consumers nor manufacturers will benefit from the heavy hand of unnecessary, over-prescriptive regulation that forces California consumers to buy more-expensive, less-efficient LEDs. The energy-efficiency targets for each type of LED bulb must strike the appropriate balance between efficiency, product availability and consumer cost," argued NEMA president & CEO Kevin Cosgriff.

He added that the CEC-proposed starting energy-efficiency target for omni-directional LED bulbs "is aggressive but, nevertheless, achievable," but continued, "However, the proposed CEC colour specifications for LED bulbs go too far".

"The lighting industry's disagreement with the CEC's proposed regulation for LED bulbs revolves around the consumer's perception of the colour of light," explained NEMA VP of government relations Kyle Pitsor. "It is a nuanced technical point in lighting science about which experts disagree, but the CEC proposal ignores crucial trade-offs that innovative manufacturers make to ensure that consumers are satisfied."

And what are those trade-offs?

"First, that consumers get the right quality of light for their particular needs; second, that the price of the light bulb will continue to decrease; and third, that they continue to stimulate demand for the most efficient LED bulb," said Pitsor.

"The CEC proposal fails all three of these tests because it would overregulate the LED bulb specifications that California consumers will be forced to buy, creating unnecessary barriers to achieving California's efficiency targets," concluded Pitsor.

If the regulations are adopted without NEMA's proposed revisions, the association says California consumers will have fewer LED options, and LEDs will be noticeably more expensive and less energy efficient than other lighting options, thereby undermining California's energy-efficiency objectives.

"The CEC should not assume that one colour specification suits all. Consumers deserve choices, and they should expect their government to assist in making them available," said Cosgriff. EB

IMPROVING WIND TURBINE RELIABILITY

Continued from page 16

Ensuring roundness

Another critical step for improving the reliability of wind turbines is checking the roundness of slip rings while they are in service.

Non-round slip rings place additional stress on carbon brushes, wearing them out faster than under normal conditions and causing early failure. Slip rings that are not round can also cause carbon brushes to spark due to a poor electrical connection. If this is the case, power is not being drawn from the slip ring as efficiently as possible, and overall power generation decreases.

Stay spinning

Keeping these tips in mind will help wind turbine operators reduce the overall maintenance necessary for their turbines and, therefore, reduce downtime, time-consuming trips up and down turbines, and the danger to workers associated with these trips.

In addition, the selection of appropriate components, such as carbon brushes, and scheduled roundness checks with a profiler can reduce the costs associated with turbine upkeep. Increased power generation uptime and reduced cost lead to the most cost-effective wind turbine operation possible. EB

Russ J. Tallyen is a design and application engineer with Morgan Advanced Materials. The company's Electrical Carbon business produces carbon and metallized-carbon current collector strips and assemblies for linear electrical transfer. Visit morganelectricalmaterials.com.

The 2015 Canadian Electrical Code requires all branch circuits in dwelling units supplying 125V receptacles rated 20A or less to be protected by a combination type Arc Fault Circuit Interrupter (AFCI).

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TWO NEW EDITIONS OF CE CODE-PART III FOR POWER T&D

CSA GROUP

Codes for safe electrical installation are fairly well known, but the public tends to be more familiar with the parts pertaining to homes and consumers. The Canadian Standards Association (CSA), however, has just published a new edition of two standards for power transmission and distribution.

By way of context, the Canadian Electrical Code (CE Code) is published in several parts. Part I is the safety standard for electrical installations. Part II is a collection of individual standards for the evaluation of electrical equipment or installations. (Part I requires electrical products to be approved to a Part II standard).

Part III is the safety standard for power T&D circuits. Part IV is a set of objective-based standards that may be used in certain industrial or institutional installations. Part VI establishes standards for the inspection of electrical installation in residential buildings.

"The Canadian Electrical Code Part III specifies minimum requirements for electricity supply and telecommunication systems in support of public safety and reliability of service," said John O'Neill, senior project manager for electrical standards with CSA Group.

The two new editions of standards from CSA focus on Part III and pertain to electrical protection, safety and design criteria for both overhead and underground T&D systems.

O'Neill explains Part III consists of a collection of nine standards dealing with the design and construction of power and communication lines, electrical stations and electrical coordination between different types of systems, such as between power and communication systems or power systems and pipelines.

9

Number of standards comprising CE Code-Part III

The new editions of two key standards published in 2015—"Overhead Systems" and "Underground Systems"—cover power and communication lines and deal with issues such as clearances and separations, strength of poles and towers, and loading conditions, including the impact of weather, O'Neill added.

"These standards are referenced by electricity distribution and transmission utilities, telecommunication carriers, engineering consultants, electrical safety regulators and manufacturers across Canada."

The new C22.3 No.7 "Underground Systems" is referenced by electrical and communication utilities. The standard helps ensure the safety and protection of people, services and property by specifying minimum design requirements for underground electricity supply and communication systems.

The latest edition of the standard includes several major changes and updates including revised definitions and new clauses, and reference materials dealing with line-of-sight at intersections, and supply cable bonding techniques.

The new edition of C22.3 No.1 "Overhead Systems" helps ensure the safety and protection of people, services and property by specifying minimum design requirements for overhead electricity supply and communication systems. The standard is referenced by railways, regulators, engineering consultants, electrical and communication utilities across Canada.

While the CE Code Part I is perhaps more well-known to Canadians than Part III, the latter is nonetheless vital to Canada's electrical safety system. Without safe overhead and underground systems in place, consumers and businesses would not get the electricity they need, and public safety would be at risk. EB

To learn more about the standards discussed above, visit www.csagroup.org.

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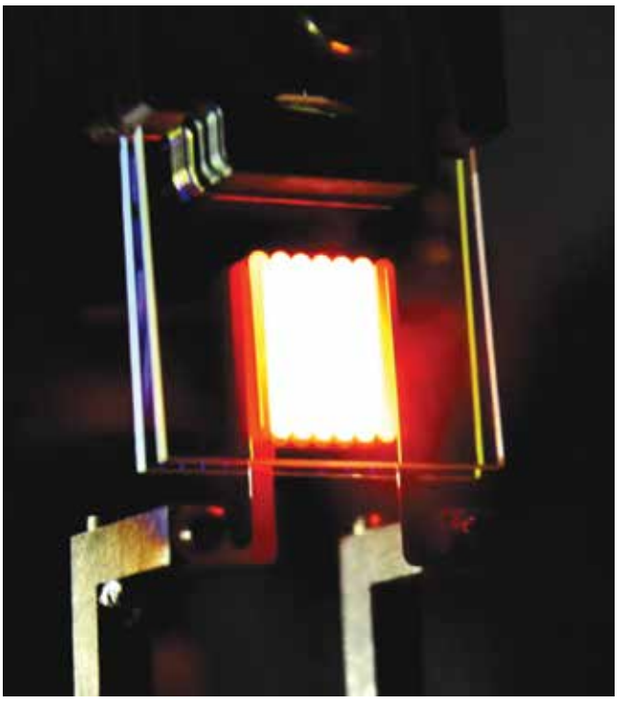
WILL INCANDESCENTS MAKE A COMEBACK VIA PHOTONIC CRYSTAL?



A proof-of-concept device built by the researchers demonstrates the principle of a two-stage process to make incandescent bulbs more efficient. This device already achieves efficiency comparable to some CFL and LED bulbs.

Despite facing extinction, traditional incandescent light bulbs may yet make a comeback thanks to a technological breakthrough by researchers at MIT and Purdue University.

The problem with incandescents has never been light quality, but the fact that over 95% of the energy that goes into them is wasted, mostly as heat. That's why country after country are phasing them out, if not outright banning them.

The MIT and Purdue researchers may have found a way to change all that via light recycling.

Their findings are reported in the journal Nature Nanotechnology by three MIT professors—Marin Soljacic, John Joannopoulos and Gang Chen—as well as MIT research scientist Ivan Celanovic and post-doc Ognjen Ilic, and Purdue's Peter Bermel.

Between 2% and 3%

Efficiency of conventional incandescents

Between 7% and 13%

Efficiency of conventional fluorescents (incl. CFLs)

The key is to create a two-stage process: the first involves a conventional heated metal filament, with all its attendant losses; then, instead of allowing the waste heat to dissipate in the form of infrared radiation, secondary structures surrounding the filament capture this radiation and reflect it back to the filament to be re-absorbed and re-emitted as visible light. These structures—a form of photonic crystal—are made of Earth-abundant elements, researchers explain, and can be made using conventional material-deposition technology.

A key to their success was designing a photonic crystal that works for a range of wavelengths and angles.

It's that second step that makes such a difference in how efficiently the system converts light into electricity, the researchers note; the efficiency of conventional incandescents is between 2% and 3%, while that of fluorescents (including CFLs) is between 7% and 13%, and that of LEDs between 5% and 13%. In contrast, the new two-stage incandescents could reach efficiencies as high as 40%, the team says.

That said, the first proof-of-concept units made by the team come nowhere near 40%, achieving only about 6.6% efficiency but, even at that level, the concept units rival the efficiency of some of today's CFLs and LEDs, and are a three-fold improvement over today's incandescents.

The team refers to its approach as light recycling, Ilic explains, since their material takes in unwanted, useless wavelengths of energy and converts them into desirable visible light wavelengths. "It recycles the energy that would otherwise be wasted," says Soljacic.

A key to their success was designing a photonic crystal that works for a range of wavelengths and angles. The photonic crystal itself is made as a stack of thin layers, deposited on a substrate.

Ilic explains that when you put together layers, with the right thicknesses and sequence, you can get very efficient tuning of how the material interacts with light. In their system, the desired visible wavelengths pass right through the material and on out of the bulb, but the infrared wavelengths get reflected as if from a mirror. They then travel back to the filament, adding more heat that then gets converted to more light. Since only the visible ever gets out, the heat just keeps bouncing back in toward the filament until it finally ends up as visible light.

The technology involved has potential for other applications, Soljacic says, as in energy-conversion schemes such as thermo-photovoltaics (in which heat from an external source [chemical, solar, etc.] makes a material glow, causing it to emit light that is converted into electricity by a PV absorber.

"LEDs are great things, and people should be buying them," Soljacic says, "but understanding these basic properties" about the way light, heat, and matter interact and how the light's energy can be more efficiently harnessed "is very important to a wide variety of things." EB

– With files from David Chandler, MIT News Office.

PHOTO COURTESY THE RESEARCHERS

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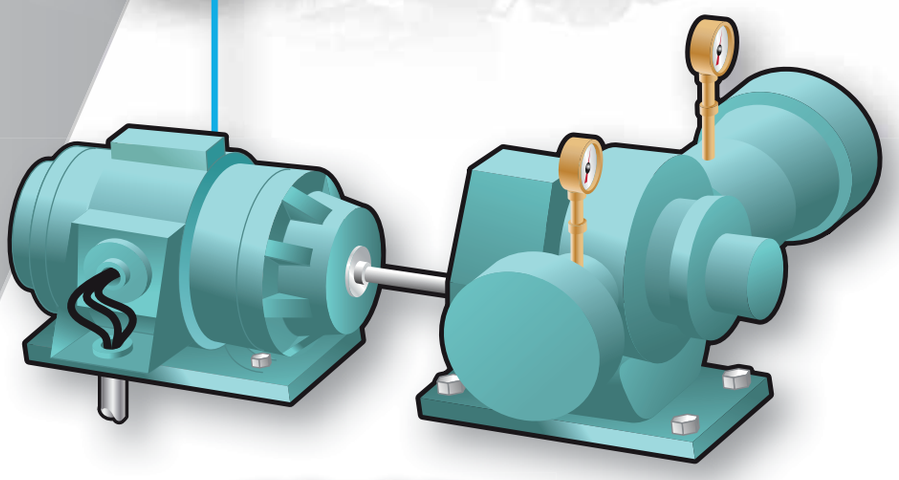

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The Crazy 8s: negoti8, medi8, arbitr8 & litig8

The means by which an electrical contractor can resolve disputes and claims with a general (or owner, assuming you are contracting directly with them) is often contractually premised on what I call *The Crazy 8s:* negotiate, mediate, arbitrate or litigate. Let's have a look at each to understand their basic dynamics.

NEGOTIATE

After delivering notice of a potential claim or change, typical contract language will mandate the parties negotiate a resolution. The key aspect to negotiating anything is the fact that such negotiations are held *without prejudice;* in other words, they are meant to be off the record. Just make sure that with whomever you are discussing your claim or change has the same understanding.

As a result, you should feel free to compromise your position in an effort to negotiate and settle the claim without worrying about any subsequent recourse against you (i.e. "I will acknowledge that back charge for cleaning for X if you pay me Y for those two changes").

MEDIATE

The mediation process is also conducted without prejudice, but involves a mediator (referee) in the settlement discussions. The mediator is not a judge, and certainly not an arbitrator; he is there simply to facilitate settlement. The materials filed in mediation discussions are off the record and, therefore, you should have a degree of comfort when discussing potential compromises to your claim.

In the construction context, you will want someone who is not only trained as a mediator, but has experience in construction law.

Part of the dynamic involves choosing an appropriate mediator. In the construction context, you will want someone who is not only trained as a mediator, but has experience in construction law. Lastly, there is no means by which the mediator can be compelled to be a witness at any subsequent proceeding so, again, the process is truly without prejudice.

ARBITRATE

This process is on the record. It is essentially the same process as litigation (below) except for a few important differences: you get to choose the arbitrator and, to some degree, have input on the rules involved in the hearing and the ultimate determination of your claims. And, unlike the trial process, you pay for the arbitrator's time (which is typically split among the parties involved in the arbitration).

CCDC 40

Typical contract language may refer to "Rules for Mediation and Arbitration"

Arbitration can arise contractually when it is expressly provided for in your contract, or consensually when the parties agree to enter into arbitration proceedings. Typical contract language may refer to certain rules (e.g. CCDC 40 Rules for Mediation and Arbitration).

In Ontario and other common law jurisdictions, legislation exists to help with some of the parameters of getting to and through arbitration proceedings. However, those pieces of legislation are not all-encompassing rules associated with arbitration and, as a result, you have the ability to better define the rules and steps to be taken.

Arbitration is meant to be more flexible than a trial process, which can allow the parties to do away with many of the formalities of a trial, including those relating to evidence. However, appeals are difficult to make after an arbitration decision because Courts of Appeal allow for a high degree of deference to the evidentiary findings of the arbitral panel or arbitrator.

LITIGATE

This process is also completely on the record and, in fact, a transcription of all evidence is maintained during the hearing (which is not always necessary in arbitration proceedings) and has all the trappings of trial formalities. The judge assigned to the trial may be decided on the very morning of the actual start of the trial, and the parties are bound to the Rules of Civil Procedure applicable in that jurisdiction and, further, to the rules of evidence.

Appeals are somewhat easier to make from a trial decision but, again, Courts of Appeal will show a great degree of deference to the trial judge's findings relating to the evidence. EB

Dan Leduc is a partner in the law firm Norton Rose Fulbright Canada LLP and practices almost exclusively in construction law. He is frequently called upon to advise and represent owners, engineers, subcontractors, suppliers and builders in such front-end services as contract review, tender issues and general construction matters, as well as in litigation and arbitration. Dan can be reached at 613-867-7171 or dan.leduc@nortonrosefulbright.com.

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Excellence and appreciation in electrical safety

A simple question—"What do workers want?"—appears on the back cover of a great book entitled "30 Days to a Happy Employee: How a Simple Program of Acknowledgment Can Build Trust and Loyalty at Work" by Dottie Gandy.

The simple but incredibly powerful answer also found on the back cover states, in part,

> It's not more money, bigger offices, better benefits, or flex-time. Recent surveys reveal that the No. 1 reason employees quit their jobs is that they don't feel valued on a human level.

They don't feel appreciated, which is a simple expression of gratitude, really. When people feel genuinely appreciated for what they do, they will not only continue to do it, but strive for continual improvement.

In her book, Gandy says appreciation builds a strong sense of loyalty and commitment from employees, which have a beneficial impact on your bottom line. What could be better than having committed employees who work safely contribute to the financial well-being of your business?

The great sports coaches—all the way from the minor to professional leagues—figured this out a long time ago, and they are the ones leading outstanding teams, often without the very best players. Sadly, there are many who have never figured out the value of well-placed appreciation.

This concept of appreciation within electrical safety could not have been demonstrated any better than by the 2015 Electrical Safety Champion Awards program.

The Maintenance Team award was given to Fabrene Inc. from North Bay, Ont. It is evident that this is a very committed group whose managers back them up completely. The Individual Champion award was given to Kevin Holm from Canadian Nuclear Laboratories in the Ottawa Valley, Ont., who made sure to thank everyone involved and, in particular, his manager Len Schryer, with whom he has worked closely over the last few years.

The Electrical Contractor award went to Tarpon Energy Services from Calgary, Alta. They, too, noted a strong management commitment is at the core of their safety success. Last, but certainly not least, the Utility award went to London Hydro from Ontario, whose core vision is safety everywhere, at all times.

Interestingly, the very best OHS standards like CSA Z1000 "Occupational health and safety management" and ANSI/AIHA Z10 "Occupational Health and Safety Management Systems" both insist that management commitment is the very first step in any safety program. It is evident that all of these award winners were backed by very committed senior management teams. Without continuing documented management commitment, these award winners could not have been successful.

The very best OHS standards insist that management commitment is the very first step in any safety program.

These award winners are testaments to what can be accomplished with great support and truly caring people executing the electrical safety improvement plans with due diligence.

CSA Z1000, for example, states very importantly in Sub-Clause 4.1.1 "General - Commitment", leadership and effective participation are crucial to the success of an OHSMS.

Also, Clause 4.2.2.1 "Responsibility, accountability, and authority" states senior management of the organization shall provide leadership for OHS activities and assume overall responsibility for the OHSMS.

Clause 4.2.2.1(b) also suggests what is evidently the case in the business units of these award winners: providing appropriate financial, human and organizational resources to plan, implement, check, review and correct the OHSMS.

Regardless of the hazard, no health & safety managed system can thrive without management commitment... plain and simple. CSA Z1000 and ANSI Z10 clearly recognize this as the very first step in any managed system.

Letting the outstanding people in your organization execute their passion, thirst for learning and rigour in building electrical safety excellence within your organization is a win-win scenario for all concerned. Your staff will love it and continue to excel, and your business will thrive.

Start thinking now and submit your nominations for the 2nd Annual Electrical Safety Champion Awards program at www.ebmag.com/esca. You can nominate yourself or anyone you know who is deserving of the honour. Please note the categories and make your selections. The 2016 nomination process opened March 1, and closes September 16, 2016. EB

A subject-matter expert on electrical safety, Mike Doherty is the director of learning & continual improvement at Shermco Industries Canada Inc. He is a licensed electrician and an IEEE senior member, and has served as the Technical Committee chair for CSA Z462 since its inception. His specialties include electrical safety and health & safety management, maintenance, consulting, training, auditing and electrical incident investigations. Mike can be reached at mdoherty@shermco.com.

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Kick your C&D clients to the curb

Think back to when you were in school. Remember report card day? Did you get mostly A and B grades, or was there a mix of As, Bs, Cs and Ds? How did your parents react? Chances are they high-fived you for the good grades, and had a serious discussion about the bad ones and how you could improve them.

Back in those days, we would rely on our parents and teachers to create a plan that would help us improve our grades; maybe that involved dropping the classes we were failing and taking new classes in which we would excel.

Those same tactics can be applied to your electrical work. It's time to improve your business' report card by dropping your C&D-grade clients to make room for more A&B-grade ones.

Grading your clients

A-GRADE (AWESOME)

These regular clients are happy to pay you what you quoted (sometimes more) and pay their bills on time. A-grade clients are pleasant to deal with, provide amazing referrals and are great communicators, as they provide you with all the details you need to do the job right the first time.

B-GRADE (BASIC)

These clients eventually pay their bills, but sometimes need to be chased. B-grades are sensitive to pricing and are only somewhat loyal (long-term relationships aren't a top priority for them), but their jobs tend to run pretty smoothly.

C-GRADE (CAN'T DEAL WITH)

C-grade clients are constantly changing their minds, but never want to pay for it. Even when you sell the job below your cost—*and they know it*—they *still* demand a better price. They generally don't pay on time and, when they do, it's less than the amount showing on the invoice.

D-GRADE (DEADBEAT)

D-grade clients are like leeches, draining the blood out of your business and your team. They treat your crew like dirt, which may push some of your top employees to quit. They are never satisfied, and you're truly lucky to get paid, because they see you as a bank, not as an electrical contractor.

You may be surprised to learn some of the clients who you thought were As and Bs are actually Cs and Ds!

How did your clients rank?

As you read through these descriptions, don't feel discouraged when some of your own C and D clients come to mind—it's a sign that you're ready to start saying goodbye to them.

I've created a really effective tool to help you grade your clients. It's an Excel file, and I've completed the first two rows for you. The link tinyurl.com/hhthx3q takes you directly to the download.

Grading your clients this way makes you realize how much time you've been wasting on Cs and Ds. And you may be surprised to learn some of the clients who you thought were As and Bs *are actually* Cs and Ds, usually because of a lack of profit and/or they're not paying their bills on time.

How to kick them to the curb

1. Pick the top few Ds and send them a letter informing them you're no longer going to be working with them. Phone them to make sure they received it.

2. Let your team know who's been informed, and tell them the new rules of the game. Put a list of those clients up on a bulletin board to help everyone remember who they are *not to deal with* any longer.

3. Create a script for anyone answering the phones so they know how to keep the door closed against D-grade clients.

4. Identify the A&B-grade clients for your team, and discuss how much better these clients are to be treated.

5. Determine where you will find more A-grade clients, then—as though you were going fishing—work on creating a marketing plan that wields the right *lures* for *reeling* in those clients.

6. Create strategies for boosting your C-grades to Bs, or show them the door, too.

Once you've kicked your C&D clients to the curb, your company will have more opportunities for higher profits and cash flow, and enjoy an overall better atmosphere. Plus, you'll save yourself hundreds of hours of dealing with unhappy clients that can never be pleased.

Getting rid of your Ds and Cs frees you up so you can both pay closer attention to your existing A-grades and fish for new ones. You end up actually *working less for more profit!* Treat your A-grades like gold, and they'll reward you with repeat business time and again. You soon won't ever again have to deal with another D-grade client.

Things are about to get very busy now that Spring is here. Now is the time to put your plan into action. EB

Andrew Houston is the owner and founder of Profit for Contractors. He has been consulting to trades business owners for nearly a decade, helping them improve their business skills so they can achieve their personal and business goals. A graduate of George Brown College, Andrew achieved Industrial Controls Licensed Electrician as well as Electronics Engineering Technologist. Visit www.profitforcontractors.com.

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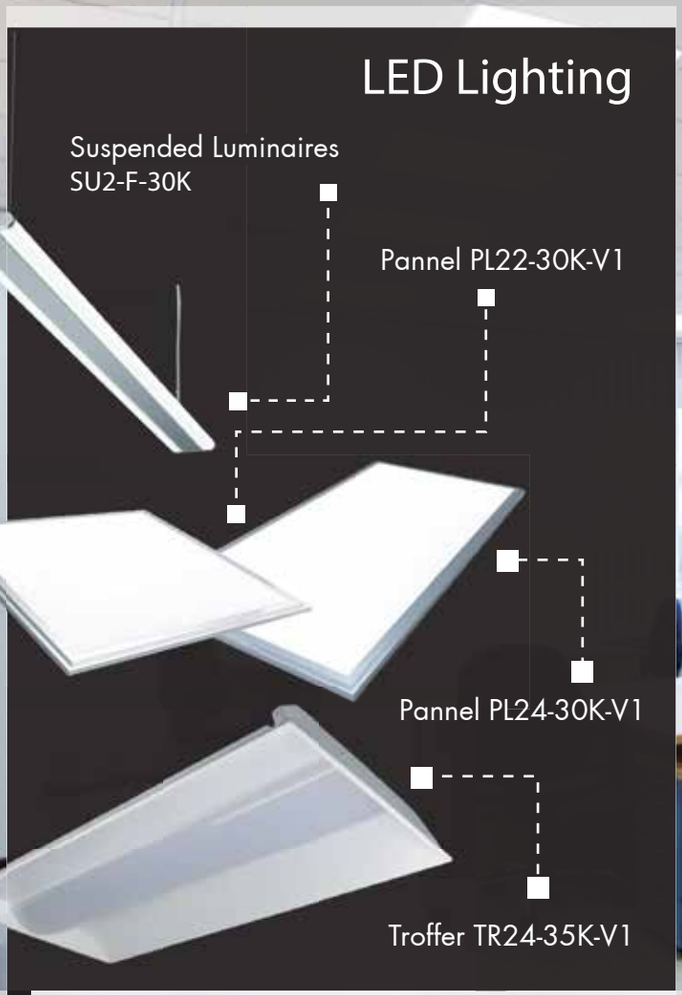

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SCALE-UP RENEWABLES GENERATION TO MATCH THE SCALE OF WEATHER SYSTEMS

Because the sun is shining or winds are blowing across the United States all of the time *somewhere*, a new study by NOAA and University of Colorado Boulder researchers shows the States could slash greenhouse gas emissions from power production by up to 78% below 1990 levels within 15 years—even while meeting increased demand.

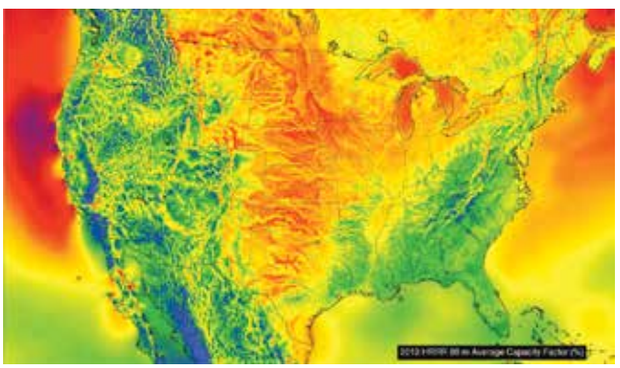
Their study used a mathematical model to evaluate future cost, demand, generation and transmission scenarios. It found that, with improvements in transmission infrastructure, weather-driven renewable resources could supply most of the nation's electricity at costs similar to today's.

"Our research shows a transition to a reliable, low-carbon, electrical generation and transmission system can be accomplished with commercially available technology and within 15 years," said Alexander MacDonald, co-lead author and recently retired director of NOAA's Earth System Research Laboratory (ESRL) in Boulder.

While improvements in wind and solar generation continue to drive down the cost of producing renewable energy, these energy resources are inherently intermittent. As a result, utilities have invested in surplus generation capacity to backup renewable energy generation with natural gas-fired generators and other reserves.

"In the future, they may not need to," said co-lead author Christopher Clack, a physicist and mathematician at CU-Boulder.

MacDonald theorized that the key to resolving the dilemma of intermittent renewable generation might be to scale-up the renewable energy generation system to match the scale of weather systems. So he assembled a team of four other NOAA scientists to explore the idea.



A high-resolution map based on NOAA weather data showing wind energy potential across the United States in 2012.

Using NOAA's high-resolution meteorological data, they built a model to evaluate the cost of integrating different sources of electricity into a national energy system. The model estimates renewable resource potential, energy demand, CO2 emissions and the costs of expanding and operating electricity generation and transmission systems to meet future needs.

> "Our research shows a transition to a reliable, low-carbon, electrical generation and transmission system can be accomplished with commercially available technology and within 15 years."

The model allowed researchers to evaluate the affordability, reliability and GHG emissions of various energy mixes, including coal. It showed that low-cost and low-emissions are not mutually exclusive.

"The model relentlessly seeks the lowest-cost energy, whatever constraints are applied," Clack said. "And it always installs more renewable energy on the grid than exists today."

Even in a scenario where renewable energy costs more than experts predict, the model produced a system that cuts CO2 emissions 33% below 1990 levels by 2030, and delivered electricity at about $0.086/kWh. By comparison, electricity cost $0.094/kWh in 2012.

CO_2

By making changes only within the electric sector, the U.S. could cut total CO2 emissions

31%

below 2005 levels by 2030

Were renewable energy costs lower and natural gas costs higher, the modelled system sliced CO2 emissions by 78% from 1990 levels and delivered electricity at $0.10/kWh. (The year 1990 is a standard scientific benchmark for greenhouse gas analysis, says CU-Boulder.)

A scenario that included coal yielded lower cost ($0.085/kWh) but, not surprisingly, the highest emissions.

This new paper, the researchers say, suggests the U.S. could cut total CO2 emissions 31% below 2005 levels by 2030 by making changes *only within the electric sector,* even though the electrical sector represents just 38% of the national CO2 budget. These changes would include rapidly expanding renewable energy generation and improving transmission infrastructure.

In identifying low-cost solutions, researchers enabled the model to build and pay for transmission infrastructure improvements—specifically, a new, high-voltage DC (HVDC) grid to supplement the current electrical grid. Their model did "choose to use [HVDC] lines extensively", and the study found that investing in efficient, long-distance transmission was key to keeping costs low.

MacDonald compared the idea of a HVDC grid with the interstate highway system from the 1950s. "With an 'interstate for electrons', renewable energy could be delivered anywhere in the country while emissions plummet," he said. "An HVDC grid would create a national electricity market in which all types of generation—including low-carbon sources—compete on a cost basis. The surprise was how dominant wind and solar could be."

"It shows that intermittent renewables plus transmission can eliminate most fossil-fuel electricity while matching power demand at lower cost than a fossil fuel-based grid—even before [energy] storage is considered," said Stanford University's Mark Jacobson. EB

IMAGE BY CHRIS CLACK/CIRES

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Training and common sense are the cure

These comments follow our news item posted January 19, 2016, at EBMag.com, "Electrocuted machine tech costs Ideal Drain Tile $110K" (tinyurl.com/gtd4sl6).

WHAT IS COMMON to all of us—whether employers or employees—is that we face various levels of risk to our lives every day. That is why we have laws in place for training in the safe use of our vehicles to execute our drive to work safely, and laws for training in the safe use of our tools and equipment to execute work practices safely. We are all collectively responsible for a safe work environment. — *James A.*

INTERESTING ARTICLE, BUT I'm curious about other charges. Was the worker an electrician? Obviously you can't charge a dead worker but, if he was qualified, he should have known what would happen.

IT ALSO AMAZES me that an employer is expected to spoon-feed their workers with every possible lockout scenario. When does common sense and general competence

come into play? Maybe that's possible in a factory environment but, for contractors, you'd spend more time training than actually getting work done. Nobody wants to pay for that. — *richarddb*

AS A FOLLOW-UP to this sad story that too often repeats itself, it would be interesting to know if the employer will also face charges according to Bill C-45 (Section 217.1 of the Criminal Code). — *Paul G.*

We always welcome your comments, insights and article ideas. Got an itch to write? Scratch it by emailing the editor at acapkun@annexweb.com, or comment directly on the items you see at EBMag.com.

Bergeron brings meaning to greening

ALTHOUGH I HAVE not written to you before, you should know that I have enjoyed every edition of Electrical Business magazine that I have read. Your articles are well-researched and informative for many sectors of our complicated and diverse industry. I am sure it is a challenge to keep up!

I want to thank you and mention in particular the article from Ron Bergeron "Less greening and more meaning" (EBMag January 2016, p.54). This was a wonderful piece, to say the least. Mr. Bergeron has it right. He has formulated my thoughts and feelings in a way I never could, and has backed up his information with facts and solid reasoning.

He is to be congratulated, because I think he speaks for many electrical contractors. — *Dale M., Ontario* EB

Ouellet Jet & C Range air curtains

Ouellet Canada (L'Islet Que.) recently signed an agreement with air curtain manufacturer Thermoscreens (Barrie, Ont.) that allows Ouellet to expand its range of products. With this partnership, Ouellet has added two series: Jet Series air curtain designed specifically for drive-through applications; and the fully programmable C Range Series for entrances, hallways, service doors, commercial buildings, etc.
OUELLET
www.ouellet.com

Cree's SmartCast PoE with Cisco

Cree has introduced SmartCast Power over Ethernet (PoE), an "open platform that enables the Internet of Things (IoT) for buildings through better light". Cree's series of SmartCast lights, switches and dimmers operate with Cisco's standards-based PoE-powered network architecture. The company says this is the first LED platform that makes the Cisco Digital Ceiling framework ready for mass deployment.
CREE
www.cree.com

Banvil 2000 e-Motion switch

Banvil 2000 (Milton, Ont.) says its new e-Motion gesture switch is an intelligent, touchless, multi-function light control switch that reacts only to the intent of the user and ignores random movement. It enables users to turn lights On/Off and manipulate dimmer settings without making contact with the switch.
BANVIL 2000
www.banvil2000.com

Hubbell's NX app in beta testing

Hubbell Building Automation says the free NX room setup tool is now fully functional and available in beta as a smartphone app. With this, both iOS and Android phones and tablets can be used to set up NX room controllers via Bluetooth.
HUBBELL
www.hubbell-automation.com

AR111 LED from Soraa

Soraa says it has introduced the "world's first full visible spectrum 4-degree" AR111 LED lamp. The standard ANSI size, 6W lamp has a CRI of 95 and R9 of 95, whiteness rendering and is customizable with the company's Snap system, where beam shapes can be altered and colour temperature modified.
SORAA
www.soraa.com

Alera Lighting's Curv lens and Plank

Alera Lighting has two linear lighting solutions: the Plank 7-in. LED (LP7) and the Curv radial lens LED. The Plank fixture has a rectangular form that can be used for uplight, downlight or a combination of the two. Meanwhile, the Curv fixture's opal acrylic lens provides indirect-direct or direct illumination.
ALERA LIGHTING
www.aleralighting.com

Appleton Viamaster certified for hazardous locations

Appleton Group says its Viamaster linear LED luminaire has been certified for CEC, ATEX/IECEx and NBR IEC markets. As a result, this lighting series can now be specified in oil refineries, petrochemical facilities and other hazardous locations. The Viamaster is engineered with an IP66 and NEMA 4X rating, and includes a hinge access system to reach the terminal block and driver.
APPLETON
www.emersonindustrial.com

Liteline's MicroPot

Liteline says its LED MicroPot, a mini downlight, is best for creating an ambience to highlight collections, cabinets, and corridors/hallways. The MicroPot emits a warm white light and can be used in damp locations. The fixture is installed in an aluminum housing, which allows for enclosed wiring. Housing includes a strain relief to secure electrical cables and two torsion clips.
LITELINE
www.liteline.com

Accadia from HessAmerica

HessAmerica has an in-ground LED luminaire for architectural lighting purposes: the Accadia. Housed in stainless steel and prewired with cable, it has a tempered glass lens and individual LEDs mounted on aluminum core printed circuit boards for thermal management. It is available in three sizes with lengths of 1 ft, 2 ft, or 3 ft.
HESSAMERICA
www.hessamerica.com

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Ontario Construction Secretariat
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Visit futurebuilding.ca

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Visit lightfair.com

IEEE's Industrial & Commercial Power System Conference
May 1-5, Detroit, Mich.
Visit sites.ieee.org/icps2016

EB **BICSI Canadian Conference**
May 2-5, Niagara Falls, Ont.
Visit www.bicsi.org

EB **Ideal Supply South Tradeshow**
May 11-12, Stratford, Ont.
Visit www.idealsupply.com

EB **AQME 30th Annual Conference**
May 11-12, Laval. Que.
Visit www.aqme.org

EB **OEL Electrical Industry Conference**
Ontario Electrical League
May 11-14, St. Thomas, Ont.
Visit www.oel.org

IAAE Airport Lighting Maintenance Course
International Assoc. of Airport Executives
May 16-20, Campbell River, B.C.
Visit tinyurl.com/hdm24qp

EMC & NRCan's Energy Summit
Excellence in Manufacturing Consortium & Natural Resources Canada
May 17-18, Niagara Falls, Ont.
Visit tinyurl.com/h65uq5s

EB Indicates EB will be there.

Visit EBMAG.COM for an extensive list of upcoming industry events.

Mersen launches Surge-Trap line for North America

Marking it as "another key milestone for its recently formed Global Surge Protection organization," Mersen launched the Surge-Trap product line for North America, which is available right now. The Surge-Trap NEMA Type 1 surge protective device series comprises six products; all are NEMA devices for ANSI/UL 1449 Type 1 and 2 applications, indoor and outdoor use, and provide UL96A lightning protection. Mersen says is has designed a cataloguing system and "partner portal" to help its partners compare features and find the right product for customers.
MERSEN
ep-ca.mersen.com

DX 2 fastening tool from Hilti

Hilti presents its powder-actuated fastening tool, the DX 2, which covers a range of applications, the company says, including attaching kicker plates to concrete; fastening sill plates; attaching drywall to concrete; fastening electrical cable holders to concrete; attaching chicken mesh to concrete; and fastening wood to concrete and steel.
HILTI
www.hilti.ca

GMP reel-handling accessories

General Machine Products Company (GMP) has introduced three reel-handling accessories to its line of

aerial and underground cable placement tools and equipment. These components—the pole mount spindle, the reel buck, and the reel caddy—are engineered to make fiber optic cable deployment safer and more productive, GMP says.
GMP
gmptools.com

Ringdale's CT energy monitor/data logger

Ringdale's CT energy monitor and data logger with ethernet connectivity for single- or 3-phase power systems allows energy and facility managers to monitor and detect power issues. The logger measures RMS current and voltage. Managers remotely access the solution through their network to identify where energy is being wasted or to identify patterns of increased power use.
RINGDALE
www.ringdale.com

Leviton integrates BitWise and Omni

Leviton announced the free integration of Omni security & automation control systems into BitWise BC1, BC2 and BC4 audio/visual control systems. This allows BitWise customers to create custom interfaces for their OmniTouch 7 touchscreens, Leviton says, utilizing new graphical elements such as icons and backgrounds.
LEVITON
www.leviton.com

Fluke's 1587 FC multimeter

The 1587 FC insulation multimeter from Fluke is a wireless digital insulation tester plus full-featured true-rms digital multimeter (DMM), combined into one hand-held tool. The 1587 FC also adds four new diagnostic capabilities when used in conjunction with the Fluke Connect smartphone app.
FLUKE
www.fluke.com

Carlo Gavazzi UA18CSD, UA18ESD sensors

Carlo Gavazzi's compact ultrasonic sensors are available in M18 housings constructed of thermoplastic (UA18CSD Series) and stainless steel (UA18ESD Series). They provide sensing distances up to 800mm, Carlo Gavazzi says, in spite of their thread length of 38.3mm. Both digital output and analogue output versions are available.
CARLO GAVAZZI
www.gavazzionline.com

Arlington's LTMC50 fitting

Arlington's zinc fitting fits three sizes of PVC jacketed MC cable: No. 12, No. 14, and No. 10, the company says. The LTMC50 1/2-in. fitting comes with grommets and washers and is liquid- and concrete-tight. Arlington says it's ideal for parking decks.
ARLINGTON
www.aifittings.com

Dymo XTL 300, 500 labelers

Dymo has a new series of industrial labelers: the XTL line. The XTL 300 comes with a "life-like" onscreen print preview and colour display, while the XTL 500 is associated with larger labeling needs, such as large cables. The 500 model prints pre-sized and continuous labels from 1/4 in. up to 2 in.
DYMO
global.dymo.com

Platinum Tools 8-in-1 stubby

The 8-in-1, ratcheted, stubby screwdriver (19120C) from Platinum Tools features seven bits and a six-position bit retention holster in the cap. The bit load includes Phillips (1, 2, 3), slotted (3/16-in., 1/4-in.), torx (T15, T20), and a 1/4-in. nut driver.
PLATINUM TOOLS
www.platinumtools.com

Wago's Topjob S terminal blocks

Wago has introduced what it calls "the industry's only pivot-style fuse terminal blocks in a 3-conductor variant". The newest addition to the Topjob S family allows a second conductor to be connected on the field side, Wago says, and solid or ferruled conductors can be directly pushed in.
WAGO
www.wago.us

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RangeRack Cable Tray is introducing four lines of "heavy-duty" aluminum cable trays: the BY4, BZ4, BY6 and BZ6 series. The BY series is CSA class D/6M and the BZ series is CSA class E/3M. Both are available in 4-in. high and 6-in. high siderails and are CSA and UL certified.

RANGERACK
www.rangerack.ca

HD Electric's DVI-100, DVI-500 indicators

The DVI-100 and DVI-500 series digital voltage indicators from HD Electric have been designed to be used on both transmission and distribution systems in overhead and underground applications up to 500kV. Voltage is displayed on a large LED display with a 2- or 3-digit readout and an alarm alerts the user to the presence of voltage above 100VAC.

HD ELECTRIC
www.hdelectriccompany.com

CMH Wire Pro version 3.0

CMH Software has released the 3.0 version of its residential Wire Pro software. Designed for smaller electrical contractors, the software provides wiring information and documentation while also allowing contractors to leave customers with an updated schematic printout. The software is compatible with Windows 7, 8, Vista and XP.

CMH Software
www.cmhsoftware.com

LanTEK III certifier from Ideal Networks

Ideal Networks has upgraded its LanTEK cable certifier, used to help build cabling networks that meet existing TIA and ISO/IEC performance requirements up to Cat7A. The LanTEK III incorporates Time Domain Return Loss (TDRL) and Time Domain Near End Crosstalk (TDX) so field technicians can locate issues quickly, Ideal Networks says.

IDEAL NETWORKS
www.idealnetworks.net

Lightship app for worksite management

British Columbia company Lightship has launched its productivity and safety application for worksites, also called Lightship.Connecting to mobile devices and worksite sensors, the app can follow tasks and track and communicate with workers, vehicles and equipment for teams and fleets.

LIGHTSHIP
www.lightshipworks.com

CODE *conundrum*

TACKLE THE CODE CONUNDRUM IF YOU DARE!

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

How did you do?
3 • Master Electrician **2** • Journeyman
1 • Apprentice **0** • *Plumber?!?*

Compiled by Ontario's Electrical Safety Authority
www.esasafe.com

QUESTION 1

Manually operated, general-use switches intended for AC systems shall have an ampere rating not less than the current rating of the load when they are installed in branch circuits supplying non-inductive loads.

a) True b) False

QUESTION 2

A Class I location is:

a) An area that has flammable vapours
b) An area that has combustible dusts
c) An area that has ignitable flyings
d) None of the above

QUESTION 3

For interconnection of power production sources, means of isolation shall be provided to isolate:

a) Utility feeders
b) Renewable energy sources
c) All sources of supply

ANSWERS Electrical Business, March 2016

Question 1

The radius of the curve on the inner edge of bends made on smooth aluminum-sheathed cable shall be not less than ___ times the external diameter of the sheath for cable more than 19 mm, but not more than 38 mm in external diameter.

c) 12. Rule 12-712(2).

Question 2

For banks, the minimum ampacity for service or feeder conductors shall be based on a basic load of ___ W/m^2 of the area of the building based on outside dimensions, plus other special lighting loads, equipment loads, heating and air-conditioning loads.

d) 50. Rule 8-210, Table 14.

Question 3

The overload protection is not required for a 2-hp, manually starting motor connected to a 240V branch circuit with adequate overcurrent protection.

b) False. Rule 28-308(a).

ADVERTISER INDEX

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CODE *file*

DAVID PILON

Rule 14-100: Nothing new to see here

(Part 3)

As we continue our look at CE Code Rule 14-100 "Overcurrent protection of conductors," note that Appendix B makes it clear this Rule is only for the interconnection of electrical equipment. It does not apply to overcurrent protection of equipment covered elsewhere in the code.

I may have misled you by the way I worded the exemption note in a previous column, so I will try to clarify before going any further. Looking at Subrule (d), where the conductor:

(i) is the only circuit fed from a high-voltage distribution transformer protected with a primary fuse or breaker up stream;
(ii) terminates in a single overcurrent device not exceeding the ampacity of the conductors; and
(iii) is protected from mechanical damage

Where a transformer exceeding 750V is installed with primary protection that also protects the secondary conductors, and the secondary conductors are mechanically protected and terminate in a single overcurrent device, then protection is not required immediately where the secondary conductors receive their supply so long as protection is installed where they terminate for distribution or use.

This excludes transformers protected in accordance with Rule 26-252(4) and Table 50. The transformers protected in this manner are still required to have protection installed where they receive their supply on secondary side and are permitted to tap off of a primary feeder, so long as the feeder overcurrent protection does not exceed the ratings as listed in Table 50.

An example is a 4160/600 75kva transformer with primary fusing set at 15A. 15A • the turn ratio of 7 = 105A; therefore, with secondary conductors of #2AWG copper (115A) or #1/0AWG aluminum (120A) run in conduit or armoured cable, and feeding a 100A breaker, there is no requirement for the protection of these conductors immediately at the transformer location where they receive their supply.

The wiring would need to leave the control cabinet and be adequately protected from mechanical damage to meet the intent of this Rule.

The 100A breaker is still a requirement, but it may be located remotely so long as the conductors are mechanically protected throughout their length.

We now need to look at Subrule (e).

- Overcurrent protection may be omitted where the smaller conductor is at least #14 AWG or larger,
- is located external to the control equipment enclosure, and
- the branch circuit overcurrent device is not set at more than 300% the rating of the control circuit conductor, or
- opening of the control circuit would create a hazard

An example of this could be a machine that requires a remote start/stop station to operate it. If the machine operates and is fused at 60A, then control circuit wiring would need to be rated for 20A. The wiring would need to leave the control cabinet and be adequately protected from mechanical damage to meet the intent of this Rule. Also, if this circuit is a critical safety system, and tripping would result in a loss of control over the machine and/or endanger life or limb (e.g. fire pump circuit) then, once again, the protection may be exempted.

14-100 covers a number of exceptions to the general requirements for protection of conductors interconnecting electrical equipment. While tap conductors pose some inherent risks by not being protected at their source, protection can often be safely provided by ensuring mechanical protection, restricting distance and location or, sometimes, by using primary protection on a transformer to effectively protect the secondary conductors. EB

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Always consult your AHJ for more specific interpretations.

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