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Electrical Business

THE AUTHORITATIVE VOICE OF CANADA'S ELECTRICAL INDUSTRY

In the rush to label everything,

is anyone doing an arc flash analysis?

PM # 40063602

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- LED parking lot lighting (Page 7)
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Electrical Business

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October 2009 • Volume 45 • Issue 9

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

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Putting smart grid into better perspective

I am officially declaring that 'smart grid' should no longer be spelled with any capitalization. Although IEC and NEMA continue to capitalize the thing, I believe this just makes the whole notion a little too high-and-mighty for my liking. It's time smart grid was brought down from the 30,000-ft level to ground level... to my level.

There's no question that the smart grid is revolutionary—a paradigm shift, in fact—but there's nothing mystical about it. It's all about making our current electricity grid more intelligent, and it goes hand-in-hand with new, possibly very green and small (note that "green" is not capitalized) methods of power generation, electric vehicles and more.

Before going any further, I should thank Ravi Seethapathy of Hydro One and the folks at EEMAC (who got Ravi to speak at their latest Industry Speaker session) for opening my eyes just a little bit wider on the subject.

Our current, aging electrical infrastructure is based on a large-scale power generation model, where gigawatts of electricity are produced before being shunted long distances to the customer. It's a pretty linear model, which keeps things nice and tidy, and straightforward. No problem. When something breaks down, we may be inconvenienced for a while—like the Blackout of 2003—but, eventually, we'll find the problem by just following the powerlines.

But we find ourselves in the 21st century. We're seeing the rapid development and deployment of new power generation alternatives, like solar, wind, run-of-river, biogas, etc., and we need a way to not only include them in our grid, but a way to manage their contributions and shortfalls. After all, the sun isn't always shining and the wind isn't always blowing! We need to infuse our electrical infrastructure with the intelligence it needs to monitor, measure, bill, etc., electricity from all kinds of other sources, as well as be able to ramp up tried-and-true standby methods (like hydro, nuclear, etc.) when shortfalls are anticipated.

A smart grid allows us to flex our power resources to their fullest capability—giving us insights into the system we never had before—and will simplify the interconnection of new power projects to existing backbones. This is all pretty cool stuff.

Now, smart grid also has some big problems, the biggest of which may be storage. When you produce excess energy, and no one's around to use it, where do you put it? Battery technologies (pick any one) are way too expensive to be seriously considered for storage of this magnitude, but here's where the electric car comes in. Some people think that excess power could be distributed across, and stored on, the batteries of thousands—if not millions—of electric vehicles.

When you have a smart grid, such power distribution can be facilitated. Same goes for when you plug in your electric vehicle into someone else's outlet; a smart grid will know who plugged in and where, and where to send the bill.

While smart grid—and, especially, electric cars—is still pretty far off from being a daily reality, the point is that it *will become* a reality. For your reading pleasure, check out:

- www.nema.org/gov/energy/smartgrid
- www.iec.ch/zone/smartgrid

... and start thinking now of how you and your business can fit into this future. EB

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Nowadays, arc flash is *the* hot topic in electrical safety, with a lot of advice and information being disseminated in articles, courses, software, etc. And while it is clearly a part of CSA Z462, "Workplace Electrical Safety", practically nothing is being said about preventive maintenance for switchgear.

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Garrad Hassan joins Germanischer Lloyd

In photo (left to right): Pekka Paasivaara, member of the GL executive board; Andrew Garrad, CEO Garrad Hassan; Dr. Hermann J. Klein, member of the GL executive board.

Garrad Hassan (www.garradhassan.com)—based in Bristol, United Kingdom—is joining Germanischer Lloyd to form a fully integrated technical assurance and consulting company for renewable energy (www.gl-group.com).

The companies are merging with the aim of being a leading global independent provider of consulting, engineering, turbine design, certification, measurement, project management, strategic advice, inspection services and software products for renewable energies. The two will provide technical services over the entire life cycle of wind, solar, marine and other renewable energies—both onshore and off—including safety, integrity, reliability and performance management.

"The merger of GH and GL is a reflection of growing demand of customers for a single service provider who offers solutions for challenges in technology, environment and asset performance on a worldwide scale," said Pekka Paasivaara, member of the executive board of Germanischer. "Together, we will offer a unique level of service expertise and global presence across the whole project life cycle."

Germanischer has already acquired the Canadian wind energy consulting and engineering company Hélimax.

Legrand launches strategic branding initiative

Legrand (www.legrandna.com)—a global player in products/systems for electrical installations and information networks—is launching a strategic branding initiative in the North American marketplace. The company says it will "establish its trusted global brand on behalf of all current brands and partners to build awareness of what's possible in this category, and generate increased interest and demand from end customers".

Current North American product lines (Cablofil, On-Q, Ortronics, Pass & Seymour and Wiremold) are recognized products that "our professional customers connect with everyday," says the company. "They will play a pivotal role in strengthening the Legrand brand over the coming years."

"Our current customers will benefit from the increased visibility of Legrand as a trusted end-user brand through greater product demand and a focus on value-added products," said John Selldorff, president and CEO, Legrand North America.

The new branding initiative will include new corporate literature, advertising campaigns, in-store merchandising, signage and web presence investments that will occur at varying stages beginning Q4 2009.

Columbia-MBF Electrical Group adds AFC Cable Systems AC90

Columbia-MBF Electrical Group (www.alliedeg.com) has introduced AFC Cable Systems AC90 cable to its portfolio. Columbia-MBF Electrical Group supplies steel and aluminum conduit, flexible conduit, custom armouring and identification, inner-duct, fire stop, metal framing and cable tray to the Canadian market

"This offering supports the portfolio, and is an extension of the Eastern Wire + Conduit armoured products group," said Steve Elsdon, Columbia-MBF Electrical Group's vice-president of sales & marketing. "It is an alternative wiring method to steel conduit, making it a natural fit for Columbia-MBF."

A complete AC90 offering stocked at the Mississauga, Ont., distribution centre in sizes 14 to 6 AWG is now available to ship. Tyco Electrical and Metal Products is one of the largest manufacturers of this type of cable in the U.S.A., said Elsdon, under the brand name AFC Cable Systems.

This line will be represented across the country by Adanac Sales Inc. (www.adanacsales.com), McKenna Agencies Ltd. (www.mckennaagencies.com), Roney Marketing Inc. (www.roneymk.com), and Brockway Enterprises (www.brockwayenterprises.com). Additional agent appointments will be made shortly.

Hydro-Quebec files strategic plan 2009-2013

Hydro-Québec's (www.hydroquebec.com) recently filed Strategic Plan for 2009-2013, says the utility, features energy efficiency, the development of renewable energies and technological innovation. Hydro-Québec will invest $25 billion in the province over a five-year period.

"Hydro-Québec will continue to develop major hydroelectric projects such as Romaine and Petit-Mécatina, in addition to bringing 4000 MW of wind power onto the grid," said Thierry Vandal, Hydro-Québec's president and CEO. Substantial investments in the transmission and distribution grids are also expected. "Grid technology will evolve considerably over the coming years," Vandal added.

Hydro-Québec Production will invest $10.4 billion and increase its hydroelectric generating capacity by 1000 MW by 2013 as a result of the Eastmain-1-A/Sarcelle/Rupert project. The Romaine project will add a further 1550 MW by 2020. The division will also continue work on the draft design of the 1200MW Petit-Mécatina complex. In addition, Hydro-Québec Production plans to develop a portfolio of 3500 MW as part of the Québec government's Northern Plan, including 3000 MW in major hydropower projects; these projects will be presented in a future Strategic Plan.

Hydro-Québec TransÉnergie will make investments totalling $7.8 billion. The division will carry out large projects to integrate new wind power capacity, develop the transmission system and ensure its

long-term operability, and build a new interconnection with New England. By 2015, nearly 4000 MW of wind power will be available.

Between now and 2013, Hydro-Québec Distribution will invest $6.2 billion in its grid and in energy efficiency, including $1.7 billion under the Energy Efficiency Plan.

Hydro-Québec will implement a plan to support transportation electrification. This plan is aimed at providing financial support for the development of infrastructure for public transit, developing and marketing advanced technologies, test-driving electric vehicles and experimenting with their integration into the power grid, and planning infrastructure for vehicle charging.

Alstom and Schneider consider bidding for Areva T&D

Schneider Electric (www.schneider-electric.com) and Alstom (www.alstom.com) are considering making a joint offer to acquire Areva Transmission and Distribution (T&D), recently put up for sale by its parent company. To achieve this, Alstom and Schneider Electric would create a common structure that would bid for Areva T&D and, should the offer get accepted, would ultimately transfer the transmission activities to Alstom and the distribution activities to Schneider Electric.

This offer will optimize the strategic, industrial and commercial strengths that both Alstom and Schneider can bring to each of the two areas of T&D, say the partners, and maximize the value of the business. This offer would consequently be more attractive for the vendor.

The high-voltage transmission part of Areva T&D is close to Alstom's own activities in power generation. Alstom would bring to Areva T&D its knowledge in power networks and automated systems, the management of large projects, and the benefit of its commercial network, which is particularly focused on power generation utilities—the primary market for high-voltage activities.

The medium-voltage distribution part of Areva T&D is a business in which Schneider Electric is active and wishes to reinforce. Schneider would bring to Areva T&D its technical and operational strengths in automation and medium voltage, its sales network, as well as a complementary access to industry, building and infrastructures—major markets for medium-voltage activities.

GE Electrical Distribution teams up with Carbon Controls

GE Consumer & Industrial (www.ge-ed.com) has established a new partnership with Carbon Controls Ltd. (www.carboncontrolsltd.com), a Calgary-based distributor of instrumentation and control equipment. As exclusive supplier for GE's Drive product line in Alberta and Saskatchewan—including the new AF-6 Series AC Drive—Carbon Controls Ltd. will also represent other GE Electrical Distribution products, including variable frequency drives, motor control centres, harmonic and line/load filters, motors, transformers and switchgear.

"Carbon Control's proven expertise in sales, service and integration of variable frequency drives and MCCs was a natural fit with GE's Electrical Distribution business in Western Canada," said Aaron Chronik, district manager for GE Lighting and ED products in Western Canada. "This new alliance will enable us to build a higher profile for GE ED products, such as our cost-conscious AF-6 Series Drives, within the oil and gas, and waste management sectors."

Developed in response to customers' requests for drives with built-in functionality in a compact package, GE's new AF-6 Series AC Drives are easy to set-up and meet all relevant global standards, says GE. For more information, contact Herb Yang at herb.yang@ge.com or (604) 451-3209.

Britech now rep'd by Munden Enterprises in Atlantic Canada

Britech Heating Cables and Controls (www.britech.ca) has announced that Tony Munden and his team at Munden Enterprises (www.mundenenterprises.com) is its representative in both Newfoundland and the Maritime Provinces.

Munden Enterprises is a full-service representative that works with consulting engineers, electrical distributors and contractors.

"The addition of Newfoundland to their territory will help them build on the great success they have had by implementing a stocking distributor program throughout Nova Scotia, Prince Edward Island and New Brunswick," said Gerry Lemieux, president of Britech, adding, "They have also been influential and successful in having NS Power recommend Britech Heating Cables for earth storage heating systems in Nova Scotia."

Ontor SW-Ont distributor for SICK, Carlo and Yaskawa

Ontor Ltd. (www.ontor.com) has been appointed distributor for several new product lines in the Southwestern Ontario region: SICK, Carlo Gavazzi and Yaskawa.

SICK is a player in machine guarding, industrial sensing applications and logistics automation. Carlo Gavazzi Automation Components meantime, specializes in sensing devices, control components, power supplies and energy meters. Finally, Yaskawa manufactures inverter drives, motion controllers, and servo drives and motors.

Other lines recently taken on in Southwestern Ontario include Rex Manufacturing, E-Drive, THK, Dwyer, Alpha, THK, Littelfuse, Orientalmotor, Pilz, Exele, Arista, Vipa and Dehn.

Wide-Lite Cradle-to-Cradle recycling program

Wide-Lite's (www.widelite.com) new Cradle-to-Cradle (C2C) Recycling Assistance Program gives participants the opportunity to reduce their environmental impact by reintegrating old products back into the production cycle.

At the product's end-of-life or time of replacement, program participants need only return the fixture to Wide-Lite, which will disassemble, recycle and dispose of all components, including the carton used to return them, according to environmental guidelines. By specifying Wide-Lite's C2C option, participants may be able to earn additional points toward Leadership in Energy and Environmental Design (LEED) certification.

BA Robinson work for Habitat for Humanity-Costa Rica

While in Costa Rica on its annual Partners Plus Program trip, B.A. Robinson Co. Ltd.'s (www.barobinson.com) staff and guests had the opportunity to take part in one of two build days held in conjunction with Habitat for Humanity-Costa Rica. Over the course of these two days, the frame of a new home was erected.

"I'm extremely proud of the hard work that went into this project," said Ross Robinson, president of B.A. Robinson Co. Ltd., and workday participant. "Our staff and customers gave up a full day out of a week's holiday to support this cause, and we are the only Canadian company to assist Habitat in this region. This is a reflection of the strong character and Canadian spirit of our customers. I'm very pleased that we could contribute to the livelihood of a local family."

For both groups, each day consisted of travelling to the build site and then working on the new home. The group mixed concrete from scratch to pour the floor and the foundation. To add a truly Canadian flavour to the project, a Toonie was inserted into the foundation—for luck. Before departing on the second day, the walls were also raised. This home will be completed and turned over to a deserving local family by Habitat for Humanity-Costa Rica.

Before leaving, the group took up a collection and purchased a gift certificate for groceries for the family that will move into the home.

B.A. Robinson Co. Ltd. is a fully diversified distributor of plumbing, heating and electrical products to the construction industry and retail home improvement market in Western Canada. Founded in 1936, the company operates from 24 locations in British Columbia, Alberta, Saskatchewan, Manitoba and Northwest Ontario. The Partners Plus Program is a loyalty program offered to trade customers.

DeWALT discontinues NASCAR sponsorship

DeWALT (www.dewalt.com) is not renewing its agreement with Roush Fenway Racing to sponsor Matt Kenseth—driver of the #17 Ford Fusion—for the 2010 NASCAR season. DeWALT says that, while the motor sports program has been a valuable marketing tool over the past 12 years, it has decided to redirect its resources in light of an unprecedented decline in the construction industry.

"Our decision to discontinue the sponsorship, while a difficult one, will help us to continue delivering value to our customers and end users, while managing our financial results," said Les Ireland, president of the North American Power Tools and Accessories Group for DeWALT. "We remain committed to the team for the 2009 season, and will have an ongoing presence in the sport as DeWALT tools will continue to be used to build and maintain racecars and equipment."

GE Lighting appoints Associated Component Sales as OEM sales agent

GE Consumer & Industrial-Lighting (www.ge.com) recently appointed Associated Component Sales (ACS) as sales agent for GE OEM lighting products in Canada.

Effective immediately, ACS's Craig Hamel will be responsible for leading GE OEM accounts previously managed by Darryl Kalloo who, in addition to maintaining his role as GE OEM national account manager of key accounts in Canada, recently took on the additional responsibility of ballast manager for Canada.

Kalloo retains overall responsibility for sales of GE OEM lighting products in Canada, and will work closely with Hamel to ensure a smooth transition. "The ACS alliance will be a real asset in allowing us to grow our OEM business in Canada while maintaining quality service to existing accounts," said Kalloo.

Craig Hamel can be contacted at (514) 518-5559 or chamel@acsatlanta.net.

BOMA Toronto CDM program hits 10-million milestone

The Building Owners and Managers Association (BOMA) of Toronto's Conservation Demand Management (CDM) Program (www.bomacdm.com) has hit the $10 million milestone (for over 100 buildings) in its delivery of electricity conservation incentives.

Funded by the Ontario Power Authority (OPA), the CDM program has committed $10 million in retrofit incentives for commercial buildings of 25,000 sf or larger located in the 416 telephone exchange area. This commitment has leveraged over $70 million of capital expenditures by building owners and tenants to complete the electricity conservation projects.

To date, the CDM program has accumulated an estimated 123,500,000 kW/h. Qualified program participants include owners and tenants of commercial office buildings, retail properties, hotels, entertainment venues and mixed-use industrial facilities. Popular retrofits include lighting, HVAC redesign and replacements, deep lake water cooling systems and the installation of VFDs (variable frequency drives).

Many participants in BOMA Toronto's CDM Program own real estate across Canada, says BOMA Toronto, and most of them are interested in seeing the program expanded throughout Ontario. Though no decision has been made, BOMA Toronto says it is looking at doing just that.

Sola agency partnerships in Alberta and the Atlantic

In Alberta, D.A.D. Sales (www.dadsales.com) has been appointed exclusive sales agent for Sola Canada (www.solacanada.com). Ed Tuggle and his team at D.A.D Sales are responsible for sales coverage of electrical distributors, contractors and end users in all of Alberta, Southeastern British Columbia west to Cranbrook, and BC's Northeast into Fort St. John. Their territory also includes The Yukon and the Northwest Territories.

In Atlantic Canada, Munden Enterprises (www.mundenenterprises.com) was appointed as exclusive sales agents for Sola Canada. Tony Munden and his team are responsible for sales coverage of electrical distributors, electrical contractors and end users in Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland-Labrador.

Sola Canada is a North American manufacturer of a range of HID ballasts and components, magnetic fluorescent and sign ballasts, and a growing line of electronic ballasts for linear and compact fluorescent lamps. *Continued on page 8*

LED parking lot lighting gets the thumbs up

A look at Bradford District High School

By Anthony Capkun

Located just off of Highway 88 in Bradford, Ont., Bradford District High School is undergoing a major retrofit—the first since its construction back in 1972. Part of its upgrade included new parking lot lighting, with LED fixtures as the source.

Despite the fact that LEDs have yet to truly penetrate and come into their own in the general illumination arena (they're still considered by many to be only good for architectural, design-type purposes at best and, at worst, just too darn expensive), Simcoe County District School Board *opted* for this form of illumination for the high school's parking lot. To find out why, I paid a visit to the school and met with Brad Parkes, supervisor of design and construction services with the school board, and Forrest Jones, technical lighting representative with Rutenberg Sales.

We chatted in the school's cafeteria/auditorium; besides the luxury of being able to daydream about being back in high school, I was afforded the fortuitous opportunity to chat with one of the custodial staff members... but we'll get to her later.

Starting in the 1990s, Parkes says, the rising cost of energy got the board thinking about ways in which it could save energy. When it came to LEDs, he admits that—after first seeing them in various architectural magazines—he only envisioned them in undercabinet applications. However, LED manufacturers insisted that LEDs could be more and do more, and their advertisements in the various magazines that Parkes received drove this point home. It worked, because the supervisor found himself visiting various manufacturers' websites to learn more.

Let's cut to the chase: Parkes met up with Jones to discuss retrofit possibilities, with the latter suggesting The Edge area luminaire by RuudLED. The installation was performed by Wallwin Electric Services Ltd. (Barrie, Ont.). Founded in 1951, it has expanded several times from its original 320-sf building due to steady growth. Its client base has grown outside of its traditional Central Ontario haunt to include several regions in Canada, the United States (and international, too). Wallwin offers complete industrial and commercial electrical contracting services, specializing in design-build projects and more.

A great feature, says Parkes, is the quality of white light coming from the fixtures, which makes colours show true at night. This is a popular feature with the police in the community, who like the idea of buildings being constructed/retrofitted for safety. With true white light illuminating the parking lot, identifying things like the colour of the jacket worn by a "person of interest", for example, becomes child's play. "This school is used all the time by the community, so safety is a concern," says Parkes.

The Simcoe County District School Board expects payback on this investment in roughly 15 years, though Parkes is still waiting on numbers from his maintenance team to calculate the ultimate payback. However, he's sold on LEDs, and plans on sticking with them for future retrofits—and not just for parking lot lighting.

"I think right across the board we're overlit," says Parkes. "We'll be doing more lighting retrofits. A lot of our engineers are still at 12 W/sf, and I want to get down to 7-8 W/sf." (He mentioned they are also incorporating daylighting where they can.)

The verdict?

Now that the fixtures are installed and in operation for about a year, what's the verdict? For this, let's get back to custodial staff member I met: a true end user. Her name is Melissa Nichols, and she heads the custodial department. She and her staff are the ones who work under these lights every evening, so who better, in my opinion, to determine whether it's thumbs up or down?

"The old lights were blinding, yet dim, with pools of light or dark," says Nichols, adding that they now have, "nice, uniform [light] distribution." When it comes to regular tasks performed outside, Nichols says the illumination is better overall, "and there are no complaints". EB

Brad Parkes, supervisor of design and construction services with the Simcoe County District School Board (left) and Forrest Jones, technical lighting representative with Rutenberg Sales.

Note the difference in lighting between the parking lot and the street beyond.

LIGHTING COMPARISON

	LED Retrofit Scheme	Previous Scheme
Light source	5 light bars (100 LEDs at 350mA)	400W MH horizontal lamp
Cut-off classification	Full cut-off	Full cut-off
Relamping	100,000+ hours (L_{70})	15,000 hours average
No. of assemblies	30 poles and 42 fixtures	32 poles and 46 fixtures
Average footcandles	2.05	2.80
Minimum footcandles	0.3	0.2
Power consumption	128 total system watts	455 total system watts
Projected energy savings	74.3%*	

* 327W x 42 fixtures + 455W x 4 removed

Siemens Canada officially launches Tiastar motor control centre production at a ribbon cutting ceremony at its Burlington, Ont., manufacturing facility. In photo (left to right): Siemens Canada president and CEO, Roland Aurich; Cam Jackson, mayor of Burlington; and Joris Myny, Siemens' vice-president of the Industry Automation and Drive Technologies division. Photo courtesy Siemens Canada. For more photos from the event, check out EBMag's online gallery at www.EBMag.com.

Siemens launches Tiastar MCC production; good news for Canadian manufacturing

At a September ceremony with dignitaries, customers and employees, Siemens Canada officially announced that its Industry Automation division has begun production of the Tiastar motor control centre (MCC) at the Siemens manufacturing facility in Burlington, Ont. EBMag was there to take in the action.

The company invested more than $2 million in design, retooling and upgrades to the facility to accommodate the new production line. In addition, the company has projected the creation of 50 skilled positions in engineering and production to fulfil the capacity.

"Today's announcement reflects our ongoing commitment to manufacturing in Canada and represents a significant investment for Siemens," said Joris Myny, vice-president of the Industry Automation and Drive Technologies divisions. "Bringing the Tiastar MCC production line to Ontario also demonstrates our goal of providing our customers with 'Made in Canada' solutions."

Siemens Tiastar MCCs are typically used in commercial building applications to control the speed of fans and pumps and compressors. In addition, they are commonly used in industrial applications wherever motors are found.

"In these tough economic times when many manufacturers are moving production offshore, Siemens sees investing in manufacturing in Canada as an opportunity. We know leveraging technology in the manufacturing space makes good sense," said Anthony Bezina, the Burlington facility plant manager. "We are using intelligent manufacturing techniques, which include efficiencies in equipment layout and automated solutions to help increase productivity and to become more competitive."

In addition to selling the new MCCs in Canada and the United States, Siemens has identified the potential of additional export business. The MCCs are assembled using products meeting IEC standards, which opens up a global market. "Our decision to bring the production line to the Burlington facility was based on a number of factors, the most important being the trained and skilled labour force Siemens has in place. We are pleased to maintain and grow the employment in our Burlington facility during these tough economic times," said Myny.

For photos from the event, and soon-to-be-released video footage, visit www.EBMag.com and click PHOTO Galleries.

It is with sadness that EBMag announces **the passing of Jim Sinneave, owner of EECOL,** on September 4 at the age of 80. Jim was born in Regina, Sask., on September 4, 1929. On June 4, 1949, he married Marion, and together they made their home in Regina. Jim began his career with EECOL Electric in Regina, working for many years within the company before becoming president and CEO. As owner of EECOL, Jim always remained active in the company, until his passing. Among other organizations across North America, he was an active supporter in his community, being a major contributor to the Children's Hospital Foundation. In 2007, Jim began the Sinneave Family Foundation to help people with autism. Jim is survived by his wife Marion of 60 years; daughter Debbie Foss; sons and daughter-in-law, Rob Sinneave and Rick and Brune Sinneave; as well as six grandchildren.

Brady Canada's Melanie Toulmin (www.brady-canada.ca) has been named branch development manager for Central/Southwestern Ontario. She joined the company over 10 years ago, holding the position of marketing/communications manager for the last seven. In her new role, Toulmin is responsible for new product launches, developing various promotional programs within branches, and delivering the communications of all Brady Canada business to distributors. EB

U of Calgary engineers suggest smart charging for plug-in-cars

A group of electrical engineers at the University of Calgary's Schulich School of Engineering conducted a study, and found plug-in hybrid electric vehicles (PHEVs) could release 40% to 90% fewer greenhouse gas emissions in Alberta than conventional passenger vehicles. The environmental impacts of PHEVs in Alberta would depend on factors such as vehicle battery size, battery charging time and wind production levels.

The research of professors Hamid Zareipour, Bill Rosehart and PhD candidate Mahdi Hajian was presented at the Institute of Electrical and Electronics Engineers (IEEE) Power & Energy Society General Meeting in Calgary.

They say Alberta needs 'smart' charging systems to make the most of Alberta's wind resources. Infrastructure would include technology with communication links to allow system operators to distribute electricity to vehicles when wind power production is at its highest, usually at night.

Optimal use of clean energy is especially important in Alberta, say the researchers, because it uses the highest amount of thermally generated power in Canada. More than 90% of electricity in Alberta is produced by methods that emit greenhouse gases: burning coal, oil or natural gas.

Smart charging systems would also help the power system handle the increased demand for electricity resulting from widespread adoption of hybrid cars. Cars would be charged outside of peak demand times to avoid overloading the grid. EB

VISIT EBMag.com
and click **Calendar** to see an extensive list of upcoming events.

You may have noticed this VIDEO ICON (the movie camera) in the pages of Electrical Business and wondered what it's all about. Wonder no more! When you see the VIDEO ICON next to an item in the magazine, it means there is an associated video on our website. Be sure to check it out!

Visit www.EBMag.com and click VIDEOS.

National Forum on Workplace Electrical Safety
CSA
November 2, Halifax, N.S.
November 5, Ottawa, Ont.
November 16, Regina, Sask.
November 19, Calgary, Alta.
Visit learningcentre.csa.ca and click Electrical

2009 Canadian Electrical Code Essentials
CSA
November 3, Mississauga, Ont.
November 16, Halifax, N.S.
November 23, Vancouver, B.C.
November 26, Red Deer, Alta.
December 3, Sudbury, Ont.
December 7, Markham, Ont.
Visit learningcentre.csa.ca and click Electrical

Networking Luncheon: Tom Mitchell (Ontario Power Generation)
Ontario Energy Network (OEN)
November 9
Toronto, Ont.
Visit www.ontarioenergynetwork.com

APPrO 2009: Canadian Power Conference
Association of Power Producers of Ontario (APPrO)
November 17-18
Toronto, Ont.
Visit conference.appro.org/conference2009
** See the APPrO ad Page 31*

Construct Canada Trade Show
December 2-4
Toronto, Ont.
Visit www.constructcanada.com

Solar Conference 2009
CanSIA (Canadian Solar Industries Association)
December 7-8
Toronto, Ont.
Visit www.cansia.ca/2009CanSIASolarConference

2010

Networking Luncheon: Paul Murphy (Independent Electricity System Operator)
Ontario Energy Network (OEN)
January 12, 2010
Toronto, Ont.
Visit www.ontarioenergynetwork.com

PowerTest 2010 Electrical Maintenance and Safety Conference
NETA (InterNational Electrical Testing Association)
February 15-18, 2010
Long Beach, Calif.
Visit www.powertest.org

Electrical Learning Expo
Alberta Electrical League (AEL)
Date TBA
Calgary, Alta.
Visit www.elecleague.ab.ca

The Work Truck Show
NTEA (National Truck Equipment Association)
March 9-12, 2010
St. Louis, Mo.
Visit www.ntea.com

Electrical Safety, Technical and Mega Projects Workshop
IEEE IAS (Industry Applications Society)
March 29-31, 2010
Calgary, Alta.
Visit www.ieee.org/estmp

Upper Midwest Electrical Expo
North Central Electrical League (NCEL)
April 14-15, 2010
Minneapolis, Minn.
Visit www.ncel.org

International Open Shop Contractors Conference
April 29 - May 1, 2010
Kelowna, B.C.
Details to come

MEET Show
May 5-6, 2010
Moncton, N.B.
Visit www.masterpromotions.ca/meet.asp

Annual Conference
Electro-Federation Canada's (EFC's) Supply & Distribution Council (S&D)
June 2-5, 2010
Kelowna, B.C.
Visit www.sndconference.com

Annual General Meeting
IED (Independent Electrical Distributors)
June 14-16, 2010
Jasper, Alta.
Visit www.ied.ca

Annual Conference
Electrical Contractors Association of Ontario (ECAO)
June 23-27, 2010
Kingston, Ont.
Visit www.ecao.org

CUEE (Canadian Utilities Equipment & Engineering) Show
September 14-15, 2010
Mississauga, Ont.
Visit cuee.ca

In the rush to label everything,

is anyone doing an arc flash analysis?

By Ron Bergeron, P.Eng.

Nowadays, arc flash is the hot topic in safety, with a lot of advice and information being disseminated in articles, courses, software, etc. And while it is clearly a part of CSA Z462, "Workplace Electrical Safety", practically nothing is being said about preventive maintenance for switchgear.

CSA Z462 states in Annex B: "Studies by the Electrical Safety Authority of Ontario indicate that 66% of safety incidents can be attributed to maintenance-related issues". At the CSA electrical conference in Toronto last fall, speakers noted (from field experience) that, where switchgear had not been maintained, 10% of breakers would not operate and 35% would not be within parameters.

This is close to the data given by CSA Z462... "A survey performed by the InterNational Electrical Testing Association (NETA) in October 2007 indicated that 22% of service-aged circuit breakers had some type of malfunction, and 10.5% did not operate at all during maintenance testing..."

Few establishments have performed any preventive maintenance on their switchgear from the time it was installed. This means that doing an arc flash analysis (AFA) is a waste of time and money; worse, it provides a false impression of safety.

Analysis and costs

The following conversation happens all too often. A maintenance supervisor will call me up and say:

Supervisor: We have been made aware of arc flash. Can you tell us what clothes to wear?
ME: That's the *last* question. You need to look at putting labels on all the gear.
Supervisor: Can you come out and put labels on?
ME: Yes, we can, but that first requires an arc flash analysis.
Supervisor: How much does that cost?

Once he gets this answer, the conversation grinds to a halt. After a long pause, the supervisor says, "I will have to bring this to management". In most instances, nothing ever happens.

While it's good that the message of protective clothing and other PPE (personal protective equipment) is reaching the masses, it has also diminished the overall and fundamental problem of arc flash.

An AFA costs money: a small plant (i.e. 1000kVA substation connected to the utility grid with only a few points [600/347 secondary]) will cost somewhere in the neighbourhood of $8000. That same plant with 200-odd points will probably cost around $22,000. This includes the analysis, labelling and basic staff training. Add another $2000 for additional training required by the electricians on staff. A coordination study adds a few more thousand dollars.

Preventive maintenance

Now comes the hard part:

ME: You require preventive maintenance on your switchgear breakers before we do the analysis.
Supervisor: How much does *that* cost?

Once they hear *that* answer, it is unlikely that anything will move forward. The older the gear, the more expensive it is to perform maintenance; it can run in the tens of thousands of dollars.

After shutting off the power in one establishment, for example, three breakers would not turn back on. It cost about $30,000 to replace them. That was only for the three we tried: management did not want us to try any others. This particular place also had other odd things going on: the GFI on the main breaker was disconnected, and the white wires were connected to the ground bus. The system, as we discovered, was delta! You can see the number of things that may have to be fixed before anything else can be done.

Public safety

Before any arc flash analysis, the electrical system needs to be properly operational, with all wiring and grounding examined to ensure it meets code. When we conduct an AFA, we scrutinize everything (i.e. breaker details, wire size and length, transformer impedance, etc.), and we have a responsibility to report: we cannot turn a blind eye to code violations. Public safety is paramount.

CSA Z462 states: "Employers shall implement and document an overall electrical safety program..." (4.1.7.1). Such a program includes safety-related work practices. Annex E of CSA Z462 outlines 10 principles, nine controls and 12 procedures. This takes time and effort to accomplish... and dollars are associated with all of it. The cost of this safety program—including preventive maintenance and repair to switchgear, updating drawings, working to code, analysis updates and more—will make it cost prohibitive for many organizations. Without legislation to force the issue, most establishments realistically will not spend the money on the total package.

There is a rush, however, to put stickers on things. All this does is create an illusion of safety.

When the actual gear in the field does not match the theoretical computer analysis, the analysis is considered incorrect. In the interest of public safety, we are obliged to say the following when companies show an interest in arc flash analysis:

A. An arc flash analysis will be conducted provided the following conditions apply:
- There is proof of preventive maintenance on the switchgear.
- All items found to be contrary to the electrical code will be brought up to code.

B. To paraphrase CSA Z462 4.3.3.1, this study is a static view of the plant electrical system on a specific date. To maintain the relevance of the study, several things are required:
- A preventive maintenance program to ensure all current interrupting devices operate within prescribed tolerances.
- The AFA must be updated after additions and/or modifications to the electrical system.
- The AFA must be reviewed periodically (never more than five years).

When you take all this into consideration, it's clear that the cost of the initial arc flash analysis is the least of the expenses. However, an AFA is useless unless executed properly in all its dimensions. After all, neatly printed labels won't make the equipment any safer. EB

An electrical contractor since 1971, Ron Bergeron is a professional engineer, master electrician and MBA grad. He has been an OEL member for 37 years, including a term as a board member. Ron was involved with ESA on various councils from 2000-2008. In 1990, he received the PEO Citizenship Award for Ontario in recognition of his community involvement. Ron has continued with volunteer service, including six years as vice-chair and chair of the local utility company, Cornwall Electric.

By Dave Smith

Open season on pranksters

My older brother Frank received a horrible shock across his chest in the ninth month of his electrical apprenticeship. His chest was hammered, and his heart felt like it was going nuts. As he was sitting, winded, wounded and scared, his journeyman came around the corner from where he had cycled the circuit breaker to see how his apprentice enjoyed his 'initiation' into the electrical trade.

Frank left work that day and never came back, the memory of that incident still vivid in his mind 40 years later.

In the second year of my apprenticeship, my journeyman pulled the same stunt, but the shock was just across my right hand. It's amazing the extent of pain and fright caused by 120vAC running amok across your nerves and muscles.

It is mind-boggling and amazing to think that these pranks were actually pulled off by our journeymen—the people to whom we were indentured. Then I learned that pulling these kinds of dangerous stunts is actually a century-old tradition, bequeathed from one generation of electrician to the next.

EBMag's editor wrote about one such incident in Alberta in his "From the Editor" in the April 2006 edition. In that case, a worker had the leads of a megohmeter applied to his hands, which sent current racing through one of his hands to the other. Of course, that current passed through his heart along the way. The worker was young and in good physical condition, with no known previous cardiac issues, yet he was hospitalized and treated as though he had suffered a heart attack. He was eventually discharged from the hospital but *subsequently re-admitted* for further treatment and monitoring *due to continuing cardiac problems*.

According to Work Safe Alberta's "Workplace Health and Safety Bulletin", applying the leads of a meggar to an unsuspecting worker is known to occur in the electrical trade: typically to first-year apprentices as a kind of initiation.

It's bad enough inflicting pain on yourself (and we've all been buzzed at some point), but you have to question the sanity of some people when the pain is intentionally inflicted—especially by someone in authority.

At every course I teach to electrical workers, I ask: Who's ever had an idiot come up behind you while you were in a live panel and startle you? And, in every class, at least 80% confirm it has happened to them.

Many years ago, an electrician told me a story of a prankster who snuck up behind a 61-year-old journeyman tightening screws in a live panel, and startled him. Intent on his work, the journeyman—who was also a husband, father and grandfather—was so startled, he went into cardiac arrest and died.

Arguably, the prankster did not expect this outcome, but is there ever a 'right time' for pranks, especially when you consider the fact we work with lethal energy?

The time has come for this industry to mature to the point where immaturity of this kind is simply not tolerated, and grounds for immediate dismissal.

Health & safety is top-of-mind these days, which is where, incidentally, it should have always been; and not just because someone might take us to court, but because *it is the right thing to do*.

Not a person among us wants to be the one to send a coworker—perhaps our friend—to the burn unit or worse: the morgue. There's nothing simple about a 'small' shock. You have no idea what effect it will have on the prank's victim. Then there are the long-term health effects of being shocked, which are often completely misunderstood by the medical community.

We should all be helping one another work safely so we can all go home to our families and friends at the end of our shift. As for pranksters—whom every electrician, including me, has encountered—there should be a special season for them: somewhere between moose and deer, with *no bag limit.*

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) available to you. Feel free to use them to support your own safety program and other initiatives.

University of Alberta takes top marks in reflective retrofit

By Seth Warren Rose

Photos courtesy Relumen Engineering Inc.

With school colours of green and gold it's no wonder the University of Alberta sets the gold standard for 'green' lighting. As early as 1998, the university made the decision to save energy with a new lighting technology and set in motion a $25-million, seven-year lighting retrofit.

The breakthrough for the university began when it recognized that the ballasts in the library's luminaires were beginning to fail. In retrofitting the library with new fixtures, the university discovered that a new reflective material in the luminaires saved enough energy to pay for substantially improved lighting, campus-wide.

Better reflection for more light

What was unique about the university's library project was that it was one of the first in Canada to take advantage of a new Miro technology. A major feature of Miro is its total luminous reflectance of 95%, compared to 87% for conventional anodized aluminum strip. That, according to the German manufacturer Alanod, the maker of Miro—which boasts optimal colour rendering, and places nearly every photon of light exactly where the designer intended.

The optical technology was introduced to the University by Relumen Engineering of Edmonton, Alta. (www.relumen.com). Relumen was an early adaptor of Miro optical surfaces to maximize the efficiency of luminaires, says Wayne Rogers, a lighting consultant with Relumen, who discovered the technology while attending Lightfair in New York. Relumen was also the first to combine the even-more reflective Miro Silver with T5HO in high ceiling applications, harvesting yet more light.

Like most organizations, the economics of such projects are contingent upon payback. According to Mike Versteege, the university's energy management program manager, as long as a project could be financed through energy savings, it made sense.

Originally, the university worked on a 10-year loan schedule. But with labour rates increasing by 60% in 2006, project costs almost doubled. It became difficult to meet the 10-year financial criteria, so the university moved from a 10-year loan to a 15-year. It structured a seven-year program; each year borrowing 3.5 million dollars for energy management projects. Roughly 5 million sf of the university has now been retrofitted with the new lighting technology.

"We were able to do a lot of lighting retrofits under that model" says Versteege.

By and large, the university's older T12 luminaires were replaced with T8 electronic technology and specular Miro reflectors. Before the retrofit, the entire campus was mostly lit with 2- and 4-lamp 1x4 and 2x4 recessed T12 fluorescents. Some areas with high ceilings, such as the running track, had HID fixtures. According to the Eneref Group, using the right combination of lamp, reflector, optics and ballast could achieve 75% energy savings over older T12 systems.

For the library, Relumen developed a specialized stack fixture to punch light down to the bottom of the book shelves. The surprised students and facility were able to read book spines, even at the bottom shelves, for the first time. According to the university's senior systems engineer Dennis Gibeau, the combination of Relumen's parabolic design and the reflector technology was what delivered light all the way to the bottom of the narrow 4-ft aisles of books.

"The Miro reflector was definitely the key to maximize energy savings" said Gibeau. "You wouldn't be able to create the stack light without it. The bottom shelves are not dark and you can actually read the spine on the books."

Early on, at $0.05/kWh, payback schedules were tight. But once energy costs spiked to $0.10/kWh, justifying further lighting projects was somewhat easier. What also changed was the university's method of funding. Instead of capital funding coming from the university, project funding was borrowed from the future energy savings.

"This funding model freed up more opportunity to do projects" says Gibeau.

Soon after the library project was complete, the institution developed a $25-million, seven-year plan, or about $3.5 million dollars per year. Not all projects met the payback requirements. Some projects were much better than payback, and some not. Project averaging made loan repayment feasible.

"There were some really good projects and some others were just squeaking over," Gibeau says.

For the most part, Relumen designed three types of fixtures throughout the university, all of which use Miro technology: a recessed fixture for office T-bar environments; a surface-mounted wrap fixture; and a standard stairwell fixture. Relumen retrofitted close to 5 million sf of space with over 30,000 fixtures.

To assure consistent product availability for such a large lighting project, Relumen worked with Anomet to supply the optical surface materials. According to Nancy Dow, vice-president of Anomet, the use of Miro as a reflector material in luminaries "has steadily increased in Canada since 1996" because of its "proven performance" as an energy saver.

Other university projects

Two of Relumen's larger lighting projects for the university include the Phys Ed complex and Ag Forestry complex.

The 430,000-sf Phys Ed structure is made up of three buildings: East, West and Pavilion. Roughly 4000 new fixtures were installed in the Phys Ed structure. Relumen reports that 2,080,000 kWh are saved from the retrofit as the building went from an energy use of 662 kW to 306 kW. Despite the substantial reduction in energy use, the building saw a 20% increase in light levels—from about 45 fc to 55 fc.

And, of course, occupants enjoy the benefits of moving from T12 fluorescent with the 60 Hz flicker to T8 electronic technology. The new fixtures are closer to daylight, with an 85 on the Colour Rendering Index (CRI). (Daylight, by the way, has a CRI of 100. The older T12s had a colour rendering index of about 62 CRI.)

Until Miro was introduced, anodized aluminum and

Top left and right: Before and After installation shots at Rutherford library, University of Alberta. The lighting system offers more light and better colour rendering, giving students a better view of books.

Miro reflector lighting system at the Butter Dome Pavilion, University of Alberta.

white painted aluminum were the most common reflector material. "Specularity makes Miro unique among reflective materials", said Alanod's engineer, Matthias Weigert. Specularity is a material's ability to direct light exactly where the lighting designer points it. Older reflectors diffuse light, thereby wasting light on the walls and ceiling where it's not needed. Especially for high ceiling heights, lighting designers now look for materials that are nearly 100% reflective and highly specular to bounce light in the most efficient way possible.

But the Phys Ed's giant Butter Dome pavilion, with its 60-foot ceiling, is where the reflective technology really shines, so to speak. Relumen developed a unique luminaire for the dome; a rather tall order, since the dome required only 500 luminaires. But Rogers says Relumen is set up to work with small manufacturers who can "take our design and build what we want".

Relumen developed a 5-in. deep unibody reflector/luminaire to work with T5HO lamps and to project the light from the 60-foot ceiling. To form the body of the luminaire, Relumen cleverly used the Miro-Press reflector material in a heavier 0.032 gauge. Typically, in fixtures, the reflector material is 0.016 or 0.020 gauge.

"If we had not used the Miro material in a very specially designed reflector/luminaire we would not have been able to achieve what we did at these mounting heights," explains Rogers.

The Agriculture Forestry building saw similar energy savings, dropping from 621 kW to 230 kW, or 2,400,000 kWh saved, reports Rogers. The Ag Forestry building is a broad cross-section of classrooms, offices, laboratories, greenhouses and growth chambers.

After each retrofit, Gibeau says they worked closely with the occupants to make sure lighting quality had improved. After all, the objective was two-fold: save energy and improve lighting. Gibeau says that well over 95% of occupants were "very happy". A few complained that lighting levels were "too bright" or had "too much light". In those cases, the university made a lamp adjustment, since the next occupant in that office may prefer the light the way it was intended.

According to Versteege, "The fixture design and custom reflector material definitely drives significant savings. Whereas normally you would need two lamps, you only need one. We harvest the majority of the light".

As any top-rated university knows, it takes more than clever technology to be completely successful—it also takes teamwork. And Rogers explains that it was the team effort that helped make the project so successful. EB

Seth Warren Rose is the executive writer for the Eneref Group, which advances ecologically sensible building products (www.eneref.com). He has over 25 years of experience in marketing green building design and construction products.

It's your BUSINESS

By Ron Coleman, B. Comm., FCCA CMC

What is profit and how do you get more of it?

Critical success factors and key performance indicators

Part 3 of 3

Your Critical Success Factors (CSFs) are those things that must be controlled to make (keep) your business successful. They also have specific outcomes—set by you—to let you know whether you are achieving your target. They cannot, however, be managed because they are not 'activities'.

You see, to achieve a specific CSF, you must first identify the activities that make up that CSF. These are your Key Performance Indicators (KPIs), and they can be both measured and managed.

So, what factors do you need to get right in your business to be successful?

1. Sales. How much?
2. Profits. What percent of gross profit? What percent of pre-tax profit?
3. Cash flow. What are your limits?
4. Marketing. What products/services/customers are your 'A' priorities?
5. People. How many do you need in each area?
6. Communications. How/when do you get the word out, both internally and externally?

All these Critical Success Factors have measurable outcomes. You must develop your own CSFs, followed by Key Performance Indicators that will help you manage and measure success.

Example

CSF: To not exceed Line of Credit of $200,000.

KPIs:

- Accounts receivable: must be under 45 days.
- Payroll: no more than 30 people on the payroll in any one month.
- Accounts payable: must average greater than 30 days.
- Inventory: level must not exceed $80,000.
- All new capital assets must be financed 100%.
- *Any other items that would impact cash flow? Loan repayments? Holdbacks?*

Once you have established these Key Performance Indicators, you just need to get—and review—weekly reports. When all KPIs fall in line, you know you're in good shape. Whenever they're out of line, you know you are headed for trouble.

Table 1 shows examples of Key Performance Indicators for each of the seven Critical Success Factors I identified above.

TABLE 1

	Target Range	Company Actual	Rating
1. Sales			
a. Proposals outstanding			
b. Closure percentage			
c. Work on-hand			
d. Average sale			
e. Product upselling / change orders			
f. Classifying A, B, C, D customers – dentify percentage in each category			
g. Incoming phone calls			
2. Profits			
a. Labour			
i. Field office ratio			
ii. Unapplied time			
iii. Budget to actual			
iv. Average hourly rate			
v. Callbacks			
vi. Dollar sales generated per hour			
vii. Warranty calls			
viii. Service to install labour mix			
ix. Percentage overtime			
x. Sales per employee (team member)			
b. Materials			
i. Budget to actual materials			
ii. Mark-up percentage			
iii. Labour-to-material ratio			
iv. Waste factors			
v. Inventory control			
3. Cash flow			
a. Current ratio			
b. Acid test ratio			
c. Working capital turnover			
d. Age of receivables			
e. Age of payables			
4. Marketing			
a. Cost per lead			
b. Return on advertising – lead tracking			
c. Coupon redemption			
d. Store traffic			
e. Enquiries – Quotes			
f. Percentage of business from repeat customers			
g. Percentage of business from new customers			
h. Marketing cost as a percent of sales			
5. People			
a. Training			
b. Performance evaluations			
i. Set goal			
ii. Review progress			
iii. Identify strengths and weaknesses			
c. Team Meetings			
6. Communications			
a. Newsletter			
b. Customer feedback			
c. Customer complaints / compliments			
7. Fun			
a. Contests			
b. Social activities / club			
c. ClimateCare meetings			
d. Christmas Party / special events			

TABLE 2: This chart shows how one contractor monitored his sales

Method of forecasting sales								
All figures $000s								
Value of Planned Maintenance work (PM)		$ 1,000						
PM scheduled in advance monthly								
We know from our history that replacement systems represent 30% of PM work								
We acquire 15% new customers and lose 5%								
		1	2	3	4	5	6	**Total**
Planned maintenance		105	85	40	45	95	110	**480**
Replacement systems	30%	32	26	12	14	29	33	**144**
Acquisition of new customers	15%	16	13	6	7	14	17	**72**
Defections	-5%	-5	-4	-2	-2	-5	-6	**-24**
Net service/replacement work		148	121	59	67	138	160	**672**
Work on hand, not started	$ 600	25	50	75	125	125	125	**525**
Work in progress - jobs started	$ 200	75	50	50	25			**200**
O/S bids (15% conversion)	$ 5,000		50	75	90	100	100	**415**
Projected bidding (15% conv.)	$ 1,500				50	75	90	**215**
Projected sales for next six month		**247**	**269**	**256**	**353**	**433**	**469**	**2,027**
Target level	**$1,500 – $1,800**							
What's my best strategy for handling this work load, which is higher than our capacity?								

Ron Coleman is a member of the Institute of Certified Management Consultants of British Columbia. A noted speaker, he has completed many interfirm financial comparisons of groups of construction companies in Canada and the United States. Ron's numerous published education programs include a 36-hour business management course specifically designed for ECABC. He is also author of the book, "Your Million Dollar System: How to Increase the Value of Your Construction Business by One Million Dollars in Three Years". Visit www.ronaldcoleman.ca.


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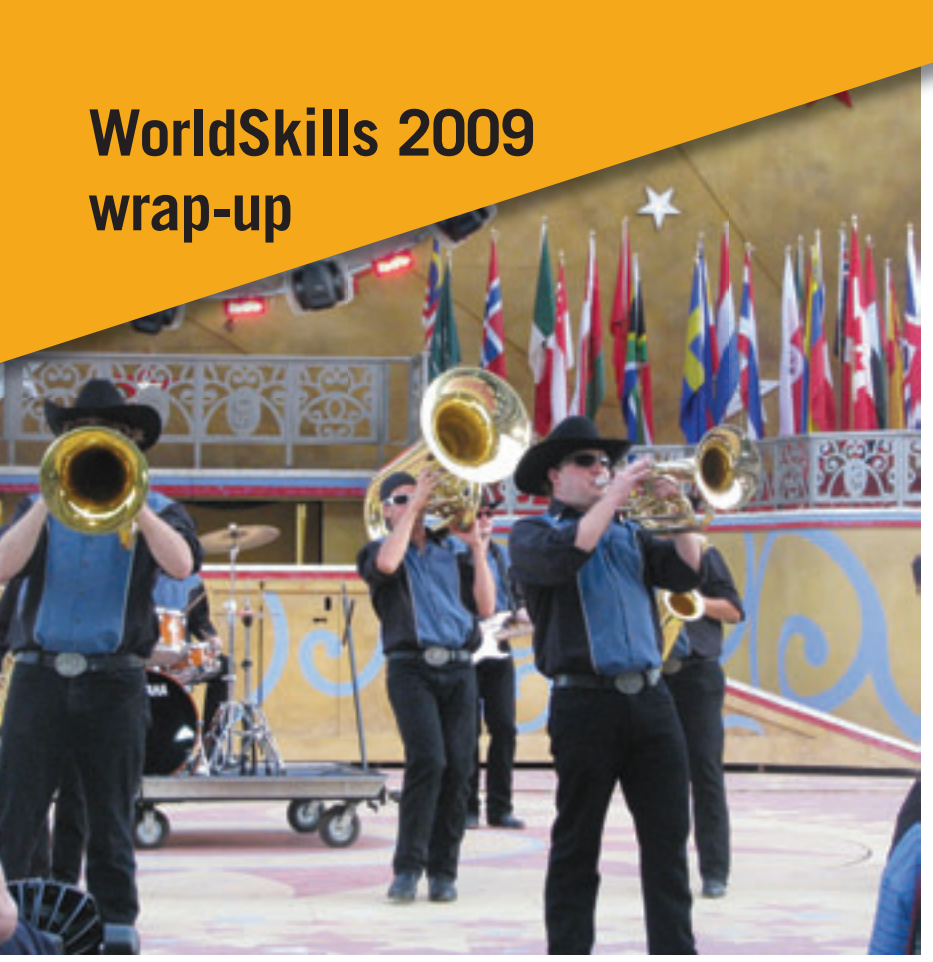

The Olympics for the skilled trades has come and gone

By Carolyn Yates

From September 1 to 7, competitors from all over the world flocked to Calgary, Alta., for WorldSkills 2009. The event had over 1000 of the world's top students and apprentices—aged 17 to 23—competing for Gold, Silver and Bronze medals in their respective fields, which spanned trades, services and technology from Electrical Installation and Information Network Cabling to Industrial Control.

Team Canada walked away from the competition with eight medals and 12 medallions of excellence. This year, the team boasted 38 competitors competing in 35 contest areas. The lead-up to the competition involved an expert-driven training program that incorporated training from both a competition expert and an individual who works with the competitor on a local level.

"There are a lot of variables that fall into play, with equipment and familiarity with equipment and scheduling, and how our young people handle the stress," says Shaun Thorson, executive director of Skills Canada. "We're just looking for them to do their best on the competition day. If they end up winning a medal or being recognized with a medallion of excellence for their performance, then that's kind of a bonus."

The focus on education

But the competitions themselves are just one of many facets to this Olympiad of skills. One other important facet is that of education and promoting awareness about the skilled trades. WorldSkills was promoted through every school in Alberta, and many school boards pushed the first day of school up several days to be able to send classes there on field trips.

"It's a great tool for the promotion of skilled trades and technology occupations," says Thorson. "Not only a great experience for the competitors but, more importantly, a great experience for the young visitors that will come to the competition site and see young Canadians competing at a very high level on very complex projects."

Over the course of the four-day event, close to 100,000 young people walked through Stadium Park and had the opportunity to see 45 careers in action. The competitions are, in most cases, viewable from four sides, allowing the public a glimpse into the workstations and into what the competitors are creating.

"We want [young people] to understand that these are good career choices," says Brian Pardell, vice-president of operations for WorldSkills Calgary 2009.

The green aspect

One of the elements introduced to this year's competition was a focus on sustainability and the

STEPHEN DINGWALL of Calgary competed in the Industrial Control arena. He was drawn to the trades because he desired something that challenged him both mentally and physically. He is currently working as a fourth-year electrician.

DANIEL REID of Cochrane, Alta., competed in the Information Network Cabling arena, and is currently studying telecommunications systems at the Southern Alberta Institute of Technology (SAIT).

CRAIG SPADY of Red Deer, Alta., represented Canada in the Electrical competition. He's enjoying his career as a journeyman electrician, and has achieved his interprovincial Red Seal designation.

VISIT EBMag's Videos page at www.ebmag.com (click Videos) to find EBMag's Carolyn Yates' WorldSkills report, on location in Calgary.

WORLDSKILLS QUICK FACTS

- 1000 competitors
- 38 Canadian competitors
- 51 countries
- 45 skills competitions
- 5000 international experts, delegates and judges
- 30 languages
- Over 861,000 sf of competition space
- 150,000 students and public spectators

"We want young people to understand that these are good career choices."

environment. Improved recycling and disposal programs—both for the competition grounds and the competitions—were a priority, and one that WorldSkills organizers hope to carry into the future.

"We maintain a green environment for the event. We have a lot of pieces for the event and we want them to have a life afterward. For some of our events, the project that competitors are building are going to be given out to different charities in Calgary, so that we don't have this great chance to build these projects [only to] throw them in a landfill," Pardell explains.

"Our organization has taken a stand to ensure that this competition comes off [as environmental and sustainable] and, as the host organizing committee, we've also tied in with WorldSkills International (the parent group) to ensure that they understand that by doing things a little differently [...] we have this ability to create an environmental or a green competition, and build on that from year to year," says Pardell.

He hopes that individuals—both in and out of the skilled trades—will learn by example. "Just because it's a trade-related field doesn't mean you can't consider it a green one as well."

London 2011

The next WorldSkills will be held in 2011 in London, England, and organizers expect it to surpass the already-high standard set by the Calgary competition.

"The best thing to do is look at what's happened in Calgary. They've raised the bar significantly and we want to raise it further still. We want to build on many of the things that have happened in Calgary and make it even better," says Aidan Jones, executive director for WorldSkills London 2011.

Similar to this past event, attracting and educating young students will continue to be a priority. The event will also continue to have Ambassador Booths at each competition, where visitors can meet with practitioners of a trade and learn more about it.

"We expect a lot of schools to come through and learn [...] about vocational skills and vocational career choices," Pardell adds.

"I think the event itself, in terms of the competition, is very important because it highlights the excellence in skills and really sets benchmarks for quality," adds Jones. "But I think, apart from the competition, it's also really important to use the event as a way of getting messages across about the value of a trade as an alternative to going to university and just choosing an academic path." EB

Lighting design for safety and worker productivity

By David Herres

Sizing out and specifying lighting for dwellings (including guest rooms and suites in hotels and motels) is a simple, intuitive process—even for fledgling electricians. This is because we have lived our entire lives in dwellings and know by experience the amount of incandescent lighting required for various work and living areas.

It is a simple matter to provide three volt-amps per square foot of dwelling area, place one or more ceiling lights in each room with receptacles spaced according to applicable codes. With the addition of some modest kitchen task lighting, a residential design is almost complete.

A few features make for a better job. In new construction and remodelling, it is said that premium upscale lighting is the least expensive way to add value to a building. Consider what the addition of a few high-end outdoor fixtures can do for an otherwise nondescript building! Then there is the whole concept of low-voltage landscape lighting.

Notwithstanding these extras, residential lighting is not a big issue in the life of a practicing electrician. But when you get into the world of commercial and industrial lighting, let's just say it is not for the faint-hearted.

The trick with large facilities

In many of these venues, like a passive storage warehouse, lighting comprises a major fraction of the total connected load. If you did the electrical design for such an occupancy only to find out after the building was put into service that, for whatever reason, the lighting was insufficient, you might have to put in a bigger service and rework the entire electrical structure. Similarly, it is not at all good to overbuild because, in that instance, the owners are not getting good value for their money.

The larger the building, the more removed it is from everyday experience, especially in terms of lighting design. We cannot all become lighting design engineers overnight. But as we peruse the literature and become familiar with the terminology (lumens, colour rendition and the like) and sizing conventions, a good plan is simultaneously to enter this type of work in an incremental fashion, beginning with small retail operations and office situations before attempting a large manufacturing operation with high bay areas, telecom rooms and office space.

We have to recognize the fact that the electrician will not always influence the entire building design. Ideally, a new industrial location will have extensive skylights. Besides cutting energy costs, these simple architectural units provide a high quality diffuse light that has been found to vastly increase worker comfort and productivity. Employee accidents and errors are reduced while morale and loyalty increase. Unfortunately, by the time the electrician comes on the job, the building has exited the design stage. But it is still possible to influence certain other aspects of the finished product. One of these is interior painting. Ceiling and walls should be white (use matte instead of high gloss to minimize glare). The floor should be light coloured, low gloss. These seemingly minor building decisions can greatly augment good lighting choices to create a more comfortable and productive workplace.

Interior industrial lighting is conveniently divided into low-bay and high-bay, each of these requiring different design approaches.

Metal halide outdoor fixtures, like these parking lot lights, provide excellent colour rendition and enhance customer experience.

Photos by Judith Howcroft

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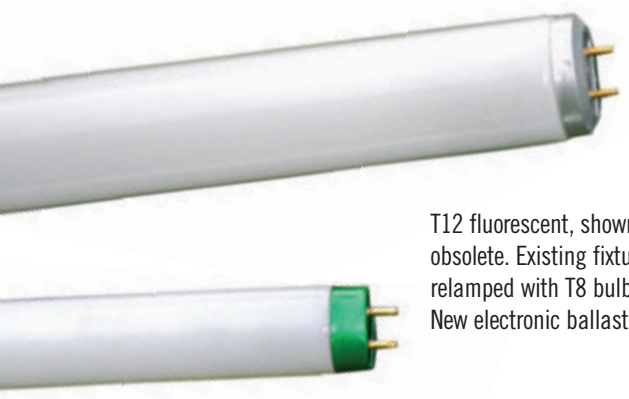
Fluorescent bulbs should be changed before blackening occurs, otherwise ballasts are damaged.



T12 fluorescent, shown at top, is obsolete. Existing fixtures should be relamped with T8 bulbs (bottom). New electronic ballasts are required.

Upscale interior lighting is an excellent investment in this commercial area.

When the ceiling height is less than 25 ft (with the fixtures typically hanging 3 ft lower), it is considered a low-bay workspace, while greater heights are high-bay. High-intensity discharge fixtures come in high- and low-bay versions. Low-bay fixtures provide a wider spread of light, usually 65° to 100°. The spacing is generally equal to the mounting height.

The other solution in a low-bay setting is to use linear fluorescent fixtures. In a remodelling job involving old T12 fluorescent fixtures, change them over to more efficient T8s. This involves changing the ballast. Ignore the old wiring and follow the wiring diagram on the new ballast. The sockets are the same and don't need to be changed.

As a fluorescent bulb ages, it produces more heat and less light. It also draws more current, which burns out the more expensive ballast. As such, fluorescent bulbs should be changed well before they fail completely. Large facilities have a fixed schedule for bulb replacement. A sign of aging is that the bulbs begin to blacken at the ends. They should be changed before that becomes pronounced.

Besides fluorescent, 250W metal-halide low-bay open or prismatic glass reflectors are appropriate for ceiling heights under 25 ft.

The high-bay setting is a whole different world. Because of the greater distance, task lighting assumes a greater significance—both in terms of cost savings and from the point of view of worker comfort and productivity. What this means is individual lighting, usually fluorescent strips, directly above or behind glare-defeating valances at each workstation.

Lighting types used in a high-bay setting are 400W and 250W metal halide, prismatic reflector, or 4-ft, two-lamp T8 fluorescent pendant reflector, or 4-ft, one-lamp T5HO fluorescent pendant reflector.

The T12 fluorescent with magnetic ballast is pretty much obsolete for interior lighting, because it is less efficient than its counterparts (less light per watt), boasts 60Hz hum and flicker, and mercury vapour with poor colour rendition.

Developed in the 1960s, metal halide achieves excellent colour rendition, and is appropriate for both interior and exterior work.

Lighting design objectives

Of course, a key design objective is to provide comfortable, productive light at minimum cost to the owner. Proper switching and dimming capability are important ways to minimize energy use. Other strategies involve resisting the impulse to overbuild and to use the most efficient lighting available. (While we have not yet entered the LED era, there is no doubt it is the wave of the future.)

In approaching a new design, the first step is to ascertain the light level required, so a careful survey of contemplated usage is in order. What type of work will be done at the facility? A machine shop or art restoration studio requires much higher light levels than, say, a warehouse for storing boxed appliances. Ambient

Gasketed low-bay fluorescent lighting is appropriate in this laundry where severe moisture may be present.

Lighting control is vital for efficiency and economy of operation. A key element is the timer, which can be set to regulate lighting on a daily basis.

daylight via windows or skylights can reduce reliance on artificial light needs (thereby reducing energy use); however, it cannot be relied upon when the facility operates during hours of darkness.

In figuring the number and placement of light fixtures, local conditions must be considered. Special prismatic fixtures are available when the workplace is divided into longitudinal aisles, for example.

A great impediment to worker comfort and productivity is glare. This condition occurs when areas of excessive brightness impinge upon the field of vision, reducing perceptive functionality and, over a period of time, causing actual physical pain. The remedy is controlling glare by means of light placement and sizing and/or adjusting workstation positioning. Sometimes it is possible to defeat glare by reducing fixture wattage. Computers and control panels should be located so that the screens face away from light sources, including windows. Bright light fixtures can be raised so that the light is not directed into workers' eyes. A certain percentage of the light should be directed upward toward a lightly coloured ceiling so that it diffuses downward.

HID ballasts can create a strobe effect that is extremely uncomfortable—even hazardous—to some individuals. Additionally, it can make rotating machinery appear to stand still, which can cause worker injury. One remedy is to power adjacent lighting from different legs of a three-phase system so that the pulses cancel out. Another approach is to introduce T8 fluorescent lighting, which is powered by higher-frequency electronic ballasts.

If the organization has a safety officer, he should become familiar with lighting technology and be able to implement solutions to worker discomfort on a case-by-case basis.

Dealing with specific occupancies

Specific occupancies require individualized approaches when it comes to lighting design. A healthcare facility, classroom, retail store, manufacturing location and hazardous area all present different needs and challenges in terms of lighting design.

In the classroom, lighting specifications and layout are of great importance to the health and safety of teachers and students alike. Colour rendition and elimination of glare are prime objectives. The ubiquitous recessed parabolic 2x4 or 2x2 fluorescent panels are not ideal in this setting, since distracting shadows are often generated where they are least desirable—right on the desktop. At least some of the lighting should focus on the front of the room where teacher and board are located, which will also help minimize shadows.

In the classroom, it is helpful to use more fixtures of less intensity so as to create a diffused, relaxing ambience. Large variations in light cause fatigue and detract from the learning experience.

Lighting control is a whole area of expertise that needs to be incorporated into the lighting design. Occupancy sensors and timers are highly effective alternatives to manual switching, which can be neglected, and expected savings are never realized.

Do not neglect the emergency lights: these are sometimes excluded in the initial design and left to the installer. Location is of great importance. All public areas and means of egress should be generously lighted, with particular attention paid to any stairways or changes in floor level. Since a power outage and presence of dense smoke may accompany a fire, it is essential that abundant light from redundant fail-safe unit emergency lights be provided. Exit lights should never be positioned so as to mislead individuals in an emergency.

Good lighting design enhances worker comfort and productivity and contributes toward cost savings. Accident prevention and worker and public safety are moral imperatives as well. EB

Buying your next work truck (Part 2)

Chassis selection

By Robert C. Johnson

A qualified truck sales rep will be able to take the information you've provided to put together a recommended chassis package... They should be able to provide you with both full performance projections for the truck and the projected loads on each axle, based on the gross payload factor and weight distribution you provided.

Photo © GM Corp.

Last month (EBMag September 2009) I went through a process for determining the type of truck body and equipment you need to perform a specific job. I highlighted the importance of determining your job requirements before selecting the appropriate chassis, rather than guessing as to what kind of truck you need—then trying to make it work. Failure to do so often results in having a truck that is either too small (high maintenance costs and shortened life cycle) or too large (higher initial and ongoing operating costs).

You are the expert when it comes to determining the body and equipment you need for your business. Again, you can usually depend on your local truck equipment supplier for assistance.

Having gone through the body and equipment selection process, you are ready to select an appropriate chassis for your next work truck. But trucks are not your business so, at this point, I highly recommend you work with a qualified truck dealer for this part of the process. Before you talk to one, though, you should have an idea of the kind of chassis you want. Typical choices include: vans; cut-away vans with box bodies; conventional chassis cabs; and low cab forwards (cab over).

In some cases, the upfitting selections you've already made determine the type of chassis, but there is considerable playing room between cut-away vans, conventional chassis cabs and low cab forwards. When you're using a box body and want access between it and the cab, then a cut-away is probably your first choice. When excellent forward visibility and a short wheelbase are important considerations (typically inner-city applications) then a low cab forward may be your first choice. Otherwise, a conventional chassis cab will give you the most options when making your final selection.

Take control

When talking to a truck dealer, take control of the transaction. Many of them have stock units on the ground, and they will do their best to convince you that what they have in stock is the perfect truck. Instead, tell them you have already selected the body and equipment you want, and want their assistance in spec'ing the perfect chassis to match. (That said, I'm not suggesting you refuse to consider a stock unit. If the dealer can demonstrate that it meets your needs—and offers you a good price—by all means, think about it.)

Be prepared to give the dealer the following information:

- Preferred chassis style.
- Total payload required for selected body, equipment and cargo.
- The back of-cab-to axle length (CA) required for the body you have selected. (Truck bodies are built in standard lengths to match chassis manufacturer's standard CA dimensions.)
- Centre of gravity for body as designed.
- Desired transmission.
- PTO requirements.
- Overall length constraints, if any (may force you to a low cab forward).
- Preferred engine type (gasoline or diesel). Not always an option.
- Any other special requirements as identified by the selected equipment manufacturer, such as minimum frame ratings.

Is the sales rep qualified?

An experienced truck sales rep will be able to take the above information and immediately start working up a recommended chassis. They should ask you questions about: desired truck performance (i.e. startability, gradability, road speed, etc.); desired truck driving range (impacts fuel tank capacity); and various options, such as brake system design (i.e. hydraulic, air-over-hydraulic, straight air). They should also ask you about your expected duty cycle and projected truck life.

Again, you're not a truck expert. You just know what you want. When you don't understand what they mean by some of these items, ask them to explain in terms you can understand. They should also be prepared to make recommendations on items such as startability and gradability. Factors such as road surface conditions (pavement, sand, mud, etc.) and application requirements, like towing a trailer, will impact the recommended startability and gradability ratings. If they don't ask for this kind of information, you should consider seeing another sales rep.

While answering these questions, take time to tell the sales rep about any issues or problems you've had with your existing truck(s). They can use this information to help determine the proper specs for your new ride.

Putting it all together

A qualified truck sales rep will be able to take the information you've provided to put together a recommended chassis package. Most, if not all, truck manufacturers provide their dealers with computer programs that identify the best components for a truck based on inputted payload and performance criteria. They should be able to provide you with both full performance projections for the truck and the projected loads on each axle, based on the gross payload factor and weight distribution you provided.

If you are looking for a light-duty truck in the Class 2 through 4 ranges (6001 lb to 14,000 lb) your options will be limited in terms of engine, transmission, axles, etc. In addition, these trucks are typically sold at car dealerships, so the sales staff may not be trained in selling work trucks. As a result, you may have a problem finding someone who can really help you select the proper truck for your application. Again, if the sales rep does not seem to understand trucks, ask for a qualified salesperson.

Some things to look for

Once the sales rep has given you a proposal, look it over carefully to ensure that none of the axles are overloaded, and that none of the limiters you previously identified—such as total truck weight or length—are exceeded. As a general rule, the front axle should not be loaded more than 90% to 92% of its rated capacity, and the rear axle(s) should not be loaded to more than 95% (in a worst-case scenario).

Make sure the proposed chassis has the required 'clear' CA dimension. On any truck, the overall CA length and the 'clear' or 'usable' CA are not the same, due to intrusions by the engine/transmission (common on low cab forwards) or by the exhaust when it is vertically mounted behind the cab. (Exhaust intrusions on diesel-powered trucks are a major issue, since the exhaust system on diesel trucks equipped with the most recent emissions systems cannot be moved or modified.)

Other potential clearance issues on larger trucks include the location of fuel tanks, frame-mounted battery boxes, and air tanks. These items are usually not an issue when the body you're considering is mounted above the frame rails (flat bed or box body), but there may be interference issues when you are considering a service body. If you are planning on operating an auxiliary engine, like a welder or generator, check to see whether the truck's fuel tank is equipped with an auxiliary fuel tap. If not, it can often be added as option when the truck is ordered.

If you are planning on mounting equipment like a crane or aerial lift, ensure the proposed frame meets the equipment manufacturer's requirements. Likewise, if your proposed truck requires a transmission-mounted power take-off (PTO), make sure there is adequate room between the transmission and exhaust system. If the dealer is not sure, talk to your body dealer. They typically have access to information provided by the various chassis manufacturers.

This list is by no means all-inclusive, but it should give you an idea of the various kinds of things you have to keep in mind.

Take the time to do it right

The process I've described takes a lot of time and effort. However, a new truck is a significant investment, and you'll have to live with your decision for some time. Take advantage of the resources available to you through your body and equipment suppliers, qualified truck dealerships and trade associations like the National Truck Equipment Association (NTEA) and the Canadian Transportation Equipment Association (CTEA). Also, don't forget that you can learn a tremendous amount about what kind of truck bodies and equipment are available by attending both industry-specific and general truck equipment industry trade shows. EB

Bob Johnson is director of fleet relations with NTEA (National Truck Equipment Association, www.ntea.com), and possesses more than 40 years of experience in utility fleet and heavy equipment maintenance and design. He holds a degree in mechanical engineering, an MBA in general management, and has completed numerous special training programs provided by various OEMs and component manufacturers. He can be reached at bobj@ntea.com.

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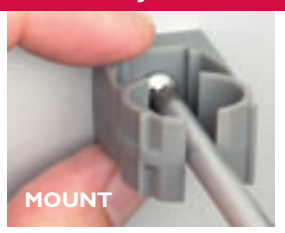

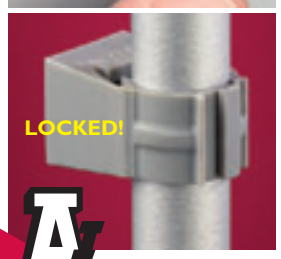

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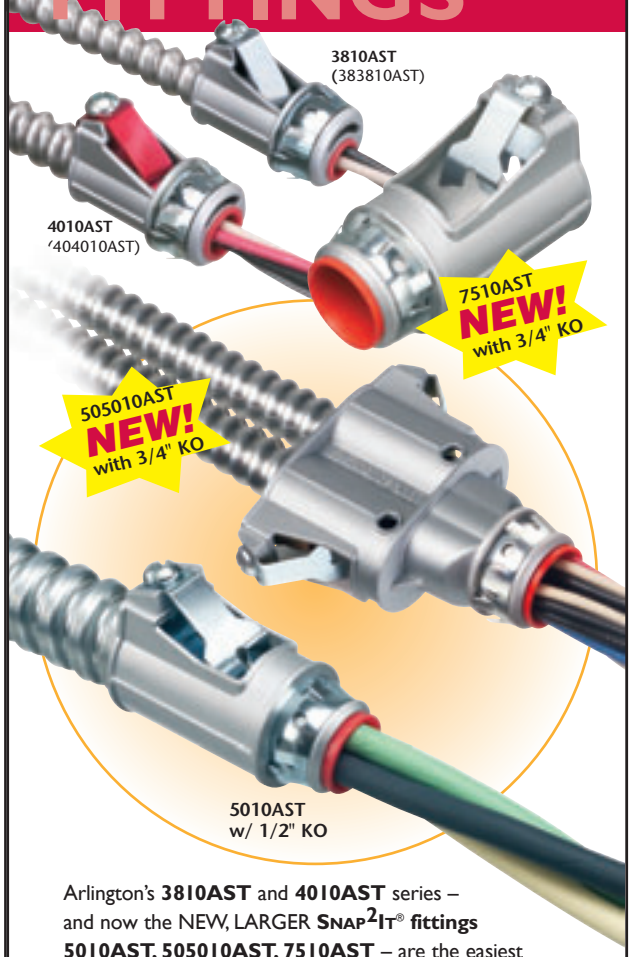

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4 Add bracket to inside of box.

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(Left) **Front row, L-R:** Genevieve Roldan, Andrea Halpin, Colin Ray, Lee "Hackman" Breton, Bill Craig.
Back row, L-R: Andy Canalichio, Darcy Baskin, Gerry Ouellette.

(Below) Lee with one of the children (Ryan) at Roger's House. Lee is holding a craft that Ryan had completed earlier in the week—his version of a Roger Neilson tie. (Roger Neilson was famous for his flashy ties; in fact, there are several on display around the house.)

Ottawa Senators exhibition hockey game against the Montreal Canadiens.

The Hackman Cometh

Lenox's Lee Breton dismembers Zamboni for Roger's House Charity

By Robert Russell

The Lenox Industries Hackman World Tour made it's second of only two Canadian stops the week of September 14 in Ottawa, Ont., which culminated in the original Hackman himself, Lee Breton, cutting an iconic, signature-covered Zamboni in half using Lenox T2 reciprocating saw blades. EBMag was invited to swing by and take in the action.

(To the uninitiated, this feat may not seem all that impressive but, bear in mind, this particular Zamboni was built in 1964 on a sturdy Jeep chassis with 1/4-in. steel throughout the body structure.)

Over the course of the week, members of the Hackman team encouraged area residents and visitors to sign the Zamboni, which was on display in and around the Ottawa area. For each signature, Lenox promised to donate $1 to Roger's House charity on behalf of The Sens Foundation (up to a maximum of $10,000).

Roger's House is a freestanding, eight-bed palliative care facility on the grounds of CHEO (Children's Hospital of Eastern Ontario) for children with progressive life-limiting illnesses. The Sens Foundation, which uses the resources of the Ottawa Senators hockey team to help youth in the Ottawa region, is a major supporter of the charity, and is dedicated to annual donations in the range of about $300,000.

Breton and the rest of the Hackman team were on-hand at Roger's House on September 18 to meet with some of the kids and tour the facilities.

When all was said and done, Lenox had collected the requisite 10,000 signatures on the Zamboni and, before firing up the reciprocating saw on September 19, presented Roger's House with a cheque for $10,000 during the second intermission of the

The technology behind Lenox's new T2 reciprocating saw blades delivers up to 100% longer blade life and 25% faster cutting performance in metal cutting applications, boasts Lenox, due to optimized tooth geometry for each TPI (tooth per inch) specification. This patent-pending technology results in minimized heat build-up that, in turn, eliminates premature tooth dulling and blade failure.

That technology was put to the test in front of a crowd of hundreds when Lee "Hackman" Breton amazed hockey fans by cutting through 6400 lb of steel Zamboni in—get this—just seven minutes and 47 seconds!

Whenever somebody signed the Zamboni, they were asked to fill out a ballot with their guess as to how long it would take The Hackman to dispose of the machine. Early guesses had the cutting time anywhere from 45 seconds to 90 minutes, but the winner was Seamus McLaughlin, who thought The Hackman would be able to get through the steel skin in seven minutes and 46 seconds. For a guess a mere second off the actual time, McLaughlin won himself a Lenox tool bag, filled with over $550 worth of Lenox products, including: HT50 hacksaw frame; locking tradesman knife; retractable utility knife; 656G and 618G Gold, and 966R reciprocating saw blades; 1-in. Bi-Metal utility bit; 9-in-1 multi-screwdriver; nut driver set; and more.

Breton, who has been cutting various items in half for over 28 years under the Hackman name was also unsure of just how long it would take him to cut through the tough skin of the Zamboni. When asked, he chuckled, and said, "I don't know... I really have no idea. That's a good question."

The Hackman has cut everything from cars to double-decker buses to two-bedroom houses using the latest Lenox cutting tool technology. His fastest cut was a car, which took him an amazing mere 36 seconds to cut through. The longest was a house, which took him 1.5 hours to dispose of. When he started out as Hackman nearly three decades ago, he was using just a hacksaw, doing all of the cutting by hand.

New guy on the block:

The Running Man

By Linda Menheere

Consider the languages spoken in Canada, and consider that Allophones (people whose mother tongue is neither English nor French) represent one-fifth of our population. Over six million people fall into this category yet, as a population, we continue to operate within the context of our two official languages. And, as an emergency lighting manufacturer, we continue to produce EXIT or SORTIE signs.

However, the emergency lighting world is on the brink of another revolution! The first, back in 2007, saw our industry eliminate incandescent lamps from its products, making the switch to 'green' LED technology. The second is now in the works: plans are underway to amend the 2010 National Building Code (NBC) to include The Running Man for egress lighting.

Who is The Running Man, you ask?

The "Running Man" was introduced to the 9/11 Commission by the European ISO committee who had been working on standards for egress for the European Common Market. The Running Man has become an international symbol of emergency egress throughout Europe, and the NYC Building code represents the first time his image will be mandated in the United States.

Plans to adopt The Running Man into Canada's National Building Code will occur in January or February 2010. To make him official and a legal member of your next construction project, the provinces are required to adopt him into their provincial guidelines. You could see The Running Man as early as March 2010 if your province chooses to embrace him—and it likely will.

The Running Man is a fully opaque sign from head to toe, unlike existing products where only the letters are illuminated. He will meet a minimum size requirement, and offer a variety of directional indicators for egress. CSA C22.2 No. 141 will feature our new, hasty friend, along with traditional EXIT and SORTIE products, making available a variety of solutions for your next emergency lighting project.

Canada can finally standardize the look of its signage with its European counterparts while maintaining less than 5W per face. LED construction will once again make us even more efficient than Europe, with a similar sign built to Canadian energy efficiency standards.

Our six million Allophones will now identify the sign denoting the path of egress in the event of an emergency, should their province follow suit. A global and uniform egress message will prove beneficial for all. As an industry, we're proud to introduce this new member to our egress lighting family, and we hope to see him in a building near you soon. EB

Linda Menheere is the marketing manager at Beghelli Canada Inc., and can be reached at linda.menheere@beghellicanada.com.

Flexible solar strips light up campus bus shelter at McMaster

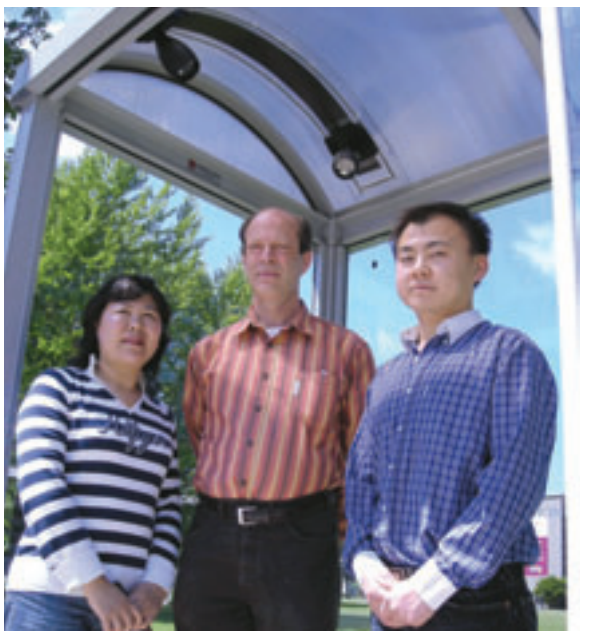
There won't be any more waiting in the dark at this campus bus shelter as new, flexible solar cell technology (developed by a group of engineering researchers at McMaster University) has been installed to power lighting for night-time transit users.

The researchers are also hoping that the prototype will help boost efforts to commercialize the new technology. The bus shelter is located on the west side of University Avenue between the John Hodgins Engineering Building and the Life Sciences Building.

"Our goal is to provide a clean, affordable power source for bus shelters that will let transit companies run Internet-based scheduling updates," said Adrian Kitai, a professor of engineering physics at McMaster who guided the project. "The solar technology can also be used to light up bus shelter signage and provide lighting for general safety."

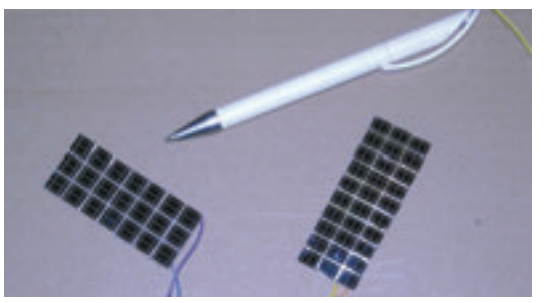
Interior daytime view of flexible solar strip designed by engineering researchers at McMaster with bus shelter lighting.

Interior night view of campus bus shelter with lights that are powered by batteries charged through a flexible solar strip designed by engineering researchers at McMaster.



Julia Zhu, Adrian Kitai and Wei Zhang developed flexible solar strips that are being used to power lighting for a bus shelter on the McMaster campus.

Exterior view of flexible solar strip designed by engineering researchers at McMaster on curved bus shelter roof.



These small silicon solar cells are similar to the ones tiled together to build the 90-cm long solar strips that power light fixtures in the McMaster bus shelter.

The flexible solar cell project started as a master's thesis for Wei Zhang, who subsequently worked as an engineer in the Department of Engineering Physics. Julia Zhu, a research technician in the department, and Jesika Briones, a Master's of Engineering entrepreneurship and innovation graduate, also helped develop the initiative.

The ability to bend the solar cells to fit the curved roof of the bus shelter is one of the main features of the technology. The flexibility is achieved by tiling a large number of small silicon elements into an array, mounting them onto a flexible sheet, and connecting them through a proprietary method. The two solar strips installed on the McMaster bus shelter are about 90-cm long and 12-cm wide. Each strip has 720, 1-cm square solar cells, and generates up to 4.5 watts of power.

With the help of Facility Services at McMaster, a solar strip was mounted at each end of the bus shelter roof and connected to two energy-efficient, multi-LED light fixtures. Each light fixture uses only 600 milliwatts of power, and produces about the same light output as a 3W regular tungsten bulb, or what a small night light would use. The lights are bright enough for easy reading.

The solar cells capture sunlight during the day and convert it to electricity to recharge batteries located in each lighting unit. The batteries can hold enough charge to light the shelter for the better part of a night.

The solar cell research team is monitoring the installation to determine how much solar power is required to fully recharge the batteries based on weather conditions. Winter months will be a particular focus as shorter and overcast days, snow and cold can affect the charging ability of the solar cells and batteries. EB

Molex portable Woodhead flood light

Molex says it has unveiled an industry first through its Woodhead product line: a hazardous location portable flood light. The worklight features two 300W halogen lamps that do not heat the enclosure above 160°C, a rubber (SOW) cordset and a hazardous location plug to provide optimum flexibility and portability in a multitude of applications, such as natural gas service utility locations, refineries, shipyards, fuel oil loading docks and petrochemical plants. The flood is CSA approved and complies with Canadian standards for methane atmospheres.

WOODHEAD
www.woodhead.com

Eye Lighting 400W metal halide pulse-start lamps

Eye's 400W MH lamp is rated for universal mounting, reducing inventory for both distributors and end users by eliminating different models for vertical and horizontal mounting. The lamp, boasts Eye, offers 7% more initial lumens in the vertical position and 11% more in the horizontal than competitive lamps. The company also claims the lamp delivers up to 21% more mean lumens, resulting in longer periods between re-lamping.

STANDARD PRODUCTS
www.standardpro.com

GE Energy Smart 7W PAR20 and 10W PAR30 LED lamps

GE Consumer & Industrial says its two new LED lamps—a 7W PAR20 and 10W PAR30—enable restaurants, retailers and other commercial customers to make significant strides toward general lighting with white LEDs. These ecomagination products are available as spots or floods, feature advanced optical control to concentrate the white LED light on the targeted area, says the company, and effectively diminish wasted extraneous light. Delivering halogen-like colour (82 Colour Rendering Index [CRI]), the 10W 3000K lamp produces 340 lumens and offers, claims GE, up to 80% energy savings.

GE CONSUMER & INDUSTRIAL
www.ge.com

Philips 600 lumen A-shape LED bulb

Fully dimmable down to 10%, Philips says its "next-generation" A-shape, prototype LED bulb delivers a high-performing package of lumen output and efficacy, colour and dimmability. Powered by Luxeon Rebel LEDs from Philips Lumileds, the 8W 120V bulb delivers 75 lumens per watt—five times the efficacy of an equivalent incandescent. The bulb is suitable for use in table lamps, overhead fixtures and other general indoor lighting applications. Philips' prototype is scheduled to be commercially available by late 2010.

PHILIPS
www.philips.com

Watt Stopper DLM distributed lighting control system

Watt Stopper/Legrand's Digital Lighting Management (DLM) is an all-digital suite of plug-together lighting controls that automatically configure to the most energy-efficient sequence of operation (based on components in the system). With DLM, each room or space in a building has its own control network where you simply connect room controllers, occupancy sensors, switches and photocells as needed. Plug n' Go technology (patent pending) recognizes what is connected and automatically configures the space. DLM uses Cat 5e RJ45 cables to connect room components. Room controllers drive the loads, and are available in one-, two- and three-relay configurations for On/Off switching or 0-10V dimming. The occupancy sensors include LCD displays, which show configuration details and settings, and programming pushbuttons for tuning parameters. Sensors also include an infrared (IR) transceiver for wireless configuration and control.

WATT STOPPER
www.wattstopper.com

McGill TL40PMT0 temporary 400W HID fixture

McGill introduced a 400W high-intensity discharge fixture (TL40PMT0) designed to provide bright, energy-efficient and economical temporary lighting on construction sites. Its design—including die-cast aluminum ballast housing with powdercoat paint—also makes it suitable for lighting damp tunnels, bridges and marinas. Other safety features include a quick-attach wire guard combined with an overall design that keeps the fixture out of the way of danger. The cUL-listed fixture outputs 7 fc at a 20-ft mounting height (when properly installed), and its open-air ballast helps it to keep cool.

MCGILL
www.mcgillelectrical.com

Lovato switch disconnector GA series

Lovato announced the release of its switch disconnector GA series with current ratings ranging from 16A to 125A. The series comes with a range of accessories, including: different types of handles (screw/ring fixing); simultaneous or early-make contact operation of the fourth pole (with respect to switch disconnector poles); earth and neutral terminals; auxiliary contacts; etc. The GA series is available in compact sizes (16A to 40A, and 63A to 125A), and is supplied with a padlock-friendly handle on the disconnect.

LOVATO
www.lovato.ca

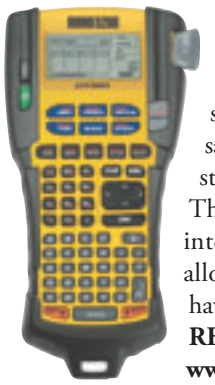
Panduit CT-3001 connector crimping tool

Panduit says its CT-3001 is the industry's first power connector crimping tool featuring Milwaukee Electric Tool's M18 XC high-capacity lithium-ion battery. The company says this provides 60% more crimps per battery charge than traditional NiCad or NiMH batteries, with a 2.9-second crimp cycle time. The CT-3001 is supplied with a battery charger and two rechargeable batteries, which include an LED 'fuel' gauge to display remaining power. Controlled cycle crimping and die retention pins help ensure consistent, reliable crimps every time, says Panduit.

PANDUIT
www.panduit.com

Dymo Rhino 5200 hand-held labelling printer

Industrial-grade and specifically designed for professional installers, Dymo says the Rhino 5200 is an advanced, easy-to-use label printer. 'Hot key' technology allows you to automatically format and size labels for frequently used applications, saving you time by reducing the number of steps and buttons required for formatting. The Rhino 5200 also boasts a new graphic interface with "intuitive" prompts, which allows you to change formatting without having to re-key data.



RHINO
www.rhinolabeling.com

Smart Sensor ultrasonic cable height meter

The ultrasonic cable height meter measures the height of the highest and lowest of up to six cables, with measuring ranges of: 3m to 23m (25-mm cable); 3m to 15m (12-mm cable); 3m to 12m (5.5-mm cable); and 3m to 10m (2.5-mm cable). This instrument is easy to aim and read measurements, says the manufacturer, and emits 15 short bursts of sound (the microprocessor calculates the elapsed time for the sound to be reflected back to the meter). The meter also measures the distance between wires, as well as the dimensions of houses and distances between objects. The large measuring sensor results in higher measuring accuracies (±0.5% of reading ±2 digits). The meter records measuring conditions (i.e. location, time and temperature), and comes with battery, accessory bracket for horizontal measurements, pouch, instruction manual and hard carrying case.

ITM INSTRUMENTS
www.itm.com

GMP Corner Cable Block

General Machine Products Co. introduced its Corner Cable Block line of specialized cable blocks. Engineered to handle most utility cable installations, the blocks promise snag- and damage-free travel of fiber optic cable, coax and innerducts around tight corners or bends in an aerial environment. They

also evenly distribute the load when pulling around corners to protect the cable, and are available in 45˚ and 90˚ radius models. Each model has two cable retaining rollers to prevent cable or innerduct from slipping off.

GENERAL MACHINE PRODUCTS
www.gmptools.com

New Caddy sway bracing products from Erico

Erico has a new line of Caddy products to help make it easier to install a variety of sway bracing for seismic and other catastrophic events. Structural attachments include: bar joist and I-beam adaptors; and universal structural attachment/multi-attachment. Longitudinal and lateral sway braces include easy/standard universal sway, while lateral sway braces include Quick/Quick Grip lateral. The sway bracing products are FM approved and UL listed, and are suitable for use with service pipe up to 10 in.

ERICO
www.erico.com

Greenlee MagnumPRO line of fish tapes

Greenlee has launched MagnumPRO: a line of fish tapes for use in virtually all construction settings. All MagnumPRO fish tapes include features such as a rapid tape pay-out and rewind mechanism to help speed up the fish tape's movement, and a smaller fish eye with an offset bend for improved fishing ability. The fish tapes also come with a viewing port that lets you see inside the case to see how much tape remains. Each fish tape case in the MagnumPRO line comes with a comfort handle that provides an ergonomically friendly grip, helping reduce user fatigue. A 360º uniform grip surrounds the case to provide more durability; the grip ridges on the flared case also help prevent slipping.

GREENLEE
www.greenlee.com

DeWALT DWD525K & DWD520 ½-in. corded hammerdrills

DeWALT launched its new line of heavy-duty, 1-2-in. corded hammerdrills featuring 10A motors, mode collar adjustment, and a new mid-handle grip design (on the DWD525K). These new features, says the company, provide electricians, general contractors, etc., with greater performance and versatility while drilling and/or hammerdrilling into wood, metal or masonry. The 10A motor design has about 40% more copper than previous models at the same motor size. These tools are equipped with anti-slip, soft-grip handles and 360º locking side handles for increased comfort and control.

DEWALT
www.dewalt.com

Cobra low-profile cable ties

Cobra's cable ties feature one-third the head height of standard cable ties and, when cut, the stub is concealed within the head to create a smooth, snag-proof outer surface conforming to the bundle. Eliminating the sharp protruding barbs of conventional cable ties, the company says these low-profile ties are safe to handle, producing a strong and attractive finished bundle. Available in UV-resistant black and natural nylon, Cobra low-profile cable ties are UL/CSA listed, QPL approved and come in 7-in. to 16-in. sizes in medium- and heavy-duty styles.

COBRA
www.cobracabletie.com

Lenox bi-metal ship auger bit

Designed for extreme durability, Lenox says the ship auger bit has a unique bi-metal construction that allows the bit to outlast others of similar ilk. (The same bi-metal technology used to make Lenox reciprocating and band saw blades.) The high-speed steel screw tip and cutting edges give these bits a longer tool life in tough applications, including nail encounters that can damage or break other ship auger bits. To increase the life of the bit, the bi-metal edges can be sharpened with a Lenox diamond file.

LENOX
www.lenoxtools.com

Ideal redesigned Triple Tap threading tool

Ideal has expanded its offering of hand tools with the introduction of its redesigned Triple Tap threading tool. Whether it's forming new screw threads, cleaning out obstructions, or re-tapping burred and stripped threads, the Triple Tap is ready to tackle the job, boasts Ideal. The Triple Tap now features a Santoprene handle that reduces the risk of repetitive strain injury. Soft yet durable, Ideal says the textured handle assures a steady, slip-resistant grip—even when wet. In addition, the grip extends tool service life by resisting damaging oils, fluids, perspiration and abrasions.

IDEAL INDUSTRIES
www.idealindustries.ca

Cooper B-Line Buzznut for bolted framing applications

Cooper B-Line says the Buzznut can be installed at any desired position on the ATR and can be easily removed or adjusted at any time. The product's slip-on design, says the company, allows for a seamless retrofit without disassembling existing supports in the process. According to Cooper, studies show an improved installation time of over 40% versus a traditional square washer and hex nut installation. The company reasons this can be attributed to the elimination of threading long spans of ATR with the hex nut, as well as a reduced number of components in the assembly. The Buzznut carries similar load capacities of an ATR, and is available in numerous sizes.

COOPER B-LINE
www.cooperbline.com

Hilti DD 120 diamond coring system

Self-contained as a complete system, Hilti says the DD 120 is compact, lightweight and small enough to fit inside a kit box, yet packed with the power to core up to six 4-in. diameter holes in reinforced concrete. The system features a steering display at the top and an anchor base plate at the bottom. The drill stand, carriage and drive are integrated to reduce set-up time; all you need to do is add water. A carriage lock fixes the carriage in position. The DD 120 comes from a 1600W motor with two speeds: the first is 650 rpm, while the second speed is 1380 rpm. This gives you the ability to match the speed to the application and bit diameter. Weighing 22 lb and sporting a convenient carrying handle, Hilti says getting the DD120 to, from and around the jobsite is easy.

HILTI
www.hilti.ca

Bosch SPS10 professional super-compact screwdriver

Weighing barely 1 lb and with a compact, ergonomic chassis design, Bosch says its SPS10 compact screwdriver is ideal for work in cramped quarters. While the new driver is small—small enough to be practically unnoticeable in a pocket or tool pouch—it lacks nothing, says the company, when it comes to the power needed to get the job done. The SPS10 delivers enough torque to consistently drive 1/4-in. screws, with the 4V Max Litheon battery produces enough power to drive up to 110 screws on a single charge.

BOSCH
www.boschtools.com

Fluke 1AC-I VoltAlert tester

Fluke has introduced the latest in its VoltAlert family of AC non-contact voltage testers. With the 1AC-I, electricians, maintenance, service and safety personnel can test for energized circuits and defective grounds by simply touching the tip of the pocket-sized tester to a terminal strip, outlet or power cord. The 1AC-I includes a new Always-On feature, and is built with low power circuitry to sustain battery life. It also boasts a Battery Check button to ensure battery and unit are both in good condition when using the tester. The tester detects voltages from 90 to 1000 vAC and comes with a two-year warranty.

FLUKE ELECTRONICS CANADA
www.flukecanada.ca

FLIR i7 IR camera for under $3500

FLIR Systems unveiled the new i7 thermal imaging infrared camera today—the first professional-grade thermal imaging camera, says the company, under $3500 Cdn. The FLIR i7 couples 120x120 (14,400) pixel infrared resolution with 2% accuracy and 0.1°C thermal sensitivity. It reveals abnormal temperature readings with images displayed on a 2.8-in., high-resolution colour LCD. The automatic design, intuitive menu navigation and focus-free lens make it simple to use, says FLIR. Three measurement modes are available: spot (centre), area (minimum/maximum) and isotherm (above/below). Image controls include three palette options: iron, rainbow, and black & white. Up to 5000 images can be captured and stored on the included MicroSD card, while the onboard thumbnail gallery feature makes browsing easy. The unit weighs less than 340 g and meets IP43 dust-/splash-proof standards.

FLIR SYSTEMS
www.goinfrared.com

AEMC CM605 100AAC/DC clamp-on meter

AEMC says its multifunction CM605 clamp-on meter is an ideal choice for both process and general industrial markets. It's good for measuring 4 mA to 20 mA process signals, as well as higher currents (up to 100A) associated with general industrial monitoring and troubleshooting. The device can measure both AC/DC voltage (up to 600V) and current. It can also measure resistance up to 10kΩ, including a continuity buzzer to assist in circuit verification. For convenience, the CM605 can also hold the last reading in the display and capture the peak value at the time of the measurement.

AEMC
www.technical-sys.com

Accubid releases LiveCount takeoff tool for contractors

For contractors with access only to PDF or TIF images (rather than native CAD drawings), Accubid LiveCount promises the efficiency of paperless on-screen takeoffs, as well as seamless integration with Accubid's Estimating and ChangeOrder solutions. As you mark-up an image file, your takeoffs are automatically reflected in your estimate. Among LiveCount's attributes is the ability to easily takeoff lengths and counts, plus display them in your colour scheme on your layers. It also helps you navigate images with pan and zoom features.

To learn more about Accubid, including its range of professional development courses and product training labs, visit www.accubid.com.

Southwire's new website promises enhanced user experience

Southwire's completely redesigned website promises better interaction between the company and its industry visitors, including contractors and distributors. It was redesigned to be easier to navigate, and faster for visitors seeking information on products and technical services, or placing orders. Among the site's features is Q-Service (an ordering and self-service system) and SWIM, which incorporates EDI and Internet technology to enable vendor-managed inventory. The site also includes information on the company's sustainability efforts, as well as an enhanced video library with product demonstrations, training and instruction, and more.

Visit Southwire at www.southwire.com.

ConEst JobTrac project management software v.04

ConEst released the latest version (# 4) of JobTrac, its project management software solution (part of the company's PowerSuite). JobTrac helps you more efficiently manage daily operations, says ConEst, from tracking project submittals, change orders and material purchase orders to scheduling labour and project payment applications. A built-in Gantt chart establishes Start/Finish dates, as well as assigns dependencies/constraints for all project tasks. The software tracks and compares the budgeted estimate costs versus actual and, when it comes to billing, JobTrac produces a schedule of values that's used for payment application.

To learn more about ConEst Software Systems, visit www.conest.com or email sales@conest.com.

Quick Cable battery acid spill clean-up video

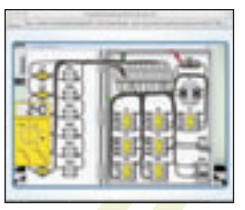
Citing an extreme lack of information, Quick Cable set to work on a video entitled "Battery Acid Spill Cleanup". Available to everyone, the eight minute-long video is the result of hours of research and consultations with Bill Ramsey—a battery industry expert who has written and published widely on battery maintenance and safety.

To view "Battery Acid Spill Cleanup", visit www.quickhowto.com (under Safety First).

IEC launches smart grid portal

With the launch of its web portal "IEC Global Standards for Smart Grid", the International Electrotechnical Commission (IEC) says it is providing a one-stop access point for anyone involved in smart grid projects with a comprehensive catalogue of standards. The site also provides a definition of the smart grid concept, a section regarding regional differences, context and needs and, says IEC, is a good starting point for anyone wishing to better understand the smart grid.

To visit the IEC Smart Grid portal, go to www.iec.ch/zone/smartgrid.



Simutech Version 4 of Troubleshooting Skills series

Simutech says the latest version (# 4) of its Troubleshooting Skills series (electrical, control and motor circuits) boasts improved simulation capabilities and an enhanced evaluation system. Each title in the series includes in-depth content modules with videos demonstrating specific concepts and techniques. Users can now remove multiple wires, trace wire paths and inspect components for defects. Enhanced simulations offer more accurate component behaviour, and you are able to customize regional settings for North American or European standards.

To learn more about Troubleshooting Skill series software (v.4), visit www.simutechmultimedia.com.

New Yukon Advanced Energy Services Software Platform

Cooper Power Systems has released the newest version of the Yukon Advanced Energy Services Platform, which serves the needs of utility teams in advanced metering infrastructure, demand-response, intelligent capacitor bank control, and substation monitoring and distribution automation solutions. Yukon now contains a demand-response consumer portal for a multi-language customer audience, a Web service-based integration engine for information sharing with other utility applications, and an expansion of its commercial and industrial demand response module. (Yukon currently manages systems with nearly 100,000 metering devices and others with more than 500,000 load management devices.)

Visit Cooper Power Systems' Energy Automation Solutions (EAS) site at www.cooperpowereas.com.

SolaHD Enduring Protection catalogue

SolaHD published "Enduring Protection", a 28-page catalogue summarizing the company's power protection products, giving detailed specs and current information on available surge protection devices, Active Tracking filters, and data/signal line surge protectors. Highlighted in the catalogue is the STV 100K series of hardwired surge protection devices designed for installation at the service entrance, branch panel or a dedicated sensitive electronic load. The STV 100K series includes a fault current fusing level of 65kAIC.

For a free copy of the Enduring Protection catalogue, visit www.solahd.com or email tech@solahd.com.

Watt Stopper Lighting Energy Calculator

Watt Stopper of Legrand has launched a Web-based energy savings tool that allows you to calculate the potential energy savings available with occupancy sensors. The calculator provides a list of pre-defined lighting control measures (LCMs) that allow you to compare different control methods and identify how best to achieve additional maximum energy lighting savings. Future versions will include calculations for plug/receptacle load control, daylighting and time-based controls. There are two assessment levels: Quick and Full.

Visit www.wattstopper.com/laa to try out the calculator.

Bulbrite relaunches website to better showcase solutions

Bulbrite's redesigned website showcases over 2500 SKUs, including LEDs, HIDs, CFLs, halogens and more. New user-friendly features include detailed product pages as well as a Related Items tab, which allows you to see other lamp options. The site's education centre provides information on a range of things, like LED basics, bulb shapes and sizes, base and filament types, etc. There are also energy-savings and ROI calculators, which figure out things like Total Dollar Savings and payback period.

For more on Bulbrite, visit www.bulbrite.com.

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www.hayata.com

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Email: info@lstoch.ca
Website: www.lstoch.ca

New Commercial Grade LED Decorative Lamps

STANDARD has introduced its commercial grade decorative LED product line, including replacement lamps and string lights systems, as an energy efficient and low maintenance solution for all lighting effects. Offered in C7, C9, G8, G11 and S14 shapes, the LED retrofit lamps are versatile and convenient and fit conventional sockets without additional hardware and transformers. Using approximately 1 watt per lamp, these replacement lamps provide significant energy savings over conventional incandescent equivalents.

STANDARD also added commercial grade LED string lights systems including accessories such as taps, a spacer wire and a power cord. The lights feature superior quality sealed housings as well as durable lenses. The LED string lights and accessories are equipped with heavier gauge wire and patented weatherproof coaxial connectors keeping dirt, water, snow and salt away from the connections. They can also be installed to blink, flash, dim and fade, and 125 strings of lights (over 3 000 lights) can be connected together to the power of just one plug.

Standard Products
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BY LES STOCH, P.ENG.

Resistance grounding and Rule 10-814

Let's look at Rule 10-814 and the bonding conductor sizes given in Table 16 as they apply to resistance grounded systems, and answer the question: Are Table 16 minimum wire sizes appropriate when maximum available ground faults are limited by resistance grounding, or are there any circumstances under which bonding conductors may need to carry larger fault currents?

Rule 10-814(1) specifies minimum bonding conductor sizes; it refers us to Table 16, which specifies that minimum bonding conductor sizes are based on the ampacities of the largest circuit conductors or equivalent for parallel conductors. (In earlier versions of the Canadian Electrical Code [CEC], bonding conductor sizes were based on overcurrent protection ratings. The change came about with the 2006 code and was carried over to the present 2009 version.)

As an example, Table 16 specifies that an electrical system supplied by 800A wiring will require minimum-size bonding conductors of either #1/0 AWG copper or #3/0 AWG aluminum.

Simply put, the minimum bonding conductor sizes shown in Table 16 are based upon the maximum allowable wiring ampacities shown in Tables 1 to 4 to provide wire sizes that are calculated not to fail under ground fault conditions. It stands to reason that bonding conductors must have sufficient current-carrying capacity to safely carry the available ground fault currents without melting or burning off.

But what happens when our system is resistance grounded? Such systems reduce ground fault currents returning to the transformer neutral by interposing a grounding resistor between the system neutral and the system ground electrode.

Let's look at another example: a 1500KVA, 13.8kV, 600V transformer supplying 2000A service equipment by means of a 2000A bus duct. The transformer neutral is resistance grounded at the transformer location. The transformer and the 600V service are grounded to separate grounding electrodes. Checking Table 16 tells us we need to provide a minimum 250kcmil copper conductor for bonding between the transformer and the main service equipment in the building.

Next we look at CEC requirements for installing the grounding resistor and its wiring. Rule 10-1102(2) advises us that, for systems of 5kV or less, the neutral grounding device must be sized to limit ground fault currents to 10 amperes or less when the electrical system is to remain operational during a ground fault. Rule 10-1108 gives us the minimum sizes for copper grounding conductors—between the system neutral and the grounding resistor (#8 AWG) and between the grounding resistor and earth (#8 AWG). Notice these wire sizes are much smaller than 250kcmil.

Ground fault currents must always find their way back to the transformer neutral through the system's grounding and bonding connections. In our current example, Rule 10-1102(2) limits the maximum ground fault current to 10 amperes, so the grounding resistor will be sized accordingly. And Rule 10-1108 provides the minimum grounding conductor size of #8 AWG copper.

But if there's only one place for ground faults to go—to the transformer neutral through the grounding resistor—why do we need a 250kcmil copper bonding conductor to carry 10 amperes of ground fault current? Why does one section of the fault path need to be so greatly oversized in relation to maximum possible ground fault currents? Should Rule 10-814 be adjusted to accommodate resistance grounded systems?

I can only think of one instance where larger bonding conductor sizes could provide a meaningful safety benefit: however slight, there's always the possibility that two ground faults could occur simultaneously on separate phases, some distance apart. This could result in a phase-to-phase fault and the bonding conductors would need to safely carry fault current until interrupted by the operation of overcurrent protection. EB

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Tackle The Code Conundrum... if you dare

So, you think you know the electrical code, eh? Well, we'll soon find out if you're an electrical code junkie or downright code-clueless. Take a look at the following questions and check your answers in November's Electrical Business.

How did you do?

3 of 3 – Not only are you smart, you love to show off.
2 of 3 – You're pretty smart, but you still missed one.
1 of 3 – Your understanding of these questions is not up to code.
0 of 3 – Did you come up with your answers by playing Eenie, Meenie, Minie, Moe?

Question 1

All the luminaires located in an unfinished basement shall be controlled by a wall switch located at the head of the stairs.

a) True
b) False

Question 2

Optical fiber cables outside of buildings shall be of the types specified in Table 19.

a) True
b) False

Question 3

Poles, masts, standards or devices designed as supports for signs that are also used as electrical raceways for conductors shall be approved for the purpose.

a) True
b) False

Answers to Code Conundrum

Electrical Business September 2009

Q-1: Three single-pole breakers are permitted to have their handles mechanically interlocked to form the equivalent of a three-pole breaker.

b) False. Rule 14-302 requires three-pole circuit breakers to open by the manual operation of a single handle.

Q-2: Ground fault protection is required for a 1000-amp, 120/208-volt solidly grounded service.

b) False. Rule 14-102(1)(b) requires ground fault protection for circuits of solidly grounded systems rated 150 volts (or less) to ground and greater than 2000 amps.

Q-3: A luminaire shall be provided for each ___ m^2 (or fraction thereof) of floor area in unfinished basements.

b) 30 m^2. Rule 30-506(1).

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