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Electrical Business

JUNE/JULY 2010

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There's no question the stakes are higher in the world of mega projects

Eyes wide open for mega projects

For those who have been—and for those who live and work there—there's nothing to me like the vast expanse that is Alberta. I am reminded of that again as I write this, as I'm in a car on my way from Edmonton to Jasper (with someone else driving, of course!).

Alberta is Big Country and, quite appropriately, it's also a land of mega projects. You will recall EBMag attended the IEEE IAS' Electrical Safety, Technical and Mega Projects Workshop in Calgary back in March and, I have to tell you, the gathering opened my eyes to the unique world of billion-dollar projects.

There's no question the stakes are higher in the world of mega projects, so it's a good thing that an event dedicated to them—and the pros who work with them—exists.

The education track itself was reason enough to attend. Arc flash safety and awareness was a popular theme, as it should be. Schneider's Daniel Roberts was there, as was Magna's Kerry Heid and ESPS's Terry Becker, all bringing their unique perspectives to the subject. But there were also other subjects you don't typically come across at the usual events, like anti-freeze systems for pipelines, or new technologies in the market for super heavy-duty cable tray applications, and lighting innovations for hazardous environments.

Upon attending this event for the first time, what struck me most was how much the delegates were "into" the material being presented. When you go to as many events as I, you get a sense of who's there for work, and who's there for play. That's not to say there was a shortage of friendliness or good will (or hospitality suites, for that matter) but, ultimately, delegates were there to learn—from the roster of experts lined up for the education track, and from each other.

The same was true of the exhibit hall. While it did not contain hundreds upon hundreds of exhibitors, it was filled with companies who develop innovative products specifically targeting this group and, in fact, some companies chose this venue to officially unveil some of their new products.

A big thanks to George Morlidge and the other organizers who invited me, and put on an excellent event to boot. If you're remotely involved in mega projects, I highly recommend this event. Keep reading EBMag and visiting EBMag.com and, as soon as we know of the next workshop, we'll let you know. Until then, keep your eyes wide open. EB

On the cover and page 14

Motor failures: common causes (and solutions)

Most motor failures stem from damaged bearings or stator windings. Fortunately for plant managers, most premature motor failures can be prevented using straightforward solutions for protecting them.

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DEPARTMENTS

British Columbia moves ahead with Clean Energy Act

British Columbia's new Clean Energy Act (www.gov.bc.ca/cleanenergyact) sets the foundation for a new future of electricity self-sufficiency, job creation and reduced greenhouse gas emissions, powered by unprecedented investments in clean, renewable energy across the province.

According to a press release issued jointly by the Office of the Premier, the Ministry of Energy, Mines and Petroleum Resources and BC Hydro, Bill 17 builds upon British Columbia's unique heritage advantages and wealth of clean, renewable energy resources.

"The new Clean Energy Act opens the way to an exciting new age of economic growth and job creation by unleashing British Columbia's full potential in clean energy, power smart technologies, environmental stewardship and climate action," said Premier Gordon Campbell. "It will maximize the value of our public heritage assets for the benefit of British Columbians by forever securing competitive rates and generating new streams of revenue for crucial public services."

The act advances 16 specific energy objectives by expediting clean energy investments, protecting BC ratepayers, ensuring competitive rates, encouraging conservation, strengthening environmental protection and aggressively promoting regional job creation and First Nations' involvement in clean electricity development opportunities.

"British Columbia has a proud history of producing clean, reliable electricity at rates that are among the lowest in North America," said Blair Lekstrom, minister of energy, mines and petroleum resources. "The Clean Energy Act builds on the work of the Green Energy Advisory Task Force (www.gov.bc.ca/empr/index.htm) with a new statutory framework to encourage new investments and jobs, strengthen BC Hydro and secure British Columbia's power needs at low rates for generations to come."

The new Clean Energy Act sets the foundation for three areas of priority:

1. Ensuring electricity self-sufficiency at low rates

The act will strengthen B.C.'s legislated goal of electricity self-sufficiency by 2016 with a new regulatory framework for long-term electricity planning, bold commitments to clean and renewable electricity generation, streamlined approval processes, and new measures to promote electricity efficiency and conservation.

It also strengthens protection for BC ratepayers with new measures to promote competitive rates and to ensure that all of the benefits from the province's heritage assets continue to flow to British Columbians. These objectives will be accomplished through long-term planning; public investments and conservation; and new investments in clean, renewable power and energy security. The British Columbia Utilities Commission will continue to ensure appropriate rates are set in advancing government's energy objectives and long-term resource plans.

2. Harnessing BC's clean power potential to create jobs in every region

The act will provide BC Hydro and renewable power producers the tools necessary to establish British Columbia as a clean energy powerhouse that enables economic growth and job creation in every region. It will enable BC Hydro to maximize the value of its energy resources for ratepayers and taxpayers. It will provide a new model to secure long-term export power sales to other jurisdictions seeking clean power by partnering with renewable power producers without risk or cost to BC ratepayers.

The act also creates a First Nations Clean Energy Business Fund to provide the opportunity for First Nations to create investment and jobs in renewable power production.

3. Strengthening environmental stewardship and reducing greenhouse gases

The act enshrines in law measures the Province will take to reduce greenhouse gas emissions, help customers save money through conservation and protect the environment.

The Environmental Assessment Act process will be strengthened to specifically provide for assessments of potential cumulative environmental effects. In addition, the development or proposal of energy projects in parks, protected areas and conservancies will be prohibited by law.

The Clean Energy Act builds on the work of the Green Energy Advisory Task Force, appointed in November 2009 to provide insights and recommendations on a comprehensive strategy to put B.C. at the forefront of clean energy development.

Electrical Business

June/July 2010 • Volume 46 • Issue 5

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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SUBSCRIPTION RATES:
Canada: Single issue $7.00 • Ten issues: $35.00
(including tax)
USA: $59.00 (US) and International: $75.00 (US) per year
United States Second Class Postage Paid at Lewiston, NY (USPS-741-470) US POSTMASTER: send address changes to ELECTRICAL BUSINESS, P.O. Box 8145, Lewiston, NY 14092

Send address changes to:
ELECTRICAL BUSINESS
240 Edward Street, Aurora, ON L4G 3S9
Return Postage Guaranteed
Canada Post - Canadian Publications Mail Sales Products Agreement 40063602 ISSN 0013-4244
Printed in Canada

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

CCAB BPA WORLDWIDE BUSINESS

Unity in fight against electric heating ban

EEMAC, along with its Electric Heating Section, has created a North American Heating Coalition comprising over 15 companies (Canadian and American), whose goal is to stop the International Energy Conservation Code Committee from banning the use of electric heating.

The group's main concern is the 6 to 5 vote at the last IECC meeting, which would change the code on electric resistance heaters. The proposed new text at issue is as follows:

"403.7 Space Heating Equipment (Mandatory) - Electric resistance heating shall not be used for space heating. This includes, but is not limited to, electric space heaters, electric furnaces, electric baseboard heaters, electric wall heaters and electric thermal storage."

Though there are some small exceptions, the proposal ultimately eliminates the future market for such equipment. The Electric Heating Coalition believes that the facts are "ill advised, biased and misrepresented".

To get involved, contact EEMAC's vice-president, Wayne Edwards, at wedwards@electrofed.com.

EEMAC is the Electrical Equipment Manufacturers Association of Canada, a council of Electro-Federation Canada (EFC).

MCEE 2011 is announced – 4 shows in one

Four-shows-in-one makes MCEE the meeting place for Eastern Canada's electrical and mechanical industries. The trade show and conference takes place April 20 and 21, 2011 at Place Bonaventure in Montreal.

Produced by the Corporation of Master Electricians of Quebec (CMEQ), Corporation of Master Pipe Mechanics of Quebec (CMMTQ), the Canadian Institute of Plumbing & Heating (CIPH) and the Corporation des entreprises en traitement de l'air et du froid (CETAF), MCEE claims it is Canada's largest plumbing, heating, electrical and lighting trade show, and the only major industry event in Eastern Canada in 2011.

Together, the four associations say they represent 90% of the region's electrical, plumbing, HVACR and MRO contractors and wholesaler distributors. Show organizers also say IES Montreal (Illuminating Engineering Society) and EFC (Electro Federation Québec) support MCEE 2011.

MCEE 2011 is expected to attract over 6000 visitors involved in all areas of sales, design, specification and installation. They include contractors, wholesaler distributors, builders, engineers, architects, designers, renovators and maintenance personnel. More than 300 exhibitors from across Canada and the United States are expected to display a range of products in electrical equipment, lighting, alarm systems, etc.

Both new and green products will be a focus of MCEE 2011, say organizers. Judges will carefully review exhibitor applications; finalists meeting their criteria will be displayed in the New Product Showcase. Winners in a variety of product categories will be announced at the show.

Also, a free seminar program will provide practical solutions to technical, sales and design challenges.

Mark your calendars:
MCEE
April 20-21, 2011, Place Bonaventure, Montreal
Visit www.mcee.ca for details.

Hydro Ottawa 2010 Tool and Equipment Inspection Week

Policies and procedures may help sustain a safe workplace but, for Hydro Ottawa, a practical approach—including equipment inspection and emergency rescue techniques—reinforces the importance of health and safety for its outside employees. This year, more than 200 field-based employees participated in Hydro Ottawa's annual Tool and Equipment Inspection Week, an event unique to Hydro Ottawa.

Industry experts were invited to perform comprehensive inspections and tests of tools, personal protective and critical safety equipment belonging to outdoor workers. The latter half of the day was spent practising rescue techniques, such as pole rescue, bucket evacuation and underground cable chamber rescue. Health and wellness experts were also on site to answer questions.

"Prevention is key when it comes to reducing the chances of work-related injury," says Dave Stephens, safety and trades training supervisor. "This week is intended to remind our employees their safety comes first."

Among the tools inspected and tested were grounds. Inspectors checked for rips and tears, and verified the current matched safety standards. Fall-arrest equipment was also inspected for tears along straps and belts, and checked for bent or broken hooks.

First Aid kit inspectors looked for out-of-date products and non-essential items. Some of the most common risks found include traces of blood, broken objects and rust. Contents were also inspected for mould, which can be caused by humidity.

Amp guns, gas battery hydraulic-powered tools, worker protection tags and dielectric sticks were also inspected and tested. In addition, compliance kits were verified to ensure the regulation manuals and reference guides were accurate and complete.

Employees then practised their emergency skills during bucket truck rescue and evacuation exercises, which challenged their rappelling skills. Pole climbing and pole-top rescue skills were also tested. Underground cable jointers also practised their rescue techniques in underground chambers. All of the completed inspections and exercises were based on the guiding legislative requirements, in accordance with Hydro Ottawa's procedures and industry best practices.

New to the event this year was a "Wellness at Work" campaign, promoting physical and mental wellness as key to maintaining a safe and healthy workplace. Vendors including orthotic, chiropractic, nutrition and fitness experts were onsite with the Canadian Mental Health Association and employee assistance program reps, as well as nurses who provide health checks for employees.

Hydro Ottawa staff have come to look forward to this annual event. It allows them to keep their tools and skills up to date, contributing to peace of mind that a solid foundation is in place for their daily assignments. The company, meantime, benefits through the efficiency of a consolidated day-long event that ensures compliance with industry regulations and reassures that best practices are being followed for keeping employees safe.

Tool and Equipment Inspection Week was held over four days at five Hydro Ottawa-owned work centres across the city. The annual event is planned and managed by Hydro Ottawa's Human Resources department.

(*Contributed by Hydro Ottawa* [www.hydroottawa.com].)

Schneider helps Team North create award-winning solar home

Schneider Electric (www.schneider-electric.ca) recently donated Xantrex inverters, Square D Powerlogic Energy Management system, Veris current transformers, QO circuit breakers, a QO loadcentre and safety switches to Team North's solar-powered home—North House.

North House, which produces more energy than it consumes, is a recipient of the 2010 Ontario Association of Architects (OAA) Design Excellence Award. The annual awards offer Ontario architects, students and interns an opportunity to showcase their best work and increase public appreciation of the services provided by the architectural profession.

"The products we received from Schneider Electric were critical for both our energy production and energy monitoring systems," said Lauren Barhydt, Team North's project manager (a graduate student at the University of Waterloo School of Architecture). "We were grateful for the products, but also for the kind and thoughtful advice from Schneider Electric's engineers—especially in the crunch-time of our deadline!"

Eaton and Takaoka to collaborate on electric vehicle charging

Eaton Corp. (www.eaton.com) says it will collaborate with Takaoka Electric Mfg. Co. Ltd. to develop and launch DC Quick Chargers for charging electric vehicle (EV) battery packs. The collaboration will enable Eaton to provide a complete line of charging stations across residential, commercial and industrial applications in North America.

According to Eaton, Tokyo-based Takaoka Electric is a leader in the installation and operation of EV chargers, and brings to the market extensive technical knowledge of all aspects of electric vehicle charging.

Eaton says it is currently working to advance the EV charging infrastructure in Burlington, Ont., and many other communities across North America.

Eaton Certified Contractor aims to go national

Eaton Corp. developed a program last year that provides certification to residential electrical service contractors; this year, the company aims to take the program national.

In April of 2009, the Eaton Certified Contractor Network (ECCN) program was launched in Ontario, and a total of 32 contractors were certified by years end (myhome.eatonelectrical.ca). 2010 will see the program take flight nationally, targeting a goal to certify 100+ contractors from coast to coast.

The five-year strategic plan for ECCN includes the recruitment and certification of over 300 electrical service and renovation contractors that will provide homeowners in all cities and towns across Canada local access to the benefits and advantages associated with hiring an ECCN contractor.

The ultimate goal for Eaton is to have the top 25% of electrical residential service and renovation contractors in Canada enroll and engage in ECCN.

Northland secures contracts for solar wind and hydro in Ontario

Northland Power Income Fund (www.npifund.com) has been awarded contracts under the government's Feed-in-Tariff (FIT) program to build 216MW of renewable green energy projects in Ontario.

The projects include 13 ground-mounted solar projects totalling 130MW located across the province, the 60MW Manitoulin Island wind farm, and four run-of-river hydro projects on the Kabinakagami River totalling 26 MW. Construction of the first projects could begin this year—after all permitting is completed—and the total investment by Northland is expected to reach almost $1 billion over the next four years.

"These awards confirm the validity of Northland's clean and green energy strategy. I am also especially happy for the Constance Lake First Nation, our partner in our water power projects on the Kabinakagami River. These projects represent responsible use of our natural resources and will be an important source of income for Constance Lake through their long-term ownership interest," said John Brace, CEO of Northland.

MEET 2010 a success - looking for ward to 2012

The MEET Show (Mechanical Electrical Electronic Technology) Show that took place May 5-6 at the Moncton Coliseum was a resounding success! Traffic was up over 2008, with the event welcoming 5514 visitors through the doors during the two-day run.

Exhibitors commented on the qualified audience that this show always attracts, and MEET has once again solidified itself as a must-attend industry event. Exhibitors from all over Canada and the States displayed the latest equipment available to the electrical and mechanical industries, and visitors commented on the diverse and high-quality products that were showcased.

The first biennial MEET Innovation Awards were handed out on the opening morning of the show. Taking home awards on the electrical side were:

- Electro-Federation Canada Innovation Award: Fluke 233 digital multimeter (Fluke Electronics - See Photo).
- IESNA Innovation Award: LED Mini Star (Magic Lite Ltd.).

"We are extremely pleased with the high caliber nominations that were received for our inaugural 2010 MEET Innovation Awards, and the winners definitely demonstrate innovation at its finest in North America," said Mike Patterson, MEET Show chair.

For a recap of what you missed, Visit www.ebmag.com for EBMag's MEET Show 2010 Virtual Show Guide.

Osram Sylvania celebrates 25th anniversar y of its CFL

Osram Sylvania is marking the 25th anniversary of its first modern, compact fluorescent (CFL) light bulb that screwed in like an incandescent and featured an integrated electronic ballast.

According to Wikipedia, the modern CFL was invented by Edward E. Hammer, an engineer with General Electric, in response to the 1973 oil crisis. In 1980, Philips introduced its model SL—a screw-in lamp with integral ballast. Then, in 1985, Osram started selling its model EL lamp.

CFL technical specs (then and now)	1985	2010
Average lifespan	6000 hours	12,000 hours
Size	8.1 in.	3.8 in.
Wattage	7, 11, 15, 20	5, 10, 13, 20, 23, 26
Shape	Stick T	wist
Colour temperature	Warm White	Warm White, Bright White, Daylight
Mercury	10-15 mg	<1.5 mg
Price	$50.00 $4.99	

Cooper Virelec and Manitoba Hydro collaborate on substation

Cooper Power Systems (www.cooperpower.com) says it is working with Manitoba Hydro (www.hydro.mb.ca) and its system integrator, Virelec (www.virelec.com), to develop fully IEC 61850-compliant substations. The project is intended to modernize, automate and integrate over 100 substations, following IEC 61850, "Communication Networks and Systems in Substations".

The project includes implementing a complete and secure Cooper Power Systems substation automation solution based on SMP Gateway data concentrators, SMP I/O input/output discrete modular units, SMP 16/SP substation-grade computers and the Yukon Visual T&D HMI system.

The SMP16/SP substation-grade computer, combined with Visual T&D software, will provide a tool for local SCADA management with a substation single-line diagram HMI. To replace traditional hardwiring, IEC 61850 GOOSE messaging will be used over the fiber optic ethernet LAN installed in the substation.

"Utilities are adopting IEC 61850 for substation automation to help improve their interoperability and efficiency," said Mike Stoessl, division president, Cooper Power Systems. "Building on our existing 61850 offering, we've established a leadership position that allows us to help Manitoba Hydro improve its network management performance, achieve significant cost and time savings and realize improved reliability."

B.C. Alberta and Saskatchewan launch New West Partnership

British Columbia, Saskatchewan and Alberta launched the New West Partnership today, creating what they call "an economic powerhouse of 9 million people with a combined GDP of more than $550 billion".

"This represents an historic step forward for western provinces, as they work together to provide economic leadership," said Saskatchewan Premier Brad Wall. "We are combining the strength of our three vibrant economies and working together to create lasting prosperity. Our three provinces have created a model that cements the West as the economic powerhouse of Canada."

The New West Partnership aims to create Canada's largest interprovincial barrier-free trade and investment market, and see the three westernmost provinces work together to the benefit of workers, businesses and investors in all three provinces.

"In today's global economy we need to break down barriers and open trade within our borders to build a stronger Canada," British Columbia Premier Gordon Campbell said. "The New West Partnership creates a strong economic alliance in Western Canada that will build stronger connections between our provinces and improve our competitiveness."

The three provinces signed the New West Partnership at the third joint British Columbia-Alberta-Saskatchewan Cabinet meeting in Regina. Building on shared strengths, the New West Partnership contains four components:

- A comprehensive economic agreement, which will remove remaining barriers to trade, investment and labour mobility, further enhancing the competitiveness of Canada's Western Provinces.
- An international cooperation agreement, that will see the three provinces cooperate on trade and investment missions to international markets, and share foreign market intelligence to advance joint interests and increase business competitiveness.
- An innovation agreement, which will enable provincial innovation efforts to be coordinated to better attract investment and talent, helping build critical mass of innovation activities in the West.
- A procurement agreement that will enable the provinces to capitalize on their combined buying power through the joint procurement of goods and services.

Buy Authentic anti-counterfeiting campaign launched

Eaton, Schneider Electric and Siemens joined forces with Electro-Federation Canada to raise awareness of the risks and hazards associated with counterfeit and unsafe electrical products.

"Many counterfeit electrical products are unsafe and may not have been tested and certified safe to use by testing agencies like CSA International who, among other Canadian certification laboratories, tests and certifies billions of products for the safety of the public," reads the press release.

The campaign includes print ads, postcards and buttons. (You'll see those print ads in Electrical Business and L'industrie électrique). Packages containing information materials and awareness buttons were sent to distributors, informing and encouraging them to spread the word during the month of May to their customers.

Visit www.electrofed.com for more information on unsafe circuit breaker products, potential risks and hazards, as well as guidance on how to identify and report unsafe products.

Hendrix and Kerite join to form Marmon Utility LLC

Hendrix Wire & Cable (www.hendrix-mc.com), a provider of underground and overhead distribution products, has joined forces with The Kerite Company to form Marmon Utility LLC. Further, the two underground divisions at both companies have been integrated into a single business unit: MV Underground Cable.

"The Hendrix and Kerite brands have gained recognition in the utility industry as leaders in quality," said Dan Carberry, general manager of Hendrix/Kerite MV Underground Cable. "We are excited about the opportunities that this integration will bring to our family of products and services."

This integration means customers will have access to both TRXLP and EPR insulation on primary cables through the same sales channel. For more information, contact your local Marmon Utility LLC rep.

Siemens receives St. Joseph wind turbine order

Siemens Energy (www.siemens.com/energy) has received an order for the supply of 60 wind turbines for the St. Joseph wind farm in the province of Manitoba. The purchaser is Pattern Energy, and the wind farm will boast an installed capacity of 138MW.

For this project, Siemens will be responsible for supply, technical field assistance for erection, and commissioning of the 60 wind turbines—each rated at 2.3MW. Siemens also signed a two-year service and maintenance agreement.

"The Canadian wind power market is very promising. We are expecting it to grow from today 3400MW to more than 15,000MW in 2020," said René Umlauft, CEO of the Renewable Energy Division of Siemens Energy. The company has already supplied wind turbines for the Wolfe Island and Port Alma wind farms, and also received orders for the Chatham and Gosfield wind projects.

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BICSI Canadian Conference highlights

A network cabling student at the Pre-Apprenticeship Training Institute

A highlight of the recent **BICSI** (www.bicsi.org) **Canadian Conference & Exhibition** held in Montreal was the presentation of the **Ross Cotton Canadian Region Award** to **Peter LeVoy,** vice-president of marketing at **Anixter Canada.** The award was presented by Richard S. Smith, BICSI's Canadian Region Director.

Also, a major milestone was achieved when BICSI announced three new Authorized Training Facilities (ATFs) in the BICSI Canada Region: **Léonard de Vinci Professional Training Center of the Marguerite-Bourgeoys School Board** and the **Pierson Electrotechnology Centre** (Montreal, Que.), and Toronto, Ont.'s **Pre-Apprenticeship Training Institute** (PAT, www.patinstitute.ca).

"[PAT] is well known in industry for its excellent entry-level training and candidates in the electrical, plumbing, network cabling, HVAC and appliance service trades," said PAT president, Rui Cunha, adding, "Industry will benefit greatly from having access to BICSI training in Canada, and the opportunity to hire BICSI-certified entry-level people."

BICSI certification in information technology systems is globally recognized.

Panduit Canada Corp. (www.panduit.com) announced **Isaac J. Callaway** has joined its sales team as an account manager, Network Connectivity Group, based out of Calgary, Alta. Callaway has a Bachelor of Science in Electronics Engineering Technology, and has many years of experience as a field, NPI & manufacturing engineer, says Panduit. Email cdn-ijc@panduit.com to reach Callaway directly, or try his cell at (403) 437-7279. Meantime, **Panduit Canada has a new HQ** at: 85 Enterprise Blvd., Suite 400, Markham, ON L6G 0B5.

Congratulations to **Kevin Marcus,** purchasing manager at **Mott Electric Ltd.** (New Westminster, B.C.), who won a $500 prize for participating in an electrical contractor survey! Marcus took the time in April (about 10 minutes) to work with a market research company working on behalf of Canada's electrical products industry. The purpose of the study was to help manufacturers, distributors and rep agencies better understand the business pressures and needs of the electrical contractor. Visit www.ebmag.com for a video and to learn more.

EGS Electrical Group Canada Ltd. (Elmira, Ont.) has appointed **Jeff Harris** sales manager, Canada. Harris possesses over 25 years of experience in the electrical industry: in wholesale distribution, sales & marketing and, on a national level, as a sales manager for strategic accounts for energy-saving lighting solutions. He is responsible for sales of Appleton, OZ Gedney, McGill and Sola HD for the EGS Group across Canada. He can be reached at jeff.harris2@emerson.com.

Blue Line Innovations (www.bluelineinnovations.com), the St. John's, Nfld.-based maker of the PowerCost Monitor, made what it calls a "key human resources move" by appointing retail executive **Craig Stewart** to its management team as vice-president of sales.

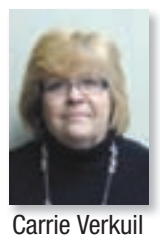
Dave Keller

The newly-created position of senior director of e-business at **Leviton** is now held by **David Keller**. In this role, he leads web-based marketing initiatives and focuses on the company's online identity, doing so through the development of new web strategies, content expansion and compliance of design standards (www.leviton.com).

Craig Paylor

Wilson Jones

Craig Paylor, president of **JLG Industries Inc.** (www.jlg.com), has announced his retirement. **Wilson Jones,** executive vice-president of **Oshkosh Corp.** and president of Oshkosh's **Fire and Emergency** segment, has been named Paylor's successor. Jones joined Oshkosh Corp. in 2005 as vice-president and general manager of the airport products business after more than 20 years in the specialty vehicle manufacturing industry.



Carrie Verkuil

Tivoli LLC, a manufacturer of linear LED and other indoor/outdoor lighting systems, has appointed **Carrie Verkuil** as national sales manager. Verkuil, who specializes in commercial lighting industry sales and applications, is Lighting Certified and a member of the **Illuminating Engineering Society (IES)** (www.tivolilighting.com).

By Stephen Tatrallyay, LLB

Suppliers have broader access to Trust Provisions

of Construction Lien Act

In a decision released March 16, the Ontario Court of Appeal settled (once and for all, hopefully) the issue of how closely a supplier has to be associated with an individual construction project before it can have access to the trust provisions relating to that project. While specifically applying to the Ontario legislation, the decision will impact all jurisdictions having trust provisions.

Background to Sunview case

In *Sunview Doors Ltd. v Pappas et al*, Sunview supplied custom sliding patio doors to Academy Doors & Windows Ltd., a company wholly owned and operated by the Pappas family. Academy went out of business in October 2006, owing Sunview about $60,000 across eight outstanding invoices.

Each order contained specific information as to the dimensions, colours and instructions regarding door opening direction—all of which made it obvious the doors were intended for specific construction projects. Sunview, however, had no knowledge as to where or what these projects were, as Academy picked up the completed doors from Sunview's shop. When pressed to provide information as to where the doors had gone, Academy refused.

Sunview brought an action against Academy, its directors and bookkeeper for breach of the trust provisions of ss. 8 and 9 of the Construction Lien Act, and under s. 13, which directs those in control of the company to adhere to the trusts at the risk of personal liability. First, it was necessary to find that Academy had breached the trust. The big hurdle was a prior case of the Court of Appeal called *Central Supply Co. 1972 Ltd. v Modern Tile Supply Co.* ([2001]OR [3d] 783).

In this case, Central provided standard tiles as they were ordered. They had no knowledge as to where the tiles were going, though it was reasonable to assume they were going to some construction project(s). The court held, however, that for the statutory trust to arise, the claimant or supplier must "intend that the material sold be used for the purposes of a known and identified construction project".

Sunview was unable to do this and, thus, lost at trial. The Divisional Court, however, allowed Sunview's appeal, holding that the Central Supply case was distinguishable because the product being sold was clearly unique and custom made, unlike the Central Supply case where the product was simply stock items. It also held that Central was wrongly decided to the extent that it required the claimant to be able to identify a specific project to which its product was sent.

Case conclusions

After a rigorous review of the prior case-law and the principles involved in statutory interpretation, the Court of Appeal—which sat as a panel of five because one of their decisions had been challenged—unanimously held that their decision in Central Supply was wrong (insofar as requiring that the materials be shipped to a specific project to the knowledge of the supplier).

The court was particularly unimpressed with the actions of Academy in refusing to identify the projects into which the doors had been incorporated. This fact is mentioned several times by the court; for example, to find that Academy had received payment for various projects to which Sunview's doors had been supplied.

Since Academy was in default in the action, it is assumed to have agreed that all the facts set out in the Statement of Claim were true. The arguments of the individual defendants were found to be without merit, and the Divisional Court's decision upheld. The Court of Appeal agreed that they did not decide the Central Supply case correctly and overruled it, meaning it is no longer good law in Ontario and—until a judge rules otherwise—other provinces having similar legislation.

The moral of the story? There are two, actually. First, it is good business practice for a supplier to ship directly to a jobsite so he has a record of where the product went. Second, even when the supplier fails to take this precaution, the law of Ontario now permits access to the trust provisions of the Construction Lien Act in some cases (depending on the other facts) when the supplier does not know where his product went. EB

Stephen Tatrallyay is certified by the Law Society as a specialist in Construction Law, and has been president of the Canadian College of Construction Lawyers (CCCL) and both the National and Ontario branches of the Construction Law Section of Bar Association. He practices in Stratford, Ont., and can be reached at (519) 271-6360 or statrallyay@rogers.com.

By Dave Smith

Where do *you* stand...

on the Left-Hand Rule?

"When you are switching a piece of electrical equipment with the operating handle on the right-hand side, where should you stand to operate that piece of equipment?" This question was asked at a recent conference—it never seems to go away.

I have been an electrician since 1975. The Left-Hand Rule was drilled into me and every other apprentice going back to 1879 when Thomas Edison turned the power on. We were drilled and grilled to stand to the right of the equipment, grab the handle with our left hand, face away and very forcibly operate it either On or Off in a swift, decisive movement, with no hesitation.

With the advent of arc flash awareness, this rule is being challenged by some who suggest it is safer to reach across the front of that equipment—placing your body directly in front of it—and operate that handle with your right hand. The rationale is this: were there an arc flash, then the metal door would protect you.

I have a few things to say about this line of thinking.

With the Left-Hand Rule, we have 131 years of empirical evidence showing that it works; we don't have nearly the same amount of evidence with this new thinking. I have logged over 12,000 hours in classrooms—most of them teaching electrical safety—and have met numerous students that have had doors blow past, or over, them. When they followed the Left-Hand Rule, their bodies were not hurt. Those who got caught by a door, however, always suffered major damage.

Secondly, let's say the door protects you from the blast. What research has been done to evaluate the force of that same door bursting its clasps and propelling your arm backward with all of its unspent force? Would it merely destroy your rotator cuff and shoulder ligaments, or rip your arm right out of its socket?

Six years ago, an operator pushed a 480V Start button on a 30-amp contactor with a dead short 40 ft away in a motor. When he hit the Start button with his right hand, the door blew open, driving his hand leftward into a pipe and permanently damaging his arm. He'll never throw a ball again.

Thirdly, this thinking ignores the fact that doors can get ripped off of hinges. My very first experience with this was with a hospital electrician in Calgary in 1981. He threw on a 600-volt star-delta starter with his right hand and, when it came into the first stage, he could hear something sizzling. He immediately started moving out of the way, but it exploded when it hit the second stage, ripping the door clear off the hinges. His left hand was caught by the flying door, breaking his lower arm and hand. The door bent an iron railing about 10 ft away, and the explosion was heard on the 5th floor! There was enough force in that blast that, had he been standing directly in front, it would have caved in his entire chest and completely crushed the bones in his face.

Recently, I was standing 20 ft from the secondary of a utility transformer... in front of a 30-year old, 1600-amp disconnect that had not been operated in eight years. This switch was old and ugly. If you feel like putting your arm across to operate that disconnect, I honour your courage: you definitely have more of it than me.

Were I still an electrical foreman, I would go ballistic were I to see one of my crew operating that piece of equipment in that fashion. My son is a journeyman, and I hope he never reaches across such a piece of equipment. The explosive force would be thousands of horsepower!

The reality is this: there are no simple answers to complex questions. When you operate any type of switch, recognize there is nothing more than a thin metal door between you and as much energy as the system can supply. So it makes sense to do this in the safest manner possible, or you'll get, permanently disabled... maybe worse.

We never intend nor expect something to blow up, but electrical systems are subject to water infiltration, environmental contamination, incipient failure, and things that creep, crawl and slither. Additionally, you have no idea what damage may have occurred years ago to a critical part of the insulating system. We always accept in blind faith that our equipment is in good shape... until the day it blows.

There certainly are instances where you are forced to put your body at risk but, if it is at all avoidable, then don't do it. When the operating mechanism is in the centre or to the hinged side, the please stay on the hinged side.

When it is opposite the hinged side, then follow the Left-Hand Rule and protect yourself from an arc flash with the right PPE (personal protective equipment). Put on your rubber gloves and leathers (they give great arc flash protection), protect yourself with multiple layers of FR clothing, and put on your face shield and face the switch. Take a deep breath, close your eyes, and move that handle with all the muscle you can muster and no part of your body in front of that door.

Should a small explosion occur, nothing will happen; a larger one will bulge the door; a larger one yet will blow the door open and, sometimes, rip the door right off of its hinges. Once you witness the aftermath of such an event, you would never advise anyone to put their body in front of a switch.

If you choose to do it, then more power to you. For my part, I'll continue to follow the Left-Hand Rule that has proved itself time and time again over the last 131 years.

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. You will find this article (and others) available to you at www.canada-training-group.ca. Feel free to use them to support your own safety program and other initiatives.

continued from page 9

Knaack celebrates 50 years on the job

Knaack LLC (www.knaack.com) is celebrating its 50th anniversary, officially kicking things off at its Crystal Lake, Ill., HQ.

"We would like to thank all the folks who made the first 50 years of Knaack possible," said Chad Severson, president. "Our gratitude begins with the folks who use our products for a living, to trusted channel partners, and to both current and prior employees of Knaack. Finally, we'd like to recognize our suppliers for, without their help along the way, we wouldn't be observing this wonderful milestone."

Founded in 1960 to supply jobsite boxes to a construction supply house, Knaack began in a 2000-sf facility—in Crystal Lake. It has since expanded its HQ location to more than 400,000 sf with 285 employees.

MacLean polymer and porcelain cutout deal with S&C Electric

S&C Electric Co. (www.sandc.com) and MacLean Power Systems (www.macleanpower.com) have entered into a definitive agreement whereby MacLean will acquire certain assets related to S&C's polymer fuse cutout line, and will be granted by S&C the exclusive rights to market and sell porcelain fuse cutouts in Canada and the States.

"This is a terrific combination: marrying the S&C fuse cutout with MPS's complementary products to better meet customer needs in the U.S. and Canada while maintaining fuse cutout production in Suzhou to keep S&C a strong competitor in overseas markets," said John Estey, president and CEO of S&C. "This will also allow our Canadian and U.S. teams to focus more strongly on developing innovative new products, including those for the smart grid."

Type XS porcelain fuse cutouts will continue to be manufactured by S&C in its Chinese facility and sold exclusively by MacLean under its brand name. The assets related to the Type XS polymer fuse cutout will be relocated to MacLean's York, S.C., facility.

"Given MacLean's desire to enter the cutout market, reaching this agreement with S&C is the best-case scenario for MPS," said Tom Smith, president and CEO of MacLean. "We get to enter the market by working with S&C, a recognized industry leader in technology, quality, and customer service."

Solar Source locating manufacturing facility in Windsor

Solar Source Corp. (SSC, www.solar-source.ca) will be locating a manufacturing facility in Windsor, Ont., to produce crystalline silicon solar PV panels. It will serve as SSC's and its manufacturing partner's "beachhead investment in North America".

SSC is a Canadian renewable energy holding company wholly owned by Solar Bancorp Inc.—a Canadian solar-focused merchant bank. SSC has partnered with Hind High Vacuum Company (HHV), a manufacturer of amorphous silicon thin film and crystalline silicon solar panel manufacturing tools in India.

The first phase of the project is expected to result in 150 full-time jobs, while the second phase is expected to create an additional 50.

"Windsor's embrace of the new renewable energy era as highlighted in Ontario's Green Energy Act is impressive, and we wish to congratulate them on their forward thinking attitude," said Ross Beatty, SSC president. EB

Motor failures:
common causes (and solutions)

Thomas H. Bishop, P.Eng.

Most motor failures stem from damaged bearings or stator windings. Lack of lubrication, over lubrication, misalignment and bearing (shaft) currents often dramatically shorten bearing life. The culprits responsible for premature failure of stator windings include mechanical or thermal overload, poor ventilation, and transient voltages/use on variable-frequency drives (VFDs). Fortunately for plant managers, most premature motor failures can be prevented using straightforward solutions to protect bearings and stator windings. >

Bearing failures

Bearings are small compared to other major motor components, making them particularly vulnerable to damage and wear. It's no surprise, then, that studies blame more than half of all motor failures on bearing malfunction, most of which result from too little or too much lubrication. The key to avoiding these conditions is to establish a lubrication program using bearing and motor manufacturer guidelines to determine the frequency and amount of lubrication for the motor application, duty (continuous or intermittent), environmental conditions, and bearing size.

Another significant cause of bearing failure is misalignment, the effect of which increases by the cube of the change. For example, an alignment value that is twice the new installation tolerance will reduce bearing life by a factor of 8 (2^3). The solution is simple: align the motor and driven equipment to new or better installation tolerances.

Bearing currents (see Figure 1) are typically caused by dissymmetry in the motor frame or powering the motor from a variable-frequency drive (VFD). Decades ago, bearing currents were only an issue on very large motors due to their inherent lack of magnetic symmetry. The ubiquitous use of VFDs today, both for new installations and retrofits, subjects these motors to a "chopped" output waveform. The resulting magnetic dissymmetry produces a current path from stator frame to shaft and through the bearings at each end.

Although no solution to bearing currents yet exists, some remedial measures are available. Among the most common of these are insulated bearing housings, ceramic rolling element bearings, and shaft-grounding brushes. Other methods include insulating the shaft bearing journal, installing completely ceramic bearings, and using conductive grease. Applying filters or reactors to the VFD also helps by reducing the magnitude of the bearing current.

Winding failures

Statistically, stator winding failures run a distant second to bearings as a cause of motor failures. Yet the extent of damage, repair cost, and downtime associated with a winding failure is often orders of magnitude greater than for bearing failures.

When it comes to stator windings, mechanical overload is the leading cause of failure. Operating a motor at "only" 15% above rated load (i.e., equal to the 1.15 service factor of many motors) can reduce winding thermal life to one-fourth of normal. A common misunderstanding is that motors can be loaded to their service factor continuously. Actually, service factor capability is intended only for short-term, intermittent use. The solution to mechanical overload is straightforward, but not always easily executed: reduce the load to no more than the power rating of the motor.

Thermal overload (see Figure 2) results from steady-state electrical causes such as over voltage, under voltage, and unbalanced voltages. A variation in voltage of more than 10% from rated or a voltage unbalance greater than 1% from the average results in excessive heating of the windings. This is another case where the solution is straightforward: bring the voltages at the motor to within tolerance. Implementation can be daunting, however, as it may require special transformers or adjusting the load on each phase.

Electric motors require the ventilation effects of internal and external airflow to extract heat from winding

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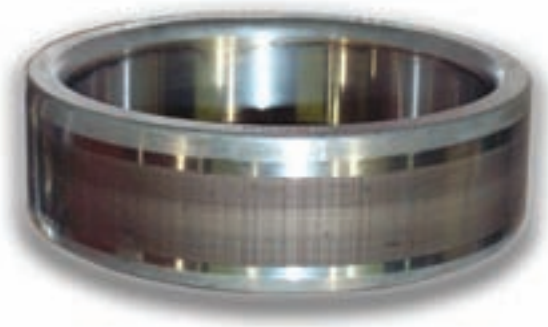

FIGURE 1
Fluting of the bearing caused by shaft current due to use on a VFD.

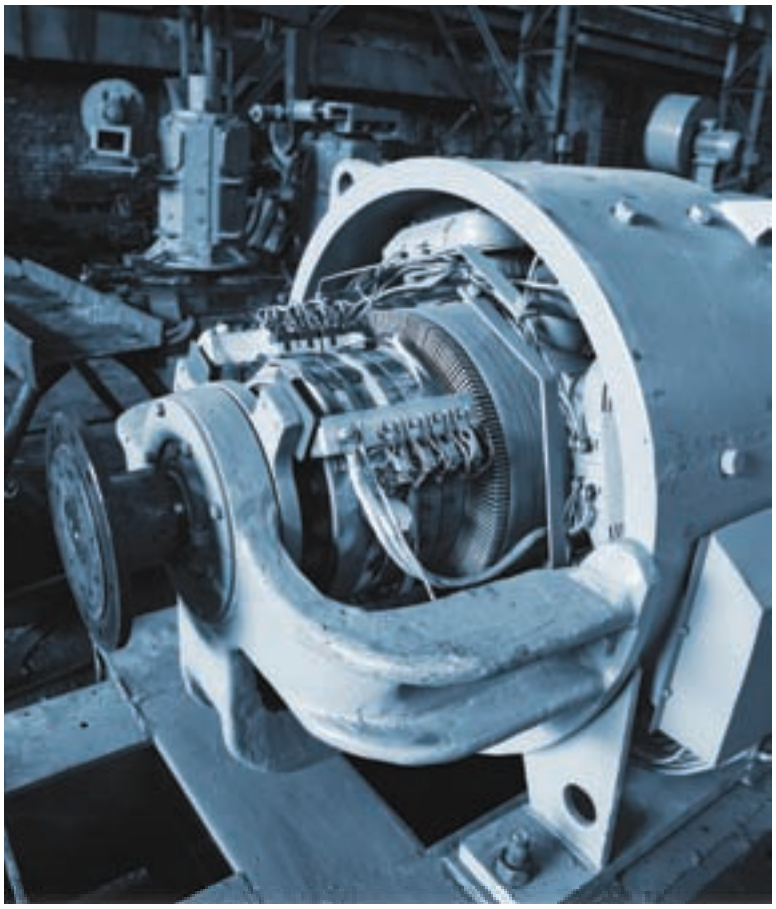

Figure 2
Symmetrical overheating of the entire winding caused by over current.

and other component losses. Accumulation of contaminants on the stator windings or externally on the frame and the fan cover (if applicable) may inhibit airflow. Damaged or missing fans also significantly reduce the flow of cooling air. The solution here is to repair or replace damaged or missing fans and to clean the motor. If the motor is an open enclosure in a dirty environment, consider replacing it with a totally enclosed fan cooled (TEFC) model. It's much easier and faster to remove dirt from the exterior of a TEFC motor than from the inside of an open enclosure motor.

Transient voltages are voltage "spikes" that achieve magnitudes of many times line voltage within microseconds. A single-event transient voltage can occur due to such incidents as lightning strikes, rapid switching of the motor, or utility bus transfers. VFDs, on the other hand, continually produce high-frequency transients due to the "chopped" waveform they use to simulate a variable-voltage and variable-frequency AC supply. The partial discharge (corona) from continuous VFD transients can literally eat away the insulation of the stator winding.

The ideal solution for single-event transients would be to prevent them from occurring. The practical solution is to install transient voltage protection in the motor terminal box. Similarly, the only true solution for repetitive transients from VFDs would be a VFD output without transient voltages. Until that becomes available common preventive measures include installing filters or line reactors and inverter-duty (VFD-rated) motor windings.

Conclusion

Since most motor failures stem from damaged bearings or stator windings, it makes sense to take advantage of relatively simple, straightforward solutions that can prevent premature damage and failure of these components. The reward will be longer, more trouble-free motor life and increased productivity. EB

Thomas H. Bishop, P.Eng., is a technical support specialist at the Electrical Apparatus Service Association (EASA), an international trade association of more than 2000 firms in 58 countries that sell and service electrical, electronic and mechanical apparatus. Visit www.easa.com.

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Photo courtesy Pentair Water Pool and Spa.

Jeff Farlow

Swimming pools are receiving a great deal of attention from municipalities and utilities across North America as new technologies promise to dramatically lower the cost of operating them. Even in Canada, homeowners are spending hundreds to thousands of dollars each year on pool filtration alone, with the pool filter pump potentially the largest electricity user in a home.

According to the Canadian trade journal *Pool & Spa Marketing*, 9.4% of single-family homes in Ontario and 5.6% of homes in Canada have in-ground pools. When including above-ground pools, nearly 10% of Canadian single-family homes have a pool. In fact, the province of Ontario has more in-ground swimming pools than all but four U.S. states (California, Florida, Arizona, Texas), which means swimming pool energy efficiency is not just a 'sun belt' issue.

Lessons from the States

A Pacific Gas & Electric Co. (PG&E) study (conducted by Davis Energy Group and submitted to the California Energy Commission as part of its 2006 Appliance Standards Rulemaking docket) determined that the average residential pool pump consumes 2600 kWh annually. With an estimated 1.5 million private residential in-ground pools in California, it takes the output of six medium-sized power plants just to operate the state's pools.

The PG&E study concluded that pool pumps "are almost always the largest single electrical end-use [appliance in a home]". Data from this study was later integrated into the California Energy Commission's Statewide Appliance Saturation study, along with findings from the Los Angeles Department of Water and Power (LADWP), Southern California Edison (SCE), and San Diego Gas & Electric Co. (SDG&E) The results are shown in Table 1 (see Table page 26).

The state legislature and state utilities targeted pool systems in the 2005 rewrite of the California Energy Code, placing prescriptive requirements on pool pumps and—to a lesser degree—on heaters. This prohibited the sale and installation of some of the most common types of pumps and motors, requiring any 1-hp or larger filtration pump to have two speed settings or variable-speed drives. It also established a regulatory and certification system backed by fines and criminal charges. The state of Florida adopted similar regulations in 2008 with its Florida Energy Bill (House Bill 7135), and more states are certain to follow.

Many municipalities and utilities in the northern United States are using incentive programs to promote energy-efficient pool equipment. Photo courtesy Pentair Water Pool and Spa.

The Natural Resources Defense Council (NRDC) conducted its own study on swimming pool energy efficiency in 2008 (with funding from the U.S. Environmental Protection Agency's Energy Star program), recommending that the Energy Star and the U.S. Green Building Council's LEED Green Building Rating System adopt specs for pools as part of their basic efficiency measures for new construction. Energy Star and the Consortium for Energy Efficiency are now working with the pool industry to develop standards for pool equipment energy efficiency. (The Association of Pool and Spa Professionals—the industry's primary trade organization—is developing a set of efficiency standards that it expects will be used as a model for these programs.)

Of note to Canadian electricity professionals is the NRDC's discovery that pool owners in the State of New York would expect to pay roughly the same amount to operate a pool pump each year with a four-month pool season as a pool owner in Phoenix, Az., which has an eight-month pool season.

The NRDC based its model solely on utility rates and weather, without taking into account regional variations in pool use. Pool owners in climates with shorter pool seasons are believed to run their pool pumps longer each day. Perhaps this is why we've seen so many incentive programs for energy-efficient pool equipment in the Northeast United States. Six different programs were launched by utilities last year in Rhode Island, New York and Massachusetts—regions with comparable climate, pool ownership and electrical infrastructure to southern Ontario and Quebec.

Pumping out energy savings

Even in cold-weather communities, utilities are increasingly adopting rebate programs that encourage pool owners to replace standard pumps with energy-efficient models, particularly the variable-speed pumps that have been proved to lower energy requirements by up to 90%.

Traditionally, a standard single-speed pump motor always operates at a high speed in pool filtration systems, wasting energy. However, filtration needs can be met by operating the pump at lower speeds optimized to perform the required task. The principles of fuel savings involved in operating an automobile apply to pool pumps: just as you use less gas when you drive at 55 mph compared to 70 mph, you use less energy when your pool pump operates at slower speeds. In the case of an automobile, that means more time on the road but, with a pool, you don't have to worry about how fast or slow you circulate the water. In fact, pool professionals and equipment manufacturers today recommend running pumps slower for longer—often twice to three times as long.

Because pumping tasks can vary by swimming pools, a variable-speed pump is required to operate at the lowest speed necessary to optimize energy efficiency. Pool pumps have historically used single-speed motors, which were typically sized to address the pool task requiring the greatest pumping power. So a single-speed pump designed to support a spa, heater or water feature in addition to the pool's filtration needs will always run at the level required to support all potential operations, regardless of whether all the features are in use.

In addition, a single-speed system can't be adjusted to reflect changes in conditions—such as weather or the number of swimmers on a given day—that affect how much filtration is required to keep a pool clean.

A variable-speed pump's automation software can be programmed to always operate at the lowest optimum speed, automatically responding to changes in pumping needs with additional power for cleaning, spa operations, waterfalls or fountains, or to address changes in pool conditions, then revert back to a slower steady state when only basic filtration duties are required.

We've found that switching to a variable-speed pump can save pool owners well over $1000 per year. The slower speeds are not only more energy efficient, but quieter. The noise reduction has proved extremely beneficial for homes in

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zero lot line neighbourhoods, where pool equipment may be located directly beneath the bedroom window of the homeowner or, worse, a neighbour.

Even with all of these advantages, however, the price tag of these technologically advanced pumps can give even the most tech-savvy consumers pause when considering an upgrade. This is especially true when, despite its shortcomings, the pump that was originally installed with the pool is still functioning as well as it always has.

As has been the case with other energy-efficient technologies, incentive programs have been very successful in encouraging consumers to invest in variable-speed pool pumps. Most offer a rebate to both the consumer and installer, usually $100 to $200 each. But some utilities have been very aggressive in promoting variable-speed pumps, such as National Grid in Rhode Island, which now offers a $400 consumer rebate for the installation of a variable-speed pump. Considering each installation is reducing electricity demand by up to 2500 kWh (again, see Table 1), that might be a bargain. EB

Jeff Farlow is the program manager for energy initiatives at Pentair Water Pool and Spa (Sanford, N.C.).

Other options for pool energy savings

Variable-speed pumps are not the only swimming pool equipment electrical professionals should be keeping an eye on...

- **Lights**

LED pool lights are a much more energy-efficient option when compared to traditional incandescent and halogen. Some LED pool lights use only 70 watts to create the same light output as a 500-watt halogen.

- **Heaters**

When a gas pool heater is more than five years old, an upgrade to a high-efficiency gas pool heater meeting stricter minimum energy requirements could quickly pay for itself. A better option in many climates is an air-source heat pump, which can deliver up to 5.8 times more heat than conventional heaters at the same cost. Geothermal heat exchangers and solar heating systems may also lower pool heating costs.

- **Digital automation systems**

Digital automation systems allow operators to schedule cleaning and filtration cycles, meaning equipment will not be left on accidentally or run at a higher flow rate than necessary. In regions where off-peak utility rates are available, these systems can allow pool managers to schedule pool filtration and other operations for off-peak hours.

TABLE 1
Top annual average electric usage/kWh per home appliance

Appliance	PG&E	SDG&E	SCE	LADWP
Pool pump	2580 2557		2772 3096	
Spa electric heater	1346	903	2514	895
Central air	1108 644		1494 1075	
Refrigerator	788 780		801 754	

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Visit www.cooperlighting.com

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Visit www.cuee.ca

CANEW—Canadian Airports National Electrical Workshop
Canadian Airports Electrical Association
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Toronto, Ont.
Visit www.iidexneocon.com

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ISE (Illuminating Engineering Society)
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Visit www.ies.org/salc

NECA Convention & Trade Show
National Electrical Contractors Association
October 2-5, Boston, Mass.
Visit www.necaconvention.org

SmartGridComm: 1st IEEE Int'l Conference on Smart Grid Communications
IEEE ComSoc (Communications Society)
October 4-6, Gaithersburg, Md.
Visit www.ieee-smartgridcomm.org

CFAE Fire Alarm Instructors Conference
October 15-17,
Toronto, Ont.
Visit www.ecao.org for details and Registration form

Industrial Control Training Seminars (for WAGO customers)
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National Convention & Electric Expo
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October 26-29, Phoenix, Ariz.
Visit www.ieci.org

Fall Technical Conference
SMMA—The Motor & Motion Association
November 9-11,
St. Louis, Mo.
Visit www.smma.org

Construct Canada
December 1-3,
Toronto, Ont.
Visit www.constructcanada.com

Solar Conference
CanSIA
December 6-7,
Toronto, Ont.
Visit www.cansia.ca

2011

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IEEE IAS (Industry Applications Society)
January 24-28, 2011, Toronto, Ont.
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Utility Products Conference & Exhibition
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Visit www.utilityproductsexpo.com

DistribuTech
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Visit www.distributech.com

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InterNational Electrical Testing Association (NETA)
February 21-24, 2011,
Washington, D.C.
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The Work Truck Show
NTEA (National Truck Equipment Association)
March 7-10, 2011, Indianapolis, Ind.
Visit www.ntea.com

MCEE
April 20-21, 2011,
Montreal, Que.
Visit www.mcee.ca

Lightfair
May 15-19, 2011,
Philadelphia, Pa. (New Location)
Visit www.lightfair.com

Petroleum and Chemical Industry Technical Conference
IEEE IAS PCIC (Industry Applications Society, Petroleum and Chemical Industry Committee)
September 19-21, 2011,
Toronto, Ont.
Visit www.ieee-pcic.org

ICUEE: The Demo Expo
(International Construction & Utility Equipment Exposition)
October 4-6, 2011,
Louisville, Ky.
Visit www.icuee.com

Key factors for making informed motor repair or replace decisions

Thomas H. Bishop, P.Eng.

Decisions, decisions. Motor failure is never a good thing, and it always occurs at the worst possible time. If there's a bright side, it's the chance to evaluate your repair and replacement options and "get it right" for the long pull. To make the best of this opportunity, you need to be aware of the available repair options and follow a logical process for making motor repair - replace decisions.

Repair-replace decision process

The flowchart in Figure 1 shows the paths you might take in deciding whether to repair or replace a failed motor. It doesn't cover every possibility, of course, because each application has unique circumstances.

Application review

The first step is to determine if the failed motor suits the application. A motor with open enclosure, for instance, may not be practical for a sawmill application with lots of airborne dust and debris. A better choice might be a totally-enclosed, fan-cooled (TEFC) replacement. Processes and duty cycles often change over time, so it always pays to reexamine the application when deciding whether to repair or replace a failed motor.

If the failed motor is a "good fit" for the application, assess the condition of the stator core. Has it sustained significant damage? Prior to failure did the motor exceed its rated temperature rise (i.e., high core losses)? Absent special features that might affect price or availability, it may cost less to buy a new motor than to repair a badly damaged stator core.

If the stator core is in satisfactory condition, consider the following decision points simultaneously:

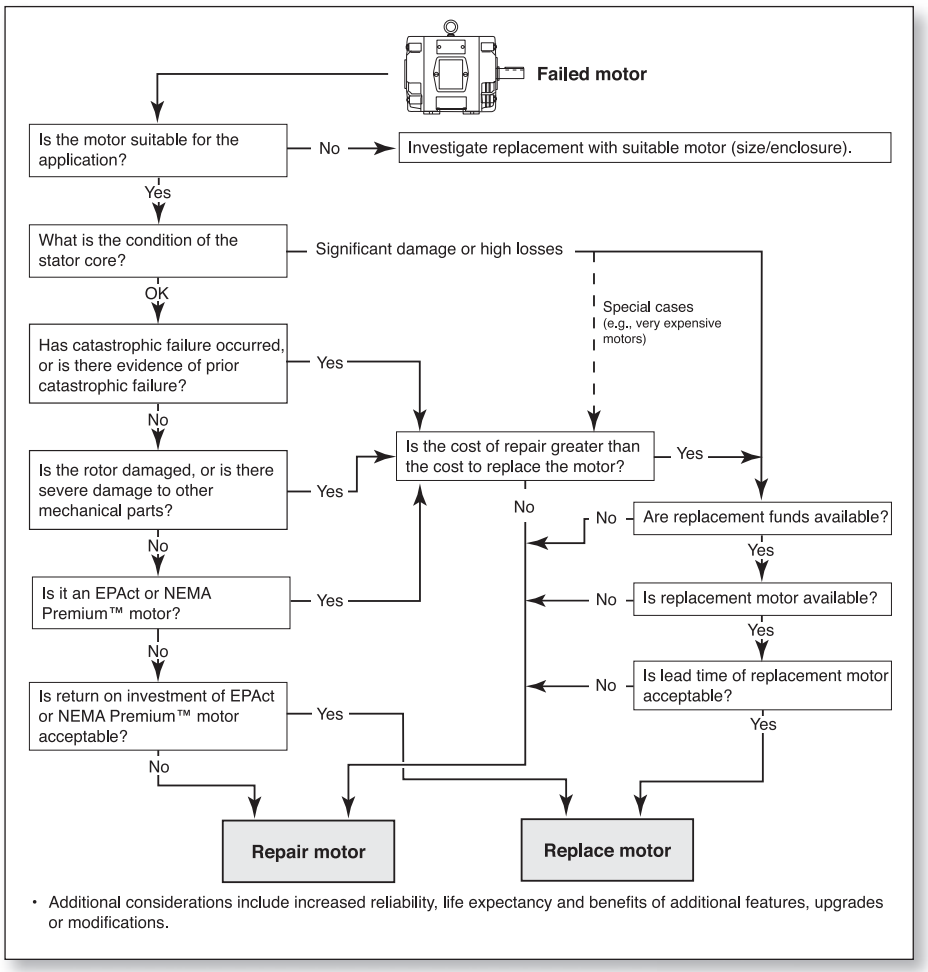
- Has catastrophic failure occurred?
- Is there evidence of a prior catastrophic failure?
- Is the rotor damaged?
- Are other mechanical parts severely damaged?
- Is it an EPAct or NEMA Premium motor?

Catastrophic failure

If a catastrophic failure has occurred, weigh the cost of repairing the motor against that of replacing it. Such failures typically cause significant damage to the stator core and windings, as well as to the rotor, shaft, bearings and end brackets. In such cases, replacement may be the most economical option–especially if you question the suitability of the motor for the application.

Rotor damage varies widely–from surface smearing due to contact with the stator, to melted bars and end rings on die-cast designs, to lifted bars or broken end rings on fabricated designs. Surface smearing can often be repaired economically. Other kinds of rotor repair may not be feasible unless the motor is very large or has special features.

The shaft, frame or other mechanical parts may also be damaged so badly that they must be replaced. Here again, the cost of buying or making a new shaft, or of purchasing a new frame, may make repair a less attractive choice than replacing the motor–unless the motor is very large or has special features.



- Additional considerations include increased reliability, life expectancy and benefits of additional features, upgrades or modifications.

Prior catastrophic failure

Sometimes evidence of a prior catastrophic failure is discovered only after disassembly, when the components are inspected and tested. Examples include a bent shaft that has bent again; a damaged rotor core or damaged rotor bars or end rings; and damaged or missing stator core iron. If previous repairs were effective and show no sign of renewed degradation, consider repair again.

On the other hand, replacement may be warranted if the present failure stems from a previous catastrophic failure that degraded the motor. The rare exceptions are cases where the damage from both failures can be repaired successfully and economically.

Whether you choose to repair or replace the motor, be sure to identify the contributing causes of failure to prevent a recurrence.

Energy-efficient motors

The points discussed so far have shaped motor repair-replace decisions for more than 50 years. The advent of energy efficient motors during the past decades introduced a new consideration–whether to replace the failed motor with a more energy-efficient model.

Broadly speaking, energy efficient motors are those covered by federal regulation (EPAct), as well as newer, premium-efficient (e.g., NEMA Premium) models. Repair considerations for these motors are the same as for standard efficiency models. Following industry best practices, qualified service centers can repair either type without affecting the efficiency rating.

Before repairing a standard efficiency motor, consider the return on investment for a more energy-efficient replacement, based on the expected life of the motor or process. To do so, compare repair and replacement costs (including the cost of any modifications needed for the new motor), and estimate the energy savings for the expected hours of operation. Note that energy savings will be more significant for motors that run 24/7 than for those that operate for eight hours a day, five days a week, or only intermittently. Larger motors (250 hp and up) also tend to be fairly efficient already, so for these sizes the differences in efficiency between standard and premium efficiency models are relatively small.

If the return-on-investment analysis shows that replacement is preferable to repair, your next consideration is whether you have the money in your budget. If not, you may still opt for repair as long as it costs less than a new motor.

Level 1	Basic reconditioning. Includes replacing bearings, cleaning all parts and replacing lubricant. Also adds seals and other accessories as agreed with customer.
Level 2	Includes Level 1 with the addition of varnish treatment of stator windings, repair of worn bearing fits and straightening of bent shafts.
Level 3	Includes Level 1 as well as rewinding the stator (i.e., replacing windings and insulation).
Level 4	Includes rewinding of the stator plus major lamination repair or rotor rebar. May include replacement of the stator laminations or restacking of laminations. Shaft replacement normally falls into this category. In short, Level 4 involves major repairs that are costly enough to justify examining the option of replacement.
Level 5	Motors that would normally be replaced except for special circumstances faced by the customer (e.g., no spare or unacceptable lead time for a replacement). Level 5 includes misapplied motors, inadequate enclosures and pre U-frame motors. A motor that should be replaced, if not for the owner's inability to operate without it.

Assuming you have the funds for a new motor, the next decision point is availability. Standard motors, such as those that fall under EPAct rules, are normally stock items. Delivery times for larger motors, or for those with special features, often range from a few weeks to several months. If the delivery time is longer than you require, a qualified service center usually can repair the original motor in far less time. It also may be able to add the special features you need to a stock motor–e.g., by converting it to a D-flange mounting.

Repair options

To make repair-replace decisions effectively, it also helps to be familiar with the various repair options for squirrel cage induction motors. Repair Levels 1 - 4 in Table 1 illustrate the expanding scope of work performed–from basic reconditioning through stator rewinding to major repair of the stator core, rotor, shaft or frame. Level 5 repairs apply to motors that normally would be replaced as a result of a straightforward repair-replace decision process, but for which other factors must be considered.

LEVEL 1 repair is a basic overhaul or reconditioning. It covers cleaning the components and minor repairs like replacing bearings and replenishing the lubricant. It also includes initial inspection and testing (before, during, and after repair).

LEVEL 2 repairs include everything in Level 1, plus varnish/resin treatment of stator windings, repair of worn bearing fits, and straightening of shafts. Due mainly to the extra labor required, Level 2 represents a significant expansion in the scope of repairs. These repairs may cost several times more than Level 1 repairs, and take quite a bit longer to complete.

LEVEL 3 repairs add stator rewinding (replacement of the windings and insulation system) to Level 2 repairs. Smaller, single-speed motors are relatively easy to rewind. Special windings (e.g., two-speed or very low-speed windings) often require more labor, material, and expertise to repair. In either case, the extra step of rewinding the stator expands the scope and increases the cost of repair considerably.

LEVEL 4 repairs are the most comprehensive. Besides Level 1-3 procedures, they encompass major repairs of the stator core and/or replacement of rotor bars and end rings. They also may include replacement of the stator core laminations or the shaft. Never undertake Level 4 repairs without first considering the option of replacement.

LEVEL 5 repairs, as mentioned earlier, apply to motors that normally would be replaced, except in special circumstances–e.g., lack of a spare or replacement unit. Depending upon the standard or special features of a particular motor, Level 5 could apply to any of the other four levels of repair.

As these five levels imply, the damage resulting from motor failures varies widely, as do the associated repair costs. While repair costs generally increase with the scope of the work, there is no "rule of thumb" for how much. What is clear, however, is that an evaluation process that fails to consider the various levels of repair is far too simplistic to yield sound repair-replace decisions. EB

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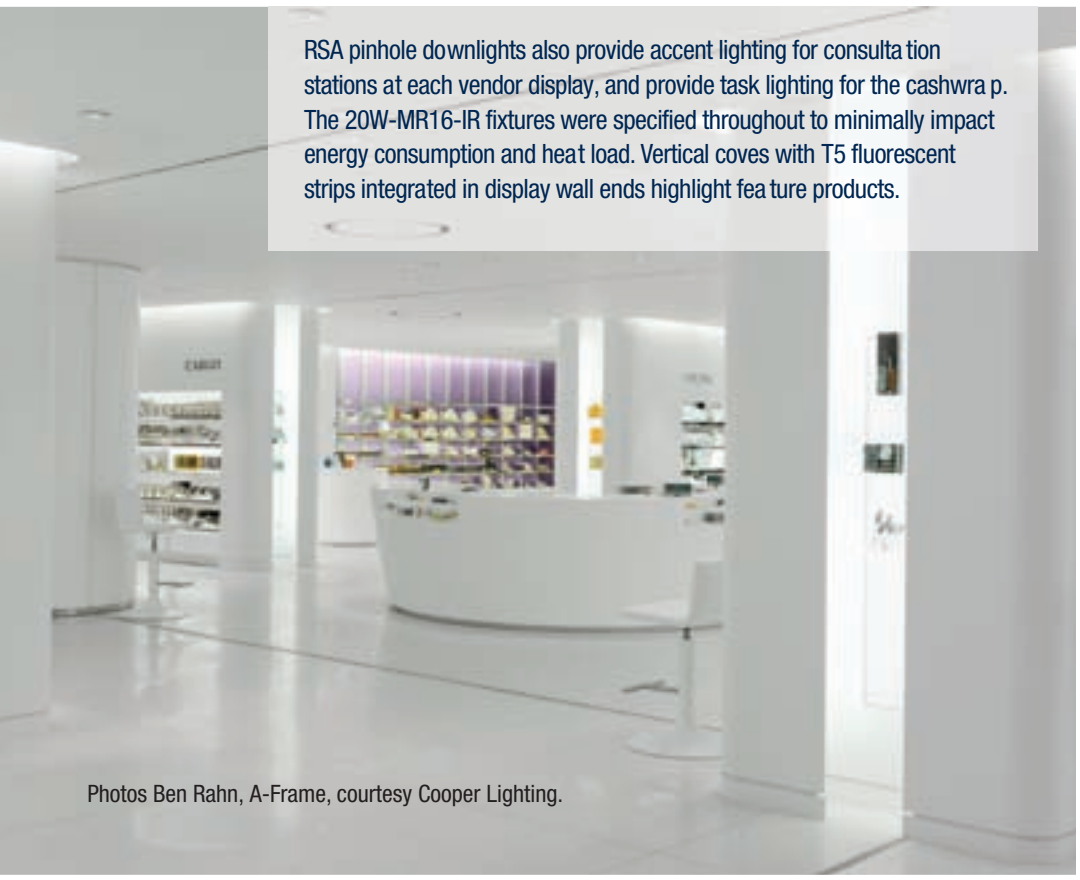
Canadian lighting project
shines at 33rd annual Source Awards

Downlighting was reduced by generating most of the ambient light via localized merchandise lighting. RSA Accurus adjustable pinhole downlights are arranged in graphic patterns, emphasizing circulation routes through the space, and are adjustable for highlighting freestanding and feature displays. The pinhole aperture reduces ceiling glare, enhancing the impact of displays.



RSA pinhole downlights also provide accent lighting for consultation stations at each vendor display, and provide task lighting for the cashwrap. The 20W-MR16-IR fixtures were specified throughout to minimally impact energy consumption and heat load. Vertical coves with T5 fluorescent strips integrated in display wall ends highlight feature products.

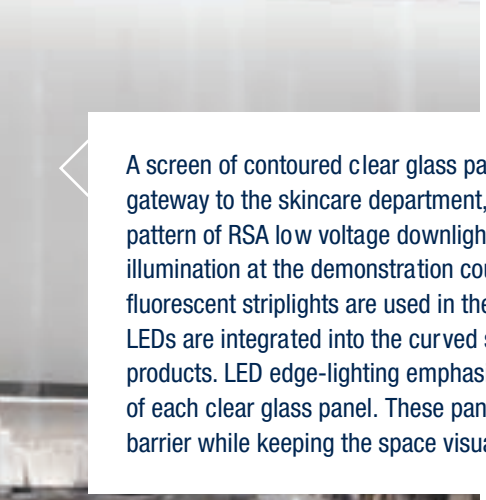
Photos Ben Rahn, A-Frame, courtesy Cooper Lighting.

Cooper Lighting announced the winners of its 33rd annual Source Awards national lighting design competition, who were recognized at Lightfair International 2010 (Lightfair) in Las Vegas. Eight professional awards and five student awards were presented. And taking top honours in the Professional Commercial Category were Jesse Blonstein, Julia Vandergraaf and Diego Burdi of Lightbrigade Architectural Lighting Design (Toronto, Ont.) for the lighting of the Murale retail boutique in Ottawa.

This 7000-sf beauty boutique was developed as a new store concept for an established Canadian retailer. The organic layout of the displays in the space breaks from the uniform aisles typical of cosmetics stores. High-CRI fluorescent- and halogen-sourced fixtures were selected, so a range of cosmetic products may be seen, sampled and selected clearly and accurately. The selection of luminaires and detailing of architectural features ensured that light sources were shielded from normal views, allowing the displays and product to have prominence.

Maintenance of the project is simplified through extensive use of fluorescent and LED fixtures, and is limited to only five lamp types (not including LEDs). The fixtures and lamps include RSA MR16 halogen downlights (one wattage and beam-spread used throughout), T5 fluorescent striplights (three lengths used), and Metalux T8 fluorescent striplights. This prototype store was a considered a success, as it led to a national rollout of stores in Ottawa, Montreal, Toronto, Calgary and Vancouver.

Photos Ben Rahn, A-Frame, courtesy Cooper Lighting.



A screen of contoured clear glass panels serves as a gateway to the skincare department, where a circular pattern of RSA low voltage downlights provide task illumination at the demonstration counter. Two-foot fluorescent striplights are used in the curved coves, while LEDs are integrated into the curved shelving to light the products. LED edge-lighting emphasizes the unique curve of each clear glass panel. These panels create a physical barrier while keeping the space visually clean and open.

Fluorescent striplights incorporated into full height mirrors provide customers with a flattering, low-glare light quality consistent with displays at which the product was initially selected. High-CRI 3500K T5 fluorescent lamps are used consistently in shelves, coves, and at mirrors.

Animated vertical linear arrays of white LEDs are embedded in the white, translucent walls of the skincare area. The LEDs are individually programmed to stream down the wall in a pattern reminiscent of rain.

The annual competition, which focuses on furthering the understanding, knowledge and function of lighting as a primary element in design, requires the primary and predominant use of Cooper Lighting products. Entries are judged on the blending of aesthetics, creative achievement, technical performance and the degree to which the lighting meets project constraints and design concept goals. EB

Lightfair 2010 boasts phenomenal West Coast showing

Lightfair, North America's largest annual architectural and commercial lighting trade show and conference, experienced its most phenomenal West Coast show last month, and EBMag was there. The 2010 show and conference, which took place in Las Vegas, ended with a record-breaking number of 22,000 registered attendees—increasing attendance by 10% from Lightfair 2008 (also in Vegas) and making it the largest in Lightfair's West Coast history.

Boasting an exhibit hall of 160,000 sf and nearly 1600 booths, the 2010 trade show floor featured 498 international manufacturers—94 of which represented countries outside of the United States. Delegates from 72 countries discovered a robust trade show floor of innovative product designs and introductions, technological advances and lighting solutions.

The exhibitors and delegates came from a variety of disciplines, representing a broad cross-section of professions, including: architects, consultants, specifiers, facility managers/owners, energy consultants/specialists, landscape architects, visual merchandisers and interior and retail designers; electrical engineers and engineers; lighting designers; electrical and general contractors; lighting retailers and distributors, and more.

This year, Lightfair debuted a new pavilion on the trade show floor—the Building Integration Pavilion—aligning it with the three established product-specific pavilions: Daylighting, Design and Global Light + Design. The Building Integration Pavilion featured companies with enterprise-system technologies used to maximize and create energy-efficient buildings.

As the highlight of its Lighting Innovation Awards program, Lightfair honoured four companies as the lighting industry's leaders in innovative product design and technology: Helieon Sustainable Light Module System by Bridgelux and Molex (Most Innovative Product of the Year); Light-Drive Elite by Traxon USA (Design Excellence Award); SSL2102 by NXP Semiconductors (Technical Innovation Award); and LightLouver Daylighting System by LightLouver (Judges' Citation Award).

The awards presentation also honoured Best of Category winners:

- Conventional Lamps: Professional LED Bulb CTA by Ledzworld Technology SDN BHD
- Ballasts, Transformers, Drivers: Quicktronic QHE T5HO/SS System by Osram Sylvania
- Chandeliers, Pendants, Sconces, Task Lights & Decorative Luminaires: Locking Ring and Decorative Lights by Recesso Lighting
- Downlights, Wallwashers, Accent Lights: Element 3 LED Downlight by Generation Brands Tech Lighting
- Track, Low-Voltage, Cable & Rail Systems: Paloma by W2 Architectural Lighting/WAC Lighting
- Fluorescent Based Troffers, Suspended, Surface Luminaires: DSBL Bi-Level Stairwell Luminaire with Deco-SMART system by DECO Lighting
- Industrial, Vandal, Exit & Emergency Lighting: SAFR Series LED Luminaires by AZZ/RAL Rig A Lite
- Roadway, Sports, Outdoor Architectural, Site Lighting: Sentinel Plasma Luminaire by PEMCO Lighting Products
- Landscape, Pool & Fountain Lighting: Luca by Structura
- Theatrical, Floodlights, Specialty Luminaires: Series 6000 HP LED Cove Light featuring CandleLED LEDs by Tempo Industries.

As we reported last month, Lightfair 2011 is being held in Philadelphia, Pa. Keep reading EBMag (and visit EBMag.com) for more on Lightfair. EB

Electrical safety: it's time to get serious!

Andy Cochrane

Despite awareness campaigns, industry statistics and loss summaries, annual safety conferences and numerous industry associations driving the safety message, we still more often than not take a reactive approach than proactive approach to electrical safety.

I am not pointing fingers or sermonizing because I was reactive, and I did not take electrical safety as seriously as I should have until we had an electrical fire. Around 3am one morning my son came into our bedroom and shouted that his bedroom was on fire. We rushed out of bed, saw the flames for ourselves (by which time the solitary smoke detector on the upper level decided to sound), woke the other two younger children and made our way downstairs. I called 911 while my wife put the kids in the car. A few moments later we were all safe, watching our house burn and the firefighters doing their job admirably.

Thankfully no one was injured and the two older children had received some fire safety education at school. We had a defined escape route but beyond this we were not adequately prepared for such an event. Sure, we had smoke detectors on each level of the home and one fire extinguisher, but this was sorely inadequate. The investigation showed there to be a wiring issue that led to overheating of a lamp resulting in ignition of insulation material—and we discussed with the fire department corrective action that we could easily undertake.

Damage was minimal at $24,000 but by far the bigger impact was the inconvenience of spending 12 weeks living in a hotel, filling out insurance form after insurance form, hunting for receipts to validate date of purchase and amount so that claims could be processed, buying new clothes and trying to replace personal items.

Once we returned to the repaired home, we installed smoke detectors in every bedroom, we installed carbon monoxide detectors on every level, we strategically placed fire extinguisher on every level and once again reviewed our fire escape plan. It was then that I came across an article on Risk Control Hierarchy and realized that, while the steps we had taken were all valid, they were aimed at protection not prevention, they were aimed at reacting quicker and more effectively to the next incident.

The smoke detectors in every room provided personal protection as did the fire extinguishers. The practice of no extension cords or extension plugs as a safety feature provided an administrative response to being safer and avoiding overheating. The continued practicing and establishment of escape routes provided an awareness of how to react, but none of these can actually prevent

FIGURE 1: Risk Control Hierarchy Chart

Steps for mitigating risk of the electric incident and their effectiveness.

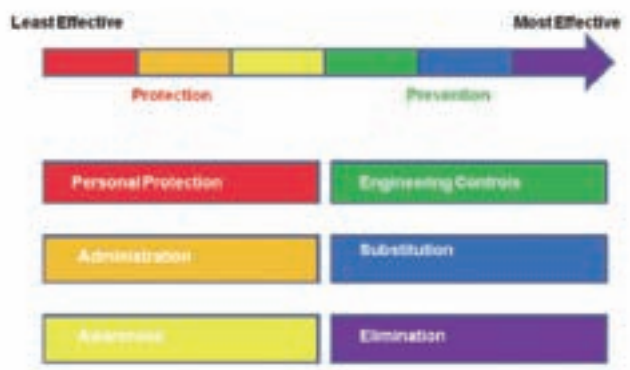
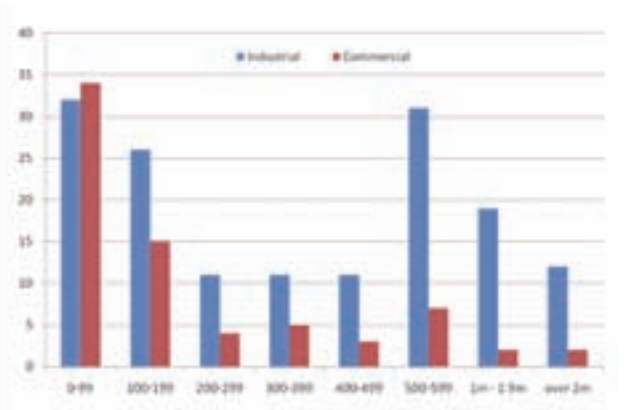


FIGURE 2: Ground Fault Losses Reported to FM Global (1992-2001)

Graph shows Number of Losses (Y) and US$ Thousands (X). (Source: FM Global UTH: Ground Fault Protection 2001.)



another event from occurring. I had spent $100 on additional detectors, etc., to react quicker and more effectively but had not implemented one real change that would avoid the next electrical fire. We then started to look closer at the idea of more effective electrical panels and outlets, lowering or substituting our risk and, of course, options for eliminating the risk. We had a new electrical panel installed with AFCI (arc fault circuit interrupters) for all bedroom circuits; we had all of our electrical outlets replaced and our aluminum wiring updated with copper tails and, finally, we implemented the simple but effective step of unplugging anything in the bedrooms at the end of each night. This investment in prevention cost $2800 and allowed us to avoid any further incident. With a little foresight and being proactive instead of reactive, this investment of $2800 would likely have avoided the fire, the inconvenience, the replacement and rebuild cost of $24,000. If only I had viewed the $2800, not as an expense, but as an investment in avoiding a greater issue.

But what about industry?

Unfortunately we remain reactive in industry where the losses are even more significant and the frequency of electrical fires higher. Whether we are the safety office, the operations manager, the facilities engineer, the CEO or an insurance associate, we can and must change our approach.

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

At the same time, we have statistics that suggest there are five to seven arc flash incidents per day in North America requiring hospitalization.

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

Quite often, the impact on business interruptions and the indirect costs significantly outweigh the direct costs. NFPA notes: "During the five-year period of 1994 through 1998, an estimated average of 16,900 reported industrial and manufacturing structure fires caused 18 civilian deaths, 556 civilian injuries, and $789.6 million in direct property damage per year". From this we can estimate that the average equipment and property damage from an electrical fire is $46,700.

There is a significant human cost to electrical accidents and arc flash victims may suffer from chronic pain and scarring. Workers may also have difficulty re-integrating into the community, and may experience anxiety, depression or other psychological symptoms. The social and economic costs may also be high. Workers' compensation pays only a portion of lost wages. Some workers may not be able to return to their pre-injury job. Employers bear the costs associated with lost productivity, reduced competitiveness, employee rehiring and retraining, as well being subject to increases in workers' compensation premiums.

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

Business interruptions due to unscheduled downtime, repair, spoilage, etc., varies by industry with per-hour costs ranging from $15,000 for automotive companies, to $24,000 for mining and metal companies, to $90,000 for airline reservation companies.

When we add the equipment and property damage estimates to the personnel costs, to the business interruption costs, then add possible fines and other indirect costs, it is quite easy to total in excess of $500,000 per incident—that's in line with the experience of the insurance company detailed above.

Moving to protection and prevention

So why then do we start electrical safety with a focus on protection rather than prevention. We quite readily invest in safety awareness training; we purchase and post warning signs; we insist on safety goggles and gloves, and perhaps even PPE (personal protective equipment), yet we do not invest in prevention nor take the steps necessary to eliminate or reduce the likelihood of an electrical incident.

The most common grounding method in use in North America for both commercial and industrial facilities is called solidly grounding. In this method, the neutral points have been intentionally connected to earth ground with a conductor having no intentional impedance. This partially reduces the problem of transient over-voltages associated with ungrounded systems, which was the primary reason for this option's growth from the 1970s onward. However, this grounding method has the highest incident level of arc flash events and electrical fires. There are estimated to be around 60,000 industrial facilities in North America that operate ungrounded and 210,000 industrial facilities that operate solidly grounded—despite the higher level of risk.

The least common yet safest grounding method in use today in North America is *resistance grounding*, where a resistor is connected between the neutral of the transformer secondary and the earth ground. The reasons supporting this option for electrical grounding can be found in several IEEE (Institute of Electrical and Electronic Engineers) Reference Guides:

- IEEE 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- IEEE 141, Recommended Practice for Electric Power Distribution for Industrial Plants

There is no arc flash hazard as there is with solidly grounded systems because the fault current is limited to approximately 5A. Another benefit of high-resistance grounded systems is the limitation of ground fault current (preventing damage to equipment).

There have been technical advances in the detection and mitigation of arc blasts in terms of current-limiting fuses, thermal ionization detectors and optical arc detection relays. These, in addition to resistance grounding, offer an engineering approach to reducing the risk and substituting with a lower level of risk, yet are not often used by either the consulting or engineering communities, nor are they requested by safety officers or facility managers, nor are they promoted by the insurance industry.

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The cost of investing in prevention technology ranges depending on the size and complexity of the operation being protected, but is likely from $15,000 to $100,000. Still, that's far below the $500,000 cost impact explored earlier. The likely payback in investing in prevention technology is less than a year—more likely one to six months.

Recently, there was an electrical fire at a recreational facility that resulted in consequential damages of $1,000,000—mostly in business interruption costs and, as the forensic engineers and insurance investigators conducted their reviews, the focus was solely on product failure and finding someone to blame. They reviewed all aspects of the electrical equipment that was specified and installed (including settings and commissioning reports) but not once did they stop to ask themselves whether the decision by the consulting engineer to specify a solidly grounded system may have been a contributing factor.

Industry data advises us that this is the grounding method with the highest likelihood of arc flash hazard. Why is it, then, when a tragedy occurs, we question everything but the chosen grounding method? There are practical reasons for specifying a solidly grounded system, especially when there's an abundance of neutral loads to be served. But surely in this scenario there is a responsibility on the specifying engineer and the operating owner to ensure that mitigation technologies such as ZSIP or optical arc detection are installed so that, when an arc occurs (which is possible at some point over the life of the equipment), the impact is limited and safety assured.

There is a place in industrial and commercial facilities as there is in our own homes for protection options, we should be made aware and understand the risks involved with electricity; we should have the necessary protective clothing and equipment; we should complete electrical safety awareness training; we must also start to take a more proactive stance and start investing in prevention technology.

I contacted my insurance broker after the house fire and advised him that I was installing new smoke detectors, etc., and it was recommended that they be wired into the telephone system so that 911 was automatically notified in the event an alarm was triggered. I could save 10% on my monthly insurance costs (and this more than covered the cost). I called again to advise that I was updating the wiring, installing a new electrical panel with AFCI breakers, etc., to reduce—if not eliminate—the root causes. I was told there would be no further reduction in premium.

So when I take protective measures to *react* quicker, I receive a benefit from the insurance industry; when I make a more significant investment in preventive measures, then the insurance industry sits on the sidelines.

Prevention technology is available now. It should be our first choice, not our last. As industry leaders, we must view it as an investment, not a cost. As safety professionals or facilities managers, we must change our thinking from protection to prevention. The payback is definable and real (and it sure would help if the insurance companies provided some support).

It's time to get serious about electrical safety. EB

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

Today's pickups
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FUEL EFFICIENCY • SAFETY • COMFORT • CAPABILITY • DRIVE • NEW DESIGNS

Gerry Malloy

Arguably, few tools are more versatile or more essential to your business than your pickup truck. And for sure, little else you buy presents you with so many choices or demands so many decisions at time of purchase.

The range of choice can be overwhelming with literally hundreds-of-thousands of combinations and permutations of make, model, body-style, trim, engine, transmission, axle ratio, wheelbase, box length. Load ratings and miscellaneous options available.

It's a fast-changing product-line, too. Not only are there several all-new models on the market, even many carry-over versions have undergone major changes to their powertrains and other key equipment.

Most of the advances in today's trucks can be categorized as improvements in one or more of four major areas:

- Fuel efficiency;
- Safety;
- Comfort, convenience and luxury;
- Work capability.

In fact, most of the pickups on the market can boast improvements in all four areas.

Safety, which was once almost ignored in this type of vehicle, has improved enormously. Almost every truck on the market now offers ABS, electronic stability control – including roll-over mitigation programming – side air-bags and much more as available options if not standard equipment.

We don't have nearly enough space in this magazine to provide you with a detailed analysis of all the pickup trucks that are or soon will be available. But the following overview should give you a sense of what's happening in the market and what's out there for your consideration.

For more details on selected models, check out the 'Video Vehicle Reviews', coming soon to EBMag.com.

Full-size pickups

Full-size pickups are the core of the truck business for manufacturers, outselling smaller pickups five-to-one. Which also means they are core products for you, their customers. Here's a brief look at what's available and what's new.

▪ Ford F-Series

Ford's wide-ranging F-Series is the best-selling pickup truck in Canada. The light-duty F-150 was all-new in 2009, when it was named both the Motor Trend and the North American Truck of the Year. It is available in five trim levels, three cab configurations and three box lengths, with a choice of three different high-tech overhead-cam V-8 engines ranging from 248 to 310 hp. In its most fuel-efficient form it achieves a combined fuel-consumption rating of 12.7 L/100 km.

Among options available is Ford's exclusive package of Work Solutions technologies, which include an in-dash computer with high-speed Internet; wireless accessories including a mouse and printer; Tool Link, a Radio-Frequency Identification (RFID) asset tracking system that enables customers to maintain a real-time inventory of tools and equipment stored in the vehicle; Crew Chief, a fleet telematics and diagnostics system; and a Cable Lock security system to secure large equipment in the cargo area.

The 'big' news for 2011 is an all-new range of SuperDuty pickups, F-250/350, which also offer two new engines – a 6.2-litre gasoline V-8 and 6.7-litre Power Stroke turbocharged diesel V-8 that generates 390 hp and 735 lb-ft of torque. Properly equipped, payload ratings can extend up to 6,520 pounds.

▪ Chevrolet Silverado / GMC Sierra

Although they vary slightly in appearance and

detail, General Motors' Chevrolet Silverado and GMC Sierra are twins under the. Now four years into their current generation and at least a couple years from an all-new model, the light-duty (1500) models continue to evolve to match their newer competitors.

A wide range of available configurations includes everything from jobsite-ready Work Truck models to the luxuriously appointed LTZ crew cab. They encompass five trim levels, three cab configurations and two box lengths – plus a Hybrid. One V-6 and two pushrod V-8 engines are offered in 4.3-litre, 4.8-litre and 5.3-litre displacements respectively, with power outputs from 195 to 315 hp. New for 2010 is a fuel saver mode that enables the trucks to make better use of GM's Active Fuel Management system, running on four-cylinders in light throttle conditions instead of eight.

A all-new HD 2500/3500 lineup makes it debut later this summer, incorporating a fully-boxed frame that improves torsional stiffness by five times, and supports a maximum tow rating of 21,700 lb. The standard engine is a 6.0-litre Vortec V-8 with variable-valve-timing but the *piece de resistance* is a new 6.6-litre turbocharged Duramax diesel V-8 that is said to top the segment in both power (397 hp) and torque (765 lb-ft).

▪ **Dodge Ram**

Technically it's just a Ram now, as the new Fiat-controlled Chrysler has decreed that the Dodge brand is reserved for passenger cars. Whatever you call it, it's a formidable truck, running second in sales only to the F-150. Introduced in its current form as a 2009 model, the Ram 1500 earned Canadian Truck of the Year honours from the Automobile Journalists Association of Canada (AJAC) and it's won a host of other awards since then.

Like its major competitors, the Ram is offered in multiple variations, including five trim levels, three cab configurations and two box lengths. Engine choices include a 3.7-litre V-6 and a 4.7-litre V-8, both overhead cam designs, as well as the legendary 390-hp 5.7-litre Hemi V-8. A distinguishing feature of the Ram 1500 is its multi-link coil rear suspension, which contributes to a ride quality widely judged to be best-in-class.

A new Ram Heavy Duty 2500/3500 lineup was launched for 2010 and it was promptly crowned Motor Trend's truck of the year. Among its many attributes, Mega Cab models offer the largest cab and greatest interior cargo volume in the segment. Powertrain choices include the Hemi V-8 and the the legendary 6.7-liter Cummins Turbo Diesel engine, which produces 650 lb-ft of torque and claims a major-overhaul interval of 560,000 km.

▪ **Toyota Tundra**

Behind the Detroit Three in terms of sales is the Texas-built Toyota Tundra. While its range of offerings isn't as extensive as those from Detroit, it is available in 15 models with three cab configurations and three bed-lengths. A new 4.6-litre V-8 engine that replaces the previous 4.7-litre version for 2010 generates 12 percent more power (310 hp) while improving fuel efficiency by 11 percent. With a combined fuel consumption rating of 12.1 L/100 km, Toyota claims it to be the most fuel-efficient conventional full size pickup truck. Also available is a 5.7-litre V-8 that produces 381 hp.

▪ **Nissan Titan**

Nissan's full-size Titan, which is built in Mississippi, hasn't achieved the sales success the company hoped for, but that doesn't mean it's not a worthy competitor. It is offered in four trim levels, two cab configurations and three bed-lengths, including a longest-in-class bed with the Crew Cab configuration. All models are powered by a 317-hp 5.6-litre V-8 engine. Among the Titan's many innovations are rear doors (King Cab) that open nearly 180 degrees, an available high-utility bed that includes a spray-on bedliner, a Utili-track tie-down system and a lockable bed-side storage compartment.

Small/mid-size pickups

While they are not nearly as popular as their full-size siblings, small and mid-size pickups provide all the space, capability and versatility many businesses need. And in some cases they incorporate innovations that aren't available in the bigger trucks.

Here's a quick overview of what's available.

▪ **Ford Ranger / Mazda B-Series**

Like it's bigger brother, the Ford Ranger is the best-seller in its class, even though it's among the oldest designs on the market. Key to that popularity is Ford's aggressive pricing strategy, which offers great value, particularly in the most popular models. A 2.3-litre four-cylinder engine is standard and a 4.0-litre V-6 is optional. Regular and SuperCab configurations are offered in short and long wheelbase versions.

Mazda's B-Series pickup is essentially the same as the Ranger, with minor trim and appearance differences.

▪ **Toyota Tacoma**

In a departure from the full-size pickup market, Toyota's long-established Tacoma is the second-best seller in the category, behind Ford. The Tacoma approaches full-size status in several respects, including an 1150-lb payload rating and 3500-lb towing capacity. It is offered in seven models, with two cab sizes. Both a 2.7-litre four-cylinder and a 4.0-litre V-6 engine are available.

▪ **Chevrolet Colorado / GMC Canyon**

Like their bigger siblings, the Chevrolet Colorado and GMC Canyon are twins under the skin. Three trim levels, three cab configurations, three box lengths and three engine choices are offered – including a new-for-2010 5.3-litre V-8. The other engines available are a 2.9-litre four and a 3.7-litre five-cylinder.

▪ **Dodge Dakota**

Closer to full-size than compact, the mid-size Dodge Dakota is a real alternative to larger pickups. Boasting more interior room than its competitors, Dakota is offered in four trim levels and two cab configurations. It comes standard with a 3.7-liter V-6 engine and a 4.7-liter V-8, with two spark plugs per cylinder is optional. Revised suspension tuning for 2010 are said to improve both ride and handling.

▪ **Nissan Frontier / Suzuki Equator**

Nissan's venerable Frontier, which shares its suspension layout and many component designs with the larger Titan, continues into 2010 with little that's new. It's available in two cab configurations and four trim levels with either a 2.9-litre four-cylinder or 4.0-litre V-6 engine. Nissan claims best-in-segment power, torque, towing and payload ratings for V-6-equipped models.

What is new to the Canadian market is the Suzuki Equator, which is based on the Frontier and shares most of its specifications. It's offered here initially as a single model – a four-wheel-drive V-6 crew cab that is competitively priced.

▪ **Honda Ridgeline**

The Honda Ridgeline is an anomaly among pickups. Created from a clean slate, it overlaps the mid-size and full-size segments in size but in appearance and design it deviates substantially from the norm – for the better in many respects. It's the only truck to feature unitized, rather than body-on-frame, construction, although it incorporates fully-boxed frame rails in that unitized structure. It's offered in four trim levels with a single configuration – a four-door AWD model. Power comes from a 250-hp 3.5-litre V-6 engine. While it doesn't look like a regular pickup truck it can perform like one, with a payload rating of 1554 lb and towing capacity up to 5000 lb.

Specialty trucks

There are several variations on the pickup that are at least interesting if not wholly practical as work trucks.

The most practical, perhaps, is the **Chevrolet Avalanche** – a variant of the Silverado that incorporates a unique cab design with what GM calls a mid-gate. Effectively, the back of the four-door cab opens to extend the pickup bed into the cab – in the open air. The **Cadillac Escalade EXT** is, in effect, an Avalanche *de luxe* and it's available in Hybrid form as well.

Ford's SVT Raptor is a variant of the F-150 that is, simply stated, a factory hot-rod intended for serious off-road adventure. It's what every work truck longs to be! EB

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† Standard Gas or available Diesel engines. Projected best in class fuel economy based on competitive data available at the time of testing using Ford drive-cycle tests (in accordance with the guidelines of the Society of Automotive Engineers' Standard J1321) of comparably equipped 2011 Ford vs. 2010 Competitive models. • Maximum payload of 6,520 lbs. (2,957 kg) on F-350 DRW Regular Cab 4x2 when properly equipped. Class is Full-size Pickups over 8500 lbs. GVWR vs. 2010 competitive models. *Conventional towing up to 16,000 lbs, or up to 24,400 lbs. on F-450 when properly equipped with 5th wheel/goose neck. Class is Full-size Pickups over 8500 lbs. GVWR vs. 2010 competitive models. ‡Max horsepower & torque based on Super Duty Diesel engine.

Standard 3W MR16 and 4W GU10 LED lamps

Standard has introduced a line of energy-efficient, drop-in replacement MR16 (3 watt) and GU10 (4 watt) LED lamps, equivalent to 20W MR16 and 35W GU10 halogen lamp, respectively. Available in Warm White (3000K) and Neutral White (4200K), these lamps are intended to replace any existing halogen MR16 and GU10 application without compromising the design of the fixture. These lamps emit virtually no heat or damaging UV/IR light during operation.
STANDARD PRODUCTS
www.standardpro.com

HessAmerica Sera LED pole-mounted luminaire

HessAmericaís pedestrian-scale Sera LED luminaire emits no uplight above 90º horizontal, and can be used for LEED lighting zones LZ2 through LZ4. The optical system consists of two high-power LEDs working in conjunction with a reflector and prismatic lens; light from the LED module is reflected outward and refracted through the lens to produce a long and narrow light distribution pattern. The prisms on the inside of the lens minimize the visual brightness of the luminaire while producing uniform illumination on the ground. Total power consumption is 39 watts. The Sera housing and integral fitter are die-cast aluminum; the formed aluminum door latch is flush to the housing and provides tool-less access to the luminaire.
HESSAMERICA
www.hessamerica.com

Jesco Sleek Plus LED S801 linear undercabinet lighting

Jesco introduced the Sleek Plus LED S801: an LED linear lighting system designed for residential and commercial use in undercabinet (and similar) and interior cove lighting applications (straight or angled). S801 modules are 0.875 x 2-in. wide, come in 12-in., 24-in. and 36-in. lengths, and use 8.6 to 24.1 watts/foot. Modules operate on 120 line voltage, require no transformers, plug in to standard wall sockets and provide uniform 3000K color temperatures. The fixtures can be switched between preset full output lighting or dimmed-output background lighting. The units are constructed of aluminum extrusions (for the housing) with integral mounting connectors, include a 6-ft cord, a 3-prong plug and a direct connector for curved lighting designs.
JESCO
www.jescolighting.com

WAC Invisiled Classic 24V outdoor tape light system

Designed for outdoor accent and display lighting applications, WAC Lighting unveiled the Invisiled Classic 24V outdoor system of LED tape lightsóthe newest addition to the firmís Invisiled family. The fixtures are IP68-rated for submersion in water up to 5 ft, as well as cUL listed for wet locations. The LED consumes 2 watts/ft, and measures 1/8th of an inch thick and half an inch wide. Each Invisiled strip can be mounted with screw-based clips; the tape is available in field-cuttable 1-ft, 5-ft and 10-ft sections.
WAC LIGHTING
www.waclighting.com

High-Lites HEPC emergency power control

High-Litesí HEPC Series of emergency power controls adapt locally switched lighting fixtures for emergency operation during power interruptions. The seriesí design bypasses the local switch so the lighting fixture will illuminate, regardless of wall switch position during emergency conditions. The controls also save energy by eliminating the need for night-light circuits, and are designed for easy installation in standard electrical boxes. The HEPC Series is compatible with motion detectors and photocells, and is approved for in-wall or in-ceiling applications. Models are available for 120vAC or 277vAC operation, and visual power readiness indicators provide status at a glance.
HIGH-LITES
www.highliteslighting.com

Bulbrite elegant KX2000 Krystal Touch krypton bulbs

Designed as a light source for ìelegantî crystal fixtures, Bulbrite offers the Krystal Touch line of krypton bulbs. The series is an extension of the companyís full-line of krypton and xenon lamps, featuring the KX-2000 as its lamp. The bulbs promise a sparkling white light and higher lumens at a lower wattage. The Krystal Touch line includes a Flame Tip and Torpedo Chandelier style, G-11, G-16 1/2óall with a clear finish. Operating on 120V systems, the models range from 10 to 60 watts, and the bulbs are offered in candelabra and medium bases. (Pictured is Schonbekís Quantum lighting fixture using Krystal Touch bulbs.)
BULBRITE
www.bulbrite.com

EB products

MacroAir solar HVLS industrial fan

MacroAir Technologies introduced the MacroVoltaic fan: a solar high-volume low-speed (HVLS) industrial fan. HVLS fan technology is designed to generate a column of air that flows down to the ground and outward 360º. The MacroVoltaic air movement system includes the HVLS fan with an attached controller, a specialized component that converts power from solar panels, as well as the solar panels, which have a 20-year warranty, standard remote control, an optional auxiliary power supply, and an optional battery backup.
MACROAIR TECHNOLOGIES
www.macro-air.com

Greenlee ES1000 cable cutter

Greenleeís ES1000 comes with a 2 1/8-in. diameter blade opening, making it suitable for cutting jacketed underground cables. The cable cutter is equipped with a Forward/Reverse lever so, should you change your mind about the cable youíre cutting, you simply shift the lever to fully open the blades. The precision-ground blades are extra thick, meaning they shouldnít flex during a cut. Greenlee says the ES1000ís light weight (7.5 lb) and small size (14 3/4-in. long) makes it easy to store on a truck, carry to the jobsite, and operate in tight spaces. The cutter uses a 14.4V battery that executes about 35 cuts in 1000 kcmil copper per charge (the battery itself takes about an hour to recharge). Each tool includes two batteries, a moulded carrying case and the choice of 120V or 230V charger.
GREENLEE
www.greenlee.com

Bosch 12V PS21 Pocket Driver

Bosch says the key attribute of its new ultra-compact, cordless PS21 Pocket Driver is its ability to reach and maneuver in tight spaces. The driver features both a shortened head length (5.6 in.) and shorter height (7 in.) from base to top. Along with its compact size, the PS21 weighs 1.8 lb, making it the lightest in its class, says Bosch, delivering 265 in.-lb of torque. Other notable performance enhancements include a two-speed drivetrain (0-350 rpm / 0-1300 rpm) and an upgrade from a 10+1 clutch to a 20+1 clutch. Bosch says both improvements were direct responses to end-user feedback, and are designed to deliver precise control regardless of application.
BOSCH
www.boschtools.com

Lind LE1425LED worklight

Lind Equipment has partnered with electrical distributor Westburne to distribute its LE1425LED heavy-duty LED work light. The LE1425LED operates as a dual-mode light, combining LEDs along the length of the light to operate as a work light with a high-powered LED on the top end for flashlight operation. Built with a replaceable polycarbonate lens and rubber end caps, the light is designed for heavy-duty use and can withstand drops and other kinds of abuse, says Lind. Despite the heavy-duty design, Lind says the worklight is incredibly light, with the light head weighing less than a pound. The product comes with 25 in. of cord and dual hanging hooks. (It is also available on a 40-in. auto-retracting cord reel under part number LE1440RLED).
LIND EQUIPMENT
www.lindequipment.net

ADVERTISER'S INDEX

Kris Paszkowiak, P.Eng.

Voltage drop calculations and heartache

Voltage drop can be defined as a reduction in voltage in an electrical circuit between the power source and the load. This difference in voltage is developed across a conductor by the flow of current through the resistance or impedance of that conductor. There is a variety of different factors that have impact on voltage drop, key factors being the wire size and the circuit length. Some additional factors include the size of the load, circuit parameters such as single phase or three phase, voltage at the secondary terminals of the supply transformer, the type of conductor material such as copper or aluminum, and the type of raceway.

Supply authorities must ensure that service voltages stay within the limits specified in CSA CAN3-C235-83 to be certain that customers' electrical equipment will operate efficiently throughout the range of the actual voltages on the system and that certified electrical equipment is designed to operate within an acceptable steady-state voltage range.

Canadian Electrical Code (CEC) Rule 8-102 requires that the voltage drop be based on the calculated demand load of the feeder or branch circuit. In the case of a branch circuit, the calculated demand must be either the connected load if known or 80% of the rating of the fuse or circuit breaker protecting the branch circuit, whichever is smaller. Also, the voltage drop must not exceed 5% from the supply side of the consumer's service to the point of utilization and must not be more than 3% in a feeder or branch circuit.

Voltage drop of a branch circuit can be easily calculated. CEC Appendix D contains a couple of helpful Tables such as Table D3 for low voltage circuits and Table D4 for extra low voltage circuits.

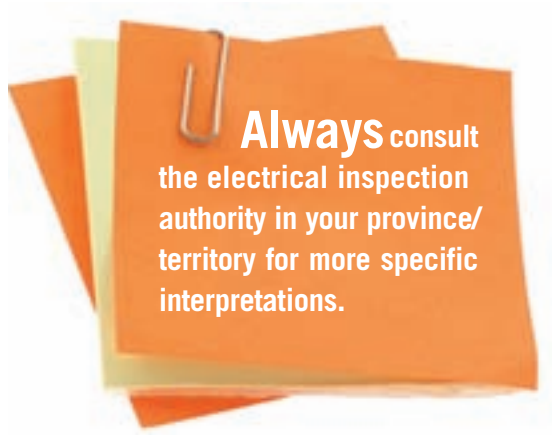
It is a common belief that in residential type installations voltage drop is not a concern because the circuit length is short. Let's do a quick voltage drop calculation using Table D3. Let's assume a typical residential branch circuit consisting of two No. 14 AWG NMD90 copper conductors carrying a maximum load of 12 amps.

Using Table D3 and the distance correction factor for 90°C cable, we can quickly determine that we can only go a maximum of about 30 m to comply with the 3% voltage drop requirement for branch circuits. This calculation shows that in today's large residential homes, 30 m is not very far and selecting a proper conductor size where there is a need to go a distance becomes a concern.

This problem becomes even more pronounced when we are working with extra low voltage circuits and the application of Rule 46-306 Remote lamps and Table D4. One simple fix is to use larger conductors where we encounter longer circuits.

In the end, making adequate voltage drop a consideration when sizing circuits could be beneficial to the life of your operating equipment. Misconceptions are common when it comes to voltage drop, but learning why it's important and how to calculate it could end up saving you time, money and heartache in the long run. EB

Kris Paszkowiak is principal of CodeSafety Associates, a consulting firm serving the needs of the electrical industry. He holds a Master Electrician licence and has served numerous organizations over the years, including the Canadian Advisory Council on Electrical Safety, Committee on CE Code Part I and UL Electrical Council. E-mail CodeSafety Associates at kris.paszkowiak@codesafety.ca.



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

Tackle The Code Conundrum... if you dare

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

How did you do with May's quiz? Are you a...

Master Electrician ? (3 of 3)
Journeyman ? (2 of 3)
Apprentice ? (1 of 3)
Plumber ?! *(0 of 3)*

Question 1

Where an extension ring is installed on a junction box, the useable space in the assembly shall be 1.5 times the volume of the junction box.

a) True
b) False

Question 2

Where exit signs are connected to an electrical circuit, that circuit shall be used for no other purpose.

a) True
b) False

Question 3

In Class 1 circuits, the overcurrent devices shall be located...

a) at the point where the conductor to be protected receives its supply.
b) within 3 m of the point where the conductor to be protected receives its supply.
c) within 7.5 m of the point where the conductor to be protected receives its supply.
d) in the primary circuit of the Class 1 power supply.

Answers to Code Conundrum Electrical Business M ay 2010

Q-1: According to Rule 26-010, a permanent, legible warning notice carrying the wording "Danger: High Voltage" or similar shall be placed ___ in a conspicuous position on a station fence.

d) All of the above. Item 36-006(1)(e).

Q-2: Overcurrent devices and disconnecting means for the separate circuit supplying a fire alarm system shall be clearly identified as the fire alarm power supply in a permanent, conspicuous and legible manner, and the disconnecting means shall be ___

d) Red and lockable in the ON position. Subrule 32-108(2).

Q-3: A neon power supply transformer with an open circuit voltage of more than ___ V between any combination of leads or terminals shall require secondary circuit ground fault protection.

b) 6000 V. Rule 34-302

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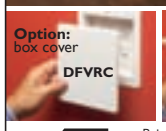
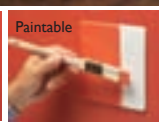
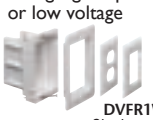


Option: box cover **DFVRC**

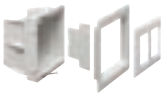


Paintable

Patented/Other patents pending



DVFR1W Single-gang



DVFR2W 2-gang w/ separator

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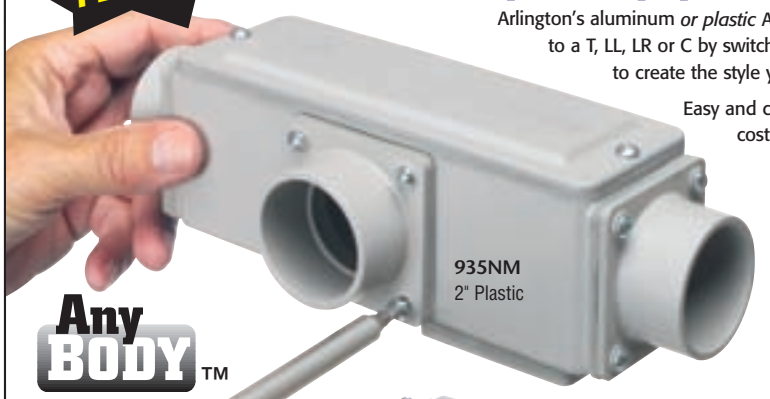

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Includes three flanges w/ glue-in pipe joint.

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- Canada orders ship with grounding lug

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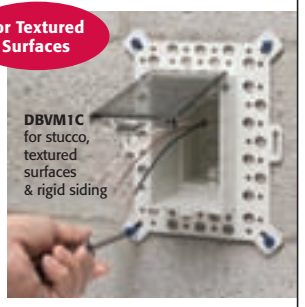

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GP19

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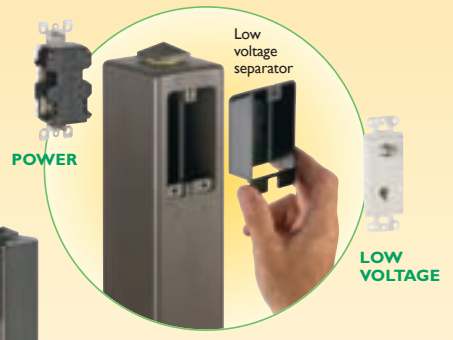

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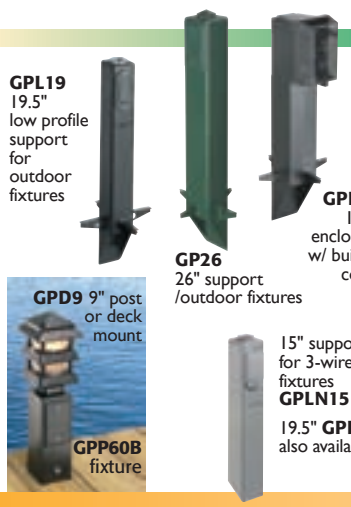

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GP26 26" support /outdoor fixtures

GPD19 19.5" enclosure w/ built-in cover

GPD9 9" post or deck mount

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Patented/Other patents pending

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