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Electrical Business

APRIL 2012



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Also in this issue...

- 8 essential features for T&M equipment
- The joy of three-phase wiring
- Gearing up for greener fleets

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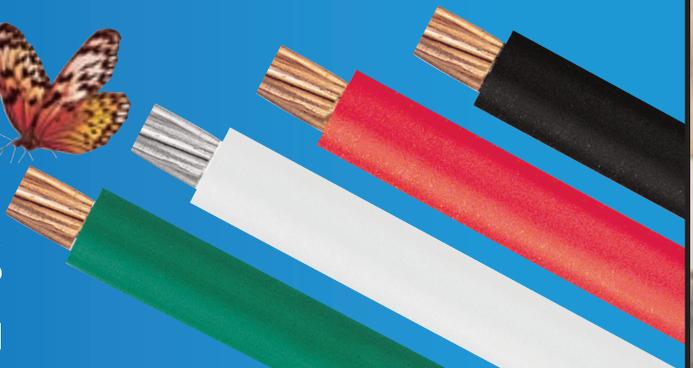


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Working together, these groups provide—in our esteem—a superior learning experience.

A university for industrial distribution?

While there are numerous educational occasions for electrical contractors and electricians to upgrade their skills and knowledge, are our electrical distributors getting the short end of the stick? What opportunities exist for them to realize their full potential?

Thankfully, there is the University of Industrial Distribution (UID, www.univid.org)—a concentrated educational program that, for 19 years, has focused on the unique needs of the industrial wholesale distribution. UID is sponsored by leading industrial distribution professional associations—such as Electro-Federation Canada—in cooperation with the Industrial Distribution Program of Purdue University. Working together, these groups provide—in our esteem—a superior learning experience.

UID students can apply their course work toward earning the Professional Certificate in Industrial Distribution awarded by Purdue University. As an industrial distribution professional, the certificate recognizes a student's achievements and commitment to continuing education.

We sat with Purdue's Dr. Kathryn A. Newton, a professor of industrial distribution, to learn more about UID (for the full interview, check out our video at t.co/tRzmAAZh, or simply visit EBMag.com's Video page).

She explained that UID founders recognized a need, not just for undergraduate education, but continuing education for the industrial distribution channel, arguably one of the "largest channels you can find anywhere". It was Dr. Jay Smith of the University of



Alabama who started UID 19 years ago, with the vision of creating something like a university with courses that students can pick and choose, and that they could build on over the years.

Everything an electrical distributor would want to learn is covered at UID, such as inventory and warehouse control, communications skills, productivity, "preparing for 2020" and finance... "especially how to make more money".

"This year in particular I think I've had more people come up and shake my hand and say, 'Wow, I can't believe what I'm getting from this week. I'm going back reenergized and ready to go,'" beams Newton, adding that UID is definitely a place where a student can learn what they need to move up in their field. "Many of them are proud to earn that professional certificate in industrial distribution." **EB**

Kathryn A. Newton



On the cover and page 14

Be productive and safe with ladders

While ladders are very common tools—used both in the home and professionally on jobsites—using ladders for electrical installation or around electrical lines poses a unique situation.

Contents

11 Gearing up for greener fleets in Canada

For the electrical industry, the most exciting development in the alternative fuel vehicle landscape is the introduction of electric vehicles. Meantime, other alternative fuels available today—such as propane autogas and natural gas—are set to make a significant impact on fleets across Canada.

16 The joy of three-phase wiring

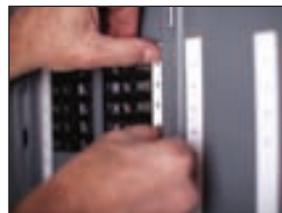
Because three-phase power isn't part of the familiar residential and small commercial scenario, familiarity with it comes at a somewhat later point in the electrician's learning curve. For many who haven't worked with it, the subject is enigmatic—even where enough knowledge has been acquired to deal with a licensing exam.

20 Proper labelling with the right tool boosts cable installer productivity

Do you follow the TIA 606-A standard? Embracing the industry standard for cable labelling is not only good practice, but also good business because it can significantly improve productivity on the job.

23 8 essential features to look for in test & measurement equipment

Technicians are blind without test and measurement tools, and the competitiveness of your business depends, in part, on the equipment you choose. Selecting the best models begins with an understanding of precisely which technical features matter and why.



DEPARTMENTS

- 4 Industry News
- 8 Personalities
- 9 Calendar
- 10 Mind Your Safety
Maintain your equipment; reduce your risk
- 26 It's Your Business
Combating ownership loneliness
- 27 Products & Solutions
- 30 Code File
Maximum circuit loading
- 30 The Code Conundrum



page 28

New Water Plumbing fined \$100,000 after worker electrocuted

New Water Plumbing Inc. (www.newwaterplumbing.ca), of Thornhill, Ont., has been fined \$100,000 for a violation of the Occupational Health and Safety Act (OHSA) after a worker was electrocuted. On December 23, 2009, two workers from New Water Plumbing were in the mechanical room of a Toronto condo tower. They had taken a large exhaust fan out of its housing, and as the workers were moving the fan, a light fixture they had moved out of the way swung back and hit the fan. Part of the light fixture was damaged, allowing its electrical charge to contact the fan. The worker holding the fan at the time was fatally electrocuted. New Water Plumbing pleaded guilty to failing to ensure that the fan was lifted, carried or moved in a way that would not endanger a worker.

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SNC-Lavalin learns of filing of proposed class action

SNC-Lavalin Group Inc. (www.snclavalin.com) says it has become aware that a “Motion to Authorize the Bringing of a Class Action and to Obtain the Status of Representative” has been filed with the Superior Court of Quebec in the Judicial District of Quebec. The company, its current directors and certain current officers—as well as certain former employees—have been named as defendants.

The motion seeks authorization of the court to bring a class action in connection with alleged misrepresentations on behalf of all persons who acquired securities of the company from March 13, 2009, to February 28, 2012, and, if so authorized, various declarations and compensatory damages of \$250 million are sought.

The company denies all liability in respect of the claims alleged in the motion and says it intends to “vigorously oppose the motion”.

Cooper Controls acquires Fifth Light Technology

Cooper Controls (www.coopercontrol.com) announced it has acquired Fifth Light Technology (www.fifthlight.com), a privately owned company based in Oakville, Ont. specializing in the design, sale and implementation of digitally addressable lighting interface (DALI) solutions and a suite of centralized building management software applications.

This portfolio of solutions enables facility management to measure and control energy consumption across individual fixtures, as well as provide for the integration and control of other building management systems across multiple applications.

Over the past several years, Fifth Light has installed over 100,000 control devices in locations across North America.

Philips Lighting responds to “erroneous” reports of L Prize bulb prices

On March 9, Ed Crawford, CEO of Lamps, Lighting Systems and Controls for Philips Lighting North America (www.philips.com) issued a statement in response to “various erroneous media reports” about the retail cost of the L Prize lightbulb:

...The ultimate price—versus the MSRP—of the L Prize bulb will arrive through a partnership between the manufacturer and utility partners across the country. The target price of \$22, as originally outlined in the competition parameters, will be achieved through utility rebates of up to \$30 through in-store purchases once the L Prize bulb is available to consumers next month.

At that time, consumers will have access to the most energy-efficient and brightest bulb available—lasting more than 30,000 hours and saving consumers roughly \$165 over the life of the bulb.



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What the heck is a BICSI, and what's it doing in Canada?

More information, as well as online registration, is now available for the 2012 BICSI Canadian Conference & Exhibition (bit.ly/zys6Zw) at the Scotiabank Convention Centre in Niagara Falls, Ont., April 19 to May 2... but who or what the heck is a BICSI?

A little history...

in the early 1970s, a small group of people from various telephone companies and the telecom manufacturing segment met once a year to problem-solve and look at better ways of performing their jobs. One of the early participants thought it would be good for building industry consultants (BICs) to get together to discuss their own concerns. The first BICs Conference was held in January 1973.

By 1974, educational meetings included BICs, architects, manufacturers and suppliers. Informal talks and activities led to the idea of establishing a professional, non-profit association. In 1977, BICSI was formed, incorporated as Building Industry Consulting Service International (BICSI, www.bicsi.org) Inc.

Today, it's just BICSI, and membership has grown dramatically from that small group of people who came together in 1973. The group provides information, education and knowledge assessment to nearly 23,000 information technology systems (ITS) professionals involved in voice, data, electronic safety & security, and audio & video technologies; their work encompasses the design, integration and installation of pathways, spaces, fiber- and copper-based distribution systems, wireless-based systems and infrastructure that supports the transportation of information and associated signalling between and among communications and information gathering devices.

In essence, the backbone of our connected world.

So why attend the BICSI Canadian Conference?

Well, if you're not remotely interested in the business opportunities that come with information technology systems, then read no further. However, if networks, fiber, ethernet, Wi-Fi, etc., rock your world, then make plans to attend the conference, where you will have opportunities to: enhance your knowledge and career with more than 25 educational sessions; visit the Exhibit Hall to learn about the latest products, services and advancements; network with peers and interact with other ITS professionals.

Hotel information is posted on the conference site; book by March 26 to receive the group rate. If you have any questions while filling out the online registration form, contact BICSI Customer Care at (800) 242-7405.

Join **EBMag** in Niagara Falls and be a part of the education, exhibits and networking.

Dow E&T increases prices effective April 2012

Effective April 1, 2012, Dow Electrical & Telecommunications (www.dow.com/electrical), a business unit in the Performance Plastics Division of the Dow Chemical Company (www.dow.com), will increase the prices of its products. The details for grades in Canada and the U.S. is as follows:

- All low and medium voltage insulation compounds will increase \$0.11 per pound.
- All power and telecom jacketing grades will increase \$0.11 per pound.
- All semicon and shield compounds will increase \$0.17 per pound.
- All specialties including Unigard and Unipurge product lines will increase at least \$0.17 per pound.
- All other grades not included in the above categories will increase by \$0.11 per pound.

Nexans completes acquisition of AmerCable Holdings Inc.

Nexans (www.nexans.ca), a global cable player, confirmed it has completed the acquisition of AmerCable (www.amercable.com), a North American producer of mining and oil & gas cables. AmerCable is also active in other industrial cable segments, including renewable energy.

The acquisition represents a major investment for Nexans in the mining, and oil & gas cable markets, says the company, adding that AmerCable's business "complements Nexans' existing operations in resource cables, providing a new strategic and operational platform in North America".

Nova Scotia approves additional COMFIT projects

Nova Scotia's energy Minister Charlie Parker has announced the latest round of Community-Feed-in Tariff (www.nsrenewables.ca/feed-tariffs) approvals for renewable electricity projects proposed for Spiddle Hill, Wedgeport, Bayswater, Cheticamp and North Preston.

"It is important for us to celebrate our successes along the way during this energy transformation," said Parker. "That's why I'm pleased to announce that Nova Scotia Power has met, and slightly exceeded, our legislated renewable electricity target for 2011. We are also meeting our greenhouse gas reduction targets."

Details of the projects:

- A 1.99-megawatt wind project in Wedgeport, near Yarmouth, owned by Scotian Wind, Scotian Windfields and WEB Wind Energy North America.
- A 2-megawatt wind project in Bayswater, near Chester, owned by Watts Wind Energy Inc., Brookfield Asset Management and Katalyst Wind.
- A 0.9-megawatt wind project in

Cheticamp, Inverness Co., owned by Celtic Current and Zutphen Wind.

- A 4.6-megawatt wind project on Lake Major Road in North Preston, owned by the Halifax Regional Water Commission.
- A 50 kW wind project at the Spiddle Hill Wind Farm, owned by the Colchester-Cumberland Wind Field Community Economic Development Corporation.

The 2010 Renewable Electricity Plan (www.nsrenewables.ca) introduced the COMFIT concept to help "provide a secure supply of clean energy at stable prices, build support for renewable energy projects and create jobs". It provides eligible groups an established price per kilowatt hour for projects producing electricity from renewable resources such as wind, biomass, in-stream tidal and run-of-the-river tidal developments. The feed-in tariff rates were established by the Utilities and Review Board in September. The province expects 100 megawatts to be produced through the COMFIT.

"More and more we are hearing good news about the government's highly successful renewable energy policy," said David Stevenson, president of Colchester-Cumberland Wind Field. "It promotes electricity from wind power, which reduces the burning of imported coal. Our company is a partner in the progressive harnessing of a sustainable and clean resource."

More than 20 community groups have submitted 90+ locally based renewable energy development proposals under the COMFIT program. Potential applicants are encouraged to contact the COMFIT administrator at comfit@gov.ns.ca to discuss projects.

Arlington presents 2011 regional and national sales awards

Arlington Industries (www.aifittings.ca) presented its 2011 sales awards at the recent 2012 NEMRA (National Electrical Manufacturers Representatives Association) meeting, recognizing national and regional sales achievement for overall sales and special product sales of Arlington products in the past year. Congratulations to Macs II Agencies Ltd. (www.macsii.com), the only Canadian winner in the list, who took home the Canadian Sales Achievement Award. The meeting was held February 1-4 in San Diego, Calif.



More **news** can be found online.

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CSA Group unveils new global brand identity

CSA Group (www.csagroup.org) has officially unveiled a new global logo and tagline to consolidate all of its divisions under a unified brand identity reflecting its “global focus”. The new tagline, “Advancing Today, Anticipating Tomorrow”, underscores the organization’s principles of “safety, collaboration, sustainability and innovation”.

“The blue bands pay homage to past logos and the trusted certification mark while the addition of green embodies the organization’s environmental commitment,” explained CSA, adding, “The fluid spherical design reflects the unification of the operational structure and global outreach, with all divisions now recognized simply as ‘CSA Group’.”

“The new brand is a result of our collaborative work with stakeholders, members and customers. We listened to their feedback about a desire to work with a more modern and global organization, while still maintaining our rich history and an emphasis on sustainability,” said Ash Sahi, president and CEO, CSA Group.

CSA Group is an independent, not-for-profit membership association whose expertise encompasses standards development, training and advisory solutions, global testing and certification services across business areas that include hazardous location and industrial, plumbing and construction, medical, safety and technology, appliances and gas, alternative energy, lighting and sustainability, as well as consumer product evaluation services.

Over \$100 000 in Scholarships with 2012 EFC Foundation Scholarship Program

Electro-Federation Canada (EFC, www.electrofed.com) has officially launched the 2012 EFC Foundation Sponsorship Program (www.electrofed.com/scholarship-program), which provides Canadian post-secondary students the opportunity to receive over \$100,000 through 45 scholarships.

Over 40 organizations in the electrical and consumer electronics sectors are providing financial support through the foundation to help Canadian university and college students achieve their career objectives.

Visit bit.ly/xd6rxo to hear from some past recipients.

“The electrical and consumer electronics industries continue to offer a wide range of exciting career opportunities,” said Jim Taggart, EFC’s president & CEO. “I am pleased EFC members are investing in Canada’s greatest future resource—our students.”

Supporting students for 16 years, the EFC Foundation Scholarship Program encourages Canadian youth to pursue a career in the electrical, electronics and telecom industries. To date, EFC has invested almost \$600,000 in the post-secondary technical training and education.

“As chair of the 2012 EFC Scholarship Foundation, it is important our industry provide financial support to students preparing to enter our workforce. Opportunities are abundant through new technologies and impending retirements. It is exciting to participate with other senior industry executives and achieve a record \$100,000 in scholarship funding,” said Elaine Gerrie, co-president and CEO Gerrie Electric Wholesale Ltd. (www.gerrie.com).

Scholarships are awarded to post-secondary students studying in an electrical or electronics concentration including electrical

apprenticeship, electrical engineering technology, electrical technician, electrical engineering, supply chain management or business administration. Scholarships are also awarded on the basis of academic achievement, areas of study, leadership, and career interests.

For more information on the EFC Foundation Scholarship Program, visit www.electrofed.com/scholarship-program. To apply, visit efcfoundation.myreviewroom.com.

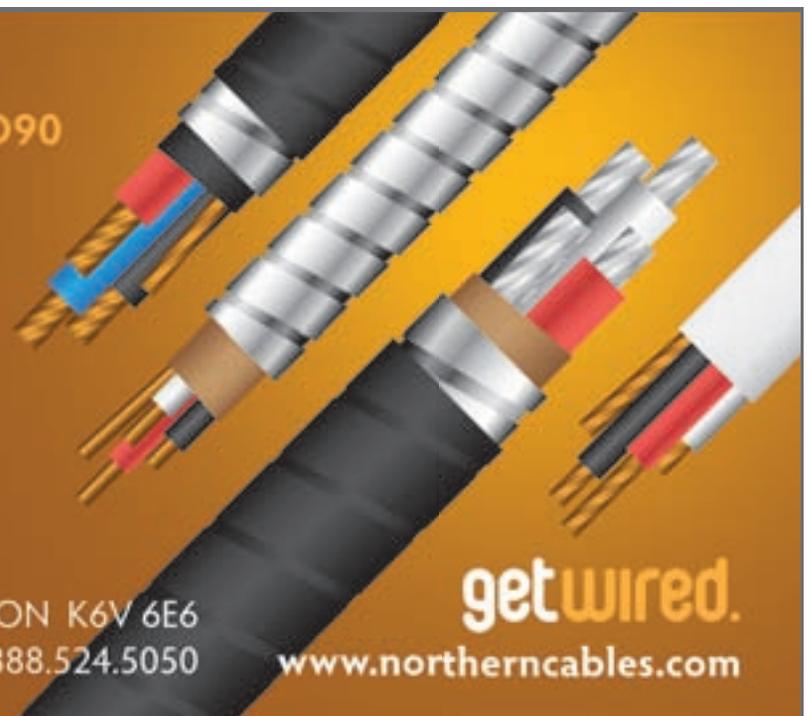
EFC is a national, not-for-profit industry association. Its councils represent over 330 member companies that manufacture, distribute and service electrical, electronics and telecom products; and that contribute over \$50 billion to the Canadian economy and employ over 130,000 workers in more than 1400 facilities across Canada. **EB**

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Steve Parent, district manager, Eastern and Central Canada, **GE Lighting** (www.gelighting.com), has announced the appointment of **Sylvain Lavigne** to the position of field sales developer/specification engineer in the Montreal Metropolitan area.

Sylvain Lavigne

In this newly-created hybrid role as both specification engineer and field sales developer, Lavigne will work with local electrical consulting engineers, lighting designers, architects, and related end users to promote GE Lighting products and solutions. He will also use his experience in the field to provide technical feedback to the GE Lighting product management team. Lavigne brings to this new role his “strong technical background” as an electrical engineer and more than 25 years of experience working in the lighting industry, the last six of which were spent as an account manager with GE Lighting, said the company.



Burndy (www.burndy.com), a manufacturer and provider of electrical connector solutions and application tooling, has appointed **Stewart Gale** to the role of senior product manager. Gale brings with him an impressive background with electrical distribution and industry knowledge, said Burndy,

Stewart Gale

noting that for the last four years, Gale owned and operated Force 9 Consulting, providing a portfolio of marketing services ranging from sales leadership training, strategic planning, market analysis, customer loyalty programs, project management and public relations. Prior to that, he led the marketing effort for Affiliated Distributors (A-D) as VP marketing and business development.



Adrian Thomas

In the interest of “further strengthening sales operations across Canada”, **GE Energy’s Industrial Solutions** business (www.geindustrial.com) has appointed **Adrian Thomas** as the new regional sales leader for the country. Thomas has overall responsibility for sales of GE Energy’s electrical distribution products and services in Canada, including switchboards and panel boards, uninterruptible power supplies, metering products, circuit breakers, motor controls and capacitors. He began his career at GE Canada as a large motors designer in Peterborough, Ont., followed by a transition to a marketing role for GE Energy in Montreal that featured a combination of sales and commercial operations. He holds a bachelor of science in engineering from McMaster University in Hamilton, Ont.



Dorothy Tully-Petersen

Dorothy Tully-Petersen—formerly national sales manager, distribution (Canada) for **Alcan Cable**—joined **Wesco Distribution Canada LP** as director of marketing for Canada, effective February 21. “Dorothy brings a great marketing background and valuable range of electrical industry experience to our group,” said **Harald Henze**, group vice-president and general manager, Wesco Distribution Canada LP. On the forefront of Dorothy’s new role will be preparations for the opening of Wesco’s latest—and North America’s largest, says the company—distribution centre in Mississauga later this spring. Dorothy is based in Wesco’s Hood Road offices in Markham, Ont. Prior to Alcan, Dorothy worked at Ideal Industries Canada.



David Brown

Kohler has promoted **David Brown** to VP of sales for its **Kohler Power Systems Americas division** (www.kohlerpower.com). Brown directs all North American sales activities of industrial generator sets, electrical controls, switchgear and automatic transfer switches, through direct sales, national accounts and distribution channel partners. He partners with marketing to create promotional programs and training tailored to specific customers. He joined Kohler Power Systems in 2008 as the director of industrial solutions and national accounts. The company is a global manufacturer of power generation equipment for residential, industrial, mobile and marine applications, with a power output range of 4 kW to 3250 kW.

Grainger announced that **Sean O’Brien**, president of **Acklands-Grainger Inc.** (Grainger’s wholly owned Canadian subsidiary), will resign from the company effective March 23, 2012. O’Brien joined Acklands-Grainger as vice-president sales in November 2007, taking on additional responsibilities for e-business and marketing in early 2009. He was named president in September 2009. **Mike Pulick**, president of Grainger International, will serve as interim president of Acklands-Grainger. Acklands-Grainger Inc. is a Canadian distributor of industrial, safety and fastener products with 2011 sales of \$982 million, 172 branches, 6 distribution centres and 2600 team members.



John LaMontagne

Leviton (www.leviton.com) has promoted **John LaMontagne** to the position of VP of sales for the company’s Lighting Energy Solutions business unit. In his new role, LaMontagne will be responsible for the sales and specification of Leviton’s portfolio of lighting systems, metering and energy management products. LaMontagne most recently served as the director of technical sales for Leviton’s Lighting Energy Solutions group. He initially joined Leviton in 1994 as a specification engineer working for the Electrical Distribution group.



Kim Cook

Halco Lighting Technologies (www.halcolighting.com) has named **Kim Cook** president, where she will also retain her current title as COO, which she has held since 2005. Since joining Halco in 1992, she has held positions as account representative, regional sales manager, national sales manager and VP of sales and marketing before becoming company COO. “Cook’s dedication, strong work ethic and solid leadership have helped transform Halco into the company it is today,” said the company.

Hammond Power Solutions (HPS, www.hammondpowersolutions.com), a manufacturer of dry-type transformers and magnetics, has named **Michael Frayne** as its new director of marketing, where he will be responsible for overseeing all marketing functions across the HPS Americas organization. He will help support the sales and growth of existing markets, as well as define the products and strategies that will be developed for new targeted markets. With over 25 years of industry experience in marketing, engineering and project management, Frayne has previously worked for Siemens, Rockwell Automation, and Molex (Woodhead/SST). He holds a B.E.Sc. (Electrical) from Western University and an M.B.A. from York University. **EB**

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A-D Electrical Supply Division Spring Network Meeting
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Canadian CommTech Show & Seminars
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IEEE IAS Industrial & Commercial Power Systems Technical Conference
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Maintain your equipment; reduce your risk

With the national adoption of CSA Z462, Workplace Electrical Safety, it is apparent that Canadian industry requires its own electrical maintenance standard. I am one of several dozen members of the volunteer technical committee developing CSA Z463, Guideline on Maintenance of Electrical Systems.

Everyone is aware of the dangers of electrocution and electrical fires. Not everyone is aware that electrical systems, like boilers, are subject to violent and catastrophic explosions resulting from maintenance failures. The only way to prevent these explosions, and the resulting injuries, is through regular testing and maintenance.

Worldwide, electrical maintenance failures have caused billions of dollars in losses. For example, in the late 1980s, an electrical maintenance failure forced a highly successful multi-national bottled water company to destroy \$200-million worth of product worldwide, leading to the loss of over half its market share. Its total losses and ultimate corporate damage are estimated to be almost \$4 billion.

In addition, a precedent has been set in Canadian law regarding lack of maintenance. A contractor was found guilty of criminal negligence causing death with respect to a workplace incident resulting in the death of his employee when brakes on a backhoe failed. The court concluded that, in neglecting to perform proper maintenance, the accused "markedly departed from the standard of care expected of a prudent and diligent person".

These costs can be reduced to \$13/hp per year by adopting preventive maintenance activities i.e. oil changes after so many hours of operation (but catastrophic failures are still likely to occur).

Everyone is aware of the dangers of electrocution and electrical fires. Not everyone is aware that electrical systems, like boilers, are subject to violent and catastrophic explosions resulting from maintenance failures.

The great difficulty is determining the proper mixture and application of differing maintenance philosophies. In CSA Z463, we are addressing four: reactive maintenance (a.k.a. breakdown, corrective or run-to-failure); preventive maintenance (time-based); predictive maintenance (condition-based); and reliability-centred maintenance (function-based).

These maintenance philosophies come with differing costs, pros and cons. Reactive maintenance has the allure of being low cost as it requires fewer staff. Running equipment to failure and repairing or replacing when obvious problems occur is a valid maintenance approach with certain equipment but any savings can be completely wiped out with lost production and other costs. Research has proven that a reactive maintenance philosophy has a yearly cost of \$18 per horsepower.

These costs can be reduced to \$13/hp per year by adopting preventive maintenance activities i.e. oil changes after so many hours of operation (but catastrophic failures are still likely to occur).

A further evolution in maintenance management is the implementation of predictive maintenance. Companies that have mastered this process have enjoyed a reduction in operation cost to \$9/hp per year, including a 10-fold return for every dollar invested in predictive maintenance, 25% to 30% reduction in maintenance costs, 70% to 75% elimination of breakdowns, 35% to 45% reduction in downtime and a 20% to 25% increase in production.

With the advent of wide-body jets in the late 1960s, airlines combined these three methods of maintenance into reliability-centred maintenance, a process where the appropriate method, or combination of methods, was employed in combination with root cause failure effect. When done correctly, this process reduces operating costs to \$6/hp per year. This process is now standard throughout the airline and utility industries, but is slow to be adopted in other industries as it can have significant startup, training and other costs with the continuing savings not readily apparent to managers lacking extensive maintenance experience.

The production practice known as 'lean manufacturing' originated with Toyota and enabled it to become the world's largest automaker. A critical adjunct to this is total productive maintenance, which is a method for improved machine availability through better utilization of maintenance and production resources. Whereas in most production settings the operator is not viewed as a member of the maintenance team, the machine operator in TPM is trained to perform many of the daily tasks of simple maintenance and fault-finding.

Only by regular and proper maintenance of your electrical system can you reduce the safety, financial and legal risks to your organization.

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

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Gearing up for greener fleets in Canada

Joe Thompson

This 2012 Ford F-450 comes equipped with a 6.8-L V8 engine and a propane autogas engine fuel system. Availability in Canada is expected in 2013.



For the electrical industry, the most exciting development in the alternative fuel vehicle landscape is the introduction of the electric car. Other alternative fuels available today—boasting an abundant refuelling infrastructure, domestic production origins and reliable technology delivering on commercial vehicle performance expectations—are propane autogas and natural gas.

Both fuels are set to make a significant impact on fleets across Canada in the coming years. Specific to propane autogas, fleet managers will soon be able to evaluate more propane autogas vehicle options, choosing a domestic, economical, clean fuel. Right now, more than 17 million vehicles across the globe run on propane autogas, making it the third most widely used engine fuel behind gasoline and diesel. Propane autogas is non-toxic, reliable, safe and environmentally friendly. And it's cheap and abundant in North America.

Looking at vehicle fuel alternatives

In the past few years, renewed interest in alternative automotive fuels has resulted in significant advances in liquid propane autogas fuel system technology. Automotive engineering companies, such as Roush CleanTech, have brought this technology to the marketplace

for a variety of light- and medium-duty vehicle platforms. Dealers, automobile manufacturers, fuel providers and industry agencies are all working together to bring Canadians a green fuel option for the eco-minded and economically conscious fleet owner.

According to the World LP Gas Association, propane autogas is chalking up a 10% to 15% worldwide increase in usage each year, due in part to the fact the product offerings are tailored for a wide variety of industries, especially the contracting and utilities sector. And Canada is showing a renewed commitment to the propane industry with the inception of the Canadian Propane Association in 2011.

Today's companies are looking to cut costs without cutting corners. According to Natural Resources Canada, propane autogas costs 25% to 30% less than the price of gasoline. Propane autogas is clean burning, leading to fewer contaminants and less carbon build-up in the engine. Many fleet owners in the States using propane autogas are reporting an additional two to three years of vehicle use when compared with their gasoline counterparts. Considering the lower fuel and maintenance costs required, return on investment is quick and can be substantial, depending on how long vehicles are kept, and how many kilometres are driven annually.

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The fuelling system in this Ford E-350 15-passenger van is being converted to run on clean-burning propane autogas.



Propane autogas is a clean, abundant and cost efficient alternative fuel, with 17 million vehicles worldwide.

Environmental benefits

Economic standards are not the only pressures weighing in on the electrical industry; environmental stewardship is becoming the gold standard

for businesses across the board. Propane autogas emits up to 60% less carbon monoxide, 20% less nitrogen oxide and up to 25% less greenhouse gases. The carbon footprint for this clean fuel is relatively small compared to other fuels with regard to total emissions and emissions per unit of energy consumed.

In the United States, propane autogas vehicles are meeting the most stringent environmental regulations, including those set by the California Air Resource Board, the 'clean air agency' of California, and the U.S. Environmental Protection Agency. Additionally, propane autogas vehicles emit 50% fewer toxins and other smog-producing emissions when compared to gasoline, with low levels of sulphur—a large contributor to acid rain.

Performance

Propane autogas vehicles also deliver when it comes to performance and quality. With performance ratings virtually identical to gasoline, propane autogas vehicles offer the same horsepower, torque and towing ratings you'd expect with a brand new gasoline-powered vehicle. Many propane autogas vehicles maintain the standard factory OEM warranty and can be serviced and maintained using standard diagnostic equipment and tools found in a typical vehicle shop.

Also, range between fill-ups is paramount—sometimes meaning the difference between making appointments on time or squeezing in an extra customer. Propane autogas fuel tanks are able to offer similar operating range compared to gasoline, and refuelling a propane autogas vehicle is just like refuelling with gasoline or diesel. The only difference is that with propane autogas, it is a closed process where a seal is formed between the refueling nozzle and fuel-fill port on the vehicle. This type of system prevents any fuel from spilling during refuelling, which is a significant source of groundwater pollution with other fuels. Plus, onsite propane autogas refuelling stations are low to no cost to install.

Propane autogas a viable alternative

According to the Canadian Propane Association, Canada produces nearly 5% of the world supply, using only a third of what it makes

annually while exporting the remainder. Canada has propane autogas infrastructure in place already, making this alternative fuel readily available. It is a domestically produced fuel that can reduce any Canadian reliance on foreign oil.

Propane is a safe choice. It poses no harm to groundwater, surface water or soil. It is a non-carcinogenic, non-corrosive fuel with the lowest flammability range of all alternative motor fuels. Propane autogas fuel tanks are made with 1/4-in. steel, making them 20 times more puncture-resistant than a traditional gasoline fuel tank. Tanks are low-maintenance and can last up to 40 years. And, should any propane leak, it won't puddle or leave residue, but rather vaporize and dissipate into the air. Propane autogas school buses for sale in Canada meet applicable safety standards, including Canadian Motor Vehicle Safety Standards (CMVSS).

The Blue Bird Propane-Powered Vision has been used to safely transport children to and from school in provinces across Canada for years. The next-generation Vision, released in February 2012, is powered by a Ford 6.8L V10 engine and a Roush CleanTech propane autogas fuel system, and is built on a Blue Bird chassis. It offers 362 hp, 457 ft-lb of torque, 67-gal tank capacity and extensive optional equipment choices. The 25-passenger Micro Bird G5 is also available in the Canadian market.

Companies like Roush CleanTech will use the success of products like the Blue Bird and Micro Bird school buses as a bellwether to test market demand for future commercial product offerings. With the demand that's been seen already, Canadians are likely to see additional product offerings over the next few years, with propane autogas-fueled Ford F-Series trucks and E-Series vans. These light- and medium-duty trucks and vans would be available with a choice of tank sizes and configurations, depending on the model and use of the vehicle.

When it comes to choosing a service fleet in the electrical and utilities industries, fleet managers need vehicles that can perform in a variety of everyday situations, such as a work truck for a supervisor or an on-road toolbox for service personnel. In addition to the progress being made on the electric vehicle front, propane autogas can be considered a wise option. **EB**

Joe Thompson, president of Roush CleanTech, is a member of the Roush Enterprise Steering Committee and resides on two energy boards. Passionate about energy, you can check out his blog at fleetblogs.com/fuelforthought. Joe may be reached at joseph.thompson@roush.com. More information on the company can be found at roushcleantech.com.



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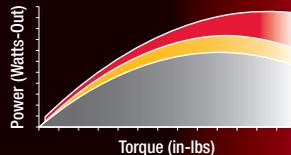


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According to the American Ladder Institute (ALI), user error is a major contributing factor to ladder incidents. Ladders are very common tools, found in homes as well in use professionally on jobsites. The rise of do-it-yourself home repair and remodelling projects has increased frequency of ladder use among all age groups and skill levels.

There are multiple factors to consider when using a ladder, including duty rating, or weight limit capacity. Remember that tools and clothing must be considered when selecting the correct duty-rated ladder. Others are choosing the right ladder for the right job, and maintaining three points of contact; that is, ensuring both feet and one hand—or both hands and one foot—are on the ladder at all times.

The use of ladders for electrical installation or around electrical lines poses a unique situation. It is imperative that ladder users inspect the environment before beginning work and before choosing a ladder. It is recommended that ladders are inspected each time they are used to ensure that all moving parts are working well and have been properly maintained. But choosing the correct ladder around electrical hazards can have unique implications.

Metal is a conductor of electricity, so ladders made of those materials must be rejected for work around electrical lines. Wood and fiber glass are good alternatives. Fiber glass does not conduct electricity, so it is safer to use around powerlines or other sources of electricity, such as highly conductive aluminum. Even though the rungs are generally manufactured out of aluminum, they are separate from the rails so electricity does not reach the rungs—unless the rungs come into direct contact with the electrical source. Wood ladders, while more resistant to electricity than aluminum, can still conduct electricity when they become wet or soiled by dirt or oily materials.

Proper storage is an important factor for maintaining a ladder in good working order. Whenever possible, ladders should be stored indoors away from extreme temperatures and humidity levels. Exposure to the elements can affect the structural integrity of the ladder material, whether fiber glass, wood or metal.

Users are cautioned to not “make-do” with whatever ladder is available and close at hand for a job. Maintenance and replacement costs should be factored into annual budgets to ensure that ladders are discarded when they



are no longer in proper working order and new ladders purchased periodically. That investment can protect personnel and reduce medical costs and lost wages.

Keep these critical safety factors in mind whenever using a ladder:

- Do not overreach or lean to the side while working.
- The user's belt buckle should always remain centred between the rungs of the ladder.
- Always face the ladder.
- Climb down and reposition the ladder as your work progresses.
- Do not allow more than one climber on a ladder at one time (unless the ladder is specifically designed for such a purpose).
- Never jump or slide down a ladder more than one rung at a time.
- To maintain 3-points of contact, use a tool belt, towlines or a co-worker to pass tools to the top of the ladder.
- Do not use the ladder if you are feeling tired or dizzy, or generally not feeling well.

Standards and training for ladders

The American National Standards Institute (ANSI) approved standards provide technical specifications for the design, manufacture and care of multiple ladder types: A14.1 for Wood Ladders; A14.2 for Portable Metal Ladders; and A14.5 for Reinforced Plastic Ladders all provide guidance and reference. Canadian standards available for reference include CAN3-Z11-M81 (R2011) for Portable Ladders.

ALI has developed a series of training modules, offered for free at www.laddersafetytraining.org, as part of its mission to promote the safe use of ladders. To take advantage of them, customers simply create an account, then sign in as they take each course. A pre-test and post-test are included; a successful test score results in a Certificate of Completion. Training can be conducted individually or in a group setting. Companies are welcome to use the training as the basis for in-house staff development; elements specific to each work situation can be added verbally or via demonstration to supplement the modules. Over 10,000 registered users currently have benefited from the training.

Don't let your family, employees or customers become a statistic. Encourage them to follow these basic safety guidelines, especially those related to work in an environment where electrical hazards exist. It is good for their health, and good for everyone's business. **EE**

Submitted by the American Ladder Institute, a trade group located in Chicago, Ill., dedicated to education on the proper selection, use and care of ladders (www.americaneladderinstitute.org).

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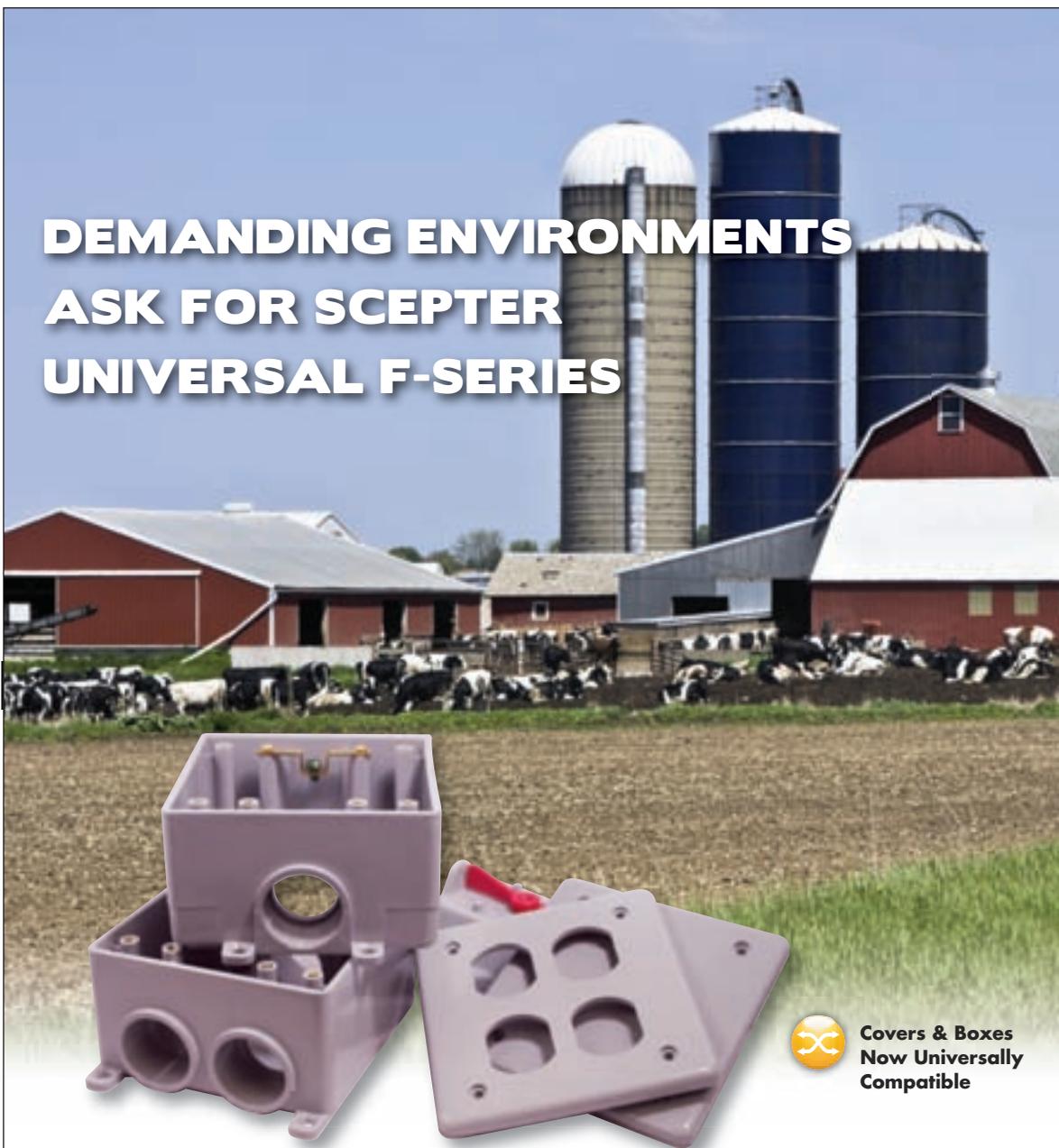
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The joy of three-phase wiring



Three single-phase transformers used in three-phase application.

PHOTO: JUDITH HOWGROFT

David Herres

At an early age, most folks become familiar with a simple two-wire DC circuit. Young children know that a dry cell has to be “put in the right way” if a TV remote or electrical toy is to function as expected and, in time, it is surmised that one conductor is hot and the other is a return line, analogous to a faucet and drain in a sink.

Most adults have come to know that an AC receptacle supplies current that fluctuates with regard to polarity; that one side is grounded, and that the grounding prong—also connected to the ground rod somewhere within the service—has something to do with safety (although the precise mechanism may not be fully understood).

The apprentice electrician has grasped the fact that the neutral conductor emanates from a centre tap in the secondary winding within a utility- or customer-owned transformer; that this conductor is re-grounded upstream from the main disconnecting means; that grounded and grounding conductors are connected via the main bonding jumper within the entrance panel; and that they go to all 120V and some 240V loads, never to rejoin.

Getting to know three-phase

Familiarity with three-phase power comes at a somewhat later point in the electrician’s learning curve, only because it is not part of the familiar residential and small commercial scenario. For many who have not worked with three-phase power, the subject is enigmatic even where enough knowledge has been acquired to

deal with a licensing exam.

For one who has wired his first three-phase motor or welder, however, the initial impression will be how simple this all is. Indeed, with some readily accessible basic knowledge, the whole undertaking is remarkably user-friendly. The economics of three-phase power, where available, is compelling as well.

For new construction—be it a farm, small machine shop or grocery store with a significant amount of refrigeration—the owner should be informed of the advantages of three-phase power. The time to make this decision, of course, is early in the design stage, so that correct choices can be made regarding the electrical service and distribution within the building as well as the outside electrical infrastructure.

To be credible in communicating with the owner, we need to go well beyond familiarity with the basic hookups.

Three-phase wiring

To start, it is important to realize that the three-phase currents are in no sense mixed or combined. That is because they are never connected in parallel. Indeed, the three phases are delivered to the load as separate circuits, albeit with specific common wires. A three-phase load will operate only when wired correctly, which means the outputs from the three windings of the generator, transformer or phase converter have to be connected to each other so that the three currents work in harmony to facilitate transfer of power. In a wye configuration, windings have to

be polarized correctly. Also, it is important that all connections are dependable so that a loss of phase will not cause motor damage and erratic operation.

Due to the arrangement of the three generator windings, which are spaced equally around the rotating armature or field, the three outputs are exactly 120 degrees out of phase. Subsequently, they are connected in one of two configurations: delta or wye. These connections may be inside or outside the generator housing.

The wye configuration is quite elegant in its simplicity. One side of each generator or transformer winding is connected to a common terminal, which is usually grounded and becomes the neutral. The opposite end of each winding becomes one of the hot phase legs. A schematic of this configuration resembles the letter Y. This circuitry is widely used and provides three-phase and single-phase power in large occupancies. (Single-phase is sometimes mistakenly called two-phase. There are two phases plus a centre tap, but it is single-phase because there is one transformer or generator winding. There is also such a thing as two-phase power. It involves five wires and is rarely used.)

For the other three-phase configuration, the schematic diagram resembles the Greek letter Delta, which is an equilateral triangle with an apex at the top. Each side of each winding is connected to one side of an adjacent winding, and these terminations comprise the three hot-phase legs. Like the wye configuration, the output is carried by three wires for a three-phase load such as a motor, and there is single-phase capability via two wires connected to any one of the windings.

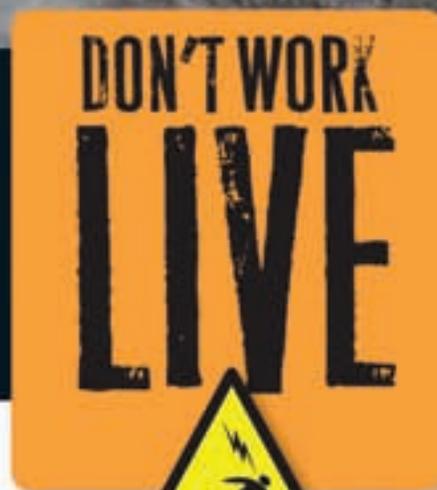
The delta configuration has two important variations. One is the centre-grounded delta, in which one winding is centre-tapped and connected to the grounding electrode system. A consequence of this connection is that the opposite corner of the delta triangle has higher voltage to ground than the other two phase legs. This arrangement is called a high-leg delta. The high leg must be colour-coded separately, usually orange, so that correct voltages are applied to loads.

The other delta variation is called an ‘open delta’. Here we see one of the windings omitted. There are only two windings but three-phase hot legs are obtained as may be seen in the diagram. This is possible because voltage level may be stepped down for local usage by means of a single three-phase transformer or a bank of three single-phase transformers. The three-transformer bank is not generally used because it is the more expensive choice. However, should one of the single-phase transformers fail, it can be removed, leaving an open delta. Since there are still three active poles, the three-phase system continues to function, though at reduced capacity of 57.7% of full power, which may be satisfactory for temporary emergency service.

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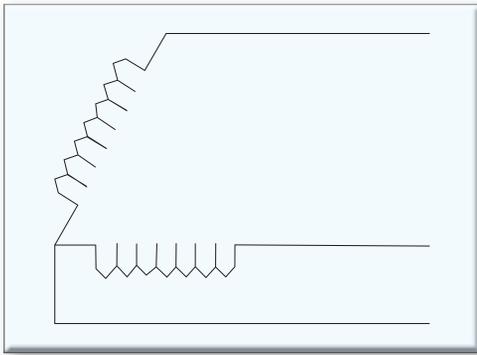
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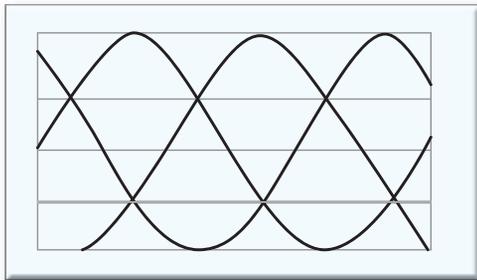
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Schematic of three-phase open delta configuration. Two single-phase transformer secondaries can provide the usual three-wire output, at reduced power.



Three-phase sine waves plotted on a single set of coordinates. Notice that the energy level never falls to zero.

Three-phase power provides single-phase capability. This is convenient because an industrial facility can have a three-phase service, with single-phase lighting and receptacle loads at various locations throughout the building. A three-phase service is brought to a three-phase entrance panel. Three-phase

loads are supplied by three-pole circuit breakers. Single-phase loads are fed from single-pole or double-pole breakers. A high-amp double-pole breaker could feed a single-phase load centre on each floor of a three-story building, providing dual-voltage single-phase capability.

It is important that the single-phase loads be balanced insofar as possible given usage fluctuations. To measure the peak load on each leg over a period of time, it is possible to hook up three clamp-on digital ammeters with latching capability so you will have a record of peak current usage over, for example, a four-week period. Then, loads can be shifted to achieve better balance. The objective, with today's proliferation of nonlinear loads, is to balance the loads insofar as possible so as to reduce heating of the neutral conductor.

Working with three-phase

One of the great advantages of three-phase power is the fact that a three-phase motor has reverse-rotation capability.

This is accomplished by reversing any two of the hot legs. It may be done at the motor, or at the load centre. To initially set up a motor, correct rotation may be achieved by trial and error, except in certain cases such as motor-driven pumps where the seals are damaged by incorrect rotation. When the motor is required to be reversible, simple switching inserted at an appropriate location along the line will provide this function.

Direct-current motors can be reversed by switching polarity, but single-phase AC motors, in contrast, do not have this capability. A

reversible single-phase motor must have separate clockwise and counter-clockwise windings, with separate switchable power to each of these, making for a more costly installation.

For a three-phase motor, it is important that each of the windings has, as near as possible, the same current. This is essential for both operating efficiency and long motor life. Unbalanced operation means more heat within the motor and less power to the driven machinery. What is the cause of this imbalance, and how may it be corrected?

Due to small variations in branch circuit, feeder and service ampacities and terminations—plus imbalance in the utility supply—it is possible that the voltages at the three-phase motor terminals could vary a small amount. Moreover, the three load windings and terminations may not have identical impedances. Depending upon how the phases are connected, it is possible for these imperfections to either reinforce or cancel one another. The plan is to connect the phases so that the latter occurs.

To do this, it is necessary to change the phase connections without reversing rotation. This may be done at the motor, motor controller, or load centre.

Measure the current using a digital clamp-on ammeter and record the current flow in each wire. Then, change the connections. Make phase A become phase B, phase B become phase C, and phase C become phase A. This is called "rolling the connections". In so doing, two phases are never reversed and motor rotation is not affected. Measure current flow in each phase for each configuration and do the permanent connection so that the best balance is achieved. To facilitate

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this procedure, leave enough slack in the initial wiring so that the required changes are possible.

Many technicians are surprised to learn that an automotive alternator produces three-phase power. Diodes inside the housing change these waveforms to a single pulsating DC voltage, which is ideal for charging a lead-acid battery.

In the commonly used wye connection, the voltage between any two adjacent coil terminations is termed the 'line voltage'. The voltage across any of the three windings is called the 'phase voltage'. There are two available single-phase voltages. The line voltage is higher than the phase voltage by a factor of the square root of 3, which is equal to approximately 1.73.

Common three-phase configurations are 208Y/120 volts, 480Y/277 volts and 600Y/344 volts (The latter is used in Western Canada). Each of these is a pair of single-phase voltages. The phase voltage multiplied by 1.73 is the line voltage. The three-phase voltage is the same as the line voltage, but it is carried on three wires of equal voltage (except in a high-leg delta) but differing in phase. The voltages are sine waves 120 degrees out of phase, due to the nature of the rotating machinery that generates them. Unlike single phase, three-phase voltage never falls to zero, resulting in a smoother-running motor, better operating efficiency and longer life.

In Canada, where the Canadian Electrical Code has jurisdiction, the colour code is green or green-yellow for the equipment grounding conductor, white for the neutral, and red for L1, black for L2 and blue for L3.

In the States, where the NEC has jurisdiction, L1 (black) and L2 (red) are reversed. L3 is blue. Additionally, for 480Y/277 volts, L1 is brown, L2 is orange and L3 is yellow. These latter colours are not code mandated—just common trade practice.

Conclusion

To summarize, for any given power range, three-phase power is typically 150% more efficient than single-phase power. Moreover, the conductors are only 75% the size of single-phase conductors. Since components and raceways are smaller, there is a definite savings here as well.

A problem sometimes encountered, especially in rural areas, is that three-phase power may not be available from the utility, and the cost to extend power lines will be prohibitive. On the other hand, when

three-phase power is available at the nearest pole, the expense of putting in a three-phase service is easy to justify.

As mentioned, three-phase power contains single-phase capability, but the reverse is not true. No transformer or passive circuitry can create three-phase from single phase. A phase converter is required. This may be either rotary or electronic. A rotary phase converter looks like a motor, but the shaft does not come out through the housing. It contains a single-phase motor winding and three-phase generator windings. It has the advantage of producing a perfect sine wave output.

Older electronic phase converters produced an inferior square-wave or distorted sine-wave output. Newer versions approximate the pure sine wave that is characteristic of rotating machinery, but it is still not the same as having utility- or customer-generated three-phase power. **EB**

A regular contributor to Electrical Business, David Herres is a Master electrician and author of nearly 40 articles on electrical and telecom wiring. He recently authored "2011 National Electrical Code: Chapter-by-Chapter", published by McGraw-Hill and available at Amazon.com.



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PROPER LABELLING

with the right tool boosts cable installer productivity

Al Feaster, RCDD

In the workshops I conduct on network infrastructure, I have the opportunity to talk to a lot of network installers about best practices in telecom network installation. When the topic turns to network cable identification, I have found that most installers are aware that an industry standard for cable labelling exists, but many confess they don't follow it consistently in their daily work.

The feedback I get from these professionals suggests they are slow to adopt the cable identification standard because they don't understand it, and believe it to be a time-consuming exercise of questionable value. Hearing this gives me the

opportunity to introduce some correct thinking, and show them how embracing labelling standards is not only good practice, it's good business because it can significantly improve productivity on the job.

Standard for productivity

The Telecommunications Industry Association (TIA) 606-A standard, adopted in 2002, defines a labelling standard that maps a cable precisely to the floor, telecom room and patch panel position or block position on which it is terminated. The standard is not mandatory though, increasingly, designers, end users and building owners are requiring

and specifying the standard. Proper labelling is good network investment management because it makes the installation and testing process more efficient, which makes installers more productive.

The TIA 606-A standard sets a minimum level of information on the cable label so that it can be traced back to the specific floor, room and termination. Following this standard labelling scheme reduces the time required to identify and trace a cable when problems occur or when a move, add or change (MAC) is required. Following the standard also discourages proprietary labelling schemes that place meaningless information on patch panels and faceplates, which might confound future maintenance and upgrade efforts. The labelling scheme also provides continuity in large buildings and multi-campus layouts, allowing owners flexibility in working with different contractors over the life of the network.

The net result of proper cabling is a far more productive installation team that performs installations and upgrades more quickly and accurately.

Conversely, a non-labelled plant is a productivity drain. Installers at the workshops often tell me they turn down repair and maintenance bids because cable tracing is so labour-intensive and adds so much to the project overhead that they can't bid competitively.

In addition to embracing the 606-A standard, contractors can boost productivity even further by

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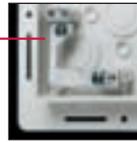
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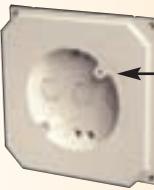
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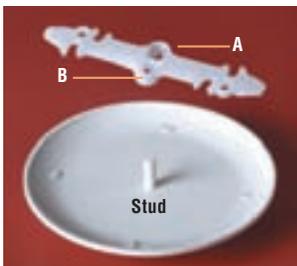


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working with the right labelling tool. The most important consideration is to use a tool that is designed specifically for the low-voltage industry. At a minimum, the labelling tool should have the following features:

- Labels that adhere properly and last ensure a good labelling job stays good, with no repeated effort and no confusion on future jobs due to labels that have fallen off the cable.
- Vertical wrap capability repeats the label code 360 degrees around the cable so it is easily identifiable and readable from any angle; this reduces cable twists that can lead to cable damage or loose connections.
- Label spacing that can be calibrated to the proper dimensions of a patch panel, so you can easily line up identifiers under each port in a patch panel; this eliminates the guesswork in spacing, speeding up the job and reducing waste.
- Templates that are pre-designed to work with major manufacturer patch panels.
- Hot keys that are programmed with the label specifics for each job.



In our workshops, we've demonstrated how the right labelling tool, coupled with a strong knowledge of the labelling standard, can cut a 45-minute job to label a patch panel to just five minutes. In large installations with hundreds of patch panels, the time savings and productivity boost can be tremendous.

The bottom line is that proper labelling with the right tool is a small investment that can pay substantial dividends for contractors, end users and building owners—an all-around win for the industry. **EB**

Al Feaster, RCDD, is national account manager with Dymo Industrial.



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8

ESSENTIAL FEATURES

TO LOOK FOR IN TEST & MEASUREMENT EQUIPMENT

Steve Maxwell

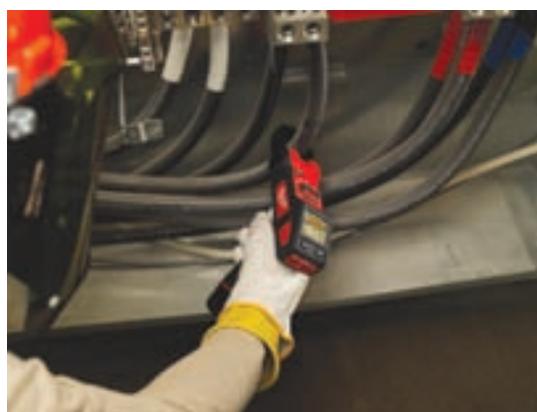
Test and measurement tools are the essential interface between electrical realities and the systems you build, troubleshoot and maintain. Technicians are blind without these tools, and the competitiveness of your business depends, in part, on the equipment you choose. Selecting the best models begins with an understanding of precisely which technical features matter and why—and that's what you'll find here.

FEATURE #1: True RMS capability

Accurate measurement of AC voltage under all conditions is what true RMS test and measurement devices deliver and, to understand why this matters, you need to realize how increasingly difficult it is to get reliable measurements of alternating voltage in the field. As electrical equipment and loads become more complex, you need a tool that's designed to meet this growing challenge.

When engineers talk about a specific level of AC voltage, they're not referring to the peak voltage level achieved by the crest or trough of sine wave current. If you could see standard 120 vAC grid power displayed on an oscilloscope, for instance, you'd find that peak and trough voltage is actually somewhere around 170 vAC. And while this number is true, it's not particularly useful in the field.

What really matters is the effective voltage, taking into consideration the shape of the AC waveform involved. This is where RMS comes in. It's a mathematical term that stands for "root mean square" and, in the electrical world, RMS describes the direct current equivalent of an AC power supply. Even though the power available at a wall outlet spikes and dips to extremes of 170 vAC 60 times a second, the power it delivers matches what you'd get from a steady supply of 120 vDC. That's why we call it 120 vAC.



Simple RMS meters (often called calibrated RMS meters) measure AC voltage assuming the pattern of alternating current is always an ideal sine wave shape. This is a workable assumption when all you do is measure clean, incoming supply voltage, but there's more to electrical work than that. The moment you're dealing with non-sine wave power (and it happens all the time), simple calibrated RMS meters can be seriously misleading.

As proof, use any simple test and measurement

tool to read the power output of an uninterruptible power supply when it's on battery back-up. Since the shape of this output is square and blocky, rather than a smoothly curved sine wave, a simple meter will show around 85 vAC, even though the actual power is a full 120 vAC. Power output readings from many inverters is similarly distorted unless you're using a true RMS meter. Distorted harmonics occur accidentally as different kinds of electrical loads interact, or from power supply components that have

been intentionally designed for simplicity.

Either way, true RMS tools deliver accurate voltage readings regardless of the shape of AC output involved. There's more to managing electrical harmonics in the real world than just having a true RMS meter in your pouch, and the kind of accurate readings they offer is an indispensable start.

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FEATURE #2: Certification capability

True RMS is one example of accuracy that comes from sophisticated design, but good design doesn't necessarily mean that a test and measurement tool is completely accurate over its working life. The other essential feature is regular calibration you can count on, and this maintenance issue must be accompanied by certification.

Top test and measurement tools have the ability to be professionally calibrated, with accuracy verified by certificate. What's the use of a meter reading you cannot, literally, trust with your life?

FEATURE #3: Ghost voltage elimination

There's more than one way a conductor can appear to be energized, and this fact can cause false readings when using unsophisticated digital meters. When a conductor is connected to a live power supply, for example, it will have a "hard" voltage that any meter can measure. But when an otherwise unconnected and insulated cable is running alongside an energized conductor, voltage can be induced to the unconnected wire, causing simple digital meters to show measured voltage, creating the illusion that it's hot when it's not.

This so-called 'phantom' or 'ghost' voltage is not usually dangerous in and of itself, but the illusion does waste time, lower productivity and creates unnecessary confusion and risk.

You're most likely to encounter ghost voltage in spare cables sitting alongside active ones in a conduit, or around blown panel fuses. Although ghost voltage is technically present, the capacity for current flow is virtually nothing. That's why you need test and measurement equipment that's smart enough to ignore ghost voltage readings.

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multimeters had enough internal conductivity to eliminate ghost voltage problems by design, but digital meters don't always do this automatically. Since internal conductivity is naturally low, intentional ghost voltage elimination features must be built into digital meters to let them work reliably in complex situations. Look for this feature specifically before you buy any tool.

FEATURE #4: Real-world toughness

Electrical test and measurement devices vary tremendously in their ability to withstand the rigors of every day field use, so look for numbers to prove durability. The IP rating is a widely used yardstick for determining whether a particular model of meter is up to the kind of environments you'll be working in.

The IP code (short for International Protection Rating, but sometimes referred to as Ingress Protection Rating) is a European system that quantifies the ability of a device to keep damaging liquid and solid contaminants out of an assembly. It's an essential part of selecting test and measurement equipment for professional use.

The world is a dusty, dirty and wet place, and it's not specific enough for a manufacturer to claim that a test and measurement tool is water or dust resistant. How resistant? What are the limits? How does one model compare with another? You need numbers.

In its most basic form, the IP rating system has two digits. The first refers to the ability to keep out solids, and the second applies to liquids. A measurement device with an IP rating of 54, for instance, is safe in the presence of environmental dust and rain. An IP of 67 keeps out all dust and withstands submersion up to one metre.

The National Electrical Manufacturers Association (NEMA) rating system runs parallel to IP and, while it is not a precise equivalent, NEMA and IP measure similar things. An IP of 67 correlates roughly to NEMA 6; IP54 to NEMA 3. At the moment, the most dust- and water-resistant digital meters carry an IP of 64.

FEATURE #5: Non-contact voltage detection

Detecting and measuring specific voltage levels is something that test and measurement tools all do. That's what they're made for. But passive, non-contact voltage

detection is another matter. It's a useful and efficient safety feature that's far less common now than it will be in the future. Why buy old-generation tools?

Non-contact voltage detection doesn't tell you the numerical voltage in a hot conductor, only that the conductor is hot. Although you'll need to test more closely for detailed numbers, an immediate "hot or not-hot" status is a fast and helpful feature that just might save your skin.

FEATURE #6: Fast, high-contrast display

Digital read-out screens vary a lot in speed and contrast. The best screens respond quickly to changing numbers, and are easy to see in all light conditions. Take the time to compare screen quality side-by-side on several models—viewed in bright and dim light conditions—while displaying varying data numbers.

FEATURE #7: Refined ergonomics

Until recently, the test and measurement tool category hadn't received as much R&D investment as other tool categories, especially when it came to user comfort, control layout and hands-on function. All this is changing.

The latest test and measurement tools are more refined, with leading-edge features like soft rubber overwrap to make holding the tool more comfortable, side-mounted control wheel location (for single-handed function selection), large jaw opening capability on clamp meters (the best now span cables more than 1.5-in. in diameter), and pistol-grip styling for an easier and more secure grip.

The entire tool category has changed enough that you definitely don't want to buy just from a catalogue or online. Pick up the latest designs in your hand before you buy, and feel how much things have changed. In addition to traditional multimeters, you'll find new and evolving tool configurations like clamp meters and fork meters.

Removable, rechargeable battery packs offer the best of all possible worlds because you never need to stop working.

FEATURE #8: Continuous-use battery systems

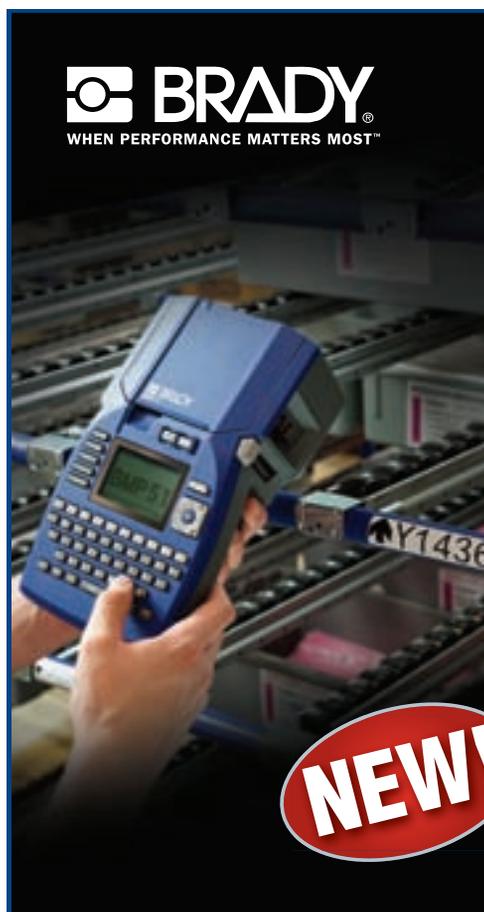
All test and measurement tools use batteries, but the most advanced systems have removable and rechargeable battery packs. There are three reasons why this feature is best.

Test and measurement tools that use throw-away AAs are more costly to operate and less environmentally responsible than rechargeable systems, and they require you to travel with spare batteries. Tools with built-in rechargeable batteries are better because they eliminate the need to buy, replace and throw away disposable cells (though they do force you to stop working while recharging batteries that have run flat).

Removable, rechargeable battery packs offer the best of all possible worlds because you never need to stop working. When your battery is out of power, simply swap it for a freshly charged one. The best battery packs contain lithium-ion cells. They offer twice as much run-time while weighing less than half as much as standard nickel cadmium batteries. Lithium-ion cells also hold their charge for a long time in storage. Even a year after charging, they still have more than 75% of their full energy capacity.

Conclusion

As the electrical universe evolves toward more sophisticated electronics, controls and systems, the need for smarter, safer test and measurement equipment rises along with it. Early adoption of the most effective and productive test and measurement gear also means greater efficiency and profitability for your business. 



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Combating ownership loneliness

No man (or woman) is an island

One of the reasons owning your own business can be so stressful is that it is very difficult to talk to anyone about it, particularly when you have a problem. Imagine having a cash flow problem (an easy problem for most of us to imagine). Who could you talk to about it?

Friends can empathize, but they really don't know what it's like to run their own business (unless they've done so). They're probably wondering when you're going to hit them up for a loan. Same thing goes for a spouse with the exception that, when times get really tough, you don't want to worry/upset them.

Your employees could be easily spooked. They're looking for a leader, not someone they have to prop up, and they don't like any mysteries involving their paycheques. Your suppliers may tighten up your credit levels. Maybe their pricing will creep up, too. Your customers will also get nervous, thinking you cannot finish the work. They may be afraid to give you more work, and may try to grind you down on pricing. Even worse, they may hold back progress payments and exacerbate the situation.

Your bank is only interested when you have more security for them; otherwise, they might call your loan. Worse, they might take the extra security, then call your loan!

You are in the loneliest place on Earth.

This is why it is good to find someone with whom you can talk about business issues. Develop a relationship with your accountant or another (non-competing) businessperson/mentor, or get into a peer group. Don't ever feel you are in the minority with business problems and loneliness.



When my contractors have issues they cannot discuss with anyone else, they often come to me, as I listen and often provide direction.

I encourage them to find an alternate: someone with whom they can spend some time on a regular basis; someone who understands and may provide guidance. Sometimes, the search for such a person seems to take forever, but it is well worth the effort when you find them. I also

encourage contractors to get involved in peer groups or get mentors.

The Takeaways

- Acknowledge how lonely it is the top.
- Find someone else who feels the same and form a liaison with them.
- Develop a relationship where you get together regularly and discuss business issues.
- Join or form a peer group. **EB**

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Ron Coleman, a member of the Institute of Certified Management Consultants of British Columbia, just published his latest book, "Building Your Legacy: Lessons for Success from the Contracting Community", which teaches you how to make more money while having more fun. A noted speaker, he has completed many interfirm financial comparisons of groups of construction companies in Canada and the United States. Ron's numerous published education programs include a 36-hour business management course specifically designed for the Electrical Contractors Association of British Columbia (ECABC). Visit www.ronaldcoleman.ca.

Standard Products dimmable decorative LED lamps

Standard Products is now offering new dimmable decorative candle, globe and A15 lamps all claim to emit a light that delivers ambiance and style at a fraction of the energy costs of its incandescent equivalents. The new shapes include candles (B10), globes (G16.5) and A15 lamps. The lamps are available in a colour temperature of 2700K and 3W and 5W. Applications include wall sconces, chandeliers, ornamental fixtures and decorative lighting applications. **STANDARD PRODUCTS**
www.standardpro.com

GE introduces Infusion LED module series

GE Lighting says its new Infusion LED module series opens up design possibilities and revolutionizes the way light-critical customer spaces can be exhibited. Ideal for spotlighting, down lighting, track and accent lighting, the Infusion LED modules are available in 1000, 1500, 2000 and 3000 lumens, in colour temperatures of 2700K, 3000K and 4000K, and CRI options of 80 and 90. Each module features a twist and lock fit, allowing for an installation where no additional tools are necessary. **GE LIGHTING**
www.gelighting.com

Lind Equipment redesigns LE981 fluorescent floodlight

Lind Equipment describes its newly redesigned LE981 65W fluorescent floodlight as an even more accessible and user-friendly product. The new LE981 has a redesigned

yellow housing that brings down the overall size and makes for a more ergonomic experience, says Lind, adding that the new product is priced 20% lower than the previous version. It is Energy Star and cULus certified. **LIND EQUIPMENT**
www.lindequipment.net

RC Lighting HSLED13 floodlight with spot focus

RC Lighting has developed a 13W LED floodlight, titled HSLED13, with a spot focus ideal for illuminating flags and other architectural elements up to 50 feet high, it says. The



product features die-cast aluminum housing, hood, and mounting arm as well as a chip and fade-resistant polyester powder coat finish. It is cUL-listed for wet locations and sports a minimum starting temperature of -40°C. **RC LIGHTING**
www.rclighting.ca

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EB lighting products

Holophane introduces GranVille II LED luminaires



“Architectural appearance combined with sustainability and a high level of performance,” is how Holophane describes its new GranVille II LED luminaires. The luminaires offer with Classic or Premier prismatic borosilicate glass optics for new or installed applications. According to Holophane, they feature a new optical design that provides HID light levels while creating a comfortable wholly luminous appearance with low glare, less uplight and less light trespass. They also include cast aluminum housing available in different styles, including two utility series and four standard housings.

HOLOPHANE
www.holophane.com

Spaulding Lighting offers 20K lumen package for Cimarron LED series

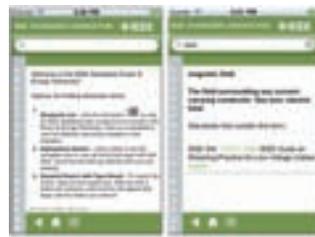


The new Cimarron LED outdoor luminaire from Spaulding Lighting, a Hubbell Lighting brand, is now available with a 20,000 lumen package - offering a choice of four lumen packages from 5K to over 20K lm. The new lumen package features 90 high brightness LEDs at 310w, and produces Type II, III, IV and V distributions in four brightness LED configurations. The series also features an energy control option which uses less than 50% of the energy of an equivalent HID at full brightness, adds the company.

SPAULDING LIGHTING
www.spauldinglighting.com

EB products

IEEE offers dictionary app for Apple mobile users



IEEE has introduced its new IEEE Standards Power & Energy Dictionary app— an Apple mobile device app offering a comprehensive dictionary of terms and definitions for those in the power industry. Created by the IEEE Standards Association (IEEE-SA), the app provides easy access to more than 3500 terms and definitions, it explains. Users can perform searches by keyword, standard number or alphabetically, and the search function automatically identifies terms as the user starts typing in the search field. The app is compatible with the Apple iPhone, iPod and iPad, and is available currently through the iTunes store.

IEEE STANDARDS ASSOCIATION
www.standards.ieee.org

Hammond Mfg HLP network/security cabinet



Hammond Manufacturing has introduced the new Hammond Low-Profile (HLP) network/security cabinet, featuring several features where similar cabinets fall short, it boasts. Designed as a hybrid networking cabinet for the communications and security professional, the unit showcases a mounting rail that can pivot 180° for easier equipment installation and maintenance. The HLP also includes a louvered front door, locking hinged top cover, fan provisions located top and bottom, and studs for quick mounting of electrical boxes.

HAMMOND MANUFACTURING
www.hammondmfg.com

GE Energy offers FDIR/FLISR reliability system

GE has released the End-to-End Fault Detection, Isolation & Restoration (FDIR/FLISR) system, a

distribution automation solution to help utilities improve the reliability of their distribution network. According to the company, the solution is capable of detecting power system outage locations and automatically sectionalizing and reconfiguring distribution circuits to restore power to as many customers as possible, helping to reduce typical customer outage time from hours to under a minute. The solution can also help improve a utility's SAIDI and SAIFI reliability indices, it adds.

GE ENERGY
www.ge-energy.com

Meltric introduces receptacle/wall box with integral circuit protection

Meltric has released its receptacle/wall box with integral circuit protection that combines the safety of a pre-wired Meltric DSN Series switch rated receptacle with the convenience of local circuit protection, it says. Available in fuseholder- or circuit breaker-equipped models, the receptacle/wall box provides an installation option for the Meltric DSN Series switch rated receptacle/plugs. The local circuit protection is rated for branch circuits at 20A, 30A and 60A, and motor 'line of sight' disconnects at 5HP, 10P and 20HP.

MELTRIC
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ADVERTISER	PAGE
Arlington	21
Brady	25
Canada's Safest Employer	28
Canadian Standards Association	22
Columbia MBF	5
Diversified	29
EFC Scholarship	26
Electrical Safety Authority	17,20
Emon	8
Falvo	29
FLIR Canada	4
Fluke	10
Hubbell Wiring	24
IED	32
IPEX	15
L Stoch & Associates	29
MEET Show	27
Meltric	29
Mersen	9
Milwaukee Electric Tools	13
Nexans	1
Northern Cables	7
Southwire Canada	31
Standard Products	2
Stanpro	18
Surge Pure	11
Thomas & Betts	1
Venture Lighting	19



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Maximum circuit loading

Maximum circuit loading is a recurring theme in the Canadian Electrical Code. Some of the code requirements are not entirely obvious without some head-scratching. This article reviews Rule 8-104, Maximum circuit loading, which happens to be one such head-scratcher.

Rule 8-104(1) begins by defining the ampere rating of a consumer's service, feeder or branch circuit to be the ampere rating of its overcurrent protection or the conductor ampacity, whichever is less. Rule 8-104(2) says the calculated loading of the circuit must not exceed its ampere rating. So far, so good.

Rule 8-104(3) defines continuous current loading. You may wonder why a definition is at all important. (This will become more apparent further along.)

Rule 8-104(3) specifies that a calculated load must be considered to be continuous unless it can be shown that it will not persist:

- for longer than one hour in every two, up to 225 amperes; or
- for longer than three hours in every six when over 225 amperes.

Rule 8-104(4) specifies that when a fused switch or circuit-breaker is marked for continuous operation at 100% of its ampere

rating, the continuous calculated load must not exceed:

- 100% of its ampere rating when connected with multi-conductor wiring sized using Table 2 for copper conductors or Table 4 for aluminum conductors;
- but only up to 85% of its ampere rating when connected with single-conductor wiring sized using Table 1 for copper conductors or Table 3 for aluminum conductors.

Rule 8-104(5) goes on to specify that when a fused switch or circuit-breaker is marked for continuous operation at 80% of its ampere rating (or if unmarked), the continuous calculated load must not exceed:

- 80% of its ampere rating when connected with multi-conductor wiring sized using Tables 2 or 4;
- but only up to 70% of its ampere rating when connected with single-conductor wiring sized using Tables 1 or 3.

Now we come to an important question: why is it compulsory to define continuous loading, and why do Rules 8-104(4) and (5) base the maximum loads on the applicable connection methods? The answer: electrical equipment

is tested and approved to CSA standards that require testing be carried out using wiring connections sized in accordance with Tables 2 or 4. Nevertheless, the Canadian Electrical Code permits this same equipment to be wired with conductors sized using Tables 1 or 3, which results in smaller conductor sizes and, therefore, higher temperatures at the equipment connection points. Consequently, loading of the equipment must be reduced to prevent overheating at the equipment connections.

Other derating factors may also be applicable in some installations. Rule 8-104(6) goes on to specify that, when other derating factors apply for reducing allowable conductor ampacities, the minimum conductor sizes must be the greater of the so-determined ampacities, or those determined by Rules 8-104(4) and (5).

Rule 8-104(7) also specifies that, when using Tables D8A to D15B for determining the minimum ampacities of underground conductors, the allowable ampacities must not exceed those determined by Rule 8-104(4)(b) and Rule 8-104(5)(b). **EB**

Les Stoch is president of L. Stoch & Associates, specialists in quality management/engineering services. He is a member of PEO, OEL and IAEE, and develops and delivers electrical code and technical workshops for Dalhousie University. He also developed the Master Electrician training program and exam (Ontario) for the Electrical Contractor Registration Agency. Visit L. Stoch & Associates online at www.lstoch.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 May's Electrical Business.

How did you do with the last quiz? Are you a...

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

Question 1

Where a fan is used to ventilate commercial cooking equipment, the control for the fan motor shall be permitted to be located within sight of and within 9 m of the ventilation duct or hood.

- a) True
- b) False

Question 2

Plug fuses and fuse holders shall not be used in circuits exceeding 125 V between conductors.

- a) True
- b) False

Question 3

Conductors in the high-voltage circuits of X-ray equipment shall be of the ____ type.

- a) TC
- b) RW
- c) Shockproof
- d) Extra-hard usage

Answers to Code Conundrum EBMag March 2012

Q-1: Where a separate bonding conductor is run with single conductor cables, it need not follow the same route as the cables.

- b) False. Ref. Rule 10-808(8).

Q-2: Sheath currents are not a concern for single conductor cables installed underground where the ampere rating of the circuit is less than 425 amps.

- b) False. Ref. Rule 4-008(1).

Q-3: Where non-metallic sheathed cable runs along metal studs, it shall be located so as to be effectively protected from mechanical injury both during and after installation.

- a) True. Ref. Rule 12-516(2).



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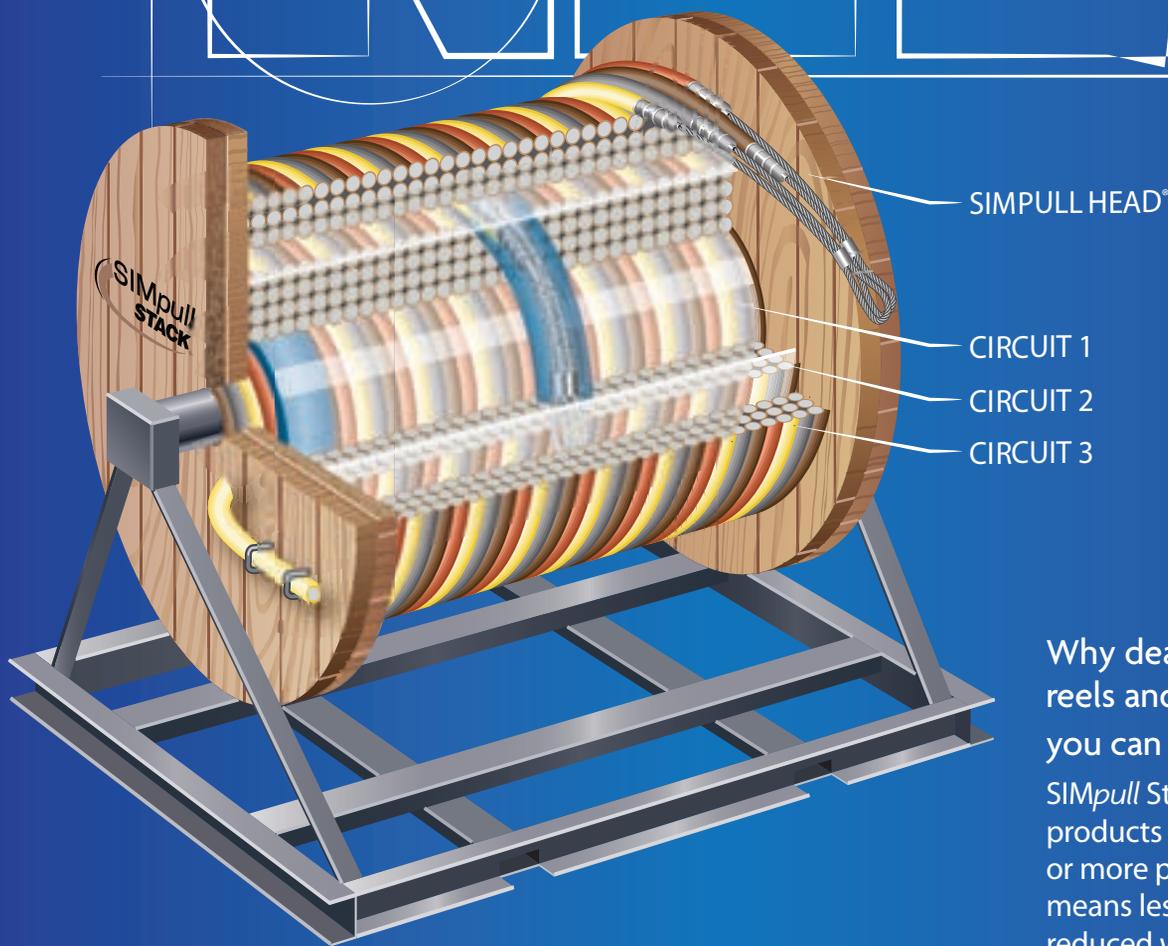
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