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Electrical Business

MARCH 2011



A new
revolution
is on page 5.

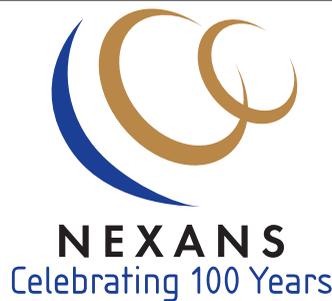
■ **Also in this issue...**

- How to select an aerial work platform
- Electrical safety for solar energy projects
- A look at wind turbine step-up transformers

Canada's burgeoning solar industry

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Are developers and designers taking the time to ensure their installations meet code?

“It’s like the Wild West in here.”

That was my thought upon attending the Canadian Solar Industries Association’s (CanSIA’s) recent Solar Conference in Toronto, though it is probably more appropriate to liken Ontario’s burgeoning renewable energy industry to a gold rush.

Dictionary.com defines “gold rush” as “a large-scale and hasty movement of people to a region where gold has been discovered”, which perfectly describes what’s happening with Ontario’s “green rush”.

And rushing they are—from all corners of the globe—to make sure they get a piece of Ontario’s lucrative FIT and microFIT (feed-in-tariff) pie for renewable energy projects.

For an industry that was virtually non-existent a short while ago, I met a number of exhibitors who claim they and their solutions meet Ontario’s domestic content requirements for FIT programs. And I wondered, how on earth did they set up operations in Ontario so quickly?

Upon discussion, though, I learned they can only do this through contract manufacturing arrangements with organizations already based in the province. Once I uncovered that loophole, I learned that a lot of exhibitors were actually relying on a very small number of local manufacturers to help them achieve that domestic content requirement.

Which makes me question: Just how sustainable is Ontario’s green industry? After all, gold rushes last for as long as there is gold. Similarly, Ontario’s green rush seems to rely solely on OPA (Ontario Power

Authority) FIT contracts. And what about safety? Are developers and designers taking the time to ensure their installations meet code? (I’ve heard some horror stories to the opposite!)

Thankfully, there are signs the green rush is not completely transient. For example, Electrical Contractors Association of Ontario (ECAO) and Ontario Electrical League (OEL) were at the Solar Conference reminding everyone that, yes, you need qualified electrical contractors/electricians making the connections in these systems. (One of the solar installers I met started as a roofing contractor and, before I could lay into him, he told me he’s hired electricians to do the electrical work.)

Meantime, the National Electrical Trade Council (NETCO) and CSA Standards are developing a national, third-party, independent personnel certification program for construction electricians installing photovoltaic (PV) equipment in Canada. Increasingly, installers and integrators are conducting and attending educational seminars to ensure their work is to code.

Some local manufacturers are expanding operations to accommodate contract manufacturing. And, happily, some companies—like Siemens in Tillsonburg and Canadian Solar in Guelph—have committed to the market they serve by establishing facilities of their own in Ontario.

So while Ontario’s green rush will inevitably cool down, I don’t see it going away any time soon. **EB**



Cover photo courtesy Canadian Solar

On the cover and page 8

Canada’s burgeoning solar industry

Ontario gets its first 250-kW PV rooftop system, which includes 1326 Canadian Solar panels on about 74,668 sf with a total rated capacity of 305-kW direct current. The system is owned by Dave Walden, president, Towcon Holdings, and is located in Cambridge.

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Whether it’s six feet or 100 feet off the ground, accessing overhead areas efficiently and safely is essential. Today, more people are getting to overhead work by using aerial work platforms, but which features should you keep in mind when selecting one?

18 IEC and e8 take step forward for global electric vehicle roll-out

The IEC (International Electrotechnical Commission) and e8 brought together all major stakeholders for a roundtable to help drive the global roll-out of electric vehicles.

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According to NFPA, electrical fires often rank as one of the top five causes of commercial building fires, usually resulting in a higher percentage of property damage than fires caused by other sources. Are you doing everything you can to prevent this?

22 Is your wind turbine step-up transformer the weak link in the wind energy supply chain?

In this 21st century land-rush to cash in on wind energy, developers are often trading low initial costs for higher total costs of ownership to be shouldered later by wind farm owners and operators. And this headlong rush to install more and more wind turbines has outstripped the usual developmental learning curve in which new technologies mature by a process of trial and error.

34 Best practices for terminating fiber optic cabling

As fiber optic cabling becomes an increasingly important aspect of Local Area Network communications infrastructures, LAN installers have to be well-schooled in the fundamentals of terminating fiber and installing fiber connectors. Check out these best practices for creating fiber optic connections.

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SAIT breaks ground with Bachelor of Science degree in Construction Project Management



Left to right: Gord Nixon, VP Academic, SAIT Polytechnic; Larry Rosia, Dean, SAIT Polytechnic's School of Construction; Todd Poulsen, VP Calgary Construction Association; Faisal Arain, Academic Chair, Construction Project Management, SAIT Polytechnic's School of Construction.

SAIT Polytechnic (Southern Alberta Institute of Technology, www.sait.ca) is launching a new degree this fall that will prepare graduates to accelerate their entry into project management within Canada's lucrative construction industry. SAIT's new Bachelor of Science degree in Construction Project Management (BSc-CPM) is the first of its kind in Canada. It will launch in September with a cohort of 32 students.

"We're very excited about this program, and so is the construction industry," said Gord Nixon, SAIT's VP Academic. "Construction project

managers require leadership ability, a broad range of management skills and knowledge of a number of core disciplines within the industry. Traditionally, they have been the product of considerable experience rather than a disciplined, focused training program. The availability of this degree program provides a fast-lane to those interested in careers in construction project management."

The four-year program is based on extensive research and consultation with industry which has heavily influenced course content. The program will apply theory, immersive learning and technological training to address the scientific management of construction projects.

"The construction industry employs close to one million Canadians and, in Alberta alone, there are more than 900 construction projects with an estimated value of \$182 billion currently proposed or underway," said Nixon. "Skilled individuals are needed to manage growth and this new degree helps to address that."

Anticipated entry-level opportunities for graduates include Assistant Construction Manager, Assistant Project Manager, Site Supervisor, Construction Inspector, Project Coordinator, Estimator, and Assistant Facilities Manager. Graduates will also be well-positioned to pursue graduate-level credentials in the construction project management domain at universities in Canada and internationally.

"Construction project management is a high-demand field that includes the design, tender and management of facilities; the budgeting, planning and scheduling of project activities; and the safe and efficient management of employees, contractors, equipment and materials," said Larry Rosia, Dean of SAIT's School of Construction. "Ultimately, construction project managers are responsible for every aspect of their projects."

Applications for SAIT's Bachelor of Science in Construction Project Management are now being accepted for Fall 2011.

**Say hello to Atkore!
Tyco sells majority stake in Electric and Metal Products business**

Tyco International Ltd. is selling a 51% stake in its Electrical & Metal Products business to the private equity firm Clayton Dubilier & Rice LLC for total cash proceeds of about \$720 million US, which it will use to "accelerate share repurchases" under a \$1-billion program announced by the company back in September.

The Electrical & Metal Products business designs, manufactures and sells galvanized steel tubes and pipes, electrical conduit, armoured wire and cable, metal framing systems and building components. The business serves a range of construction, electrical, fire, security and mechanical applications, generating revenue of \$1.4 billion in 2010.

This business will operate as a stand-alone entity under the name Atkore International (Atkore). Following the transaction, Tyco's ownership interest in Atkore will be accounted for under the equity method of accounting.

"This transaction is attractive for both Tyco and



Atkore," said Ed Breen, Tyco's chair and CEO. "Selling a portion of this business now provides us with significant cash while preserving

our ability to benefit from a subsequent divestiture of our remaining stake in Atkore as its underlying end markets strengthen. The transaction sharpens our focus on our core security, fire and flow control platforms and reduces our exposure to the cyclical steel and copper markets."

"The transaction also gives Atkore the opportunity to pursue its business strategy as a stand-alone entity with a strong partner that has a demonstrated track record of collaborating with management teams to help their businesses reach their full potential," added Breen. "Given the strength of its brands, management team and workforce, and its excellent reputation with customers, this business is well positioned to thrive, particularly as the non-residential construction market recovers."

The transaction was subject to the satisfaction of customary closing conditions, and closed in the December 2010-January 2011 timeframe.

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Sonepar Canada reaches agreement for HD Supply assets SESCO/Quesco

Sonepar Canada (www.soneparcanada.com) and HD Supply Canada (www.hdsupply.ca) have entered into an agreement for Sonepar Canada to purchase substantially all of the assets of SESCO/Quesco, a division of HD Supply Canada. The transaction is scheduled to close by the end of February 2011.

SESCO/Quesco provides business customers a complete line of electrical products, offering major brands from leading manufacturers. While focused mostly on commercial, residential and institutional markets, SESCO/Quesco has been growing in the industrial and OEM sectors.

“Sonepar Canada welcomes all SESCO/Quesco associates to our family of companies,” said Keith Moss, president and CEO of Sonepar Canada. “This strategic acquisition supports our goals to grow our business in Ontario and strengthen our place in the Canadian electrical wholesale market. Our expanded coverage in Ontario—particularly in and around Toronto—will allow us to better serve both our existing and future customers.”

“Sonepar Canada was one of several companies that approached HD Supply Canada to purchase the assets of SESCO/Quesco,” said Vasken Altounian, president of HD Supply Canada. “We felt that Sonepar Canada was the best strategic match, given its reputation as a dedicated electrical distributor on a national scale.”

SESCO/Quesco, an independent distributor in Toronto for many years, was acquired by HD Supply Canada in January 2006. SESCO/Quesco currently employs over 70 associates, operating out of five branches in the Greater Toronto Area and serving over 1000 customers.

SESCO/Quesco will join Sonepar Canada’s Ontario division, consisting of Osso Electric, Gescan and Texcan.

Bruce Power Inc. fined \$80,000 after worker injured

Bruce Power Inc., a nuclear power generation plant in Tiverton, Ont., was fined \$80,000 on January 14 for violating the Occupational Health and Safety Act (OHSA) after a worker was injured.

On October 9, 2008, the vault area of the company’s plant was

under construction. A crew from Black and McDonald was working on this construction project. While Black and McDonald workers were doing repairs, a Bruce Power electrician was on an overhead catwalk doing routine maintenance on a crane. The electrician dropped the crane’s electrical panel, which fell over six meters to hit a Black and McDonald worker on the head. The Black and McDonald worker sustained minor head injuries.

A Ministry of Labour investigation found that the

area under the overhead catwalk did not have signs posted to warn workers of the dangers overhead.

Bruce Power Inc. pleaded guilty to failing, as a constructor, to ensure that the work area was protected by signs to warn workers of the overhead danger.

In addition to the fine, the court imposed a 25-percent victim fine surcharge, as required by the Provincial Offences Act. The surcharge is credited to a special provincial government fund to assist victims of crime.

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BC Hydro Power Smart provides incentives for Philips EnduraLED A-shape

Philips (www.philips.com) is pleased with the inclusion of its Endura LED lamp in BC Hydro's Product Incentive Program and Power Smart Partners Express. The Product Incentive Program and Power Smart Partners Express provides financial incentives to BC Hydro business customers for replacing inefficient products with energy-efficient technologies. (For potential rebates in other parts of Canada, consult your local utility company for information.)

The Philips EnduraLED dimmable LED lamp is an alternative to a regular 60W incandescent A19 lamp with 800 lumens. It is ideal for ambient lighting in hospitality, institutional, commercial, residential and government buildings, says Philips. The lamp design provides full-encompassing light with 12.5W of power, and will be featured at various tradeshow this year.

EB Careers: EFC seeks VP government relations & policy and manager for EEMAC



Through its various councils, Electro-Federation Canada (EFC, www.electrofed.com)—a national, not-for-profit industry association—represents over 330 member companies that manufacture, distribute and service electrical, electronics and telecom products, contributing over \$50 billion to the Canadian economy and employing more than 130,000 workers in more than 1400 facilities across Canada.

EFC is looking to fill two vacancies: VP government relations & policy, and manager for the Electrical Equipment Manufacturers Association of Canada (EEMAC).

The vice-president government relations & policy will be a member of EFC's senior leadership team and will report directly to the president & CEO. He will lead and coordinate EFC's government relations (GR) and public policy initiatives in Canada, setting policy strategy, driving the associations/members GR priorities, and monitoring and advising on Canadian federal and provincial policy and regulatory issues. He will also represent EFC before federal and provincial institutions at senior levels, and interact with relevant members and third parties.

Meantime, the EEMAC manager will report to the vice-president of the Electrical Council, and will be responsible for providing ongoing leadership to the 16 EEMAC member Council Sections to enhance their respective industry sector position in the Canadian electrical marketplace in the EFC-mandated areas of sustainability, government and regulatory relationships and influence, product design and manufacturing safety, market research/statistics, communications, industry networking and standards and codes development.

For information on these and other career opportunities, www.EBMag.com.

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SolaMaps - world's first global interactive map for home solar installations



In what it says is a world first, SolaMaps (www.solamaps.com) shows home solar installations from around the world on an interactive map. A social network website with a twist, SolaMaps connects solar power users around the world; as each person member joins SolaMaps free of charge, their chosen avatar is placed on the site's interactive map.

"SolaMaps is not only an opportunity for people with solar systems to connect with each other, but it celebrates the widespread use of solar power and shows how this clean energy source is increasingly becoming part of everyday our lives," said SolaMaps developer Steve Ewings.

Alternate avatars differentiate those with solar panels and solar hot water systems, allowing members to communicate with each other through varying options, and see where solar power is working around the world.

Millions of homes in dozens of countries currently use solar power, yet most users are oblivious to each other and the network they could be connected to. SolaMaps provides the link to connect green-minded people employing solar power, wherever they are on the globe. The site designer hopes the shared knowledge and tips available on the site will add to their solar power experience.

"Recent analysis by the International Energy Agency found that solar electricity could represent 20% to 25% of global electricity production by 2050, and there is potential for home PV systems to produce a significant share of any country's electricity," continued Ewings.

While NASA and Google provide snapshots of the Earth brilliantly lit by the burning glow of consuming energy, SolaMaps will illuminate all the points of solar power production across the globe.

Canadian Airports National Electrical Workshop set for Montreal

The Canadian Airports Electrical Association (CAEA, www.canew.ca) has announced the annual Canadian Airports National Electrical Workshop (CANEW) will be held in Montreal this year, September 19-23. Opportunities include participating in the tradeshow, providing sponsorships, and presenting industry-related technical presentations to delegates.



CANEW is the single-largest gathering of airport and airfield electrical industry participants in Canada, and include electrical system managers, engineers, technicians, technologists, and administrative staff from airports across Canada and abroad. The workshop covers timely topics related to electrical and electronic equipment serving airport buildings and air - fields. Events including technical presentations, technical field trips, and a tradeshow are just some of the exciting events that will be taking place during the week.

The tradeshow is a highlight of the week and affords key people involved in the design, maintenance, construction, purchasing, and administration of airport electrical systems the opportunity to see products they will be interested in purchasing for their airports.

Specific details of this year's CANEW have not yet been finalized, but the event is being held at the Hyatt Regency Montreal (1255 Jeanne-Mance). The tradeshow is generally scheduled midweek.

St. Lawrence College students enjoy new Wind Turbine and Trades Training Facility

Students at St. Lawrence College in Kingston are training for clean energy careers in a new state-of-the-art Wind Turbine and Trades Training Facility. The college is also planning for the largest solar rooftop installation at any post-secondary institution in Canada.

"We are proud to be a leader in cutting-edge renewable energy technology education and innovation. We also take pride in improving our communities through green initiatives. We appreciate

the support of the government to help build a cleaner energy future," said Chris Whitaker, president and CEO of St. Lawrence College.

The college aims to help meet the growing number of jobs in Ontario's "clean energy economy" with programs that train students to become wind turbine technicians, energy system engineers, geothermal technicians and more. The college also plans to install over 1200 solar modules on three rooftops. Once completed, the college expects it to be the largest solar rooftop installation at any post-secondary institution in Canada. **EB**

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Ontario gets its first 250-kW PV rooftop system

Courtesy of Canadian Solar with Towcon Holdings and Aecon



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Canadian Solar Inc. recently celebrated the installation of Ontario's first 250-kW photovoltaic (PV) rooftop system, through its subsidiary Canadian Solutions Inc. The installation is being completed with Towcon Holdings and Aecon.

The rooftop installation includes 1326 Canadian solar panels on about 74,668 sf with a total rated capacity of 305-kW direct current. The system is owned by

Dave Walden, president, Towcon Holdings, and is located in Cambridge.

"From completing the feasibility study to installing the first CS6P 230 panel, the installation team followed all required due diligence guidelines," said Walden. "I'm proud to be part of the first 250-kW PV rooftop system installation in Ontario with Canadian Solar Solutions. It will increase the amount of solar power produced within Ontario while providing



extremely pleased that Canadian Solar has chosen the Aecon group of companies as an installation partner on their projects. We trust this is the first of many new solar initiatives that we will develop together.” **EB**

Have a noteworthy renewable energy project story to tell? Contact the Editor at acapkun@annexweb.com.



tangible financial benefits to this community.”

The McGuinty government is making important decisions affecting the future of Ontario’s electricity needs, says Canadian, including endorsing PV system installations.

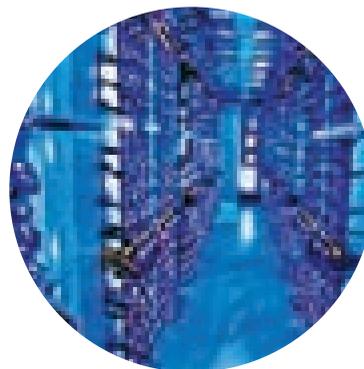
“We are extremely proud to complete the first 250-kW PV rooftop system in Ontario, since it is home to Canadian Solar and our corporate office,” said Dr. Shawn Qu, chairman and CEO, Canadian Solar Inc. “In addition, working together, we have developed a progressive model for the delivery of clean, renewable energy in Ontario and look forward to many more exciting projects like this.”

“The new Green Energy Act is certainly making Ontario an exciting place to be a contractor,” said Rob Kinnaird, director of business development with Aecon. “Projects like Canadian Solar Solution’s 250-kW rooftop installation in Cambridge line up wonderfully with Aecon’s culture and commitment to being ‘green’. We are

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Improving and/or eliminating business processes

Value engineering has become very popular in construction. Marrying capital and operating costs to ensure the greatest efficiencies is quite a skill, particularly when many customers don't see the benefit of combining the two. Unfortunately, many owners won't link the two. They won't invest in a higher capital cost to avail themselves of ongoing lower operating costs.

This is more likely true where buildings will be sold on completion or, often, when dealing with government bodies where they keep their capital and operating budgets totally independent of each other. Maybe with more of a drive toward 'green technology', this situation will improve.

L.D. Miles defines value analysis/engineering as:

Value analysis/engineering is an organized, creative approach which has for its purpose the effective identification of unnecessary costs, i.e. costs which provide neither quality nor use nor life nor appearance nor customer features.

We need to look at value-added processes within our own businesses. Look at all the activities within your business and ask these questions:

- What purpose does this process serve?
- Could we do this better?
- What would happen if we eliminated it?

By looking at all the functions within your business and analyzing them in this manner, you will likely find you can make many changes that will reduce costs without reducing the desired outcome.

Some companies spend hours and hours reconciling supplier statements without understanding why. They do this because it has always been part of the process. (There is a lot of red tape within a business that has been put there for reasons long forgotten.) I follow two principles: make sure I never pay the same invoice twice; and rely on my suppliers to tell me when I owe them money.

One reason many company processes don't work well is they are implemented half-heartedly. I find this is often the case when companies complain about the financial reports they get from their accounting program. Their initial reaction is to change accounting packages. In reality, all they need is someone who knows how to 'program' the accounting package to produce the desired reports.

I usually go directly to frontline employees and ask them about the processes they have to follow. They come up with great

suggestions for either streamlining activities or eliminating those that add little or no value. Because they do those activities on a daily basis, they are in the best position to know what value they add (if any), and how/whether they work. I then review these with the contractor and take appropriate action.

With the advent of sophisticated computer systems, it is possible to streamline many time-consuming processes.

With your team, audit the processes and activities within your business. Get them working on revamping or eliminating activities and processes that add little or no value, and reward those who work at improving processes (rather than just complain about them). **EB**

Ron Coleman, a member of the Institute of Certified Management Consultants of British Columbia, just published his latest book, "Becoming Contractor of the Year", 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 ECABC. Visit www.ronaldcoleman.ca.



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

ECAO Industry Conference*Electrical Contractors Association of Ontario***March 19-26**, Guanacaste, Costa RicaVisit www.ecao.org**AEL Electrical Learning Expo***Alberta Electrical League - Calgary Electrical Club***March 24**, Red Deer, Alta.Visit www.elecleague.ab.ca**IAEI Prairie Chapter 2011****Tradeshaw & Convention***International Association of Electrical Inspectors***March 25-26**Email Don Craig at dcraig@saskpower.com**IAEI Ontario Section Spring Technical Seminars***Int'l Assoc. of Electrical Inspectors***March 26**Visit www.iaeidnconvention.org/spring**Future Building 2011****March 29-31**, Kingston, Ont.Visit www.futurebuilding.ca**Hannover Messe - Energy (Renewable & Conventional Power Generation, T&D)****April 4-8**, Hannover, GermanyVisit www.hannovermesse.de/energy_e**Prairie Power Symposium****April 5-6**, Regina, Sask.Visit tinyurl.com/4uzvfw**EFC Annual General Meeting***Electro-Federation Canada***April 19**, Toronto, Ont.Visit www.electrofed.com**MCEE****April 20-21**, Montreal, Que.Visit www.mcee.ca**NAED National Electrical Leadership Summit***National Association of Electrical Distributors***April 30-May 3**, San Diego, Calif.Visit tinyurl.com/4vwzsg7**CanSIA Conference and Showcase***Canadian Solar Industries Association***May 3-4**, Windsor, Ont.Visit www.cansia.ca**OEL Electrical Industry Conference***Ontario Electrical League***May 4-7**, Guelph, Ont.Visit www.oel.org**PEARL Annual Conference***Professional Electrical Apparatus Recyclers League***May 14-16**, Portland, Ore.Visit www.pearl1.org**Lightfair****May 15-19**, Philadelphia, Pa.Visit www.lightfair.com**Nedco Electrifest****May 16**, Mississauga, Ont.Visit www.nedco.ca**WindPower 2011***American Wind Energy Association***May 22-25**, Anaheim, Calif.Visit www.windpowerexpo.com**ESC Bright Futures in Canada Conference***Electricity Sector Council***May 24-26**, Toronto, Ont.Visit tinyurl.com/4t86es7**CanSIA Conference and Showcase***Canadian Solar Industries Association***May 30-31**, Vancouver, B.C.Visit www.cansia.ca**S&D Annual Conference***Supply & Distribution Council***May 31-June 3**, Quebec City, Que.Visit sndcouncil.blogspot.com**IED Annual General Meeting***Independent Electrical Distributors**(Limited Partnership II)***June 14-16**, Windsor, Ont.Visit www.ied.ca**EFC Federation Cup***Electro-Federation Canada***August 22**, Milton, Ont.Visit www.electrofed.com**The Perfect Solution...**

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Sleep better for safety's sake

In every class I conduct, I have tired students struggling to stay awake. When I've built up a degree of trust with the class, I ask "Who slept poorly last night?", and 10-20% will say they did. I then ask, "Who's gone to work sleepy and tired?". Now it's a 100% affirmative response—from every class. Good sleep is not a minor thing. Sleepy students spend the day fighting to stay awake, usually displaying sub-par performance. I shouldn't have to describe the negative effects sleep deprivation has on safety.

Getting a good night's sleep has been a challenge for me all my life. The moment my head hits the pillow, my mind switches into high gear. I cannot begin to count the number of nights of falling asleep exhausted at 3 a.m. only to be up again at 6 a.m., fighting to be on my best game.

Over the years I have tried a variety of methods (meditating, silent rooms, absolute darkness, not being touched, being touched to exhaustion, ear plugs, one pillow, no pillow, all pillows, music, no music, counting sheep, vapourizing sheep, etc.) to no avail. But I have finally found a method that usually puts me to sleep quickly and perhaps it will work for you.

I discovered this method after years of researching brain science for application in our training programs. The brain stem (a.k.a. our ancient, oldest or 'reptilian' brain) controls our heart beat, breathing, body heat regulation, blinking and other autonomous functions. Wrapped around our brain stem is our emotional or mid-brain and, surrounding that, is our cognitive or thinking



brain. Meditation training directs you to clear your brain of all thought while counting or repeating a phrase. This has never worked for me because, once I cleared one thought, another promptly invaded!

Six months ago, it occurred to me that if the brain stem is the source of our autonomous body control then, perhaps, I should forget about clearing the mind. Instead, I began experimenting with lying quietly and focusing very intently on the lower central part of my brain where I assumed the brain stem resided. Interestingly, my breathing slowed when I did this.

Since then, I have found this an amazing method by which to fall asleep. No matter how my mind races, when I intentionally start to focus on what I assume to be blood flow on the area slightly below my ears and in the centre of my brain, the next thing I know, I am waking up.

I was in the Fort McMurray Airport last Thursday in a very noisy departure lounge. As a test, I leaned back and, 15 minutes later, I awoke. Even though I had just had a refreshing little nap, I tried it again on the plane; the next thing I knew, we were descending into Edmonton. I was particularly wired at bedtime last night; in the past, this would have been a 1 a.m. or 2 a.m. night—guaranteed. However, I laid back and started concentrating and, the next thing I knew, it was morning.

Previously, waking for whatever reason in the middle of the night guaranteed a million thoughts and the end of my sleep. This is no longer the case; I start to focus, and then it is morning. This has been highly successful and very effective.

If you experience poor sleep as I have, give this a try and, hopefully, it will work for you. Don't increase the physical risk in your life with poor sleep; the better your sleep, the better your daily game and the better you are prepared to come home with all of your body parts intact.

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

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

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How to select an aerial work platform to meet your job requirements

Bill Hindman

Many jobs require reaching overhead areas. Sometimes it's no more than six feet off the ground, other times it can be 100 feet or more. But no matter how high, accessing those overhead areas efficiently and safely is essential.

In years past, overhead access was accomplished by climbing ladders or erecting scaffolding. Today, more and more people are getting to overhead work faster and more safely by using aerial work platforms. These machines quickly elevate workers directly to an overhead area so no time is wasted erecting scaffolding, and energy isn't wasted climbing up to the job.

Aerial work platforms can be purchased or rented, and are available in a variety of styles and sizes to fit almost any overhead access need. (One manufacturer offers over 60 different models, including vertical personnel lifts, slab and rough terrain scissor lifts, and telescoping and articulating boom lifts featuring platform heights up to 150 feet.)

With such a variety of machines available, there's a model that will match your needs—whether you're using it indoors or out, on a solid concrete surface or driving through mud. But selecting the right machine requires more than just knowing how high you want to reach. If you don't look at all your needs, you may end up with a machine that doesn't work the way you planned. Here are some things to consider when selecting a machine.

Criteria for aerial work platforms

Obviously, platform height (how high will it reach) is the Number One criteria. But what good is a machine that is capable of reaching the desired height if, because of jobsite conditions, you can't position the machine directly under the work area. In this case, you need to look at both vertical and horizontal reach capabilities. You need to determine where you can position the machine first, then you can determine what machine will give you the combination of height and horizontal outreach you need to access the work area.

Now let's look at some other things to consider when selecting the right machine for the job. Is the work area located inside or outside? Various power sources are available, including gas, diesel or dual-fuel engines, and AC or DC power to meet these

different applications. Where noise is a concern in outdoor areas, 60-ft electric-powered boom lifts are available.

What is the operating surface? Is it a concrete slab or soft earth? Is it level or sloped, and is it firm enough to support the machine's weight? Boom lifts with additional



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outreach or rough terrain scissorlifts with outriggers may be required.

What is the operating location? Is it a congested area that requires a tight turning radius or where less tail swing is important? Are there any floor load requirements where a lighter machine may be necessary? Are there any overhead obstructions that must be navigated to reach the work area? If so, you may have to use an articulated boom lift or a boom lift with an articulated jib to reach up and over obstacles.

What is the work requirement? How many



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people are required for the application and how much material is needed? This will dictate the platform size and capacity required.

Check the platform capacity of the machine to determine how many people and tools or supplies it will hold. You'll also want to look at the platform size to make sure it will provide you with adequate working area and that it will accommodate your largest load.

Additional features to consider

Once you have decided on what type and size of machine best meets your needs, consider the type of work you will be performing from the elevated platform and what tools you will be using to do the work. Along with electrical outlets and air lines on the platform, today's leading manufacturers offer a variety of optional features that will increase your productivity even more when you reach the overhead area.

Built-in generators in the base, with power cable and air/water lines running through the boom to the platform, are available to power everything from welders and plasma cutters to saws, pressure washing systems, and lighting packages. Using these integrated tool systems in the platform increases productivity, eliminates the need for costly ancillary equipment and provides a much safer working environment since you don't have wires or hoses running over the side of the platform to the ground.

After you have reviewed your job requirements, there are still other things to consider before deciding on which aerial work platform is best for your application. No matter what machine you select, you have to be able to move it from its point of delivery on the job and around the jobsite to the actual work area. Here, too, there are many things to consider.

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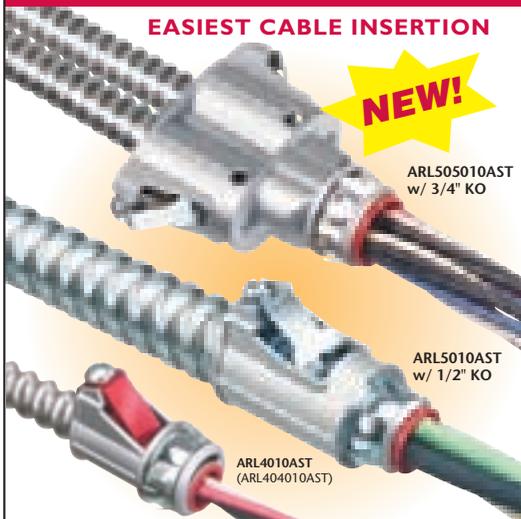


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Look at the terrain around the jobsite: is it flat or sloped? If it's sloped, you may need a machine with more gradeability. And if there's a lot of debris scattered around, you may need a machine with higher ground clearance. Now look at the surface over which the machine will be travelling. When it's soft or muddy, you may need 4-wheel drive or a machine with a crawler undercarriage. You can also choose from a variety of tire options



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including foam filled, pneumatic, high floatation "turf tires", or solid non-marking tires for use on wood flooring or tile and marble surfaces.

Finally, determine whether there are any weight restrictions in places where you will be using the machine. Many areas like parking structures, bridges and sidewalks have load limits. Also, look overhead to see whether there are any low-clearance areas where the stowed height of the machine might be critical, and see if there are any "tight" areas you need to pass through where a narrower overall machine width or tighter turning radius might be required.

Aerial work platforms have changed the way we work. They make us more productive and provide a greater degree of safety than other methods of accessing overhead areas. With the wide variety of products on the market today, there's a machine for almost any application. So take the time to review all of your needs and jobsite parameters before selecting a machine, and ask questions before you order. It could save you a whole lot of time and trouble on the job. 

Bill Hindman has been president of Industrial Marketing Systems (Des Plaines, Ill.) for over 30 years. He has been involved with aerial work platforms since the early 1980s, working first with Economy Engineering, which was later acquired by Snorkel Manufacturing, and currently with JLG Industries and Bronto Skylift. He also handles marketing communications for Aerial Work Platform Training, the North American subsidiary of the International Powered Access Federation. Throughout the years he has written numerous articles on the application and safe use of aerial devices for trade publications in the utility, construction, rental and manufacturing industries. He has also served as master of ceremonies for aerial platform safety conferences in both North America and Europe.

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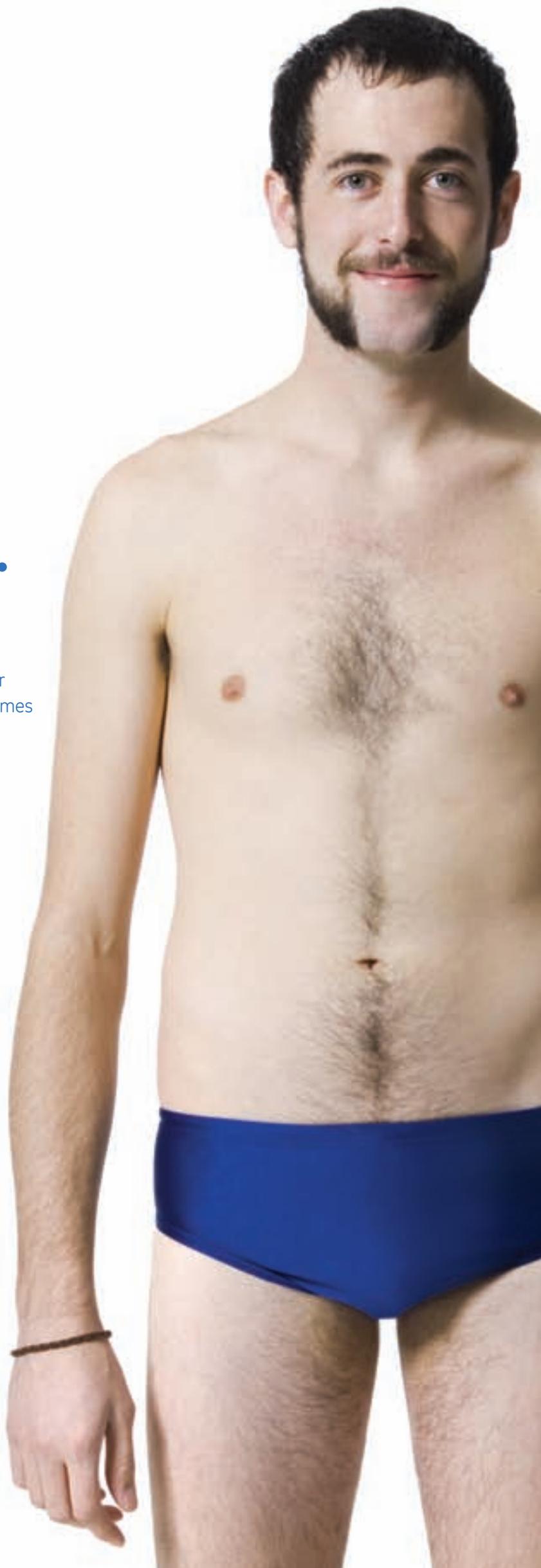
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IEC and e8 take step forward for global electric vehicle roll-out



Photo courtesy Mitsubishi

The IEC (International Electrotechnical Commission) and e8—a global organization of 10 electricity companies—say they have, for the first time, brought together all major stakeholders that need to collaborate to accelerate the global roll-out of EVs (electric vehicles). At this international roundtable that took place on January 19, 2011, in Washington, D.C., all participants confirmed that the IEC's existing and proposed international standards for EV charging satisfy their global needs.

IEC says that, until this meeting, little communication took place at an international level between automotive manufacturers, electric equipment suppliers and utilities to coordinate work around EVs. For the first time, the IEC—in cooperation with e8—has provided them with a global platform to discuss mutual needs and requirements.

The objective of the roundtable was to determine priorities for the development of EV-related standards, to define future needs, and to accelerate the broad adoption of the relevant international standards that will enable global interoperability and connectivity.

While all parties work intensely on developing technologies that will enable a more energy-efficient future, utilities are simply expected to deliver the fuel that will drive those electric cars. However, without significant investment into infrastructure, a broad EV roll-out will remain fiction.

“To make mass charging possible, global solutions are needed. Charging systems must be user-friendly, largely the same, and safe and easy to operate and use,” said Frank Kitzantides, former IEC vice-president who chaired the roundtable as IEC senior technology consultant. “To achieve this, all stakeholders need to cooperate to better understand each other's role.”

Photo courtesy Coulomb



Photo courtesy GE

To ensure sufficient energy supply and to develop the necessary charging infrastructures, future e-mobility developments must be considered and, to achieve this, all stakeholders need to be involved. IEC went on to say standardization must be quick and international to achieve global technology roll-out and durable infrastructure development, without market fragmentation due to incompatible charging systems.

In Washington, the IEC offered a platform for high-level representatives of major car manufacturers (including BMW, Ford, Mitsubishi, Nissan, Renault and Toyota) and equipment manufacturers (such as Eaton, General Electric, Hubbell and Schneider) to sit together with utilities such as AEP, Duke, EDF, Electrobras, Hydro Quebec, Kansai Electric Power, State Grid Corp. of China and TEPCO. These organizations were joined by industry association SAE (Society of Automotive Engineers) and EPRI (Electric Power Research Institute) as well as ISO (International Organization for Standardization).

All stakeholders confirmed that the IEC's existing and proposed International Standards for EV charging (on the charger side: plug, socket and cord; on the vehicle side: connector and inlet) satisfy their global needs. Four charging modes have been retained, covering AC and DC charging. All participants underlined their preference for using IEC, ISO and ITU (International Telecommunication Union) international standards.

Finally, all parties underlined the importance and usefulness of this new joint platform initiated by the IEC and e8. Follow-up meetings are already being planned.

Powering EVs (IEC work)

- TC 69 Electric road vehicles and electric industrial trucks has developed - among others - the IEC 61851-1 conductive charging standard. This standard foresees four modes for the charging of EVs:
 - **Mode 1 (AC)** - slow charging from a standard household-type socket-outlet
 - **Mode 2 (AC)** - slow charging from a standard household-type socket-outlet with an in-cable protection device
 - **Mode 3 (AC)** - slow or fast charging using a specific EV socket-outlet and plug with control and protection function permanently installed
 - **Mode 4 (DC)** - fast charging using an external charger
- SC 23H Industrial plugs and socket-outlets published IEC 62196-1 covering general requirements for EV connectors and is currently close to finalizing IEC 62196-2, which standardizes the following elements needed for AC charging:
 - **Type 1** - single phase vehicle coupler (vehicle connector and inlet), for example Yazaki or SAE J1772 (Japan, North America)
 - **Type 2** - single and three phase vehicle coupler and mains plug and socket-outlet without shutters, for example VDE-AR-E 2623-2-2
 - **Type 3** - single and three phase vehicle coupler and mains plug and socket-outlet with shutters, for example SCAME plug developed by the EV Plug Alliance.
- SC 23H is also developing IEC 62196-3 (DC) on requirements for the vehicle coupler. The work is still at an early stage and several proposals are on the table, including the DC quick charging CHAdeMO coupler as well as the possibility to use the same vehicle inlet both for DC and AC charging. 

Electrical safety for solar energy projects

Staying current on codes is the key

Jeff Seagle



Electrical fires consistently rank among the top five causes of commercial building fires, according to the NFPA. Fires involving electricity also regularly result in a higher percentage of property damage than those caused by many other sources. One of the most effective ways to address life safety concerns and better protect property against electrical fires is through education.

Electrical codes: background

Electrical codes arose in the 1880s with the commercial introduction of electrical power. The first electrical codes in the United States originated in New York in 1881 to regulate installations of electric lighting. Since 1897, the U.S. National Fire Protection Association, a private non-profit association formed by insurance companies, has published the National Electrical Code (NEC).

States, counties or cities often include the NEC in their local building codes by reference, along with local differences (much like the Canadian Electrical Code [CEC]). Also like the CEC, the NEC is modified every three years. It is a consensus code considering suggestions from interested parties. The proposals are studied by committees of engineers, tradespeople, manufacturer representatives, firefighters, and others.

Electrical safety: writing safety programs

The first step a business should take is to establish a written electrical safety program. Training and guidelines are a must for anyone working on or around electrically energized systems and equipment. Where possible, work areas should be set up away from possible electrical grounds that may come into accidental contact with electricity.

Electrical employee safety program: some items to include

- How to identify electrical hazards.
- What is considered a safe distance from exposed electrical conductors?
- Information about personal protective equipment (PPE) for electrical safety.
- How to understand proper work practices in wet or damp locations containing electricity.
- The proper lockout/tagout (LOTO) procedures for electrical equipment and systems.
- Note to unplug tools and equipment before cleaning, adjusting, or repairing them.
- Lock the power switch in the OFF position and pull fuses to prevent a person or a time clock from starting equipment under repair.
- Replace guards over augers, chains and belts before unlocking or refusing the power switch.
- Always follow the LOTO and grounding procedures appropriate for the work environment.
- Use the recommended wattage when replacing light bulbs or the recommended amperage when replacing fuses.
- When circuit boards need to be removed from their mountings, put insulating material between the boards and anything to which they may short. Hold them in place with string or electrical tape. Prop them up with insulation sticks (plastic or wood).



Special considerations for solar energy project: arc-faults and UL 94 Arc Faults

Arc faults pose the greatest fire risk to photovoltaic (PV) installations. Detecting and extinguishing arc faults in DC PV systems will require the development of new devices called DC PV arc-fault circuit interrupters (DC PV AFCIs), which are designed to detect the signature of an arc fault in the current of a PV system and stop the current from flowing through the arc fault.

The 2011 NEC includes a requirement for arc fault protection in certain new rooftop PV systems. In response, solar industry vendors are already developing technologies that not only meet this requirement, but surpass it and provide additional protection against PV system fires.

Make sure your vendors are aware of the latest codes/safety rules, and include them in your employee safety program.

UL 94, the Standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances testing

There are two types of pre-selection test programs conducted on plastic materials to measure flammability characteristics. The first determines the material's tendency to either extinguish or spread the flame once the specimen has been ignited. The first program is described in UL 94, which is now harmonized with IEC 60707, 60695-11-10 and 60695-11-20 and ISO 9772 and 9773.

The second test program measures the ignition resistance of the plastic to electrical ignition sources. The material's resistance to ignition and surface tracking characteristics is described in UL 746A, which is similar to the test procedures described in IEC 60112, 60695 and 60950.

UL flame ratings group materials into categories based on their flammability. UL 94 covers two types of testing: vertical burn and horizontal burn.

Horizontal testing

Procedure: A specimen is supported in a horizontal position and is tilted at 45°. A flame is applied to the end of the specimen for 30 seconds or until the flame reaches the 1-in. mark. If the specimen continues to burn after the flame is removed, the time for the specimen to burn between the 1-in. and 4-in. marks are recorded. If the specimen stops burning before the flame spreads to the 4-in. mark, the time of combustion and damaged length between the two marks is recorded. Three specimens are tested for each thickness.

Vertical testing

Testing is done on both bar and plaque specimens. Procedure for bars: A bar specimen is supported in a vertical position and a flame is applied to one of the lower corners of the specimen at a 20° angle. The flame is applied for 5 seconds then removed for 5 seconds. The flame application and removal is repeated five times.

Procedure for plaques: The procedure for plaques is the same as for bars except that the plaque specimen is mounted horizontally and a flame is applied to the centre of the lower surface of the plaque.

Difference in test methods and criteria

When looking at the flame ratings for plastic materials commonly moulded to fabricate enclosures, structural parts and insulators found in consumer electronic products (5VA, 5VB, V-0, V-1, V-2 and HB), a material classified as 5VA or 5VB is subjected to a flame ignition source that is about five times more severe than that used in the V-0, V-1, V-2 and HB tests.

Keeping up to date is essential: some important news updates

Staying up-to-date on new codes and rules is essential as everything is constantly changing and evolving. Below are just a couple of important new developments happening in the solar industry:




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UL awarded grant to study firefighter and photovoltaic system safety

This grant funds a project that addresses first responder concerns about fighting fires involving PV modules. This research project will investigate firefighter vulnerability to electrical and casualty hazards when fighting a fire involving PV modules and support systems in residential and commercial buildings.

The increasing use of PV systems necessitates this project. PV use is growing at a rate of 30% annually in the States. The use of this new technology has complicated traditional firefighter tactics, leaving firefighters vulnerable to severe hazards. Although the electrical and fire hazards of PV systems are addressed through current product standards and certification, a limited body of knowledge and insufficient data exists for the fire services to develop safe tactics during suppression and ventilation activities.

Evaluating the hazards associated with PV systems in firefighting operations will require the design of experimental methodologies based on UL's historical and current expertise in product testing and standards development. The experiments will develop empirical data to understand the magnitude of the hazards. Methodologies will be based on electrical principals, fire dynamics and firefighting tactics.

UL will share the results and information gained through the research with the fire service community and PV industry through web-based educational programs, presentations and articles. The results from the study will serve as the foundation for potential PV installation code revisions and the creation of tactical and operational guidelines resulting in improved firefighter preparedness and safety. Check out tinyurl.com/4sj6bme.

Update of codes and standards

Oregon is in the process of drafting a solar energy code that would establish fire safety measures such as setbacks and placement requirements for rooftop panels, as well as cut-off switches for the wires leading from the panels to inverter boxes. The code also creates standards for panel assembly and installation, requires inspections of the systems, and gives firefighters official authority to disconnect the systems during emergencies.

Other standards are in development, many in areas with which we are used to working. Fire codes (both local and national) are starting to be developed that will determine the roof array size, the size and number of walkways between the modules, the access clearance around the roof perimeter and interior walls, and the amount of array clearance around skylights and other rooftop equipment so that firefighters can vent a fire when needed.

Disconnect switches, cable and array equipment labelling, cable placement, grounding requirements and lightning protection standards are being developed. Other agencies are starting to work on permits and system approvals. With a typical PV power string having up to 600vDC, safety is very important.

Canadian standards: continue to evolve

There are a number of performance, safety and installation standards that pertain to solar energy products in Canada. Listed below are the standards that are applicable to Canada:

- CSA Standard for Solar Photovoltaics, CAN/CSA C61215-08 "Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval" (Adopted IEC 61215:2005, second edition, 2005-04).
- CAN/CSA C61646-2 "Thin film terrestrial PV modules - Design qualification and type approval".
- ULC ORD C1703-1 "PV Module Safety Standard".
- CAN/CSA F382-M89 (R2004) "Characterization of Storage Batteries for Photovoltaic Systems".
- ULC "Balance of system and applicable Standards", visit tinyurl.com/4qpbbp2.
- CSA Standards for Solar Air: CSA Standards and CanSIA (Canadian Solar Industries Association) are currently working to develop a standard for Solar Air Collectors.
- Verification Listing of Solar Collectors to the requirements of CSA Standard CAN/CSA-F378-87(R1998).
- (Many of the CSA Standards listed above can be purchased at www.shopcsa.ca under the Energy section.)

Codes and standards for PV: Article 690 of the NEC

The primary safety and wiring code for PVs is covered by NEC Article 690, which addresses safety requirements for the installation of PV systems. The latest version is NEC 2008. However, many local building codes may still be using NEC 2002 or 2005. Best practice would be to use the NEC 2008. The NEC covers everything from module installation, wiring, and grounding to connector boxes and inverters.

Performance and safety standards for individual solar components in the United States are set by Underwriters Laboratories Inc. (UL). The benchmark UL standards are:

- UL 1703 for PV modules.
- UL 1741 for solar inverters.

All components should carry a UL label. In most cases, one cannot receive incentives and rebates for array systems that have not been UL certified. (Certification can come from other test facilities, but will still use the UL benchmark standards.)

Summary: educate yourselves and your staff

Understanding the codes and educating others is essential when working on PV projects; especially as we attempt to grow our industry. Any negative press focused on fire safety in our industry can hold growth and potential to a standstill. Stay up-to-date on codes and choose vendors that are up-to-date as well. We can all stay safe and help our industry remain competitive. 

Jeff Seagle is the president of Stablin Non-Metallic Enclosures, www.stablin.com.



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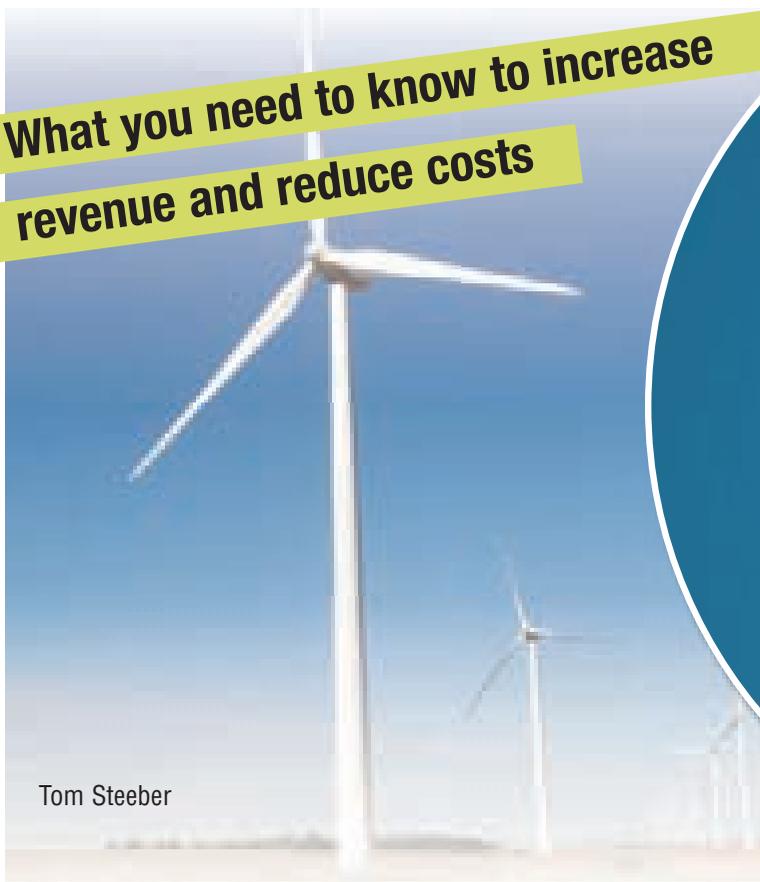
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Is your **wind turbine** step-up transformer the weak link in the wind energy supply chain?

What you need to know to increase revenue and reduce costs



Tom Steeber



Converting wind energy to electrical power is the fastest-growing segment of the U.S. energy sector. Bolstered by available federal stimulus dollars, there has been a virtual modern-day ‘land-rush’ to develop wind farms. In the words of one industry leader, “If there is a site that has a viable wind profile, access to network connections, and access for delivery of materials, and we don’t develop it, someone else will”.

This headlong rush to install more and more wind turbines has outstripped the usual developmental learning curve in which new technologies mature by a process of trial and error, resulting in defining equipment that is suited for the job at hand.

In this 21st century land-rush to cash-in on wind energy, developers are often trading low initial costs for higher total costs of ownership to be shouldered later by the wind farm owners and operators. Nowhere is this more evident than with wind turbine generator (WTG) step-up transformers.

Historically, the WTG transformer function has been handled by conventional, off-the-shelf distribution transformers. However, the relatively large numbers of recent failures has convinced many that WTG transformer designs must be substantially more robust.

In fact, using conventional off-the-shelf distribution transformers as a low-cost solution is folly. In some cases, site operators are even keeping a quantity of spare transformers at their wind farms so they have spares on hand for the frequent outages caused by using standard distribution transformers where they simply do not belong. What a waste of capital!

The key WTG step-up transformer design issues to which wind farm owners and developers should pay attention include transformer loading, harmonics and non-sinusoidal loads, transformer sizing and voltage variation, and special requirements for withstanding faults.

Transformer loading

Wind turbines are highly dependant upon local wind and other climatic conditions, and their yearly average load factors can be as low as 35%. Most utilities in the past anticipated that operational loading would be about 50%. The relatively light loading of the WTG transformer introduces two unique and functionally significant problems that must be incorporated into WTG design.

The first issue is that the wind farm transformers’ relatively low average load factors skew purchasing decisions and make older economic models inaccurate. When lightly loaded or idle, the core losses become a more significant economic factor while the coil or winding losses become less significant.

Previous purchasing decisions included an estimate of the transformer’s amount of idle time. The overall evaluation looks at how much of the time the transformer is sitting idle and how much it will be running, and compares the ratio of these two. Those looking to apply this mode to wind farms must be much more cognizant of idle time; the typically used price evaluation formula does not apply to this scenario.

For example, National Electrical Manufacturers Association (NEMA) TP 1-2002 “Guide for Determining Energy Efficiency for Distribution Transformers” and DoE (Department of Energy) efficiencies are not modelled for the operational scenario where average loading is near 30-35%. Wind farm developers should be extremely cautious about applying these standards when calculating the total cost of ownership for WTG transformers.

The second problem is that the WTG transformer is subjected to frequent thermal cycling as a function of varying turbine loads. This causes repeated thermal stress on the winding, clamping structure, seals and gaskets. The situation is analogous to breaking a wire by bending it back

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and forth until it breaks; the metal fatigue, heat and stress weaken the wire and cause it to break. The same is true of electrical connections that have to withstand repeated thermal cycling, stress and varying loads.

Repeated thermal cycling causes nitrogen gas to be absorbed into the hot oil then released as the oil cools, forming bubbles within the oil that can migrate into the insulation and windings to create hot spots and partial discharges, which can damage insulation. The thermal cycling can also cause accelerated aging of internal and external electrical connections.

Harmonics and non-sinusoidal loads

WTG transformers are switched with solid state controls to limit the inrush currents. While potentially aiding in the initial energization, these same electronic controls contribute damaging harmonic voltages that, when coupled with the non-sinusoidal wave forms from the turbines, cannot be ignored from a heating point of view.

Normal voltage is alternating at 60 cycles per second. When the transformer operates at other voltages, the voltage peaks will not line up and you will not get the amplification you would achieve when frequencies they do. The transformer tries to pass the voltage it sees through the circuit and causes extra loading. All the electronics used today send spikes on the line and each time a frequency disturbance goes back to the transformer, the transformer must be able to handle the higher loading it sees.

When a rectifier/chopper system (the electronic controller used in wind turbines) is used, the WTG transformer must be designed for harmonics similar to rectifier transformers. These are 'dirty' from a harmonics point of view, meaning they may contain high frequencies that the wind farm owner does not want to pass onto the utility power's grid because it will affect other equipment.

When this happens, it can result in a protective equipment fault, causing transmission grid equipment to protect itself against faults by shutting down. The WTG must be able to take the additional loading into consideration and provide electrostatic shields to prevent the transfer of harmonic frequencies between the primary and secondary windings. It must be able to handle the energy and not transmit it to the grid.

Transformer sizing and voltage variation

Because of the high upfront costs, no over-voltage capacity is designed in to a WTG transformer to overcome the frequent voltage fluctuations inherent with wind turbines. WTG transformers are usually designed so the transformer voltage exactly matches the wind turbine's output voltage. There is a one-to-one correspondence between transformer and turbine, and each turbine produces a fixed amount of energy, so future growth is a known fact.

At the same time, the generator output current is monitored at millisecond intervals and the operational limits allow up to 5% overcurrent for 10 seconds before the generator is taken off the system. Since the WTG transformer is designed to match the generator output with no overload sizing, its design must be uniquely robust to function without the extra capacity.

Requirement to withstand fault currents

Typically, conventional distribution transformers, power transformers, and other types of step-up transformers will 'drop out' when subjected to a fault. Once the fault has cleared, the distribution transformer is brought back online. To maintain network stability, wind turbine generators are not allowed to disconnect from the system when there are network disturbances, except within certain guidelines developed for generating plants. They must be able to stay on the line through the fault and must be mechanically, electrically and thermally able to handle the fault. This is called 'fault ride-through'.

The length of time the generator is required to stay online can vary. During this time, the generator will continue to deliver an abnormally low voltage to the WTG transformer. For example, during faults, the transformer may be required to carry as low as 15% rated voltage for a few cycles, then ramp back up to full volts just a few seconds after fault clearing. The WTG transformer must be ruggedly designed so it can withstand full short-circuit current during the initial few cycles when the maximum mechanical forces are exerted upon the WTG transformer windings.

Checklist of WTG step-up transformer must haves

The role of WTG transformers in today's wind generation scheme is unique; their design must be equally unique and robust. Don't trade long-term reliability and lower total cost of ownership for low initial cost. Make sure you consider these specific factors to ensure that your wind turbine step-up transformer is a strong link in the chain.

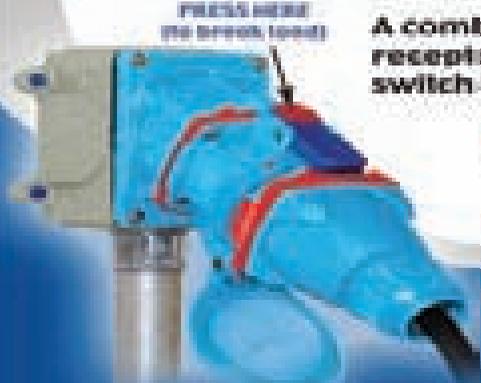
- The WTG step-up transformer should have enough cooling to handle thermal events. Since heat travels layer to layer, minimize the distances to cool it most efficiently.
- Brace the WTG mechanically to withstand events.
 - Axial forces, which drive the transformer windings to telescope and come apart, are best maintained with coiled end blocking.
 - Radial force, which make transformer windings expand outwardly, escaping each other as the electromagnetic field becomes polarized and pushes the winding apart, are best maintained with round or circular shaped coils so the forces can spread forces evenly at 360°.
- Minimize core losses due to downtime. But proactively consider cost and construction tradeoffs associated with decreasing core losses.
- When purchasing a WTG step-up transformer, make sure you factor in how reliability affects the total cost of ownership. Wind farm turbines are unique because they are ganged together and depend on each other. For example, say one transformer fails, with a loss of revenue of about \$1000 per day. It may take two or even three days to replace the transformer and, in the meantime, the faulty generator may take down 10 to 14 other generators, not allowing them to produce. So that loss of \$1000 of revenue could turn into \$30,000 in lost revenue, plus the cost of another transformer, construction labour and crane expenses.

The role of WTG step-up transformers is critical, and their design must be carefully and thoughtfully analyzed and reevaluated. We need to move from equipment purchasing decisions based on lowest initial cost to solutions that will provide the best choice in terms of total cost of ownership, network stability, reduced downtime and preventing revenue loss caused by high-maintenance issues. New transformer technology specially designed for the wind farm market should be considered carefully when making purchasing decisions. **EB**

Tom Steeber is the vice-president of marketing & sales at Pacific Crest Transformers. He began his career in the transformer industry in 1972, working at companies such as Spokane Transformer, McGraw Edison, Square D Co. and Balteau Standard. Visit www.pacificcresttrans.com.

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Dignified lighting in Vancouver's Canada Line

Vancouver's new Canada Line rapid transit system consists of 16 stations and more than 11 miles of track servicing the region's growing residential, business, healthcare and educational centres, as well as the city's port, convention centre and airport. Completed August 2009 on budget and ahead of schedule—well in time for the 2010 Winter Olympics—it adds about 10 road lanes of transit capacity in this dense urban corridor. Funded by the Governments of Canada, British Columbia and Vancouver and Vancouver Airport and the Greater Vancouver Transportation Authorities, and built to last 100 years, Canada Line ranks as one of the top 10 infrastructure projects in Canada.

SNC-Lavalin won the bid to design, build, operate, maintain and partially finance the transit system that would meet or exceed safety, speed, reliability, customer satisfaction and other specifications set by the agencies within a fixed-price contract. During the design phase in 2005, it became clear that the project required systemwide thematic architectural and lighting elements for use in all Canada Line stations.

Recognizing the importance of lighting's impact on perception, the design of which would benefit from dedicated expertise, SNC-Lavalin's internal design team engaged local lighting design firm Total Lighting Solutions with the objective of rendering Canada Line entrances to be unique and highly visible in a busy urban visual environment. This task, focused on branding, progressed into development of the systemwide lighting standards and lighting concepts, and ultimately into a detailed lighting plan for individual stations.

"The old lighting standards were isolated from

architectural design and finishes selection and contained outdated light levels," says Galina Zbrizher, Total Lighting Solutions principal. "We developed new lighting standards that are tied with the section on architecture and finishes, and specified reflectance values that addressed lighting quality as well as quantity—factors such as visibility, uniformity, glare control and visual comfort."

Canada Line includes stations both above ground and below, designed with different platform configurations where passenger arrival and departure are compressed into short periods of extreme activity in a confined space. Most of the remaining stations' area is dedicated to circulation, including concourses and vertical circulation—stairs, escalators and elevators—varying 20–50 ft in height. As such, public safety was the primary consideration.

"Our design focused on maximizing good visibility and visual comfort, while providing very uniform illumination on all surfaces by reducing shadows and glare and by clearly demarcating the physical boundaries of spaces," says Zbrizher.

The design intent was to integrate lighting with architecture in a manner that enhanced branding and recognition in complex urban environments, promoting the use of public transportation. This proved particularly challenging as the 16 stations were given distinctive designs by seven different teams of architects.

"As we were dealing with a public transit, we had to solve the challenge of meeting strict budgets while designing a lighting system that transforms spaces that are in effect light industrial environments into dignified public space," Zbrizher points out.

Finally, the lighting was designed in an environmentally responsible manner, utilizing basic principles of avoidance of overlighting, integration of daylight, and use of energy-efficient components and automatic shutoff and daylighting controls in an effort to maximize energy savings. All lighting is automatically turned off on a schedule during times that the stations are closed to the public, while lighting in daylighted spaces is shut off via photosensor when sufficient daylight is present, further reducing energy costs.

The majority of luminaires are linear high-performance T8, T5 or T5HO fluorescent luminaires with a narrow lensed aperture, organized in disciplined patterns repeated across the system and oriented in the direction of travel as a means of improving wayfinding.

“We used continuous lines of linear fluorescent and minimalist layouts to create strong graphic language integrated with the architecture and finishes and to express the dynamic character of mass transit,” Zbrizher explains. “Each pattern of light is associated with a particular location within the stations and provides a familiar feature that helps make orientation intuitive.”

The predominant lighting patterns consist of a line of light in the concourse and connectors that lead to and from the train platform to entrances and exits; a double row of downlights were the fare paid zone begins; a series of downlights over vertical circulation spaces; and indirectly illuminated ceilings on the platform plus a line of light at the platform edge and wall opposite the platform. The downlights, provided by Gotham Lighting and designed specially for this project to be of the same physical size for compact fluorescent amalgam lamps and ceramic metal halide lamps, are efficient and easy to maintain.

The wall opposite the platform edge is similarly lighted by linear fluorescent luminaires integrated into the cable tray. In stations where cable trays are not located at the platform, recessed and surface-mounted wallwashers are used to improve volumetric brightness and make the confined platforms appear visually more spacious. On the concourses, mezzanines and connectors, all finishes are primarily matte with high reflectance values to improve lighting uniformity and reflectivity.

“We built a fairly limited vocabulary of luminaires, which allowed us to reduce capital costs by standardizing lighting equipment,” notes Zbrizher. “We required luminaires that are robust and can withstand vandalism, dust and the elements while supporting our branding and wayfinding goals.”

The project’s most common and distinctive lighting element, for example, is a custom platform-edge luminaire (Peerless Lighting) based on a concept developed by Zbrizher, which provides indirect illumination for the platform and directly lights the platform edge at 20 fc (with sharp cutoff on the track side to avoid waste).

The luminaire provides high efficiency and easier maintenance because it was designed to utilize a single electronic-ballasted high-performance T8 lamp in its cross section. To accomplish this goal—as typical platform-edge luminaires contain 2–3 lamps—the optics were designed to maximize luminaire efficiency at 79%, producing 23% direct and 77% indirect distribution from a continuous lensed 3.25-in. wide bottom aperture and 2-in. wide top aperture.

“Frankly, I was a little skeptical about the manufacturer being able to achieve all of our requirements for this luminaire and I admired their composure that they did not laugh at our request!” Zbrizher recalls. “We are very happy with the results.” The manufacturer met all design challenges, Zbrizher continues, building a transit luminaire that withstands harsh environments, has good efficiency and very specific optics suitable to platform application, and boasts a streamlined appearance.

Canada Line opened on August 17, 2009 and was enthusiastically received by Vancouverites, Zbrizher says.



“We informally surveyed about 20 laypeople on what they thought of the lighting in the new stations,” she adds. “Every single person said the stations ‘feel safe.’ Most said the stations are brighter than stations on the existing light rail transit line—which of course is due to higher luminance and uniformity combined with the absence of glare.”

She adds: “Canada Line is a complex project built on a tight schedule. It’s very satisfying for us to know we accomplished our client’s goal of building a transit system that the public sees as bright, where people feel safe, and that is dignified and promotes the use of public transportation”. **EB**

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As a market leader in producing and supplying dry mustard products since 1867, G.S. Dunn has built a worldwide reputation for delivering the finest dry milled mustard products to some of the most notable names in the food industry. To ensure uncompromising quality, the company's stringent quality inspection process requires adequate lighting for optimum visibility.

To achieve the visibility needed, the company had installed 18 powerful 450W fixtures in the inspection facility; each one, however, was consuming somewhere around 540 watts of energy to run the light and the ballast. Because of the light degradation over the life of the fixtures, ensuring optimum light quality for thorough product inspection was an ongoing challenge.

In addition to light quality issues, the powerful fixtures were expensive to operate and maintain. Not only were bulb changes a costly annual occurrence (at \$100 per hour in addition to the cost of the bulbs), but the company had resorted to leaving the energy-sucking lights on 24 hours a day when a third shift was needed to meet production demands. With the metal halide's slow warm-up period, leaving the lights on proved more operationally efficient than waiting around for the lights to warm up.

The LED trifecta: colour, cost and quality

Between the marginal colour rendering capabilities and high energy consumption of the metal halides, G.S. Dunn saw an opportunity for improvement. Replacing each metal halide with a high-efficiency sealed unit (DuroSite LED high-bay fixture), G.S. Dunn dramatically reduced its energy consumption, cost of operation and product quality assurance.

"The new LED fixtures are encased in a sealed, lower profile unit with downward directional light that preserves light quality," said Kevin Whyte, operations manager with G.S. Dunn. "And, the improvement in colour rendering is impressive." He added that the





lighting showcase

“We’ve been an advocate of LEDs for a number of years,” said Whyte. “Now we’re able to see first-hand just how much of an impact this simple change can have on reducing our energy consumption and costs, as well as improving our quality and sustainability practices as a company.” **EB**



fixtures produce a crisp, clear white light that improves visibility in G.S. Dunn’s inspection area.

Operating at just 150 watts, the LED high-bay luminaires have slashed energy consumption and cost for the company, mitigating the costly ballast loss that pushed the 450W metal-halide’s energy draw upwards of 540 total system watts.

Furthermore, with typical LED operational lifespan of nearly 10 years, the company will save on maintenance, bulb replacement and bulb recycling/disposal.

With Instant On/Off, the new fixtures eliminate the energy wasted in leaving the old metal halides burn just to avoid the warm-up. Some of the new fixtures have even been hooked up to motion sensors, further increasing their energy efficiency by cutting burn time to just nine hours per day versus 24.

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The company is currently investigating the potential for energy-saving rebate incentives being offered by the Canadian government to help further offset the cost of installation.



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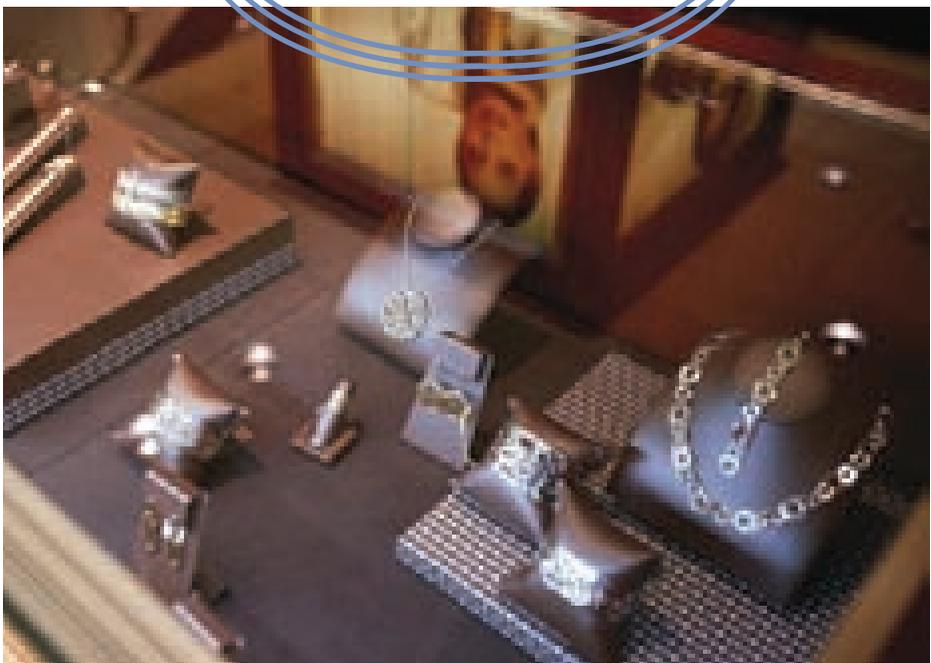
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What makes a piece of jewellery stand out from others doesn't just have to do with the four Cs (Cut, Colour, Clarity and Carat). Sometimes it has everything to do with the way it looks on display. For jewellers, display cases help protect and highlight products. But for many, the cases also hinder consumers from seeing merchandise details that can lead to sales.

As grocers and discount retailers have already discovered, LED lighting technology helps showcase product details, attract consumer attention and reduce energy expenses. And now, the LED lighting trend is making its way to the jewellery industry, where one leading jeweller is turning heads with its recent upgrade to LED lighting for display cases.

As one of the largest independent jewellers in the States, The Diamond Cellar (Dublin, Ohio) is known for its expertise in service, selection and, now, its innovative approach to showcasing products throughout its multilevel flagship store. By replacing existing display case bulbs with GE Immersion LED display case lighting, the retailer is able to add sparkle to all facets of merchandise on display, while guiding the consumer's eye throughout the cases to see the wide selection of jewellery in an effort to increase sales.

The LED system uses multiple point sources of light to increase visual reflectivity and shine while reducing operating costs. Its reflector design focuses peak light to the centre of the case and radiates light out across the case to eliminate shadows and lighting hot spots often found with fluorescent and halogen lighting, which creates a brighter, more uniform look throughout.



While halogen systems produce higher lux levels, the LED system offers better optical control, says GE, and nearly 80% energy savings, along with a long 50,000-hour rated life to reduce maintenance hassle and costs. The new LED lighting's environmentally responsible design is not only energy efficient, but also RoHS compliant and doesn't contain lead, mercury or glass.

"Jewellers know a lot about diamonds and gemstones, but what they may not realize is that lighting affects the way a consumer reacts to a piece, especially at first glance," says Joshua Gildea, product manager for LED Retail Display Lighting, GE Lighting.

Benchmark Woodworks specified and installed the lighting for The Diamond Cellar. "This is the first time we had used [this LED system] and we were able to run right through the installation without a hitch," says Benchmark president Dan Witt. **EB**

More saving. More doing.

A testament to practising what you preach

The Home Depot reduces energy consumption and environmental impact with lighting retrofits

As one of the world's largest home improvement retailers, The Home Depot Canada has a strong commitment to providing high-quality products that create value. In particular, The Home Depot Canada has developed an Eco-Options program to highlight environmentally-preferred products for consumers and contractors, which allows customers to make educated purchase decisions that will save them money, and help the environment.

This "More saving. More doing." approach for its customers is also embedded in the sustainable corporate principles of The Home Depot Canada, meaning they continually evaluate their operations to strive for the best approach—both economically and environmentally.

For example, The Home Depot Canada undertook a major lighting retrofit in all their retail stores back in 2004 that involved converting an HID system to a T5 fluorescent lighting system. This new 54W T5 HO lighting system resulted in an immediate energy savings of 21%, coupled with the added environmental benefit of using lamps that contained significantly less mercury than the 400W metal halide lamps they replaced. Other advantages to the T5 technology versus the metal halide lamps was a higher lumen maintenance and longer life, which reduces maintenance and disposal costs, as well as outstanding colour rendering, which results in an improved shopping experience.

The challenge is to stay abreast of the latest operational advances and green product adaptation that support a corporate commitment to sustainability. Within the lighting industry in particular, there is constant innovation that supports the drive to energy efficiency. And, therefore, the opportunity to re-evaluate The Home Depot Canada's lighting system presented itself in 2009 just as the stores were coming up for group re-lamping.

Philips says its 49W T5HO lamp provided an attractive alternative



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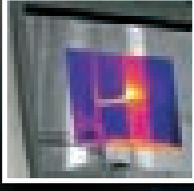
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“More saving. More doing.” approach for its customers is also embedded in the sustainable corporate principles of The Home Depot Canada.

for The Home Depot Canada, as it was a direct retrofit to Depot’s current T5 lamps, but provided an immediate savings of 5 watts per lamp. In particular, the 49W lamps will save The Home Depot Canada roughly \$2.80 in energy savings per lamp per year relative to the previous 54W models (based on a rate of \$0.10/kWh typically burning on average 16 hours a day, seven days). This translates into a total savings of \$7848 per year per store on the typical 2800 lamps run in each location, or more than \$1.4 million annually for Depot’s enterprise once all of their nearly 179 stores in Canada are upgraded.

Depot was delighted with the results of the 49W beta test installation in its Aurora, Ont. store in March 2009. The switch from 54W T5s to the 49W T5s realized an additional 10% in energy savings, with no sacrifice to light output or lamp performance. The Home Depot Canada stores actually appear to be brighter with the 49W T5 lamps, as less heat is generated in the fixture, which presents ideal temperature conditions for the T5 technology, resulting in increased lumen output.

Making this investment even more attractive for The Home Depot Canada was the opportunity to capitalize on various provincial and municipal

incentive programs aimed at energy demand reduction, such as BC Hydro’s PowerSmart program and the Ontario Power Authority’s (OPA’s) Energy Retrofit Incentive Program. The ability to oversee the overall lighting retrofit project, while at the same time working with various utility programs to qualify for rebates, was driven by the maintenance and energy teams at The Home Depot Canada.

In particular, Depot worked closely with Toronto Hydro to qualify for the latter’s Business Incentive Program (BIP). Toronto Hydro’s/OPA BIP program provides incentives on a range of energy-efficient retrofit projects that reduce peak electricity demand (kWh consumption). For energy-efficient lighting retrofits, BIP offers an incentive of \$400/kW (or \$0.05/kWh, whichever is greater) for qualified projects that will deliver a minimum of 24,000 kWh annual savings, and that will continue for 36 months or longer. The scope of the lighting retrofit for The Home Depot Canada’s GTA stores would easily qualify it for the BIP program rebate. Further analysis on the full cost of the project encompassing the incremental costs, maintenance, estimated savings and utility rebates revealed an attractive return on investment of only 1.2 years.

“These lamps deliver all of the performance and long life we had enjoyed with our previous 54W lamps, but now drive nearly 10% greater energy savings,” says Tony McKee, The Home Depot Canada’s senior energy manager. “It’s a simple change that supports our environmental goals and, with the assistance of utility incentives like Toronto Hydro’s, will save The Home Depot Canada stores over a million dollars in operating expenses every year once the stores are all retrofitted. It also allows us to focus on other important aspects of our business, such as serving our customers and employees in the highest way possible, and giving back to the community.”

The Home Depot Canada has targeted around 56 stores for upgrade in 2010, with the remainder being upgraded to the new 49W lamp spec as each store comes up for a group re-lamping. “We are delighted with this initiative,” concludes McKee. **EB**

ANNOUNCEMENT

Reg Clark, Vice-president - Industrial Products, Thomas & Betts Canada, is pleased to announce the following organizational changes:



Craig Douglas

Effective April 15, 2011, **Craig Douglas**, Regional Sales Manager, Western sales region, begins his well-deserved retirement after 35 years of loyal service to the company. Beginning in 1975 as a Sales Representative in Winnipeg, Craig successfully fulfilled a number of key roles within the organization, including his current position as Regional Sales Manager for Western Canada. We wish to thank him for his contribution, loyalty and, above all, his dedication to the company during these 35 years.

In light of Craig’s departure and in order to ensure optimum sales coverage, we have restructured the Western sales organization as follows effective April 15, 2011:

Rob Ruys, currently Sales Manager for the Mid-West, will become Regional Sales Manager for British Columbia and the Mid-West (Manitoba and Saskatchewan). Rob will be based in our Vancouver sales office as of April 2011.



Rob Ruys

Len Skoreyko, currently Sales Manager for Alberta, will become Regional Sales Manager responsible for the Alberta sales region. The creation of this new sales region reflects our commitment to bring a regional focus to the increased activity in this region. Len will continue to be based in our Edmonton sales office.



Len Skoreyko

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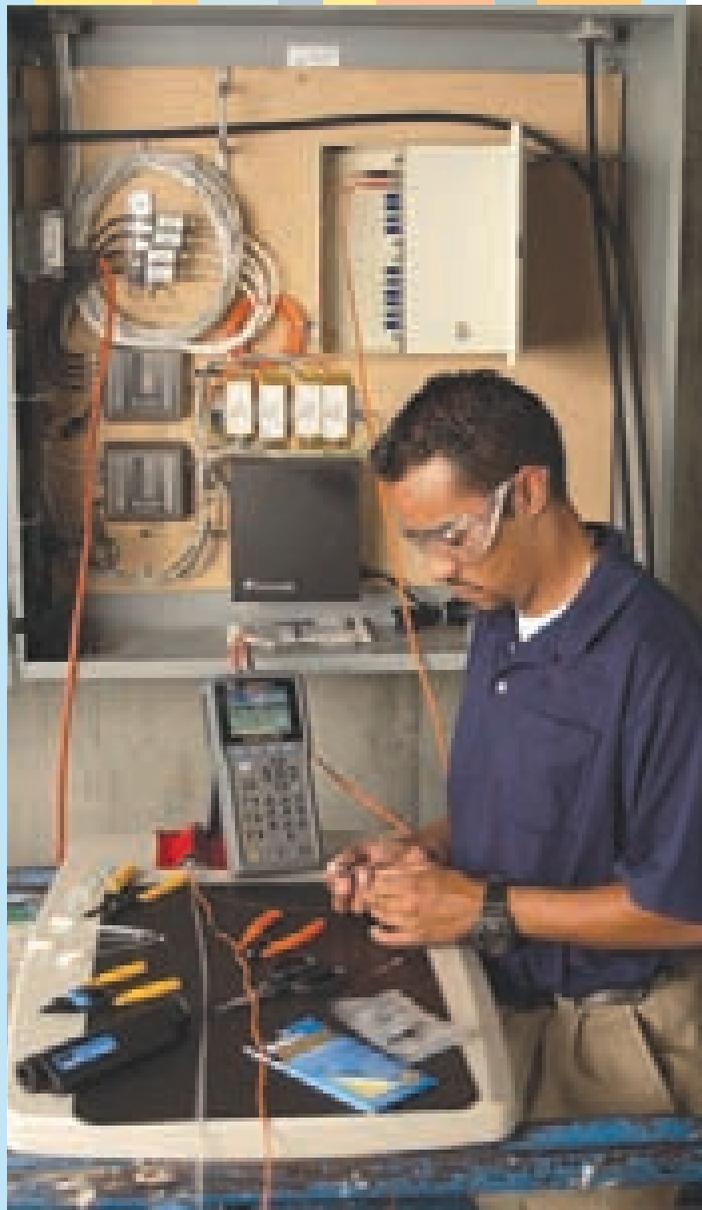
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Best practices for terminating fiber optic cabling

Dan Payerle



With fiber optic cabling becoming an increasingly important aspect of Local Area Network communications infrastructures, LAN installers have to be well schooled in the fundamentals of terminating fiber and installing fiber connectors. In fiber network installations, workmanship is absolutely critical to achieve acceptable results. Even a small imperfection or microscopic dirt on the face of the fiber can create significant problems with optical propagation that lead to failure of the link.

While having the proper tools is a critical factor for success, using the proper techniques is also paramount. As many LAN installers migrate from a focus on copper to handling fiber installations, it is all too easy to pick up bad habits that can lead to inefficiency, result in substandard quality and may also create safety risks.

This article provides a hands-on tutorial regarding the best practices for quickly, safely and correctly creating fiber optic connections that meet accepted standards of quality workmanship and assure optimal coupling efficiency. The following sections are intended to help field installers avoid problems by providing a solid base of information that can act as a learning tool and a reference source for both new and experienced field technicians handling fiber-cabling termination.

Creating and maintaining a safe work environment for handling fiber

The first and foremost consideration that all installers must keep in mind is the need for adequate safety measures when handling and terminating fiber. Not only should technicians protect themselves during the installation process; they also need to leave the completed installation area in a safe condition for other people who follow behind them.

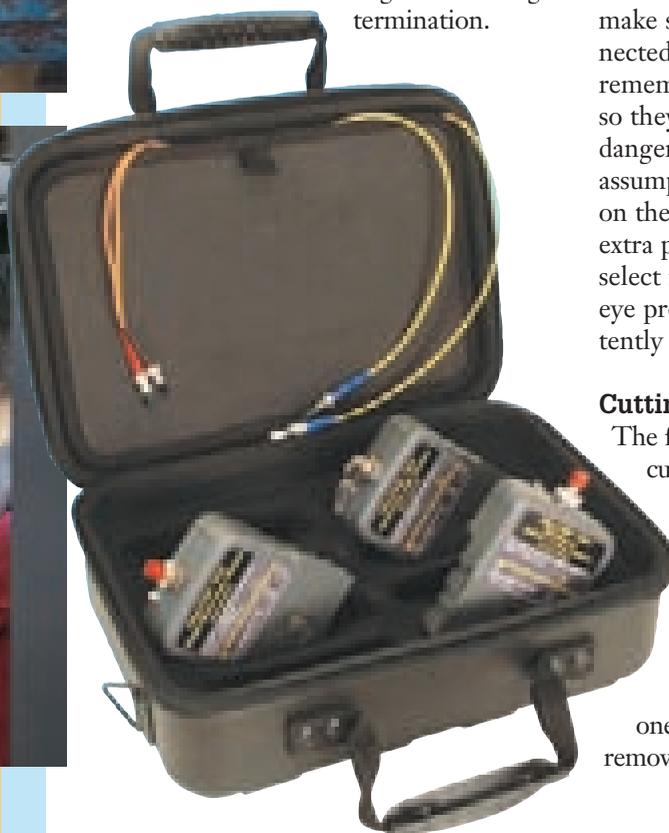
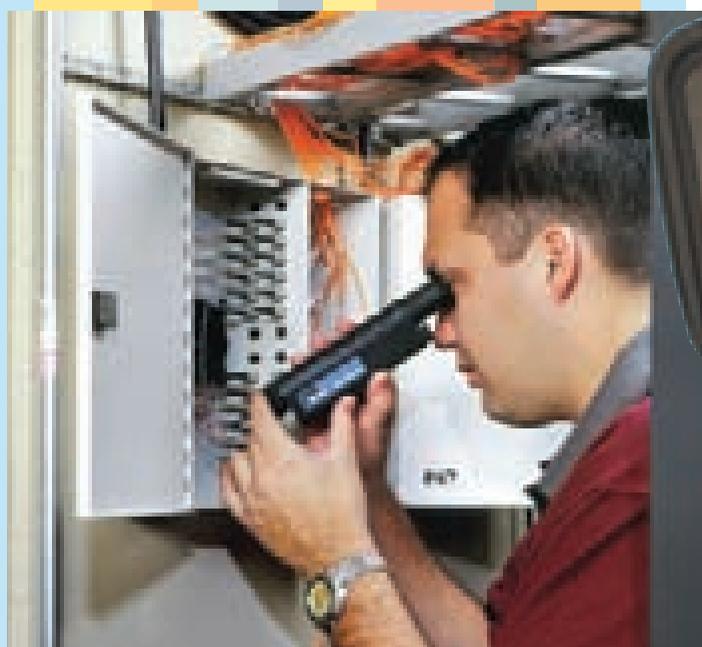
Fundamental safety tools include a dark work surface, such as a black workmat, and a proper trash receptacle for fiber scraps that is clearly marked as to its contents (not just a piece of black tape to stick them on). Unfortunately, too many technicians have been incorrectly trained in the field to just flick off the cleaved fiber scraps with their fingers; a practice that is grossly unsafe in buildings or schools where the subsequent occupants could be harmed by coming into contact with the nearly unnoticeable sharp fiber scraps.

The technician should always have a pair of Teflon-tipped tweezers close at hand for removal of fiber splinters. Safety glasses are an absolute requirement. Good safety practices also include washing of hands as soon as they are done handling the fiber and avoiding all food and drink during the fiber handling process.

Later on, when checking fibers with a microscope, technicians should always make sure that the other end is not connected to a power source. Installers must remember that laser light is not visible so they may not have any warning of the danger and therefore should make no assumptions without double-checking on the power status of the link. As an extra precaution, it is also a good idea to select field microscopes with built-in IR eye protection to guard against inadvertently looking into a 'hot' laser.

Cutting and stripping fiber cabling

The first steps in terminating fiber are to cut, strip and prep the cable. Technicians should use cutting/stripping tools that match the specific size of cable being terminated and which can perform multiple operations without having to switch tools. One tool on the market is essentially two tools in one, with a small stripping V-notch to remove the buffer and coating material



from 125µm fiber and a large stripping V-notch to strip a wide range of outer cable jacket insulation. The blade area is heat-treated for durability and laser marked for easy identification of the stripping options. Or the fiber optic stripper can handle 900/250mm fiber with replaceable precision-ground blades that cleanly cut and strip a wide range of insulations and coatings.

Even with the best-adjusted and calibrated stripper, installers still need to learn the proper technique. Continuing to keep the pressure on after the buffer has been cut can place lateral pressure on the fragile glass core. Experienced technicians learn to 'feel' for the slight loss of resistance when the tool cuts through the buffer, allowing them to ease up and avoid breaking the glass fiber. Veteran fiber installers also know the importance of keeping the stripper cutting face clean because even a small particle of dirt or debris can lead to broken or scored glass core. Therefore most experienced installers keep an old toothbrush handy in order to give the blades a precautionary cleaning before each round of stripping operations. (Safety note: never use canned air for cleaning tools in a fiber installation environment.)

Another important technique when stripping fiber is to avoid "pushing from the cut" in the manner technicians typically use to strip insulation from an electrical conductor. The tendency to bend the arm and wrist in a sweeping motion can twist the fiber cabling and create excess friction between the buffer and glass fiber, causing the fiber to curl and/or break. A better method is to 'draw the glass fiber out of the buffer' in a nice linear pulling motion. Also, for some beginning installers, it may make sense to simply cut the buffer in smaller segments (1/4 in. to 3/8 in. at a time) and pull it off a piece at a time, creating less friction and minimizing the tendency to curl.

The installer also needs to be sure the all of the coating has also been removed from the glass fiber. With some tools this can require multiple passes, but some tools are designed to effectively remove both the buffer and the coating in a single pass.

Cleaning and preparing the fiber

The next step is cleaning and preparing the fiber cabling for mating with the connector ferrule. Cleaning is critical because there is only a 1 to 2 micron clearance in between the fiber and the connector ferrule. Even a very minute amount of debris on the fiber

will interfere with fitting the fiber into the ferrule. The trimmed jacket at the base of the exposed fiber should be cleaned as well, in order to make sure that the epoxy will also adhere to the jacket for added strain relief.

Cleaning should only be done with an approved solution designed specifically for fiber such as 'tech-grade' isopropyl alcohol (99% pure). Never use standard isopropyl alcohol (70% pure) because the other 30% may consist of water, lanolin or other substances that can contaminate the fiber and keep the epoxy from adhering properly to the glass. To

support fast and efficient cleaning, many installers have turned to using specially designed split-tip swabs that are pre-loaded with 99% isopropyl alcohol. The split-tip fits snugly around the fiber to thoroughly clean it and a single swab can be used for many cleanings or until the alcohol is gone.

Mating the fiber into the connector ferrule & curing the epoxy

The next step is to apply the epoxy into the connector and insert the fiber. It is also a good idea to

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apply a small amount of epoxy to the base at the trimmed jacket for strain relief. There are a variety of approaches that can be used for curing the epoxy. Some experienced installers have developed special methods that can significantly accelerate the curing time and therefore increase overall fiber installation productivity. Traditionally, field-curing ovens use a relatively low temperature in the range of 150-200°F, which can require from 5 to 15 minutes of curing time. Some veteran installers carry a 3M Hot-Melt oven, with a temperature of up to 400°F, which can cut the cure time down to as little as 90 seconds.

Ultimately, the choice of which method to use for attaching fiber connectors comes down to a number of tradeoffs, which involve balancing the curing time against the pot life and factoring in the ability to leverage standard tools and methods. For example, crimp on connectors can eliminate the need for using epoxy but drive up the cost of the connector itself as well as requiring proprietary tools. Room cure epoxy can eliminate the need to have a field-heating oven but can take as much as 60-90 minutes to cure, with the added complication of only a short (5-8 minutes) pot life, meaning that the mixture sometimes can set up faster than it can be applied.

Heat cure epoxies are no different from room cure except that they are formulated to have a long pot life but cure quickly in high temperatures. This typically gives the installer the best balance when terminating many fiber connections by providing flexibility for applying the epoxy many times before it starts to set up, along with the ability to cure each connection in a matter of a few minutes with a high-heat field oven. Experienced installers also can take advantage of this flexibility by interleaving a number of different operations (epoxy, curing, cooling, etc.) in parallel to further boost overall throughput and efficiency.

Scribing the connection and removing excess fiber

Once the epoxy has cured and the connection has cooled, the next step is to scribe the glass and remove the excess fiber. The objective of scribing is to assure a clean break across the entire face, without shattering. This involves scoring the glass close to the connector end and then running the fingers up the connector and pulling away the excess glass along the linear axis to create a clean break near the connector face.

Depending upon the specific requirements and personal preferences, different installers may choose between ruby, sapphire or carbide scribing tools. Ruby and the sapphire are industrial gemstones polished to a super-sharp edge. There is essentially no difference between the two as far as cutting properties are concerned. From a personal preference standpoint, some people like to use a lighter scribe such as the sapphire and others prefer the ruby scribe's darker line that provides contrast against the glass. Advanced carbide scribes deliver a smooth superfine cutting edge that is equal to either the ruby or the sapphire gemstones.



The basic tradeoff is that gemstone scribes are slightly less expensive than carbide however they are more fragile. Dropping ruby or sapphire scribes on a hard surface can chip the cutting surface but a carbide blade is much more rugged and durable.

Polishing processes

After the fiber has been scribed and removed, the face is polished through a series of steps to achieve a smooth surface. The first step involves an 'air polish' using a 12 micron grit lapping film, in which the film is held up by one corner and the face of the connector is gently rubbed back and forth against the suspended lapping film. The objective of the air polishing step is simply to bring the level of the glass down to the level of the glue bead at the connector opening. This step only takes about 20-30 seconds and can be checked by gently rubbing a finger over the surface to assure that any jagged edge left from the scribe break has been smoothed down flush with the bead.

The next step is to use a polishing puck on a rubber or neoprene pad, along with progressively finer lapping film to smooth the fiber face down to the required level. The lapping film is placed face up on the pad and the puck is placed on the film. Then the connector is inserted into the polishing puck and is moved in Figure 8 motions across the surface of the film to polish down both the glue bead and the glass. It is important to check the surface regularly to avoid over polishing. Most epoxy is infused with a blue dye so it is readily apparent when the glue bead has been eliminated. The inherent give in the polishing pad allows the polishing process to produce a slightly dome-shaped result that eliminates the glue around edges and creates a smooth face for propagation of the light through the fiber.

For multimode fiber, the polishing process should progress at least down to 3 micron lapping film, with 0.5 micron being optional (always check the recommendations of the connector and fiber manufacturers). For singlemode fiber, a final polishing step with 0.5 micron film should be mandatory to minimize coupling loss and assure adequate light propagation. Some installers also finish the process with a final "wet polish" by applying a small amount of 99% pure isopropyl alcohol to the 0.5 micron lapping film.

The lapping films should always be cleaned between before each use. The underlying neoprene pad also should always be clean in order to avoid any grit or debris that can cause bumps in the polishing action. After polishing, the entire

connection should then be cleaned with 99% pure isopropyl alcohol or similar solution, including both the fiber face and connector ferrule. Here again, do not use canned air and never blow on the connector face in an attempt to clean it!

Inspecting with field microscopes

Each connection should then be inspected using a good field microscope (with built-in eye protection). For multimode fiber, the minimum magnification should be 100x. For singlemode, the magnification should be at least 200x. The installer should look for a well-defined 'bulls-eye' where the centre of the bulls-eye is the core of the fiber and the next ring is the cladding and the final outer ring is the connector itself. The inspection also should assure that there are no scratches, pits, chips, nicks or glue residue. The examples below show a comparison of plucked, dirty and clean fiber faces.

When selecting a field microscope, installers should look for those that include multiple adapters to handle a variety of different standard connector types. In addition, some of the newer field inspection microscopes use LEDs instead of incandescent sources for backlighting because white LEDs provide a more pure light source and make it easier on the technicians' eyes—especially after repeated usage in the field.

As soon as the connector has been inspected, it should be immediately covered with a clean dust cap in order to protect it from dirt or damage.

Testing for basic continuity

Field installers also should be responsible for conducting a continuity check of the fiber link, using a basic fiber optic continuity tester, typically with a powerful Krypton light source to provide long range testing. The continuity tester should include a soft ferrule gripping membrane to protect the finished ferrules while firmly securing the connector in the tester body. In addition, visible laser-light source testers can be valuable for checking the integrity of the jacket and detecting breaks in the cladding along the whole length of the link.

Ultimately, field installers are fundamentally responsible for delivering high-quality consistent workmanship and a functioning network infrastructure, while maintaining a safe and productive work environment. By obtaining the right tools, learning the right techniques and seeking out in-depth training on proper procedures, field technicians responsible for installing fiber networks can meet all of these objectives while simultaneously achieving a well-deserved high degree of pride in their work. 

Dan Payerle has been actively involved in the LAN cabling business providing network design, testing, troubleshooting, consulting and training services for a variety of companies over the last decade. Working with several training companies, Dan developed training programs for copper and fiber optic installation courses, and created curricula for trade schools to use in the process of becoming nationally accredited. Today, he serves as senior product manager for the DataComm division of Ideal Industries Inc. (www.idealindustries.ca).



EFC Industry Recognition Award 2011 Call for Nominations

Nominate an outstanding leader for Electro-Federation Canada's (EFC, www.electrofed.com) Industry Recognition Award (IRA), an annual award honouring an individual who has influenced the Canadian electrical, electronics, appliances, or telecommunications markets, either as a current or retired industry delegate, or as an industry supporter.

The recipient of this year's award will be recognized during a banquet luncheon at EFC's annual general meeting on April 19 in Toronto. Nominations due by March 11.

Visit tinyurl.com/4cmbjx4 for the Nomination Form.

Past IRA recipients have included:

- **2010** - Richard Waterman, International Electrical Supply Corp.
- **2010** - Pat Costello, Toshiba of Canada Ltd.
- **2009** - Michael Kenney, Thomas & Betts
- **2008** - Bill Buckley, ShawCor Ltd.
- **2007** - Ken Gerrie, Gerrie Electric Wholesale Ltd.
- **2006** - William E. Saylor, Rexel Canada
- **2006** - Reginald D. Gemmill, Whirlpool Canada LP
- **2005** - John H. MacDonald, Ideal Supply Co. Ltd.
- **2004** - Gerald G. Dunnigan, Techspan Industries Inc.

Sonepar Canada (soneparcanada.com) has appointed **Paul Lachance** to the position of vice-president of vendor relations. Most recently, Lachance held the position of president and CEO of Wolesley Canada; under his direction, the company more than doubled its annual revenue. "Paul brings some unique talents to our company that provides a critical fit with our long term strategic goals," said **Keith Moss**, president of Sonepar Canada. "His business acumen and wealth of experience in the distribution business will be a great asset to Sonepar Canada and he will have a direct and positive impact to our future."

WattStopper (www.wattstopper.com) has signed **Yorkland Controls** (www.yorkland.net) as its first Canadian lighting controls distributor partner for the mechanical marketplace. WattStopper, a Legrand group brand, is a manufacturer of lighting controls for commercial and residential use. In business for nearly 40 years, Yorkland Controls has roots in distributing and warehousing heating control products such as Flame Safeguard, and burner and boiler management systems. Over the past several years, the company has expanded into new markets, including building automation

and more recently in electronic refrigeration components and systems. Yorkland Controls has four offices in Ontario, including two in the greater Toronto area.



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EB lighting products

Osram Sylvania LED Ultra 2700K, A-Line PAR and globe lamps



Osram Sylvania introduced dimmable LED 2700K retrofit reflector A-Line, PAR and globe lamps as energy-efficient alternatives to halogens boasting “exceptional colour rendering”. Part of the Ultra High Performance Series (Sylvania’s second-generation LED retrofit product line), the 2700K retrofit reflector LED lamps reduce energy consumption by up to 84%, says Osram, and provide up to 20X more life compared to the halogens lamps they replace. The 6W MR16, 8W PAR20, 15W PAR30LN and 18W PAR38 lamps and are replacements for 20W MR16, 50W PAR20, 50W PAR30 and 75W PAR38 halogen lamps, respectively, and are offered in 25° and 40° beam spreads. Additionally, the PAR20, PAR30 and PAR38 lamps are available in 2700K and 3000K with 85-89 CRI. All PAR lamps are damp-location rated and RoHS compliant, free of lead and mercury, and emit no UV or IR radiation.

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www.sylvania.com

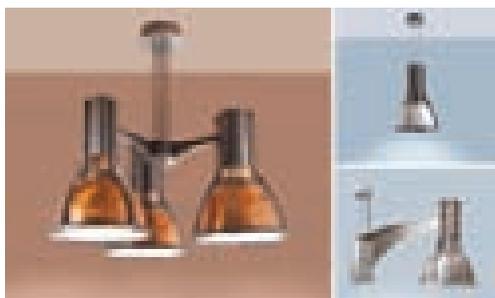
Holophane Petrolux LED luminaries lighting system

New Petrolux LED luminaires from Holophane provide a reliable, low maintenance lighting solution for harsh environments, including classified hazardous locations, says the company. The luminaries include several performance features including: Endural borosilicate glass LED optics; dedicated thermal management system; Universal Mounts; dimming options; and robust outer aluminum housing. They are also marine and IP66 rated to protect against harsh elements.

HOLOPHANE
www.holophane.com



Cooper Lighting Shaper 1300 HP luminaires



Cooper Lighting, a division of Cooper Industries plc, has introduced its Shaper 1300 High Performance (HP) Series, a new line of high-bay luminaires with different specification options. Available in two sizes (14” & 18” diameter), five optical choices and several lamping options, the series can be ceiling, wall or pendant mounted in configuration choices of single or multiple fixture options of two-, three- and four-pendant luminaires. The fixtures can be ordered with standard or dimmable ballast.

COOPER LIGHTING
www.cooperlighting.com

Halco Lighting Technologies features HaloXen MR16 lamps



Halco Lighting Technologies, a manufacturer of lamps and ballasts, has introduced its Reduced Wattage HaloXen MR16 Lamps, which are said to reduce energy consumption by up to 26 percent, provide 5,000-hour average rated life and achieve a high efficacy level through the lamp’s specialized Halogen-Xenon gas mixture. The Xenon gas helps reduce filament evaporation and increases light output, while the halogen gas extends the life of the lamp by re-depositing evaporated tungsten back onto the filament, says the company. The lamps are available in 16, 26, 37 and 57 watts and replace standard halogen 20, 35, 50 and 75 watt lamps.

HALCO LIGHTING TECHNOLOGIES
www.halcolighting.com

Alumen8 8-YJ Series wall luminaire

Alumen8 unveiled the 8-YJ Series of wall-mounted, quarter-round linear T5 luminaires, intended to replace incandescent, halogen or linear T8s in either new or retrofit applications. Single or dual T5s are shielded by an impact-resistant curved and sandblasted translucent acrylic, no-glare outer lenses. A choice of one or two 28W or 54W lamps per unit provide indirect uplight or diffused downward white light. Hidden



program-start, low harmonic-distortion, thermally protected electronic ballasts are standard. HO 347V or 480V ballasts are optional, while dimming

and emergency ballasts are available, as are aisle and 360 occupancy sensors, as well as multi-circuiting options. Units are cUL and UL listed for damp location use.

ALUMEN8
www.alumen8a.com



Traxon Technologies introduces Cove Light AC

Traxon Technologies has introduced its new Cove Light AC system, a high-performance and high-output LED fixture, which it says is suitable for applications in architectural, hospitality, and residential environments for general lighting, wall washing, and alcove illumination. Powered directly with line voltage, the system has an output of 300-400 lumens per foot, and is equipped with a 180° rotation axis, a 150° x 150° beam angle and 120 x 40° optics. Five colour temperatures are available, ranging from 2700K to 6500K.

TRAXON TECHNOLOGIES
www.traxontechnologies.com

EB products

Generac updated XP Series portable generators



Generac Power Systems has introduced an updated XP Series of portable generators, which it says is ideal for on-site construction use. Every

XP Series generator is powered by a Generac Onvi engine that is “built to last three to four times longer than many competitive engines on the market,” says Generac. All XP Series models include idle control to conserve fuel and reduce noise; covered outlets; and a full-panel GFCI protection that is OSHA and NEC 2011 compliant.

GENERAC
www.generac.com

Wago solar positioning function block

Wago claims its Solar Positioning Function Block (SPFB) increases concentrated solar arrangement efficacy, as it enables dynamic solar mirrors to track the sun’s arc within +0.02° via the Wago-I/O-System.



For East-to-West tracking, SPFB relies on multiple variables and inputs, including atmospheric pressure, site elevation, azimuth, latitude, longitude, date and local time. Calculations are then paired with the internal clock of a Wago programmable fieldbus controller, “optimizing mirror position”. Data is communicated to a connected Wago DC motor control module and encoder, or other component (e.g., variable frequency drive) for alignment.

WAGO
www.wago.com

Greenlee offers 68-pc electrician drill/driver bit kit



Greenlee has designed a new 68-piece electrician’s drill/driver bit kit specifically so electricians no longer have to carry multiple bit kits or buy individual sets.

Instead, the kit contains the “right combination of bits needed by an electrician on the jobsite”. This kit consists of the most commonly used professional-grade bit types and sizes, so everything can be stored in one place. The self-centring high-speed drill bits are coated with titanium nitride for enhanced performance. Additionally, the masonry drill bits come with carbide grade tips and a hardened shank that is hammer-drill rated for better impact driving. The kit also features security bits that fit most security fasteners frequently used in

public facilities. All the bits in the kit are professional grade and meet or exceed ASTM standards. Every bit and drill features 1/4-in. quick-change technology. The magnetic nut drivers fit most TapCon fasteners and offer good holding power.

GREENLEE
www.greenlee.com

Lenox T2 Technology in demolition and wood recip saw blades



Lenox has expanded its T2 Technology to demolition and wood reciprocating saw blades. The T2 blades deliver 100% longer blade life and 25% faster cutting, says Lenox, compared to its previous generation of demolition and wood recip saw blades. In addition to long blade life, T2 demolition blades are the widest blades in the demolition category, boasts the company, and provide durability and control when cutting through the toughest construction materials. T2 blades also have optimized tooth geometry for each Tooth Per Inch (TPI) blade specification. Additionally, the 6-in. wood-cutting blade has a new plunge-cutting tooth design on the tip of the blade that makes plunge cuts faster and easier.

LENOX
www.lenoxtools.com



Flir E-Series of E30 E40 E50 E60 imagers

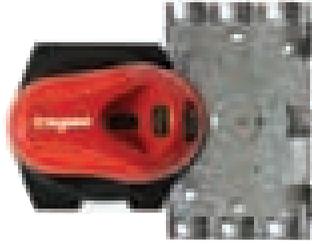
Flir Systems has announced the Flir E-Series: four all-new compact thermal imaging cameras that offer “superior” infrared diagnostic capabilities coupled with Wi-Fi connectivity to mobile devices, such as iPhones and iPads. The new E30, E40, E50, and E60 imagers are said to help users find problems faster and more easily. The series offers up to 76,800 pixels (320 x 240) IR resolution coupled with 2% accuracy, <0.05°C thermal sensitivity, 4x digital zoom, and 60Hz refresh rate. A 3.5” full-view touchscreen is also available.

FLIR
www.flir.ca

Legrand Wiremold raceway laser level and cutting guide

Legrand/Wiremold has introduced a way to “improve the ease and accuracy” of installing Wiremold 500 and 700 Series raceway with the metal raceway laser level and cutting guide. The cutting guide, which attaches to a stepladder with

a thumb screw, provides a secure channel for the saw so that cuts are straight and true (it also accommodates 1/2-in. conduit and 3/8-in. threaded rod). Once sections have been cut to length, the laser level ensures the raceway will be perfectly aligned horizontally and vertically. The level works with both boxes and raceway fittings; use it to properly align the



box base on the wall, then slide the device over the base tongue and establish a level line as a guide to make holes for raceway mounting clips. The laser level also has a guide slot that connects to corner fittings, ensuring a 90° angle. The level uses built-in magnets for attaching to metal surfaces, and push pins for drywall.

LEGRAND/WIREMOLD
www.legrand.us/Wiremold.aspx

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HUBBELL
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JLG introduces new 340AJ boom lift



JLG Industries Inc., a manufacturer of aerial work platforms and telescopic material handlers, has introduced a new model to the JLG line of boom lifts—the 340AJ. With a lift height of 34 ft, 20 ft of horizontal reach and a 17-ft

up and over reach, the 340AJ offers a Tier 4 diesel engine. A gas/liquid propane engine is also available. The lift has a gross vehicle weight of 9700 lb.

JLG INDUSTRIES
www.jlg.com

Arlington's Wire Grabber (#FLG3)

Arlington's wire grabber (#FLG3) hold on .080"-in. (2 mm) galvanized braided wire offers drop wire support for fixtures, boxes, cable trays and more, of up to 100 lb, says the company. For dry or wet locations, it claims the wire will be unaffected by oil or grease. Connector ships come fully assembled.

ARLINGTON INDUSTRIES
www.aifittings.com



Fluke CLKTO infrared window for indoor switchgear inspection

Fluke Corp.'s CLKTO 3-in. infrared window is designed to facilitate IR and visual inspections of indoor switchgear and electrical installations. It incorporates a clear, impact-resistant viewing pane that complies fully with IEEE and ANSI requirements for indoor switchgear rated at up to 72kV. With Quadband optics, this pane allows visual inspection of electrical equipment even with the cover closed. (The twist-off magnetic cover is impact-resistant to ANSI requirements.) Quadband multispectral optics allows inspection with any thermal imaging camera. (For outdoor applications, Fluke offers the CLKT C-Range, certified by UL and CSA for type 3/12 environments in Canada.)

FLUKE ELECTRONICS CANADA
www.flukecanada.ca

Irwin Vise-Grip curved jaw locking pliers feature self-energizing lower jaw



Irwin's Vise-Grip curved jaw (CR) locking pliers now feature a "self-energizing" lower jaw that delivers three times more gripping power, boasts Irwin, than traditional locking pliers—with no slipping or stripping. There's no need for heavy input pressure, says the company; the jaws tighten as torque is applied, for maximum grip. They're available in two core models: Fast Release, with a

one-handed, triggerless release and anti-pinch, non-slip ProTouch grips; and Original, with a classic trigger release. In addition, the slotted geometry of the self-energizing locking pliers increases torquing power, boasts the company. All Vise-Grip pliers are constructed of high-grade, heat-treated alloy steel.

IRWIN TOOLS
www.irwin.com

Brady Canada unveils BBP 31 sign and label printer



Brady's BBP 31 is an industrial 4-in. monochrome sign and label printer. With an "intuitive display" and "smart chip" auto-calibration supplies, users can simply type their desired text and hit

print, creating a label in as little as two steps. "There's no need to pick a label size, adjust your fonts or calibrate the printer... that's all done for you," says Brady. The BBP 31 also offers a range of advanced editing and design capabilities and a database of 200+ symbols. It can operate as either a stand-alone unit or connected to a PC. It has a library of pre-made labels as well as several design wizards for creating common label types, like arc flash labels. Materials include specialty tapes, pre-printed signs, raised profile labels, etc.

BRADY CANADA
www.bradycanada.ca

Ideal Industries 21-in-1 Twist-A-Nut multibit screwdriver

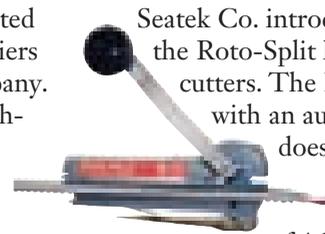


Ideal introduced its 21-in-1 Twist-a-Nut multi-bit, dual-ratcheting screwdriver that boasts "more unique fastening applications than any other tool designed for professional electricians, along with fifty percent more torquing

power than standard ratchets". The tool was configured so the four bits most frequently used by electricians are pre-loaded into the driver shaft, with an additional 12 specialty bits securely stored for quick access within the handle. Its two interchangeable chrome-vanadium shafts were designed for driving 1/4-in., 5/16-in. and 7/16-in. nuts. The handle has two Accu-Loop wire looping holes to create wire loops, along with the patented Wire-Nut ratcheting wrench formed into its bottom that accepts twist-on wire connectors from Ideal and other manufacturers. This tool is also compatible with Ideal's conduit deburring tool and 6-in-1 Tap Tool. The 21-n-1 is built around an all-metal, 28-tooth, three-position ratcheting mechanism that delivers 225 lb of torque.

IDEAL INDUSTRIES
www.idealindustries.ca

Seatek RS-101B Roto-Split armoured cable cutter



Seatek Co. introduced a new model in the Roto-Split line of armoured cable cutters. The RS-101B is equipped with an auto-clamping feature that does away with fussing with a thumb screw when cutting different sizes of AC/MC cable. Just squeeze the bottom lever and any cable from 14-2 to 10-4 or 3/8-in. Flex is secured. This patent pending system prevents applying too much force to aluminum casing. Blade penetration is set at the factory to prevent nicking of wires in standard size AC/MC cable.

SEATEK CO.
www.seatekco.com

Panasonic Toughbook U1 Ultra hand-held PC



Panasonic Solutions Co. unveiled the newest addition to the Toughbook U1 family: the U1 Ultra. Like all U1 products, the Ultra combines the portability of traditional

hand-held devices with the benefits of a full Windows OS. Offering improved sunlight viewability, the Ultra is a ruggedized device, tested to MIL-STD-810G and IP65 standards, and capable of surviving drops up to 6 feet. It is suitable for field technicians in markets such as telecom and utilities. Optional features include a 29-key numeric keypad for quick data entry and easy navigation, GPS, barcode reader, camera and mobile broadband.

TOUGHBOOK
www.toughbook.com

Erico Caddy TSRBS1625 telescoping box support



The TSRBS1625 telescoping box support, part of the Caddy line of fasteners from Erico, is made for supporting and positioning 4-in. square and 4 11/16-in. electrical boxes and mud rings. It features an open design to allow boxes to be positioned anywhere inside. The telescoping adjustability allows contractors to use only one part for both 16-in. and 24-in. stud spacings. Boxes can be installed offsite then fully adjusted to fit varying stud spaces onsite without having to modify box locations. The TSRBS1625 accommodates up to an 8-gang box in 16-in. stud spacing or up to a 10-gang in 24-in. stud spacing. The cULus pending device features a one-piece, break-apart design, and can support up to four electrical boxes.

ERICO
www.erico.com

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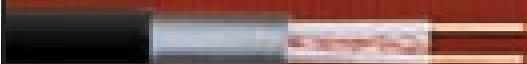
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Grounding resistance and spacing of ground rods

The Canadian Electrical Code (CEC) requires a minimum distance of 3 m between ground rods forming an electrical system grounding electrode, but what are the reasons for this code requirement?

Rule 10-700(2) specifies that a rod grounding electrode (with a few exceptions) must consist of at least two ground rods driven a minimum of 3 m apart. And, for high-voltage substations, Rule 36-302(1) also requires that every station be grounded with at least four ground rods, not less than 3-m long, spaced a minimum distance of one rod-length apart.

Why does spacing between ground rods matter? What would be the problem were the ground rods more closely spaced?

Our story begins with the grounding resistance of every grounding electrode, which has three components:

1. the resistance of the metal ground rods, grounding conductors and connections,
2. contact resistance between the grounding electrode and the earth; and,
3. the resistance of the earth.

As it turns out, the first two are relatively

small and can usually be considered insignificant when considering total grounding resistance, which can be considered as mainly the resistance of the earth.

To help us grasp the idea of grounding resistance, let's assume that the earth around a single ground rod is made up of a series of concentric, equally spaced shells. The nearest shells have the highest resistances to current flow since they have the smallest cross-sectional areas and volumes. The shells further from the ground rod are larger and, therefore, have lower resistances. Therefore, when ground current flows away from the ground rod through the earth, Ohm's Law tells us that the shells nearest the rod will have higher voltage rise than those further from the rod.

Tests have shown that the earth within the first few centimetres of a ground rod will have the highest resistance and the highest voltage rise during a ground fault. Since the resistance of the earth near each ground rod will be very high, adding a second ground rod will not reduce the overall grounding resistance by very much—unless the rod is located some

distance from the first. Driving the rods close together will result in a high mutual resistance, and the current flowing from each will raise the ground potential of the other.

For the above reasons, rods must be spaced far enough apart so as to avoid the effects of the higher resistance shells, so that the voltage rise around each does not affect the other.

We don't need to look very far for further proof. Measurement of grounding resistances at various distances from a grounding electrode have shown that the following percentages (approx.) of the total grounding resistance will occur at the following distances from the rod:

- 25% of total at .03 m
- 52% of total at .15 m
- 94% of total at 3.0 m
- 100% of total at 7.6 m

This tells us that ground rods would need to be spaced 7.6 m apart to achieve the best grounding effect. Obviously, the 3 m rule provided by the Canadian Electrical Code is a compromise... good, but not perfect.

Other available data also supports these findings. Question: when we know the grounding resistance of a single ground rod (say 25 Ω), and we want to reduce the resistance by adding a second rod spaced in accordance with the CEC, will this reduce grounding resistance to 50%?

Actually no. It will only reduce the total grounding resistance to $25/2 \times 1.16 = 14.5 \Omega$. The result of adding two rods will be $25/3 \times 1.29 = 10.75 \Omega$. (Multiplying factors for multiple rod arrangements are available.) **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 April'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

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

- a) True
- b) False

Question 2

A single disconnecting means shall be provided either integral with, or adjacent to, the distribution equipment:

- a) of emergency systems within each unit of a multi-unit building, other than a dwelling unit
- b) of fire alarm system within each area common to more than one building
- c) within each building when fed from another building
- d) all of the above

Question 3

Which of the following CSA receptacle configurations is required for an electric range having a calculated demand of 50A or less in a dwelling unit?

- a) L7-15R c) 14-50R
- b) 14-20R d) 15-50R

Answers to Code Conundrum EBMag February 2011

Q-1: For a manually started motor rated at [] hp or less that is continuously attended while operating, overload protection is not required when: a) the motor is on a branch circuit with overcurrent protection rated/set at not more than 15 A, or b) on an individual branch circuit with overcurrent protection as required by Table 29 (when you can readily determine the motor is running from the starting location).

b) 1 hp. Subrule 28-308(a).

Q-2: Where a fan is used to ventilate commercial cooking equipment, its control motor may be located within sight of and within 9 m of the ventilation duct or hood.

b) False. Rule 26-754.

Q-3: The ampacity of insulated conductors installed in surface raceways shall not exceed those of [] °C conductors, regardless of their temperature ratings.

b) 75°C. Subrule 12-1604(2).



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NOW AVAILABLE – CSA C22.6 No. 1 Electrical Inspection Code for Residential Occupancies

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