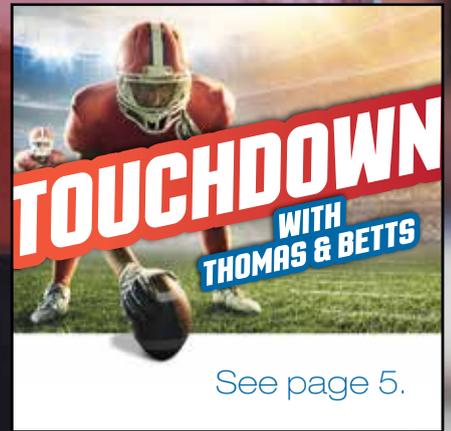


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WHICH PICKUP RULES SUPREME?

Results of the 2017 Canadian Truck King Challenge. P.10

INSIDE

- + Northern Rockies rec centre rebuilds
- + Energy-saving lighting standards are meaningless...
- + Section 8 circuit loading & demand factors

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from the **EDITOR**

ANTHONY CAPKUN

Lightfair 2017 was kind of not about lighting

After a few years of missing Lightfair due to scheduling conflicts, I was finally able to attend the 2017 edition and, boy, the exhibitors were putting their best feet forward. I haven't seen so many large, colourful and distinctive booths since... well, maybe never.

It doesn't seem that long ago that CFLs were all the rage (despite their horrible light), fluorescent tubes were still showcased prominently, and LED bulbs were a novelty... a curiosity you could only find at a few niche exhibitors.

Those early LED bulbs were about \$60 US apiece (I still have a sample of one at home) and they were *dumb* compared to today's offering of LED troffers, connectivity, colour tuning, form factors, etc.

On that note, there are a few main takeaways from this year's Lightfair. The first is that, despite the fact fluorescents are still being produced—as well as the odd metal halides—LED lighting is now the norm. And while this light source has its, shall we say, *nuances* (a polite way of saying that, sometimes, they're a bloody pain), it's also the source that's getting all the R&D and design attention. So besides getting better and cheaper, LED sources are increasingly attractive and able to handily fit into previously unheard of applications.

(This led to at least one conversation regarding certification bodies like CSA and UL not evolving alongside the industry fast enough to keep pace with technological advancements in the space, but that's a whole other story.)

The second and most-important takeaway from this year's Lightfair is not even about the light source, *per se*, but how IoT-ready lighting fixtures are the perfect vehicle for creating a connected environment. Because fixtures are installed everywhere, they can be embedded with any number of low-cost, IoT-ready sensors for heat mapping, daylight harvesting, occupancy and more.

The biggest hurdle, however, is a lack of standards for interoperability that allow you to procure/install IoT-friendly fixtures from multiple OEMs and have them work seamlessly together. As Fulham's Russ Sharer says, "Even manufacturers that command a large market share, such as Apple, realize their technology won't thrive without interoperability".

So here's hoping the lighting OEMs come together on the creation of such a standard for full interoperability—then we can truly unlock and exploit the potential of the Internet of Things. **EB**

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16 Northern Rockies rec centre rebuilds

While it was "an iconic project", Houle Electric faced numerous challenges while helping rebuild the Fort Nelson recreation centre—not the least of which is the 17-hour drive from Vancouver along the Alaska Highway.

20 Energy-saving lighting standards are meaningless! (without interoperability)

Smart lighting represents a number of potential energy-saving applications. In fact, manufacturers are already starting to build intelligence into their luminaires. So the challenge, then, isn't making solid-state lighting systems smarter—it's with communications and connectivity... standards and interoperability.

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Four Alberta electrical apprentices snag 2017 industry training board awards

Seventy-two members of Alberta's trades community, including four electrical apprentices, have been honoured for their "outstanding achievements" in the workplace and in the classroom at the 2017 Alberta Apprenticeship and Industry Training Board Awards.

Recipients were honoured in categories that focus on mentorship, excellence in instruction, work and educational achievement.

Congratulations to:

- Christopher Pearson of Calgary, electric motor systems technician
- Travis Gano of Edmonton, power system electrician
- Pavel Kozanov of Calgary, electrician
- Shayne Waterfield of Fort McMurray, powerline electrician

EXCLUSIVELY AT
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EBMag switched things up this year and trekked to Barrie, Ont. for Ideal Supply's (idealsupply.com) Northern Tradeshow (the "Southern" show was at the Stratford Rotary Complex). *Peruse the photos at tinyurl.com/lw5j4nn.*

EBMag is always excited when we have the opportunity to step out and cover a Skills event—in this case, the 28th annual Skills Ontario Competition, held for the first time at the Toronto Congress Centre.

 *Catch the action shots at tinyurl.com/kb97kry.*

For the latest industry news, events, solutions, stories and more from the industry, go to **EBMAG.COM**.

Darcy Tangedal of Athabasca won the Chairperson's Award of Excellence. Tangedal is an electrical and instrumentation specialist, according to LinkedIn, and the EIC foreman at Athabasca Oil Corp.

Stelpro heats up Bonneville's engineered homes



Micro-Natur engineered home.

PHOTO COURTESY INDUSTRIES BONNEVILLE.

Stelpro Design—a Quebec-based manufacturer of integrated heating solutions—has signed a partnership agreement that will see its products installed in all engineered homes built by custom homebuilder Industries Bonneville (maisonsbonneville.com).

"This agreement with Industries Bonneville enables us to increase the visibility and distribution of our electric heating products to a broader clientele that will benefit from a high-performance, reliable and high-quality heating solution," said Connie Chabot, Stelpro's VP sales & marketing (stelpro.com).

The agreement is exclusive for electric heating products such as thermostats, baseboards, convectors and cove heaters.

AD member sales up 8% in Q1



Sales for Affiliated Distributors (AD) members grew by 8% to \$8.9 billion in 2017 Q1, across all seven divisions and three countries, according to the buying group (adhq.com).

AD Canada was up 9%, the report says, and by industry, electrical was up 10%; PHCP (plumbing, PVF & HVAC) was up 8%; industrial was up 7%; and building materials was up 16%.

"We are pleased to see that AD independents continued to take market share and grow at a pace that's greater than their overall industries and countries," said Bill Weisberg, AD chair and CEO.

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CNL releases \$1.2-billion vision for Chalk River

"This is an important first step on our journey towards a new vision for CNL and the Chalk River campus," said Mark Lesinski, president & CEO of Canadian Nuclear Laboratories, on the release of a \$1.2-billion, 10-year strategy and vision for the future of Chalk River Laboratories.

The strategy wasn't developed in isolation, says CNL (cnl.ca), adding it reflects input from global leaders in nuclear science, Atomic Energy of Canada Ltd., current customers and others in the nuclear supply chain, local communities and stakeholders, and from staff.

An investment of more than \$1.2 billion over 10 years is intended for the facilities and infrastructure of Chalk River. For more of the strategy highlights, visit tinyurl.com/ke8sxl4.

Birnie Electric turns half a century

Birnie Electric is celebrating 50 years of business and the Mississauga, Ont. company celebrated the milestone by giving back to the community (birnie.com).

Birnie hosted a gala at the Credit Valley Golf and Country Club to commemorate their anniversary and raise funds for the SickKids Burn Program through silent auctions.

More than 200 people attended the event that helped raise a total of \$20,400 for the burn program, including a matching donation from the company.

Birnie Electric was founded in April 1967, by Peter Birnie and started as a



Two generations of the Birnie family stand together for the official cake cutting (from left to right: Debbie, Tim, Peter and Dixie Lee Birnie).

PHOTO COURTESY BIRNIE ELECTRIC.



CNL releases \$1.2-billion vision for Chalk River. PHOTO COURTESY CNL.

two-person operation working out of a small office, the company says.

"It's been a long road from putting alarm bells into Mac's Milk stores and then getting to the stage where we're an integral part of building an LRT system in Toronto," Peter says.

Bartle & Gibson relocating in Kelowna and Airdrie



Bartle & Gibson's new Airdrie location.

PHOTO COURTESY BARTLE & GIBSON.

Bartle & Gibson (bartlegibson.com) is undergoing relocations in British Columbia and Alberta.

The Kelowna and West Kelowna locations will be merging and relocating to a new 35,000-sf building, located off Hwy 97, which will have a "larger and more efficient" sales counter (to help speed up in-store service) as well as a larger showroom, the company says.

In Alberta, Bartle & Gibson's Airdrie branch is also relocating to a facility with "three times the amount of warehouse space and a paved yard".

Siemens Canada, Kensington Capital collaborate for cleantech

Siemens Canada and Kensington Capital Partners Ltd. (kcpl.ca) have entered into a memorandum of understanding (MOU) aimed at cleantech energy solutions in the country (siemens.com).

The MOU identifies "numerous focus areas", including energy storage, transmission and distribution, combined heat and power plants, power generation, smart grid, micro grid and biomass.

"Cross-company teams are being formed and we are already actively exploring how to accelerate the development of energy and clean tech solutions that will power Canada's next 150 years," said Lucy Casacia, vice-president of Cities & Infrastructure Projects, Siemens Canada.

Lumenpulse founder F-X Souvay aims to take company private

lumenpulseTM
GROUP

Lumenpulse Inc.—the parent company of Lumenpulse Group, a manufacturer of LED lighting solutions—has entered into an arrangement agreement in which a consortium led by François-Xavier Souvay (founder, president & CEO of Lumenpulse) will acquire all of the issued and outstanding common shares of Lumenpulse (lumenpulsegroup.com).

Should the deal go through, Souvay would be the president & CEO of the private company, and remain involved in all aspects of the business and operations. The transaction values Lumenpulse at about \$600 million.

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Tufts Cove marks 2 million-hour safety milestone

Employees of Nova Scotia Power's Tufts Cove Generating Station in Dartmouth recently celebrated two million hours of service without lost time due to injury (nspower.ca).

This milestone raises the bar for safety excellence, the utility said, which previously recognized 1-million hour milestones achieved by the Eastern Territory Field Operations team and the Point Aconi Generating Station team.

Tufts Cove has 70 employees, including power engineers, electricians and maintenance persons.

VFD retrofits earn Galata Chemicals \$82,711



Left to right: Trevor Van Eerde, account specialist CDM, Alectra Utilities; Mark Henderson, senior vice-president, Energy Solutions & Services, Alectra Energy Solutions; Davide Achiluzzi, director of manufacturing innovation, Galata Chemicals; Sven Bachmann, plant manager, Galata Chemicals; Leo Ciampa, maintenance, Galata Chemicals. PHOTO COURTESY ALECTRA UTILITIES.

The Bradford, Ont.-based Galata Chemicals plant was recognized recently by Alectra Utilities (alectrautilities.com) for reducing its electricity consumption by 28% through the utility's Save on Energy Retrofit program.

Galata Chemicals (formerly Solucor), an international producer and marketer of additives for the polyvinyl chloride (PVC) and associated industries, was presented with a cheque for \$82,711 as a result (galatachemicals.com).

The company most recently says it completed the conversion of "key pieces of equipment" to variable frequency drives (VFDs), reducing its electricity consumption by about 2.9 million kWh per year—the equivalent of removing 325 homes off the grid, according to Alectra. It will result in electricity savings for Galata Chemicals of over \$400,000 per year, it adds.



Tufts Cove Generating Station in Dartmouth, N.S. PHOTO COURTESY NOVA SCOTIA POWER

Leviton establishes Lighting Business Unit

Leviton (leviton.com) says it has consolidated its recent lighting acquisitions into one new Leviton Lighting Business Unit.

This reorganization aligns Leviton's recent acquisitions of JCC, Contech Lighting and Intense Lighting under one leadership team. John Ranshaw, former president of Contech Lighting, will serve as vice-president and general manager of the newly integrated unit.

Fulham acquires Control Network Solutions

Fulham Co. (fulham.com) has acquired the assets of partner company Control Network Solutions (CNS), the UK-based creator of the elitedali smart lighting control and management system.

This transaction continues Fulham's "strategic European expansion", the company stated, noting it has been developing its relationship with CNS for over a year and utilizing CNS's elitedali (control-network-solutions.co.uk).

With this acquisition, Fulham can now offer a Digital Addressable Lighting Interface (DALI) and web-based, convergent smart lighting solution.

LG Chem scores prestigious energy storage award

LG Chem Ltd.—a player in lithium-ion batteries for automotive, stationary and consumer applications—received the Brad Roberts Award for Outstanding Industry Achievement from the Energy Storage Association (ESA, energystorage.org).

Presented during ESA's 27th annual conference & expo, the award recognizes companies demonstrating "comprehensive industry commitment and participation in the energy storage marketplace".

"With systems deployed in more than 20 states and throughout the globe—and advanced manufacturing located in Michigan—we now employ more than

600 people in the U.S. alone. This award recognizes the efforts of those people, and it recognizes our amazing partners, customers and industry," said Peter Gibson, head of ESS Sales for LG Chem, North America (lgchem.com).



LG Chem executives accept the Brad Roberts Award for Outstanding Industry Achievement during the Energy Storage Association (ESA) Annual Conference and Expo. PHOTO COURTESY LG CHEM.

Residential IoT trend to keep climbing

The global market for residential Internet of Things (IoT) devices and services, including forecasts for shipments, installed base, average selling prices and revenue was the focal point in a report from Navigant Research (navigantresearch.com).

The trend is expected to continue grow during the next decade, particularly as industry stakeholders meet the demand for integrating disparate devices and in-home systems, the organization discovered. It also stated global revenue from shipments of residential IoT devices is expected to total more than \$682 billion from 2016 to 2026.

Smart thermostats, solar PV installations, connected lighting, and electric vehicle (EV) charging systems are among the numerous products consumers are purchasing, according to the report. **EB**

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THE 2017 CANADIAN TRUCK KING CHALLENGE

HOWARD J. ELMER

The Canadian pickup truck market is huge, catering to the multiple needs of work and home—sometimes all in one package. In fact, pickups serving both the workplace and the family are becoming the norm. This fact alone makes choosing the right one simply that much more complex.

Trying to offer truck buyers an unbiased perspective is one of the reasons I started the Canadian Truck King Challenge about a decade ago. Each year since, my group of journalist judges has continued to fulfil that original mandate: testing pickup trucks and vans the same way that owners use them. This real-world competition includes empty evaluations but, more importantly, testing while loaded and while towing.

The judges are members of the Automobile Journalist Association of Canada (AJAC): men and women who devote their entire year to driving, evaluating and writing about the Canadian automotive marketplace. Collectively, they brought over 200 years of trucking experience to this year's testing, driving a combined total of almost 4000 km over three long days.

This year, judges travelled from Quebec in the east and British Columbia and Saskatchewan in the west to attend the event, which is conducted at a private 70-acre site in the Kawartha Lakes region of Ontario.

\$47,090
Honda Ridgeline
price as tested

\$44,695
Chevrolet Colorado
price as tested

\$58,110
Ram 1500 price as tested

\$59,890
Chevrolet Silverado
1500 price as tested

What did we test?

The market offers up different trucks each year, but there are rarely more than two new trucks in a given year, so we also look to fill out each group to offer a decent-sized comparison.

This year, we had a field of 11, 2017 pickup trucks, falling into four classes: mid-size, full-size half-ton and full-size 3/4-ton. (The full-size 1-ton trucks were tested in London, Ont., a few days later. No commercial vans were tested this year, as there was not enough new stuff from what we did last year.)

Testing method

Each judge drives each truck empty, then with payload and, finally, with a trailer in tow, over the same route; one after the other, back-to-back. Yes, it gets repetitive, but this is the best way to feel the differences between the trucks. Trucks are scored in 20 different categories; those scores are then averaged across the field of judges and converted to a percentage. Finally the *As Tested* price of each vehicle is also weighted against the average price of the group (which adds or subtracts points) for the final outcome.

The route we use is called The Head River test loop. It's a combination of public roads stretched out over 17 km. The loop starts on gravel, moves to a secondary paved road and, finally, highway. Speed limits vary from 50 km/h to 80 km/h, and the road climbs and drops off of an escapement several times, providing



good elevation changes. At its lowest point, the course crosses the Head River twice (hence the name).

Finally, 4WD-equipped trucks (which was all of them) are driven on an internal off-road course built for that purpose at the IronWood test site.

This year, the mid-size trucks carried a payload of 500 lb and towed 4000 lb. The full-size half-tons hauled payload of 1000 lb and towed 6000 lb. The 3/4-tons towed 10,000 lb and also used 1000 lb for payload. We choose these loads by taking into consideration the lowest manufacturer set limits among each group of entries. (The weights we use never exceed those published limits.)

For the 1-ton trucks, we switch over to the London, Ont., location, where we have partners who loan us the weight and trailers necessary to test the big pickups. Patene Building Supply and IKO let us use 4000 lb of shingles for payload, while CanAm RV centre lets us tow 15,000-lb 5th-wheel travel trailers.

PHOTOS COURTESY CANADIAN TRUCK KING CHALLENGE



▲ Each judge drives each truck empty, then with payload and, finally, with a trailer in tow, over the same route; one after the other, back-to-back. This is the best way to feel the differences between the trucks.



▲ Canadian Truck King Challenge judges are members of the Automobile Journalist Association of Canada (AJAC): men and women who devote their entire year to driving, evaluating and writing about the Canadian automotive marketplace.

Categories and competitors

MID-SIZE GROUP

- Honda Ridgeline: 3.5L V6 gas, 6-speed auto, AWD, crew cab, touring trim
- Price as tested: \$47,090.
- Chevrolet Colorado: 2.8L Duramax turbo-diesel, 6-speed auto, 4WD, crew cab, Z71 trim.
- Price as tested: \$44,695.

Between the two mid-size trucks, the Honda impressed the judges. As with anything new, it had an edge, while the Colorado diesel was a big splash when it debuted last year. However, it wasn't just the new factor that pushed its score past that of the Colorado. The prior generation of Ridgeline was a niche, quirky truck that appealed to a select buyer but, this time around, the Ridgeline has moved closer to the mainstream while retaining some of its unique characteristics.

It did most everything well (e.g. payload, towing... even off-road) and still offered the most car-like ride. The judges rewarded Honda for a significant generational update. Toyota opted not to give us use of a Tacoma (which we tested last year) and Nissan did not offer up a Frontier (no doubt because it is in the last year of its current cycle before a major upgrade).

RANK	SCORE	ENTRANT
1	75.5 %	Honda Ridgeline
2	72.2 %	Chevy Colorado

\$60,025

Toyota Tundra
price as tested

FULL-SIZE HALF-TON GROUP

- Ram 1500: 5.7L Hemi V8 gas, 8-speed auto, 4WD, crew cab, sport trim.
- Price as tested: \$58,110.
- Chevrolet Silverado 1500: 5.3L V8 gas, 6-speed auto, 4WD, crew cab, Z71 trim.
- Price as tested: \$59,890.
- Nissan Titan: 5.6L V8 gas, 7-speed auto, 4WD, crew cab, PRO-4X trim.
- Price as tested: \$63,050.
- Toyota Tundra: 5.7L V8 gas, 6-speed auto, 4WD, crew cab, TRD Pro trim.
- Price as tested: \$60,025.

\$63,050

Nissan Titan
price as tested

The full-size half-ton category is the meat of the market, accounting for just under 80% of total pickup sales



▲ The Honda Ridgeline did most everything well (e.g. payload, towing... even off-road) and still offered the most car-like ride.



▲ For the 1-ton trucks, we fielded two competitors: the Ram 3500 and Silverado 3500. After a full day, the judges preferred the Chevy's ride quality while towing.

in Canada. As such, it is one of the most competitively fought over by automakers. For us, it's a segment we consider very carefully—particularly when it comes to deciding which vehicles to test.

This year, we came up with an idea that should appeal to this large group of buyers. We asked each of the manufacturers to give us the one half-ton that was its best seller in terms of most popular combination of body style, trim and powertrain. This way, we'd be testing the trucks Canadians buy most often.

Some, like the Nissan Titan, are all new; others, like the Chevy and Ram, are midway through their current life cycles. Toyota chose to give us an off-road version of its Tundra, the TRD Pro. This is the newest truck they had, not really the most-often purchased, but it was their choice to enter it. As you'd expect, the Tundra performed really well off-road.

The other entries were exactly what we asked for. The Ram emerged as the judges' choice for best all-round half-ton. However all the scores were close, and the Chevy also performed well.

Of course, I have to mention who

was missing from the list: Ford. The leader in half-ton Canadian truck sales chose not to compete. Despite having entered trucks in every other Truck King Challenge competition since 2006, they declined this year's competition. No specific reason was given, and while I certainly have my own theories as to why, I won't speculate. They were invited. They said No. We continued without them.

RANK	SCORE	ENTRANT
1	79,4 %	Ram 1500
2	76,7 %	Chevrolet Silverado 1500
3	74,3 %	Nissan Titan
4	73,7 %	Toyota Tundra

FULL-SIZE 3/4-TON GROUP

- Ram 2500: 6.7L Cummins I6 turbo-diesel, 6-speed auto, 4WD, crew cab, Laramie trim. - Price as tested: \$86,830.
- Nissan Titan XD: 5L Cummins V8 turbo-diesel, 6-speed auto, 4WD, crew cab, PRO-4X trim. - Price as tested: \$64,950 (yes, about \$20K less than the other two).

\$86,830

Ram 2500 price as tested

\$64,950

Nissan Titan XD price as tested

\$82,560

Chevrolet Silverado 2500 price as tested

- Chevrolet Silverado 2500: 6.6L Duramax V8 turbo-diesel, 6-speed auto, 4WD, crew cab, LTZ trim. - Price as tested: \$82,560.

Note that each of the trucks in the 3/4-ton category was diesel-powered. As these are the big haulers most commonly bought by Canadians, we stressed them by towing 10,000 lb of concrete. The judges made a point of saying that it was only under load that they could *really feel* how the trucks behaved.

The scoring here was close, as each truck performed well, though the Ram 2500 with the Cummins 6.7L diesel did come out slightly ahead. What was more interesting was the Nissan HD, which tied with the HD Silverado.

The Titan XD is the lightest (GVWR) of the three trucks, with the lowest tow and payload limits, but this is also reflected in its price, which elevated its overall score. However, these lower limits are not a disadvantage; if anything, it means the segment is growing and offering more choices for consumers.

This was the first time we tested the all-new 5L Cummins diesel V8. Meantime, it's worth noting that Chevy's veteran 6.6L Duramax diesel will be generationally updated next year.

RANK	SCORE	ENTRANT
1	77,0 %	Ram 2500
2	74,9 %	Nissan Titan XD
3	74,9 %	Chevrolet Silverado 2500

FULL-SIZE 1-TON GROUP

- Chevrolet Silverado 3500: 6.6L Duramax V8 turbo-diesel, 6-speed auto, 4WD, DRW, crew cab, High Country trim. - Price as tested: \$83,390.
- Ram 3500: Cummins I6 turbo-diesel, 6-speed auto, 4WD, DRW, crew cab, Laramie trim. - Price as tested: \$88,085.

For the 1-ton trucks, we fielded two competitors: the Ram 3500 and Silverado 3500. Again, we missed having Ford, particularly because its 2017 Super Duty trucks are all-new.

However, we performed a full field of tests on the Ram 3500 and

Silverado 3500. After a full day of driving both trucks back-to-back, the judges awarded the win to the Chevy Silverado 3500. Both trucks worked well; the key difference judges noted was ride quality when towing, and they preferred the Chevy.

RANK	SCORE	ENTRANT
1	75.1 %	Chevy Silverado 3500
2	71.8 %	Ram 3500

Fuel economy data

For the fourth year in a row, we had MyCarma of Kitchener, Ont., collect and translate fuel economy data during the Challenge. Using data loggers plugged into the OBD readers of each truck, the results are as real-world as they get. The report gives the fuel consumption results for each condition during testing—empty runs, loaded results, even consumption while towing. The averages include each judge’s driving style, acceleration, braking and idling (we don’t shut the engines down during seat changes).

The full results (empty, loaded, trailering) will be available for download at EBMag.com after publication of this edition. At a glance, though:

- Chevrolet Colorado beat the Honda Ridgeline in the mid-size group.
- In the half-ton category, the Ram 1500 led the pack, followed by Chevrolet Silverado, Toyota Tundra and the Nissan Titan.
- The Chevrolet Silverado 2500 edged out Nissan Titan XD and Ram 2500 in the 3/4-ton category.
- In the 1-ton group, the Chevrolet 3500 led the Ram 3500 in fuel efficiency.

Who’s the champ?

Competition is good, as it brings sharp, constant innovation. Consider Nissan, which is virtually a new player in the market, while the others have brought significant improvements to

powertrains. These changes give buyers an ever-widening range of choices. As for electronic conveniences and luxury appointments, the variety and range of content for 2017 continues to expand unabated.

All the trucks in this year’s Challenge performed well and, as a group, you’ll notice just how close the scores are. This makes

crowning a winner very difficult for the judges, as not one of these trucks is “bad”. The scores also reflect how fierce the competition is among the truck builders.

Frankly, there are few segments where the profits per unit are higher, which compels truck builders to bring their A-game.

That said, an overall winner must be crowned, so the

overall winner of the 10th annual Canadian Truck King Challenge—with the highest collective score of 79.4%—is the 2017 Hemi-powered Ram 1500. Congratulations! **EB**

Howard J. Elmer is an award-winning automotive journalist, and member of the Truck Writers of N.A. and AJAC. He is an on-air reporter for Motoring Television and chief contributor to Autofocus.ca.



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645_JUNE17



Arc flash risk assessment in the workplace

Method 1 of 2: Arc flash PPE category method

I am regularly asked by professionals from a variety of electrical sectors to help them nail down comprehensive methods for executing safe electrical work practices in real-world scenarios. This is where the rubber hits the road, involving some of the most important interactions between crews and their management teams.

And yet, it's not so much about electrical safety specifically but rather electrical safety *management* within an overall H&S (health & safety) management system.

It is my strong belief that safe work always starts with the implementation of all-inclusive risk assessments, specific to any task in the field.

Having covered the risk assessment procedure (RAP) for shock last time (EBMag March 2017), I now want to share a general overview of the RAP for arc flash against the backdrop of the "Arc flash PPE category method" a.k.a. the "Table method". (I'll save incident energy analysis methodology for a future column.)

As always, it is crucial you refer to CSA Z462-15 "Workplace electrical safety", as it contains specific details, notes and workflow that should be embedded in your business' electrical-specific, *documented* procedures.

Z462-15 Clause 4.3.5.1 General states, in part:

An arc flash risk assessment shall be performed. This assessment shall

- (a) determine if an arc flash hazard exists. If an arc flash hazard exists, the risk assessment shall determine
 - (i) appropriate safety-related work practices;

- (ii) the arc flash boundary; and
- (iii) the PPE that personnel within the arc flash boundary shall use

Determining whether an arc flash hazard even exists is the first priority; if so, the next three steps naturally follow. Arc flash hazards go nearly hand-in-hand with electrical workplaces, but Z462-15 Table 4A, "Arc flash hazard identification for alternating current (ac) and direct current (dc) systems" provides guidance on determining whether an arc flash hazard does, in fact, exist.*

This is a Yes or No question, relying upon the arc flash PPE category method. The information here cannot possibly contain every possible work scenario, but many of the *classics* are there. When Yes, then steps (i)(ii) and (iii) are required. Let's look at them in greater detail.

Step (i) can be covered simply by Clause 4.3.5.2 "Documentation"; in this case, "the appropriate safety-related work practices".

Step (ii), when using the arc flash PPE category method (calculations not being used), goes to Clause 4.3.5.3 for the "Arc flash boundary determination". This boundary shall be an approach limit at a distance from a prospective arc source within which a person could receive a second-degree burn were an electrical arc flash to occur, and may be determined by Z462 Table 4B or 4C "when the requirements of these tables apply".

When the requirements of these Tables are not met within the constraints of short-circuit current available and fault clearing times, the arc flash PPE category method *cannot* be used and an incident energy analysis must be performed.

There's a very important caveat in Step (iii) when selecting the PPE to be worn by personnel within the arc flash boundary: Clause 4.3.5.4.1 states that *only one* of the methods described in Clauses 4.3.5.4.2 and 4.3.5.4.3 shall be used for the selection of PPE. Either method, *but not both*, may be used on the same piece of equipment. The results of an incident energy analysis for specifying an arc flash PPE Category in Table 5 shall be prohibited.

When using the Clause 4.3.5.4.3 arc flash PPE category method, the requirements of Clauses 4.3.7.3.15 and 4.3.7.3.16 shall apply for arc flash PPE selection. Table 5 provides the arc flash PPE requirements for each category under this method. Annex H provides guidance on selecting protective clothing and other PPE.

Clause H.2 covers the use of Tables 4A, 4B, 4C and 5,

and is a simplified approach for providing minimum PPE for electrical workers within facilities boasting large and diverse electrical systems. The comprehensive quantifications of arc flash energies can be challenging, and needs to be completed by qualified and competent people. Ensure you are dealing with those truly experienced in getting these values correct. Otherwise, it's impossible to select PPE appropriate to the circumstances. **EB**

Notes

* See Clauses 3, 4.3.1, 4.3.7.3.15 and 4.3.7.4.2, Table 5, Annex H.

A subject-matter expert on electrical safety, Mike Doherty is an independent electrical safety consultant and trainer for eHazard in Canada and the president and owner of Blue Arc Electrical Safety Technologies Inc. He is a licensed electrician and an IEEE senior member, and has served as the Technical Committee chair for CSA Z462 since its inception in 2006. His specialties include electrical safety management, consulting, training, auditing and electrical incident investigations. Mike can be reached at mike.doherty@e-hazard.com.

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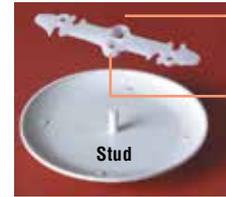
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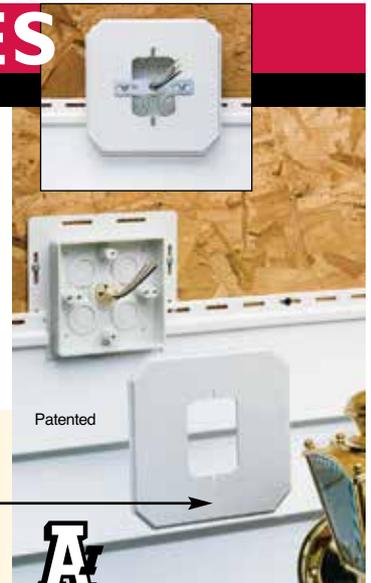
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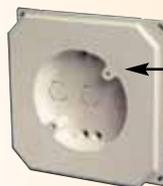
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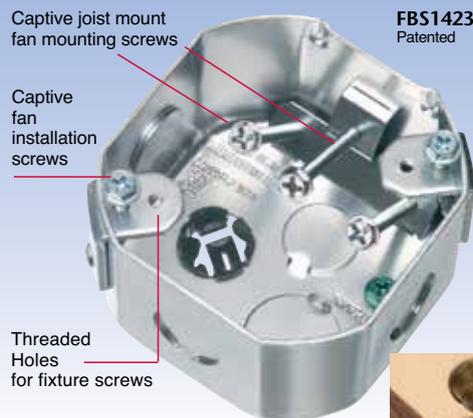
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▲ The basement was one of the rooms noted in site reports for its “well thought-out” pipe layout, designed in “such a way that all the couplings, regardless of size, are perfectly lined up”.

NORTHERN ROCKIES RECREATION CENTRE REBUILDS

Finding electrical success, despite challenging location

/ RENÉE FRANCOEUR

When Houle Electric returned to finish Phase 3 of the Northern Rockies Recreational Centre in Fort Nelson, B.C., they knew the facility was close to the community’s heart.

“It was an iconic project for us,” says Lonnie Trelenberg, Houle’s G.S.C. estimator/project manager for the NRRC project. “There’s so much sentimental value on so many different levels for this project.”

Located on the edge of the northern B.C. wilderness, Fort Nelson is about a 17-hour drive from Vancouver along the Alaska Hwy, and boasts a population of just over 4000.

There are not a whole lot of facilities for the isolated community, Trelenberg explains, which made it all the more devastating when the first recreational centre’s roof collapsed in 2007.

The rebuild occurred over three phases, of which Houle was involved in the first and last. Phase 3 consisted of a 35,000-sf addition to the existing complex in the shape of a new aquatic centre, public viewing area, climbing wall, squash court, Rotary play space, walking track, meeting room, partial basement and 3rd-storey mezzanine for the mechanical and electrical rooms.

“We took on the electrical contract and the controls contract with the mechanical contractor [Chrisman

Plumbing & Heating Ltd.] because we have a good relationship with them,” Trelenberg says. “On our low-voltage division, we’d done the rest of the facility, so we had a pretty good idea of what was going on.”

Houle was responsible for the HVAC controls/DDC (direct data control), pool controls, access control, CCTV (Genetec products), and a new fiber optics data network system.

“Basically, anything that had power going through it, we were the ones taking that on.”

It was Trelenberg’s first big project with the company and he says that, while he expected challenges, he didn’t think it would be to the degree they’d experience.

5

DDC control panels

25,000
ft

of cable

Logistical nightmare

Fort Nelson's isolation didn't make things a peach.

"Just trying to get the manpower to the location was a struggle... never mind the material," Trelenberg says.

He says only a handful of logistical companies make their way up to the town, as it's an "extremely dangerous" highway, with long stretches between communities.

"Shipping up there was absolutely excruciating," he says. "It was a bi-monthly process where there were delayed shipments."

There was a 40% increase in the project scope with no extended construction period, Houle notes. Add in the frigid temperatures of working in -45°C and trade stacking (the concrete guys were there while Houle was trying to install the electrical, and everything dominoed off of that), and the deadline situation was looking pretty grim.

"We had to break it all down and strategize. We planned two weeks in advance at all times, with who was

going to work where and with how much material," Trelenberg says.

Material delays lead to "people just standing around". Houle put a stop to that by renting six shipping storage containers about a half-kilometre away.

"This was constantly maintained to make sure we had material there when we needed it, but we had to be careful not to overbuy, either."

Houle also purchased and outfitted a 50-ft enclosed highway trailer from a local business with heated and insulated office space, and a small material parts warehouse to be kept onsite.

Every worker was then set up with their own workstations and permitted to "fill them up" twice a day. If a worker couldn't finish their designated job, they had a backup plan or two, Trelenberg says, to keep the project flowing.

He even had one foreman dedicated solely to planning—a saving grace with the 55 revisions made to the contract.

Houle's prefabrication plant in Vancouver also came in handy, as they tried to have as much built offsite as possible.



▲ Houle installed the Philips Colour Kinetics system in the aquatic centre. It's a multi-colour, LED DMX lighting control system that allows for entertaining lighting shows and colour changing.

"Because of the trade loading, we really pushed prefab on this job," Trelenberg says. "A lot of our assemblies were already prebuilt, like with our bracketry and our light fixtures. So we'd have a box with a piece of wire, connectors, all ready to go, all wired up. All we had to do was bolt it to the conduit, bolt it to wall, snap it into the light connection and it was done—that saved us a considerable amount of time."

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Disney-esque lights in the north

There's some Disney-esque magic in the aquatic centre pool, according to Trelenberg, thanks to the Philips Colour Kinetics system: a multi-colour, LED DMX lighting control system.

"Have you even been to Disneyland or Disney World? It's like the lights there—the Disney Castle at night—done through a digital, programmable lighting system. It's much more toned down than the Disney version, but every light can produce its own images to form one big image," Trelenberg says.

Houle helped with the pre-programming so the rec centre can hold lighting shows in the pool and change the lighting colours.

"It's an extra level of enjoyment," Trelenberg says. "And staff at the facility believed it could help attract more [people] to programs like water aerobics."

And it seems to have worked—according to the Northern Rockies Regional Municipality, the new aquatic centre has seen over three times the usage during its first three months after reopening as compared to the same period the year before.

The "concert-level professional lighting system" consists of a 200-head total lighting rail on the north and south sides of the pools, Houle explains, noting the rail system also incorporates an arrangement of low-power consumption emergency lighting for a "sleek look".

A benefit to the light rail system, according to Trelenberg, is a reduced reflection off the water's surface, meaning less glare for swimming competitors and spectators.

"You can actually see more clearly into the water, now," he says.

Another advantage is all the savings when it comes to maintenance, as the pool does not have to be drained and no special equipment is needed (other than a lift) to maintain the lights. Contrary to typical aquatic centres, no fixtures were installed over the pool; they're all over the decking.

"The light system actually follows the curvature of the building, so I find that extremely cool," Trelenberg adds.

The pool also has a unique HVAC system, a Reliable Controls product, where air from the pool space is reused to heat the water, according to Nick Hauff, a Houle division manager. "We have to get rid of all the humidity and, instead of wasting that, we put it into reheating."

The mechanical systems also include using the "low-grade waste heat" from the refrigeration plant—in lieu of natural gas—to heat the aquatic centre building, domestic water and pool water. The added heat recovery system includes heat exchangers, water storage tanks, and circulation and heat pumps. The annual energy cost savings of the added heat recovery system is equivalent to about 3300GJ of natural gas, according to Houle.

No second chance

As the addition was largely made of concrete, precise planning was also required when it came to the conduit.

"All of our conduits came through the concrete slab and then started coming up the walls, and it literally could not be an inch out; if it was, it would not be in the concrete wall that it was supposed to be in," Trelenberg says.

\$2,514,682

Houle's total project cost

3300 GJ

Natural gas saved by the heat recovery system

35,000-sf

Size of Phase 3 addition

◀ No LED fixtures were installed over the pool; they're all over the decking, saving on maintenance costs.

To help conquer this challenge, they relied on CAD back at the office working in tandem with a remote management tool.

"This meant preplanning in the office and sending it back to the site—making sure the site conditions matched up—because sometimes there's discrepancy between architectural and electrical. It was all about triple-checking," he says. "There was no second chance. Once that concrete was poured, it was final."

In the end, that planning all worked out, he says, and deadlines were met; Houle's costs were around \$2.5 million, while the overall project came in around \$34 million, according to the municipality.

Top-notch team

Despite all of the trials and frustrations, Trelenberg says the one thing he is most proud of is the workmanship.

"Our workmanship was so top-notch that every time we had a site visit from an engineer or the electrical authority, they actually made comments on our site review reports."

An example of one goes like this:

The cabling and conduit routing in [...] the site in general are works of art. Congratulations to Houle on an excellent job.

Another comment credits the company for being proactive and thinking ahead to avoid future problems, and yet another applauds the pipe layout in the basement.

(Note: Trelenberg and Houle would like to salute Bird construction, MMM Engineering, Kaisan Architecture, and JM Bean Engineering for their the help and support on the project.)

"We had the chance to influence other trades, because we were so organized—we built our own project schedules and presented those at the trade meetings. We suggested things like, how about the plumbers work over here for that? We didn't just focus on what we were doing, but also on who was affecting us, because you need that cooperation," Trelenberg says. "We really grabbed the bull by the horns." **EB**



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ENERGY-SAVING LIGHTING STANDARDS ARE MEANINGLESS! (WITHOUT INTEROPERABILITY)

RUSS SHARER



Smart lighting applications have the potential to reduce energy costs for office buildings and industrial facilities by as much as 90% according to Gartner, a research and advisory company.* However, smart lighting goes beyond simply installing solid-state lighting (SSL) and retrofitting programmable LEDs.

As Gartner analysts note, smart lighting energy savings require five specific components:

1. LED lighting
2. Sensors and controls
3. Connectivity
4. Analytics
5. Intelligence

Manufacturers are already starting to build intelligence into their lumin-

aires with programmable features in the SSL components. So the challenge, then, isn't making SSL systems smarter—it's with communications and connectivity. Lighting control standards are still evolving and, without a common language, connectivity is useless. We need interoperable standards to realize energy savings from smart lighting.

Before delving into a discussion of lighting communications standards, let's consider some of the potential energy-saving applications for smart lighting:

- Using SSL lighting connected to sensors makes it possible to adjust light levels based on conditions such as the amount of sunlight present or room occupancy.

In many ways, standards are like opinions: everyone has one.

- Connecting those lights to an automated control system usually qualifies your building to receive a lower energy rate in exchange for participation in demand response (DR) programs.
- Dark areas that need to be lighted at night (e.g. parking lots) can be equipped with sensors to illuminate only those areas required to get to your car, or for safety, or where motion is detected.
- Many buildings are mixing older LED fixtures with newer ones, which tend to be brighter. Smart lighting controls can tune individual unit light intensity or colour temperature to provide consistent illumination.

- Cities are looking at smart lighting for specialized applications, such as sensor controls for streetlights and pathways, tunable outdoor lighting, and controlling streetlights to aid with law enforcement and crowd control.

As an added bonus, providing full-spectrum light using LED temperature controls and support functions, such as colour tuning, can promote better health and productivity.

IoT (internet of things) promises to connect these smart lighting fixtures for centralized control. Wireless controls and grids, and wired lighting connections can support IP traffic for monitoring and managing light. In fact, a growing number of commercial buildings are installing PoE (power-over-ethernet), using ethernet connections to provide lighting power as well as connectivity.

Unfortunately, even with the proliferation of IoT, control standards are still in flux. IP data traffic can monitor performance, provide analytics and statistics, and support basic functions, but sophisticated controls require more comprehensive standards specifically designed for lighting.

As with all fledgling applications, standardization has yet to establish a common ground for interoperability.

Standards provide a lighting control *lingua franca*

It has been proven that well-defined industry standards promote growth and technology adoption in other industries. Consider the impact that Bluetooth and Wi-Fi have had in wireless connectivity: they are widely adopted because the standards are well-documented and well-understood; vendors can design products that are guaranteed to interoperate with other products complying with the same standard. That's why you can buy a smartphone, tablet or laptop from any manufacturer and be assured they will connect with Wi-Fi and Bluetooth devices from any other vendor.

Adopting common standards promotes wider standards adoption. Metcalfe's Law (coined by ethernet creator Robert Metcalfe) suggests the value of a connected system is

equal to the square of the number of connected users or devices (Figure 1). The same is true for smart lighting. The value of the smart lighting infrastructure (including the amount of energy savings) is equivalent to the number of devices squared but, to realize that value, the smart luminaries must have common protocols or standards for communications.

An explanation of how networking protocols operate demonstrates how standards promote interoperability. I like to use the analogy comparing the OSI (Open System Interconnection) protocol stack for networking with the postal service (Figure 2).

At the top, the Application layer provides the information or data presentation, much like a letter. The Session layer is what allows applications to communicate, much as a letter is carried in a mail bag.

The Transport layer moves the data between systems, just as a mail cart routes the mailbag to the right bin for delivery. The Network layer is responsible for establishing the route to the end point, much as a postal container is tagged using postal codes to be routed to its final destination.

The Data Link layer is responsible for decoding the message, just as the mail carrier uses zip codes and addresses to sort mail for final delivery. The entire infrastructure is supported by the Physical layer, which is the highway that provides end-to-end delivery.

I call this a "wired" protocol. Were the Data Link layer an airplane, you could consider it a "wireless" system.

Standardized lighting control protocols will have to operate in much the same way. Lighting control data must be generated, routed, delivered and decrypted at the receiving end so the programmed instructions can be turned into executable instructions. Protocols need to be understood and acknowledged at each step, just as zip codes provide a common protocol for routing mail.

When you don't understand how to read the routing codes, the package gets lost. Similarly, without a common control standard, the instructions are meaningless; it would be similar to sending a letter written in English to a recipient who only reads Mandarin.

FIGURE 1

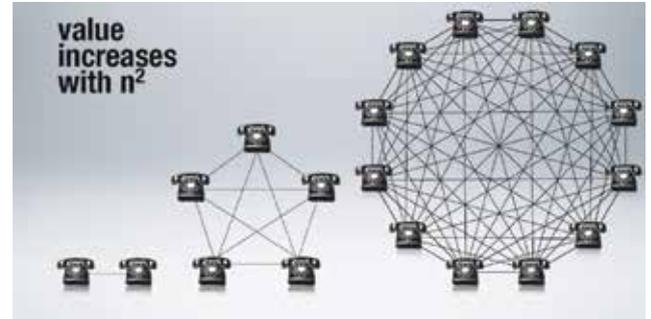
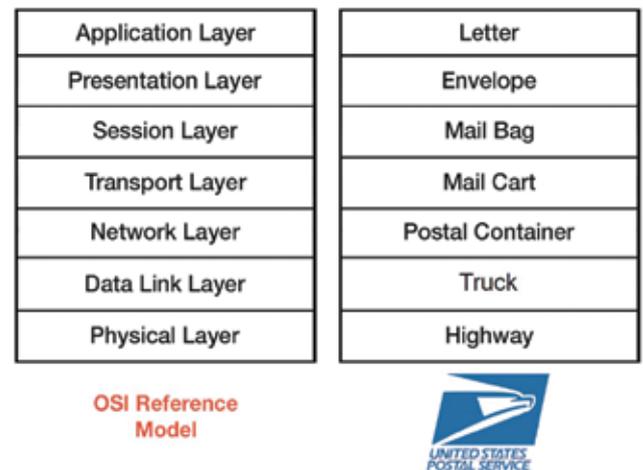


FIGURE 2



A single-vendor solution tends to create a closed system rather than a new standard; it takes multiple vendors working together to agree on a standard.

The race to win the standard

As with any emerging technology, creating standards is largely a footrace to see who can come up with the first viable approach. The early adopters will embrace the first solution to a standardization problem and, the more widespread the adoption, the greater the advantage to vendors with the first standards proposals.

However, it seldom pays to back the first vendor to provide a solution. A single-vendor solution tends to create a closed system rather than a new standard; it takes multiple vendors working together to agree on a standard. For example, consider the evolution of home videocassettes. Sony's Betamax platform faded as a proprietary system while VHS flourished because Philips made the standard openly available to other manufacturers.

Similarly, consider the fate of Novell's network operating system, NetWare. Novell had a virtual monopoly with NetWare as the network operating system of choice for personal computers and offices in 1990.

Today, NetWare is extinct and has been replaced by open internet standards that guarantee communication and interoperability.

To create a common standard, vendors have to agree on protocols that promote interoperability. Even manufacturers that command a large market share, such as Apple, realize their technology won't thrive without interoperability, which is why Apple offers its iOS platform as open source code to third-party developers.

Everyone has their own standards

In many ways, standards are like opinions: everyone has one. The lighting industry has a number of control standards that are already being adopted and adapted, and are favoured by different vendors, including:

ZIGBEE

Zigbee (zigbee.org) is a wireless specification (IEEE 802.15.4) for personal area networks involving low-power applications (10 to 100 metres), such as home automation. Zigbee provides control over different types of devices, including lighting, and has already been endorsed by the Connected Lighting Alliance. Many experts consider Zigbee to be the ideal standard for managing devices such as lighting as part of the internet of things.

TALQ

The TALQ Consortium is working to create a software protocol specification that can serve as an interface between control systems and outdoor lighting networks (talq-consortium.org). The protocol is structured to be independent of the physical communications layer (e.g. cable, wireless, powerlines) to make it more versatile and support future enhancements.

DALI

The Digital Addressable Lighting Interface (dali-ag.org) is growing in popularity as the wired standard for digital lighting controls and building automation, including lighting. Founded by Philips in 1964 and specified by technical standards IEC 62386 and IEC 60929, DALI

will likely serve as a successor to conventional lighting controls, providing a common interface for interoperability.

Even with these standards, compliance is not assured. For example, the DALI standard has approved compliance testing to qualify for a DALI trademark, but some vendors offer DALI "super set" functionality. These derivative DALI implementations are vendor-specific and are not compatible with other DALI systems.

Zigbee compliance is even more convoluted because of differing interpretations of the standard. For example, the Zigbee 0-10V dimming standard for LEDs does not specify when a luminaire *actually* turns Off, so two luminaires can receive the same control signal and one may turn Off while the other just dims to a low lighting level.

Interoperability is going to become increasingly important as new lighting technologies continue to evolve, and as building managers seek new ways to extend and automate lighting control—as well as save energy. That means building architects and administrators are going to demand more systems and vendor interoperability and look more closely at certifications and standards compliance claims.

For vendors and manufacturers, it also means more testing and more rigorous certification procedures to prove interoperability. Existing standards are sure to mature and new standards will emerge. Lighting vendors are going to have to ensure that legacy luminaires and next-generation lighting systems support common standards, especially lighting controls. And lighting customers are going to have to look carefully to ensure products comply with the right standards and offer proven interoperability. **EB**

Notes

* "Gartner says smart lighting has the potential to reduce energy costs by 90%". July 2015, tinyurl.com/kb54pak.

Russ Sharer is vice-president of Global Marketing & Business Development for Fulham Co. Inc., a manufacturer of lighting subsystems and components for lighting manufacturers. He possesses over 25 years of experience in B2B marketing and sales, including successful software and network equipment start-ups.



William C. "Bill" Smith—president of the **Electrozad Group of Companies** (electrozad.com)—was honoured with **Electro-Federation Canada's** 2017 Industry Recognition Award (electrofed.com). Smith started his career working part-time at

Electrozad Supply while attending St. Clair College, according to EFC. His first full-time job in the



industry was with State Electric in 1974. See the video at tinyurl.com/mboaxdf.



Kelly Hanson is the new president of **Southwire Canada** (southwire.ca), replacing **Axel Schlumberger**, who is assuming leadership responsibilities within Southwire's Power Systems & Solutions group. Hanson most recently served as VP of marketing for Southwire's Power Systems & Solutions group.



Louis Beaulieu, general manager of **Ouellet Canada**, announced the appointment of **Stéphane Larocque** to the position of national sales manager (ouellet.com). Larocque has been with the company for three years, reports Ouellet, adding he spent the last year supervising the Quebec sales team while managing the Greater Montreal territory.



Jay Hough (left) and **Paul MacAloney** (right) have joined the **Legrand** team as national business development managers (legrand.ca).

The two will lead the sales of three Legrand product lines in Canada—Vantage Lighting Controls, and QMotion and Solarfective (the company's residential and commercial shading businesses). They will also support Legrand's overall building control systems strategy, the company stated, as led by Wattstopper.



Peter Gregg (photo) is leaving the presidency of **Alectra Energy Solutions Inc.** (alectrautilities.com) for Ontario's **Independent Electricity System Operator** (IESO, ieso.ca) later this summer to assume the duties of president & CEO. Gregg

takes over from **Bruce Campbell**, who will be retiring after four years as IESO head. IESO also welcomed three directors to the board: **Ersilia Serafini**, **Chris Henderson** and **Glenn Rainbird**. **EB**



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Noark Electric's Ex9CKT DP contactors



Noark has a new range of definite purpose contactors—the Ex9CKT Series DP—which are available in 20-40A range in 3- and 4-pole configurations, and feature an industry-standard mounting plate with accessible mounting holes.

noark-electric.com

Ideal bi-metal hole saws

Ideal Industries (Canada) Corp. says its new line of bi-metal hole saws employs M42 high-speed steel, with an

additional 8% of premium cobalt, which promises increased strength and greater wear resistance, making them the saws less prone to chipping. idealindustries.ca

Alfra's AMT mounting tables from ITC



ITC Electrical Components says a new solution from Alfra Tools makes assembling and wiring a control panel or

its backplate safe, practical and ergonomic. The three models of the Alfra AMT family of assembly tables feature a free-standing, solid caster-equipped base with an adjustable swivel frame. itcproducts.com

Leviton family of SS enclosed disconnect switches



Leviton's Powerswitch non-fused disconnects in stainless steel enclosures include 30/32A, 60A, 80A and 100A configurations with a watertight red and yellow over-mould handle, as well as three provisions for padlocks. leviton.com

Panasonic's FZ-Q2 and FZ-A2 tablets



Panasonic has introduced two solutions to its Toughbook family: the FZ-Q2 semi-rugged 2-in-1 Windows and the FZ-A2 fully-rugged 10.1-in. Android Toughpad tablets. The FZ-Q2 comes with a standard full-sized keyboard and built-in protection, equipped with the 6th Generation Intel Core m5 vPro processor. Meantime, the FZ-A2 weighs less than 2 lb and is powered by an Intel Atom Processor with software encryption. panasonic.ca



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Eight Carhartt FR styles for women



Carhartt is adding eight new women's styles to its flame-resistant (FR) line. The assortment includes a jacket, denim and canvas pants, coverall, woven shirt and three knit shirts—all "purpose-built for women working in the electric utilities, and oil & gas industries". These products will be available July 1 at Carhartt's industrial distributors, and online August 1. carhartt.com

Algiz 8X rugged tablet



Handheld Group's Algiz 8X ultra-rugged tablet computer offers communication features such as LTE and dual-band WLAN, along with an 8-in. projective capacitive touchscreen that is "ultra-bright" and built for outdoor use. The tablet can also enable glove-mode or rain-mode, while the chemically strengthened glass can survive an impact test in which a 64-g steel ball is dropped on the screen 10 times from a height of 1.2 m. handheldgroup.com

DTI 250 kW HVPS Series switching mode power supply

Diversified Technologies Inc. (DTI) is introducing a high-voltage, switching mode DC power supply in a small enclosure. The DTI 250 kW HVPS Series provides 15kV to 100kV adjustable output with >92% efficiency and >100,000 hours MTBF



(mean time between failures). This power supply is packaged in a 24 x 36 x 74-in. cabinet and uses tap water for cooling. divtecs.com

RECALL: Shoreline tape for labelling error

Big Game Int'l is recalling Shoreline Marine liquid electrical tape with model number SL57589 and UPC 013893657589 after Health Canada's inspection program determined the products do not have proper hazard labelling required by Consumer Chemicals & Containers Regulations, 2001, under the Canada Consumer Product Safety Act (CCPSA). shoreline-marine.net



Milwaukee Tool's tape measures 30% more compact



Milwaukee says its new tape measures are 30% more compact than their predecessors. In fact, the 25-ft tape fits into what would normally be the housing for a 16-ft tape, thereby minimizing weight on tool belts. The tape measures also feature proprietary Nylon Bond blade protection, and a 5-point reinforced frame for drop protection. To watch a punishing slo-mo drop test, visit tinyurl.com/kmwyu5h. milwaukee.com

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TACKLE THE CODE CONUNDRUM IF YOU DARE!

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

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

QUESTION 1

Which of the wiring methods listed below is *not allowed* in a Zone 1 area?

- a) Armoured cable with approved glands.
- b) RWU90 cable with approved glands.
- c) Threaded rigid metal conduit with approved glands.
- d) Liquid-tight flexible conduit with approved glands.

QUESTION 2

At least one duplex receptacle must be in a residential porch.

- a) True
- b) False

QUESTION 3

A wall switch located at the head of the stairs shall control all the luminaires located in an unfinished basement.

- a) True
- b) False

ANSWERS Electrical Business, May 2017

Question 1

For hotels, the minimum ampacity for service or feeder conductors shall be based on a basic load of ____ W/m², plus other lighting loads for special areas, as well as heating and A/C loads.
b) 20. Rule 8-208(1).

Question 2

In adequately ventilated areas where paint finishes are regularly sprayed, the interiors of spray booths and their exhaust ducts are considered:
a) Class I, Zone 1. Rule 20-302(1).

Question 3

In basic care areas, and areas routinely cleaned with liquids that splash against the walls, receptacles shall be installed not less than ____ mm above the floor.
b) 300 mm. Rule 24-106(2).

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1 • Apprentice **0** • Bricklayer ??!

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CODE file

DAVID PILON

Section 8 circuit loading & demand factors

What do circuit loading and demand factors mean, and how are they different? A *circuit load* is a component or portion of the circuit that consumes power. A *demand factor* is a time-dependent fractional quantity that will always be less than, or equal to, one. Huh?

In layman's terms, this means that when we are trying to determine conductor and overcurrent protection sizes, we need to know the load on the circuit, as well as how often and for how long that load will operate on the system. The more often a load operates over a defined period, the more it will affect the type and rating of the overcurrent device and the ampacity of the cables.

So, what is the difference between a *calculated load* and a *continuous load*? When we find the calculated load, we must remember it is also considered a continuous load *unless it can be shown* that some of it is non-continuous. This is determined by the operational factors of the load, the installation type, and the intended or proposed use of the equipment by the customer.

Consider a 15-ft conveyor belt used to move product into the back of a truck at a shipping facility versus a 200-ft conveyor moving product in a processing plant; this example helps illustrate the difference between equipment operation time, not to mention the length of the belt line and the type of work performed in the facility. CE Code Rule 8-104(3)

provides guidelines for "normal operation" to determine whether a specific load is continuous or non-continuous.

What is meant by *breaker rating*? Breakers are built with an ampacity rating and continuous operation rating (expressed as a percentage). So when we talk about a 1000A breaker with an 80% rating, what we really mean is the breaker is rated for operation with a continuous load of only 800A, but may have a calculated load of 1000A. When we are designing a facility under this scenario, we need to be able to break out the non-continuous load from the total calculated load, or limit the calculated load to 800A.

How does circuit loading affect the operation of a breaker? Should the non-continuous load cause the ampacity of the circuit to exceed the breaker's 1000A rating, then the excessive amount of heating should cause the bi-metal strip in the breaker to trip. However, should the continuous load on the breaker

exceed 800A, then the same result could occur and, again, the breaker would trip. So when the system is being designed, we must ensure we are aware of the loading and demand factors to allow for a safe operation under both normal and abnormal operating conditions.

How does cable type affect breaker operation? Let's first look at the ampacity of a circuit in terms of produced heat. The termination point on the breaker is assumed to be 60C or 75C (unless otherwise marked on the equipment, as per Rule 4-006). Similarly, we need to think about the function of the cables when they are terminated on the breaker or fused switch. When

the conductors are selected in accordance with Section 4, they should be sized to satisfy ambient temperature, conduit fill and length of the run, as well as meet the requirements of Rule 14-104.

Once selected, then Rule 8-104(5)(6) places continuous load limits on these conductors. And, when they are single conductors, we are told heating at the point of termination can often be greater than that of multi-conductor cables because the breakers are tested with conductors sized to Tables 2 or 4 (see Appendix B Note to 4-006). So, the continuous load the conductors are permitted to carry needs to be reduced to ensure proper heat dissipation in the switchgear.

In the case of a 1000A 80% rated breaker, the continuous load applied to single conductors, as determined from the calculated load, shall not exceed 70% of ampacities chosen in accordance with Section 4.

Currently, these rules refer to single conductors in free air; however, a change to this Sub-rule (approved at the Part 1 level) now references cables selected in accordance with Section 4, which encompassed the DTables for direct burial below 5kV and high-voltage cables above 5kV.

I continue to watch this subject with great interest, and I'm learning more about the historical reasoning behind the Rules. It will be interesting to watch how this all progresses, and to see whether more testing needs to occur or the calculations are deemed sufficient. **EB**

Always consult your AHJ for more specific interpretations.

David Pilon has been an electrical inspector with SaskPower since 2000, and is currently the vice-chair of the Canadian Certified Electrical Inspector (CCEI) committee of the International Association of Electrical Inspectors (IAEI), Canadian Section. David can be reached at dpilon@saskpower.com.

CALENDAR

EB CSA Group Committee Week

June 19-23, Halifax, N.S.

Visit tinyurl.com/hyb9l4u

EASA Convention

Electrical Apparatus & Service Assoc.

June 25-27, Tampa, Fla.

Visit easa.com

NETCO Training Conference

National Electrical Trade Council

Aug. 19-20, Montreal, Que.

Visit ceca.org

The Source Show

Source Atlantic

Sept. 14, Saint John, N.B.

Visit sourceatlantic.ca/source-show

EB IEEE PCIC

Sept. 18-20, Calgary, Alta.

Visit ieeepcic.com

BICSI Fall Conference

Sept. 24-28, Las Vegas, Nev.

Visit bicsi.org

CANEW

Canadian Airports National Electrical Workshop

Sept. 24-29, Campbell River, B.C.

Visit canew.ca

IEEE Energy Conversion Congress & Expo

Oct. 1-5, Cincinnati, Ohio

Visit iee-ecce.org/2017/

CanWEA Conference

Canadian Wind Energy Association

Oct. 3-5, Montreal, Que.

Visit windenergyevent.ca

ICUEE

Int'l Construction & Utility Equipment Expo

Oct. 3-5, Louisville, Ky.

Visit icuee.com

EB NECA Show

National Electrical Contractors Assoc. (U.S.)

Oct. 7-10, Seattle, Wash.

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