

The Ontario **ELECTRICAL CONTRACTOR**

Vol 56 • Issue 2 • Q2 2018

Upgrades in BIM Technology and their Impact on Electrical Contractors

Estimating: Challenges
and a How-To Guide

History of Provincial
Bargaining in Ontario

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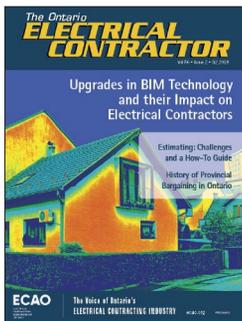
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The Ontario Electrical Contractor is printed on 10% post-consumer FSC certified paper using soya based inks. When necessary to mail an issue in an enclosure, we use an environmentally-friendly, 100% oxo-degradable poly-wrap.



The Ontario Electrical Contractor is published quarterly for:

ECAO

ELECTRICAL
CONTRACTORS
ASSOCIATION OF
ONTARIO

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The Ontario Electrical Contractor is the official publication of the Electrical Contractors Association of Ontario. Its purpose is to provide information and editorial comment on issues that are relevant to the electrical contracting industry.

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PUBLICATION MAIL AGREEMENT #40063602

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FROM THE PRESIDENT, MARK LLOYD

As you open this edition of the Ontario Electrical Contractor I trust that you are gearing up for, or are in the midst of, a very busy and productive time for your business. With that in mind I remind you to also make it a safe time for you and your employees; increased levels of work and additional workers provide more opportunities for accidents. So let's ensure that we are all putting health and safety at the forefront of our job planning and execution. As many, or most of you have heard on the airwaves throughout the province from Enzo Garritano, President and Chief Operating Officer of IHSA, "Do your part and keep your promise." I am certain ECAO members will continue to set health and safety standards in our industry.

We are in the final year of our current Principal Agreement with the IBEW/CCO. Our Electrical Trade Bargaining Agency (ETBA) wants to arrive at a fair deal, without a work-stoppage, and well before the

end of this agreement. To that end, we have put our position to the IBEW that simply: we are willing to enter into a Joint Proposal without a PNWA (Post-Negotiated Wage Adjustment), we want meaningful discussions on language, and that local bargaining should begin first in June or July of this year. We reiterated that we do not want a work-stoppage and expressed our view that IBEW/CCO and their members likely share our aversion to any interruption in work. Please stay informed and involved with this round of bargaining. ECAO and ETBA will be providing updates as talks develop. You will also find an article in this issue on the history and development of legislated provincial bargaining to provide some background on the manner in which bargaining is conducted in our industry.

ECAO engages a number of service providers who assist in making our members more efficient, competitive, and productive. One of these service providers, TeksMed Services, a WSIB claims management service, seems

underutilized by ECAO contractors. Some of our members may not be aware that TeksMed offers a complete WSIB claims management solution to all ECAO members at no extra cost. Their Workability program is proven to mitigate lost time and its effects with a focus on employee health and ability. Their approach to managing time loss helps employees stay productive, avoid wage loss and keep a positive connection to the workplace. At the same time, they support employers by reducing the amount of time spent on claim administration while lowering WSIB costs saving both time and money. Services include: return to work management, legal representation, expedited health care, comprehensive reporting, ARO and WSIAT appeals, as well as in-person representation.

I hope you have a tremendous summer, that you join us and enjoy Barcelona, as well as begin to think of getting to the ECAO Annual General Meeting September 12-13 at Blue Mountain Resort.



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FROM THE EXECUTIVE DIRECTOR, GRAEME AITKEN

As I continue to grow into this role as the Executive Director of ECAO, a role I feel is critical to the success and growth of our Association, I am so impressed by the commitment, wisdom, and professionalism of our members, affiliate partners, and industry associates. I have now had an opportunity to spend time, discuss our past and future, and get to know many of you through attendance at your events, committee meetings, and social events. There is, without doubt, a shared desire for and willingness to work to realize a more prominent place for ECAO and its members within the construction industry.

With the unwavering support of your Board of Directors we have undertaken a number of significant projects and initiatives to better serve our electrical contracting community. Notwithstanding that many have heard of ECAO's recent endeavours, I want to share a few of these with a larger audience.

1. TeksMed Services. TeksMed is a proud affiliate partner of the ECAO, offering a complete WSIB claims management solution to all ECAO members at no extra cost. They support our members by reducing the amount of time spent on claim administration while lowering WSIB costs, saving both time and money. TeksMed's services include: return to work management, legal representation, expedited health care, comprehensive reporting, ARO and WSIAT appeals, as well as in-person representation. ECAO has entered into a new agreement with TeksMed that now covers members' office employees in addition to their IBEW employees.
2. Program assessment. Whether jointly-funded through JEPP (Joint Electrical Promotion Plan) or solely through ECAO, we are undergoing

a thorough assessment of all contracts, service agreements, and consultant engagements to ensure all such arrangements provide tangible benefits to our members. In conjunction with a number of ECAO and JEPP committees and working groups we are seeking feedback on programs and renegotiating contracts and agreements to provide clear deliverables and consistent terms and conditions.

3. Databases. In addition to the obvious uninteresting nature of this subject-matter to most, it is also a laborious and tedious undertaking. Yet, designing and implementing new architecture for our databases is, in our view, crucial to moving forward in a manner that allows us to keep pace with developing technology and systems. Thank you for your patience and cooperation during our database transition. Whether it is having the ability to communicate with members in a particular sector or geographic area, having confidence that our information is being delivered to the correct recipients, or being able to easily reference members and affiliate partners from a reliable source; it is imperative that ECAO can be more responsive and accurate when providing information to our members, partners, and community.
4. Building and/or re-building relationships. The beginning of this year has seen us meet with a great number of the members of our industry, in addition to our members and partners, to solidify or begin anew our relationships. These are people and entities that have an impact, sometimes daily, on the manner in which our members conduct business. We have met with the Electrical Safety Authority (ESA), Infrastructure Health & Safety Association (IHSA), Ontario College of Trades (OCoT), Ministry of Labour (MOL), Ontario Construction Secretariat (OCS), service providers (media, promotion, insurers, etc.), and numerous external boards and committees such as Council of Ontario Construction Associations (COCA), Canadian Construction Association (CCA), and the Canadian Electrical Contractors Association (CECA). Most importantly, we are continuously working to strengthen our relationship with our labour partners – the International Brotherhood of Electrical Workers (IBEW).

The challenges are varied, the work rewarding, and the interactions stimulating. I am as excited about ECAO's development as I was when first presented this opportunity. However, your volunteerism, insightful viewpoints, and eagerness to contribute have elevated my zeal to proudly represent ECAO and our partners.

I wish you all a safe, prosperous, and enjoyable summer.

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Building Brand Awareness through JEPP

By Sherri Haigh



The Joint Electrical Promotion Plan (JEPP) funds several training and certification programs to help ensure ECAO contractors and IBEW electricians have the right skills and knowledge to compete in the marketplace.

But building your brand and raising awareness of your value proposition is also essential to any successful business that wants to continue to grow.

That's why one of JEPP's major goals is to help build the brand and profile of the ECAO/IBEW team in order to support your efforts to increase market share.

In the Fall of 2016, I was hired to help achieve that goal and have been busy working with your members to create various marketing initiatives that have ranged from commercials to stakeholder events and government outreach. Marketing alone won't build your business but it is an important element in supporting your growth and your competitors know that.

ECAO contractors have a long history and impressive track record that includes working at some of the most iconic structures in Ontario. Through our promotional programs we want to highlight those achievements. In other words, let's get your brand out there as the best choice for any purchaser of electrical contracting services.

This also includes supporting your association's efforts in educating decision makers and government about policies that can support as well as harm our industry.

Local initiatives

An important part of JEPP is its support for contractors at the local level. Joint boards (comprised of your area contractors and IBEW representatives) can apply for funding to create and implement a marketing initiative within your region. We have enhanced our application process to ensure money is spent wisely and transparently.

I can also play a role in supporting those efforts. I help negotiate TV contracts, create ad concepts, edit content and, for example, when it comes to TV commercials I will be on hand to direct the shoot from start to finish. These are services that many local boards wouldn't be able to afford but are free to you if a JEPP funding application is approved.

A recent example of a JEPP-supported initiative is the Electrical Contractors Association of Ottawa along with IBEW Local 586, who have their own commercial running throughout May on the local CTV and CBC news affiliates. The commercial features several key institutions in the community including the Heart Institute, the Government of Canada's West Block and a national museum.

Marketing activities like this one can also enhance relationships with customers who benefit from the promotion of their institutions.

Another example includes a Central Ontario joint board initiative that took place last Fall. They received funding to support the creation of a video as well as host a stakeholder appreciation night in Waterloo. The event and video were also used to highlight their long history of support for Habitat for Humanity. H for H spoke at the event praising our local contractors, IBEW electricians and retirees. Political representatives were on hand to present plaques to our members in front of more than 200 attendees.

Social media and mainstream news

We try to take a multi-faceted approach to our marketing to ensure reach and to target our audience. As part of that approach, we will be publishing a series of five articles over the next few months in the National Post to highlight our brand and to address issues important to our industry. Those articles will also be promoted through social media.

Last year, we developed a website – poweringcommunities.ca – which focuses on positive stories about the work of our contractors and their IBEW team. It also links to our videos, including the first commercial I helped produce last year which received more than 70,000 views on YouTube. It was also shown on CTV, Global and CBC.

I encourage all local boards to take advantage of JEPP funding and to ensure they are enhancing their business objectives through marketing. Please feel free to contact me for more information about local funding or if you have an interesting project/success story that I can promote.

Sherri can be reached at sherri@haighcommunication.ca.

IBEW Virtual Reality (VR) Safety

IDENTIFICATION AND ANALYSIS OF SAFETY HAZARDS ON THE VIRTUAL CONSTRUCTION WORKSITE

By Carol MacLeod

The electrical construction industry is inherently dangerous and safety is paramount. There are dangers on all job sites, particularly for inexperienced new entrants such as youth, Indigenous people, women and newcomers pursuing pre-apprenticeship training. Virtual reality technology is proving to be a powerful tool in developing immersive training resources that allow most-at-risk workers to experience the hazards of a job site safely from a classroom. The resulting increase in awareness of safety hazards leads to the adoption of safe work practices.

Virtual reality refers to computer-generated environments that simulate a person's physical presence in the real world, enabling the user to partially determine what happens in the environment. The technology allows a pre-apprenticeship trainee to virtually explore a jobsite through a 360 degree lens using a cell phone and an oculus headset.

The National Electrical Trade Council (NETCO) is the Canadian distributor of IBEW Virtual Reality (VR) Safety—owned by the International Brotherhood of Electrical Workers (IBEW) Local 2085 in Manitoba. IBEW Virtual Reality (VR) Safety will be available free of charge to IBEW local unions and joint apprenticeship and training committees across Canada following a train-the-trainer presentation at NETCO's 2018 training conference on June 9 in Mont-Tremblant, Quebec. www.NETCOtrainingconference.com

IBEW Virtual Reality (VR) Safety includes a virtual reality application and a generic Facilitator's Guide that NETCO assisted in adapting for use in the electrical construction industry. Five one-hour modules feature typical hazards:

1. Slips, trips and falls
2. Struck by, caught between
3. Fire, explosion, toxicity and asphyxiation
4. Ergonomics, elements, noise
5. Electrocution



Winnipeg-based interactive digital media company Bit Space Development Ltd. is the technology provider for the project. It will provide technical support on a user-pay basis and is available to customize the application. Founder and CEO Daniel Blair said that it took his team of 10 developers, designers and photographers about a year to produce the five modules.

In November 2017 IBEW Local 2085 pilot tested IBEW Virtual Reality (VR) Safety with about 20 electrical pre-apprenticeship trainees at its IBEW Code of Excellence training centre in Winnipeg. IBEW Local 2085 director of apprenticeship and training Chris Taran observed that “the younger trainee cohort embraces virtual reality learning technology compared to traditional talking-head lectures and demonstration-style teaching.

“The challenge in our pre-apprenticeship program is that while we are tasked with preparing trainees for work we cannot just bring them to a real job site. With IBEW Virtual Reality (VR)

Safety, trainees put on VR headsets and become aware of the dangers without being in harm's way.” He is careful to note that the resource is intended as an awareness application for use with pre-apprentices—not apprentices—and does not replace safety training at local safety associations or on-the-job.

The project benefited from partnership-building. IBEW Local 2085 was awarded a grant from the Workers Compensation Board of Manitoba. Development moved forward in partnership with United Association Local 254, boilermakers and other members of the Manitoba Building and Construction Trades Council as well as the Construction Safety Association of Manitoba and Manitoba Construction Sector Council.

Carol MacLeod is the Executive Director of the National Electrical Trade Council.



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Virtual Virtues

BUILDING INFORMATION MODELING

By James Peters

It seems pop culture regularly cycles through words, phrases and expressions that occasionally stick to the public's collective imagination—often without much understanding of their true meaning. Big data, virtual reality and artificial intelligence come to mind—sometimes even generating WESTWORLD-like fears from those so encumbered. But on construction sites small and large, simple and complicated, and scattered throughout the globe—computer-based Business Information Modeling (or BIM) has proven an incredibly useful tool for architects, engineers, construction superintendents and sub-trades.

According to most definitions, BIM consists of very sophisticated software that creates a digital representation of the physical and functional characteristics of buildings. More simply put, BIM technology hosts computer files which can be reviewed, revised or networked to assist the various trades and disciplines involved in constructing buildings.

Virtual management

A sign of the times—some of today's careers reveal our brave new world through their very job titles. Chris Little, for example, is

the Virtual Construction Manager for the Modern Niagara company, headquartered in Ottawa. Little says, "Construction by its nature can be a very conflicted, contradictory but hopefully, collaborative, experience. BIM provides a useful platform for collaboration but like anything else, it has to be used effectively and inputs have to be used consistently for the various disciplines to take full advantage of the technology."

According to Little, who started his career in the field as an amateur user, BIM is the grandson of AutoCAD. He says, "When BIM first appeared on the horizon, I had my own company that was doing CAD and interference drawings for building sub-trades. I learned using Autodesk's Revit, which remains the largest and most adopted BIM program, but it's just one of many."

BIM software, when executed properly, greatly improves the efficiency of "running interference." Interference drawings help translate a building's design concepts to real-world installations and are specific to each trade. They help identify where everyone is at, at any given time, to minimize clashes on site.

Specific training for BIM can be found in some Canadian colleges but typically as a part

of another discipline. It remains very much a tool learned on the job. In the years ahead, BIM training may well become separated with individual courses offered at colleges throughout Canada. Every year, the software becomes more complex and sophisticated and requires time and attention to master it.

Leading by example

Little says, "A useful way of explaining BIM to novices is by using a door as an example. For instance, individual users on the same BIM project could identify that the door on this floor is Chris's door, and this door will arrive on a certain date, and this is the model number for that door. And, of course, you can also include its shape, colour and insulation rating. So you can see the multiple advantages of having that data available—especially with more complex components. As long as everyone is entering the information specific to their discipline, it's a tremendous improvement."

By Little's estimation, BIM technology by consultants is now being used on large projects about 75 to 85 per cent of the time. He adds, "That doesn't mean it's trade level detail that's been included—or even done

well. BIM as a collaborative tool where the trades are enabled and producing well-coordinated models is probably closer to 25 to 50 per cent participation.”

Calgary Cancer Centre

Modern Niagara is handling the mechanical components of the new Calgary Cancer Centre, currently under construction. Little says, “On this project, the consultants have their BIM models and we have our own, and when you overlay them you see the differences. So then you discuss, refine and make revisions wherever necessary. We have our own databases that we manage and control and every other participating company has theirs. Because of the scale of this project, there are currently 30 separate BIM layers but all are intertwined. There are tools available that can data-mine all 30.”

The new Calgary Cancer Centre is being built at the northeast corner of the Foothills Hospital campus in northwest Calgary—currently with an anticipated opening of 2023. The new facility boasts 160 inpatient beds, 12 radiation vaults, more than 100 patient exam rooms and more than 100 chemotherapy chairs. It will span more than one million square feet and include a 1,650-stall underground parking garage.

BIM software, when executed properly, greatly improves the efficiency of ‘running interference,’ Interference drawings help translate a building’s design concepts to realworld installations and are specific to each trade.

Communication skills

Good communication skills, of course, are often the very essence of successful construction projects. Little agrees, “What our BIM team is always trying to do is get our models to talk to the other members of the construction team (and their models) to make sense of the big-picture. We want the people running the software to become friends and teammates with their lead foreman. We’re all here to get the foreman’s intent into the model so that he or she can see the value of the technology. A big mistake is to just hire a junior “tech-savvy” person to do the modelling. The model should represent both construction site experience and the required skill set with the software. To grow a team at Modern Niagara, we place a senior person running the software with a junior person learning and acting as apprentice.”

Little concludes, “Sometimes new technologies like this have an overrated reputation. There’s always a few people who think BIM can solve everything on a project—but as I’ve stated throughout, it’s only as good as the users who apply their own information. And sometimes it’s not taken seriously enough by some people on a construction project because of the technology’s history of having an undefined premise.

“My reply is always the same, ‘why wouldn’t you embrace a new tool?’”



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- 1.** Capturing reality. The wealth of information that's easily accessible about project sites has expanded greatly with better mapping tools and satellite images of Earth. With BIM, designers benefit from all of that information already compiled and shared in a model—in a way that paper isn't able to capture.
- 2.** Waste not, want not. With a shared model, there's less need for rework and duplication of drawings for the different requirements of building disciplines. BIM drawing tools have the advantage of being faster than 2D drawing tools, and each object is connected to a database. The quick, computerized counting of components alone has been a significant labour and money saver.
- 3.** Maintaining control. The digital-model-based workflow involves aids such as autosave and connections to project history so that users can be certain they've captured the time spent labouring on the model. They know their work is locked-down and secure.
- 4.** Improve collaboration. Sharing and collaborating with models is easier than with drawing sets, as there are so many functions only possible through a digital workflow. As a cloud-based technology, the different disciplines can share complex project models and coordinate integration with their peers.
- 5.** Simulate and visualize. An increasing number of simulation tools allow designers to visualize such things as the sunlight during different seasons or to quantify the calculation of building energy performance. The intelligence of the software to apply rules that are based on physics and best practices provides a complement for engineers and other project team members.

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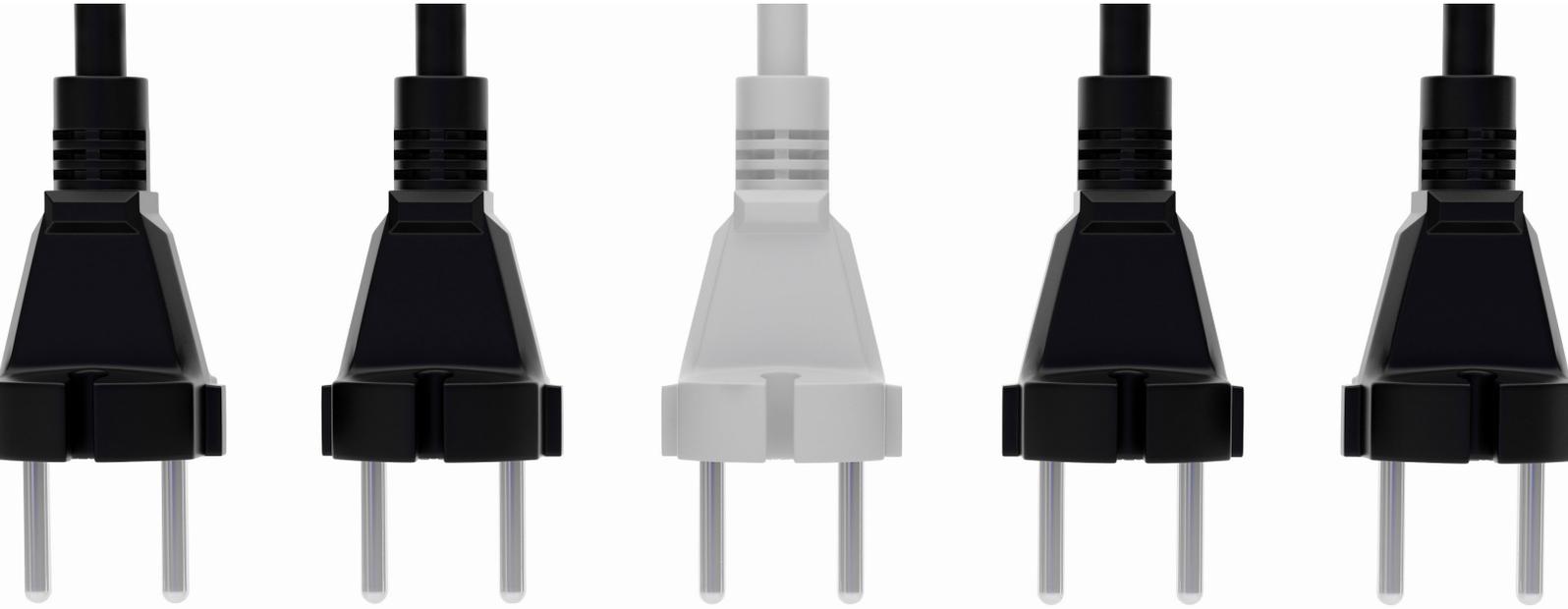
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How the Canadian Electric (CE) Code has Evolved

TO ADDRESS CLEAN ENERGY TECHNOLOGIES

In recent years, the development and proliferation of renewable energy technologies coupled with advances in battery storage have enabled home and building owners to increasingly capitalize on clean energy sources, such as wind and solar. From electric vehicles (EVs), to rooftop photovoltaic (PV) systems, to small-scale wind turbines, the utilization of renewable power systems both residentially and commercially is more prominent than it has ever been.

While this has produced many benefits for consumers, the environment and society as a whole, it has also presented new and unique challenges with regards to the safe installation, use and maintenance of emerging technologies. Additionally, it has forced regulatory bodies to amend longstanding building codes, to which electricians and installers must adhere.

Over the past six years, numerous revisions and additions have been made to the Canadian Electrical Code, Part I (CE Code) to reflect these changes and address safety concerns. The remainder of this article will focus on some of the most notable revisions, including the addition of Section 64, which covers installation requirements for renewable energy technologies, such as solar PV systems and wind turbines, as well as Sections 8 and 86, which have been revised to address electric vehicle supply equipment (EVSE).

Solar PV Systems

The 24th edition of the CE Code, which was released this past January, outlines new requirements for solar PV systems. This includes increasing the voltage limit of PV systems from 1,000 to 1,500 V. To address the worker safety concerns this change has prompted, higher voltage systems can only be installed where qualified maintenance personnel are present. Additionally, parts of the installation exceeding 750 V must be inaccessible to the public. The use of specific voltage warning signs has also become mandatory.

Appendix B provides guidance on the phrase “inaccessible to the public” by stating that: “The PV source and output circuits, along with equipment connected to or within those circuits, must be located within a fenced enclosure in accordance with Rule 26-300; guarded by locked doors; elevated three meters or more above grade level, or above any surface upon which a person could stand; or located where access is restricted by other effective means.”

Similarly, the 2018 version of the CE Code includes guidelines for the installation of combiners and recombiners, which are often present in large-scale PV systems. Rule 64-060(12) applies to PV combiners. For recombiners that are installed in excess of 7.5 meters from the inverter, a single disconnect means they are capable of being opened at the ampere rating of the inverter

input circuit installed. The installation requirements are the same for both combiners and recombiners.

Small- and Large-scale Wind Energy Systems

Section 64 of the CE Code classifies wind systems by size. Large systems are those that have a rated output over 100 kW, while small systems are rated up to (and including) 100 kW. New definitions have also been added for the wind turbine, electrical systems, wind turbine generators and terminals.

Electrical Vehicle Supply Equipment (EVSE)

In recent years, the number of EVs on the road has risen substantially. As the majority of EVs are charged at private residences, many regional regulatory bodies have revised building codes to ensure safety. Ontario, for instance, made changes to its building code in 2017 to help create EV-ready homes and workplaces. These changes took effect January 1, 2018. Similarly, in Quebec the capability to charge 240 V electric vehicles has been mandatory for all new residential construction since 2016.

“Electric vehicle supply equipment EVSE can draw a substantial load when in charging mode. For existing buildings, the addition of EVSE can result in the total load exceeding the existing service capacity. In such cases, the first option is to increase the service size. A second option is to install a system to monitor the power being drawn by EVSEs and other building loads, and control the EVSE loads such that the overall load does not exceed the limits of the existing service, feeders and branch circuits. In combination with Section 86, along with new Rule 8-500 and new subrules 8-106(11) and (12), these systems are now recognized in the code as Electric Vehicle Energy Management Systems (EVEMS). Complementary to the introduction of EVEMS, a new table of loads and demand factors has been added specifically for EVSE.”

Understanding Key Changes to the Code

Designed as a model code for electrical safety and developed with the participation of all Canadian regulatory authorities, the CE Code enables electrical and

construction businesses across Canada to remain competitive, while facilitating inter-provincial trade, labour mobility and most of all, safety.

CSA Group offers training and support products to help users understand and apply key changes and updates from the CE Code. For example, the Renewable Energy 2018 training course reviews the technologies and innovations that Canadians are using for sustainable energy independence. This course covers the requirements for renewable energy systems, including the different types,

system components and functions, and maintenance, safety and operation.

There is also the Detailed Overview of Changes course, which offers an in-depth overview of more than 60 code changes, available in workshop, online or onsite formats. All course content is conveyed through scenarios, activities and real-world examples.

Simply put, CSA Group is helping to keep Canadian electricity safe and efficient by making regulatory changes easy to understand and reference.

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Where There's Light, There's Insight

THE INTERNET OF THINGS

By Tony D'Alesio, Director of Sales (Commercial, Industrial, and Healthcare Markets—Canada) at Philips Lighting

The Internet of Things (IoT) has been called the next industrial revolution. It is already transforming the way businesses, governments and consumers interact with the physical world.

By blending the physical and digital realms, IoT is profoundly changing the way we relate to our environment, to each other and to information. It is revolutionizing the way we live, work, travel and relax.

At Philips Lighting, we use our connected lighting infrastructure to enable IoT applications in several key areas. By partnering with other leading technology and communications providers we can offer end-to-end connected lighting solutions for smart cities, smart buildings, smart retail and smart homes

Lighting is ubiquitous—it's everywhere. By leveraging the Internet of Things, energy-efficient connected LED lighting is transformed into information pathways with the capacity to collect and share data.

In an office or building, connected lighting carries valuable data. This data provides insights that can increase operational efficiency, enhance productivity and save on energy costs. Connected LED lighting provides about 80 per cent energy savings for lighting alone when compared to traditional lighting. Building managers can remotely, and centrally, monitor and manage all connected light points, energy consumption and occupancy data via software.

In Smart Offices, employees can adjust lighting and temperatures levels to create a personalized, comfortable and productive workspace through an app on their mobile phones.

Smart Cities use the latest innovations in the Internet of Things to become more livable and sustainable. Smart sensors and other smart devices—from street lights to power meters to traffic signals and beyond—are distributed throughout the urban environment. These devices work together with an open, connected infrastructure to collect data about themselves, the environment, people, and events. This data can be analyzed and shared via software platforms and mobile apps to save energy, streamline operations, and make citizens feel happier and safer.

Connected lighting can be used in retail environments. Through indoor positioning located in the lights, shoppers can use their smart devices to navigate to the products they want, adding to the ease and convenience of their shopping experience.

Connected lighting is constantly evolving and becoming more innovative. Last month, Philips Lighting launched its Interact IoT platform for data enabled devices.

The Interact platform is designed to handle data collected from the growing number of connected light points, sensors devices and systems. The highly secure, cloud-based platform uses sophisticated and modern data management and data processing capabilities to bring sense to all manner of data. The Interact connected lighting systems can be used for offices, buildings, architectural lighting, roads, streets, parks, offices, stadiums and large retail and food stores.

In addition, data from authorized third-parties can also be analyzed by Interact. For example, for a municipal authority, news articles and social media posts reacting to a new lighting installation on a bridge, can be analyzed and data sent to a social impact app dashboard that summarizes the public sentiment.

Philips Lighting has already installed 29 million connected light points worldwide and we plan for every new LED product we produce to be connectable by 2020.

It's all about creating additional value for our customers through data-enabled services that unlock new capabilities and experiences.

Tony D'Alesio has over 20 years of experience in the digital controls domain and has worked on various industry technologies capable of delivering data connectivity and energy savings. Tony is responsible for bringing new solutions to market, enabling clients can achieve their smart building goals via connected lighting technologies. He can be reached at tony.dalesio@philips.com.

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Over the past year, HealthSource Plus, a People Corporation Company, has merged with our long-time Associate Partner, Skipwith and Associates. While your new HealthSource Plus plan will continue to offer cost stability and exceptional service, you can now enjoy added value through enhanced plan offerings, enriching your administrative capabilities as it relates to the group benefits program.

Reach out anytime speak to an ECAO Benefit plan consultant:

Jason Ovsenny
Senior Employee Benefit Consultant
jovsenny@healthsourceplus.com
647-938-7303

As a result of this merger, there are three notable changes that will take effect on May1, 2018:

- The Skipwith service team are still the managers/stewards of the program but have teamed up with the nationwide bilingual capabilities of HealthSource Plus to enhance your administrative user experience moving forward.
- You will continue to experience substantial cost savings by being part of this large ECAO association plan. Not on the Plan? New members can expect to pay significantly lower costs than you would pay on your own today.

- Enjoy NEW enhanced value-added programs for all members, such as:

MyWellness Program: Great tools and resources to assist anyone in the family with their wellness needs or questions.

Preferred Provider Networks: Get reduced pricing on Pharmaceuticals and 40% off vision care expenses at our preferred suppliers.

- Choose to keep your existing plan or move to a more robust plan based on current industry benchmarking studies. Understand what your peers and competitors are doing!

We want you, our members, to get the value and expertise you need to make the best business decisions on your employee benefit programs. In the next couple of months you can expect a ECAO Benefit Consultant from HealthSource Plus to contact you to provide information on this new and exciting program!

The ECAO team is very excited to move forward with this evolutionary step in our Member Group Benefit program. We hope you take advantage of this great opportunity!

Thanks and regards,



History of Provincial Bargaining in Ontario

By Stephen McArthur and Victor Kim



The *Ontario Labour Relations Act* (LRA) mandates province-wide multi-employer single-trade bargaining for the industrial, commercial, and institutional (ICI) sector of the construction industry in Ontario. Under the current mandatory province-wide bargaining scheme, there can be only one bargaining agent for the employers (ErBA) and one bargaining agent for the employees (EeBA) for each trade. These provincial bargaining agents have the exclusive bargaining rights for the trades they represent, and the collective agreements they negotiate will bind all employers and all unionized employees in the ICI sector in Ontario.

To an outside observer, the current bargaining system in the ICI sector presents a confusing web of relationships, reflecting history, local practice and organic evolution, devoid of any

logical or legal explanation. To fully appreciate how the current system works, it is important to understand its historical roots.

The current province-wide bargaining scheme is the product of a series of legislative reforms that sought to curtail the prevalent labour relations mischiefs in the construction industry during the 1960s and 1970s. The history of labour relations legislative reform in the construction industry in Ontario has been an attempt to replace a fragmented model based on individual employer labour relations with a more centralized multi-employer model reflecting the features peculiar to the construction industry.

Until 1977, the construction industry's complexity was reflected in its fragmented traditional bargaining structure, and as such,

two features characterized the bargaining structure in Ontario; (1) collective agreement applied to a local area; (2) each trade negotiated separately. However, this complex pattern of fragmented bargaining relationship created a considerable degree of instability, inter-union rivalry, and industrial conflict. For example, even though the construction industry during the 1960s represented about 7 per cent of non-agricultural labour force and 10% of total union membership, it accounted for nearly 17 per cent of the person-days lost due to strikes.

Despite strong pressures to retain local autonomy, the labour relations mischiefs of the 1960s and 1970s resulted in legislative reforms, transforming bargaining structure. In the end, local bargaining patterns gave way to a province-wide labour relations model.

In 1976, an inquiry into the bargaining patterns in the construction industry was headed by Mr. Franks and resulted in a published report called the *Report of the Industrial Inquiry Commission into Bargaining Patterns in the Construction Industry in Ontario*. This report is often referred to as the “Franks’ Report.” The Franks’ Report stemmed from a recommendation from the representatives from both management and unions that “a system of wider-area bargaining be introduced into the construction industry” in response to the labour relations mischiefs. Mr. Franks engaged in an extensive series of consultations with the parties and called for briefs from unions, employers, and purchasers of construction services. Each of three briefs submitted supported a change to province-wide bargaining by trade. As such, Mr. Franks recommended a province-wide multi-employer single-trade bargaining scheme in the ICI sector.

The Franks’ Report resulted in the 1977 Amendment to the LRA to address the fragmented bargaining structure by consolidating the ICI sector collective bargaining on a province-wide basis by trade. The new mandatory province-wide bargaining scheme required employers and unions to designate province-wide bargaining agents who were vested with exclusive bargaining rights for the trades they represent.

The newly amended LRA also put the structure of bargaining out of reach from those at the bargaining table by prohibiting individual bargaining and making the only lawful collective agreement in the ICI sector the multi-employer agreement between the provincial ErBA and the provincial EeBA.

Since 1977, the OLRB has repeatedly invalidated union-management arrangements that were contrary to the LRA’s mandatory province-wide bargaining system. The OLRB, therefore, has made it abundantly clear that only province-wide agreements are valid, and any agreement or arrangement reached without the approval of provincial bargaining agents was null and void.

The current version of the LRA (R.S.O 1995) preserves the mandatory province-wide multi-employer single-trade bargaining scheme introduced by the 1977 Amendment.

The introduction of mandatory province-wide bargaining scheme has consolidated the fragmented bargaining structure as the new scheme reduced the number of negotiations

in the ICI sector from 250 in 1977 to 22 in 1978. Although success in curtailing prevalent labour relations mischiefs initially seemed elusive, significant improvements in bargaining outcomes were achieved in the long run, and stability has become the norm in the construction industry since 1977. While strike activities in Canada as a whole has been declining since the 1980s, the decline has been more pronounced in the construction industry as reflected in terms of the number of strikes, workers involved, and person-days lost.

However, it is important to note that the current system is not static, but rather it is continuously evolving, “as unions grow or decline or supplant one another, and as new construction methods affect the kinds of skills and the kinds of workers involved in the industry”. Even to an insider like me, every day is a new challenge under this continuously changing system.

Stephen A. McArthur is a Partner with Mathews & Dinsdale, Global HR Lawyers. www.mathewsdinsdale.com

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ESTIMATING AND SUCCESSFUL BIDDING STRATEGY FOR ELECTRICAL CONTRACTORS

By Dr. Awad Hanna, Professor and North American Consultant

The most common means for electrical contractors to procure work is through competitive bidding. In general, most public agencies, such as provincial or federal governments, rely heavily on competitive bidding to acquire and award work to contractors. Electrical contractors typically contract with general contractors/construction managers as a subcontractor or contract directly with the state as a separate prime contractor. In addition, electrical contractors can bid for work under the traditional delivery system, that is sequential and typically the design is complete at the time of bid. The other model of bidding is the fast-track model, with design and construction overlapping, as in the case of Design-Build, and Construction Management As Agent/At Risk. Fast-Track delivery causes a substantial risk for the electrical contractor, as the design document(s) is/are dynamic, rather than static, and there is always a difference between bidding document(s) and construction document(s). In the experience of this writer, in the Fast-Track model the design documents are released between 70 and 80 per cent complete.

Bid Hit-Rate and Company Growth

Research conducted by this writer found that the North American average for a hit-rate is eight per cent, that is, that contractors will win eight per cent of the projects they bid on. Estimating is an expensive process, and contractors need to be selective when they bid for work. The cost of estimates range between 0.25 and 0.5 per cent of the project cost, depending on the complexity. Typically, electrical contractors have some sort of internal process, either formally or informally, for

evaluating their chances of winning a bid. In most cases, the contractors' estimates should be very close when they evaluate the direct cost components of labour, materials, or equipment. However, the difference between two estimates will largely depend on a contractor's evaluation of risk or contingency. Contractors typically add a small percentage to their markup in terms of contingency to account for risk. On the other hand, they add higher percentages of contingency in their markup to allow for risky jobs. This system, as it stands now, is rather informal and based largely on intuition. This article provides a methodology for quantitative assessment of bidding factors, with the goal of allowing electrical contractors to improve their hit-rate.

For electrical contractors to grow at a healthy rate, with minimum number of projects to bid for, they must achieve a hit-rate of 30 per cent.

In order to improve their hit-rate, contractors should establish evaluation criteria and analyze both successful and unsuccessful bids. Figure 1 presents a hypothetical contractor with annual sale or annual sale increase of \$10,000,000.

The Figure shows the relationship between bid hit rate and the number of projects required to bid on for project sizes of 40K, 100K, 200K, and 400K. The figure demonstrates the dramatic decrease in the number of projects necessary to bid for to achieve a given sale value, as the hit-rate increases.

Estimating Risk

Quantity takeoff can impose a particular risk to estimators. There are four principal components of quantity takeoff:

- Component 1: Items that are listed such as switch gears, transformers, control panels, bus

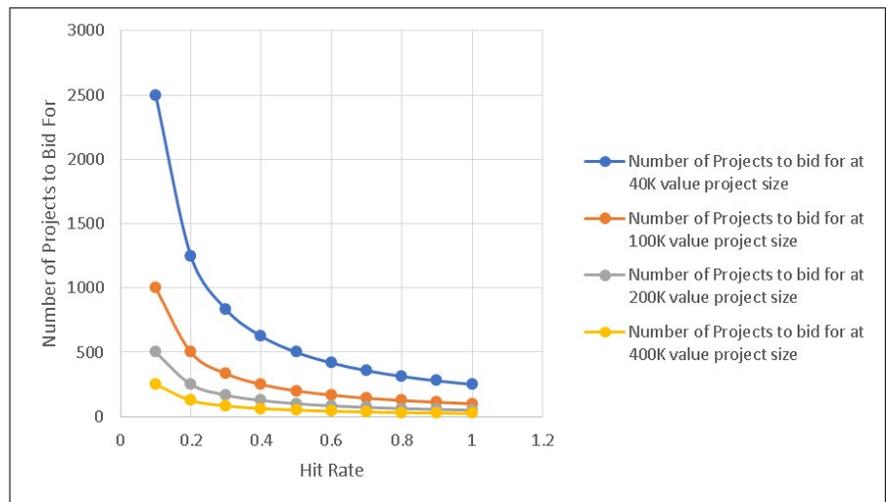


Figure 1: Decreasing Relationship between Projects to Bid for and Hit-Rate

duct and motor control centers) and is usually quoted by vendors.

- Component 2: Items that are counted such as outlet boxes, devices, and fixtures.
- Component 3: Items that are measured such as conduit, wire, trays, cables, etc. This component accounts for 60-70 per cent of the budgeted labour hours allocated for a particular project.
- Component 4: Items that are not defined in the bid document. In many cases, owners and engineers expect contractors to include items that are not shown on or included in the drawings, but are essential to offer a complete and operable system, or to meet the standards of the owner.

For electrical contractors to grow at a healthy rate, with minimum number of projects to bid for, they must achieve a hit-rate of 30 per cent.

Estimators must pay careful attention to component 3 because of the high labour hours that may result from it and expose contractors to financial distress. As a result, in the case of higher-than-usual-percentage of labour, estimators must increase their Factor to reflect the high risk of labour component. On the other hand, projects that consist mainly of procurement of equipment (component 1) impose less risk, and thus the Factor may be lower.

The word Factor represents a dollar value that is added to the bid by the electrical contractor. It is a decision made by the contractor and used to fund perceived risks. In academic literature, the word Contingency is often used interchangeably with the word Factor, but in this article

Contingency is defined as: the dollar value a contractor is instructed to add to a bid price and which are used to fund owner/GC/CM issues.

In an effort to allow contractors to better evaluate the risks present in a project, this author has developed the following assessment. The assessment is divided into nine parts, with each part focusing on a different area that may increase risk. Each question within that area is given a range. Respondents will be asked to rate the impact of each question on a numerical scale that was weighted. The maximum possible value (most positive or negative impact) was +5/-5. Throughout this worksheet, any assumed risk on the part of the contractor equates to a minus rating on the applicable scale. Similarly, opportunity that is created equates to a positive rating on the applicable scale. It should be noted that the numerical scale provided herein is a demonstrative example, and that different companies may have different needs, priorities, or constraints that would necessitate the creation of a new scale, or the modification of this one. A complete list of these factors is typically provided during Dr. Hanna's estimating seminars.

Section 1: Relationship with the Design Engineer(s)

Section 2: Relationship with the Owner/ Construction Manager/General Contractor (from prior experience or by reputation)

Section 3: Bid Preparation Time Frame

Section 4: Competition

Section 5: Assessed Risk Factors

Section 6: Geographical Location

Section 7: Project Management

Section 8: Contractual Obligations

Section 9: Anticipated Productivity Factors

Note: this is not an exhaustive list – for a more complete list of potential productivity factors, consult Factors Affecting Labor Productivity for Electrical Contractors: A Quantified Statistical Approach, also by Dr. Awad Hanna.

Awad Hanna is a professor and chair of Construction Engineering and Management Program at the University of Wisconsin-Madison. Dr. Hanna is also a provider of management education consulting services and a longtime associate to ECAO. He can be reached at ashanna@wisc.edu.

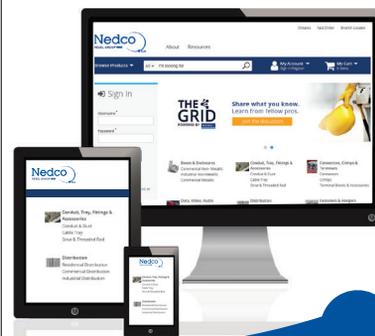
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Cultivating the Indigenous Workforce in the Electricity Sector

Provided by Electricity Human Resources Canada

Faced with a tight supply of skilled workers, Canada's electricity and renewables sector is increasingly seeing the potential of First Nations, Metis and Inuit workers as a solution to its employment needs.

There is a compelling business case for increasing the participation of Indigenous workers within the electricity sector.

- **Demographics:** Indigenous workers can provide a source of labour to reduce the shortages in skilled trades and engineering/technical occupations. Some quite recent reports highlight the limited impact that Indigenous workers can have on closing Canada's skills gaps, citing the relatively small numbers in the population. Nonetheless, in comparison to many other industries, the electricity and renewables sector has more business reasons, and opportunities, to capitalize on this demographic.
- **Geography:** Many First Nations, Metis and Inuit communities are located near major electricity and renewables sector installations, offering the opportunity to save costs and enhance retention by using a locally-based labour force.
- **Public policy:** The legal requirement for meaningful consultation with Indigenous communities affected by utility projects heightens the importance of having positive relationships with these communities. These relationships can be enhanced when local workers have an opportunity to participate in the workforce.



- **Corporate social responsibility:** Efforts to enhance the socioeconomic status and quality of life for First Nations, Metis and Inuit people show good corporate citizenship and yield important benefits to a company's reputation among stakeholders.

The Indigenous peoples of Canada number 1.7 million according to the latest Stats Canada data in 2016 and with a growth rate of 42.5 per cent accounting for 4.9 per cent of the total population. This was up from 3.8 per cent in 2006 and 2.8 per cent in 1996. (Growth by 42.5 per cent—which is more than four times the growth rate of the non-Aboriginal population over the same period), this demographic is quickly becoming vital to Canada's development.

In addition, the average age of the Indigenous population was 32.1 years, nearly a decade younger than the non-Indigenous population at 40.9 years. The census counted 145,645 children aged 0-4, 8.7 per cent of Aboriginal people in Canada.

With an expected 400,000 Indigenous youth having entered the labour market by 2016, Indigenous communities across Canada – First Nation, Inuit, and Metis – seek increased participation in the economic, political, and social affairs of this country. This creates a unique opportunity to increase the participation of Indigenous peoples in the workforce of the electricity industry.

However in order to make significant progress, a number of challenges must be overcome. It is evident that the history of relationships between electricity sector employers and Indigenous communities has not always been positive; the need to establish trust and long-term relationships cannot be emphasized enough. The skill development issue remains vitally important to both industry and Indigenous communities; there is clearly an opportunity for success based on mutual interest in this regard. Finally, there is widespread recognition that investments will be required, supported by senior level commitment and accountability for action.



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EHRC has undertaken significant consultation with both industry stakeholder and Indigenous communities over the past decade, and have identified both barriers and possible solutions which, when acted upon, will lead to greater Indigenous participation in the sector.

Barriers to greater participation by First Nations, Metis and Inuit workers include:

- Challenges in attracting workers to the sector – limited knowledge and interest on the part of employers and Indigenous workers. Levels of educational attainment and essential skills within the Indigenous labour force that do not match the current requirements within the electricity and renewables sector.
- Difficulties in acquiring relevant job readiness skills due to geographic, financial and educational preparation constraints faced by First Nations, Metis and Inuit workers.
- Personal, family and community challenges in completing a successful transition to apprenticeship and/or electricity and renewables sector careers.
 - Workplace practices that are not fully inclusive of Indigenous workers and culture.

How to Build Success

Based upon the research and consultations, we have identified 10 "gates to success" that characterize best practices and successful initiatives:

1. Establish a focus.
2. Operationalize what "success" means.

3. Invest effort to build effective partnerships.
4. Tailor to the community.
5. Start early (really early).
6. Consider the full "employment life cycle."
7. Maintain required standards.
8. Be "high touch."
9. Invest in relationships.

Support the Indigenous cultural experience

While it is evidently clear that there is no "magic solution," several organizations within the electricity sector have had notable success in engaging First Nations, Metis and/or Inuit workers, individuals and communities. At the heart of these "best practices" captured in EHRC's research study was the introduction of a dedicated strategy to address the attraction, recruitment and retention of Indigenous communities, and dedicated resources to ensure that relationships were developed and maintained. An unwavering focus on collaborative relationships and strategically targeted investments will be essential to continue building momentum.

The study, which also includes tools for employers as well as best practices from a range of companies including the Aboriginal Apprenticeship Board of Ontario, can be found here:

<http://electricityhr.ca/workplace-support/recruitment-retention/aboriginal-1-workplace-initiative/>

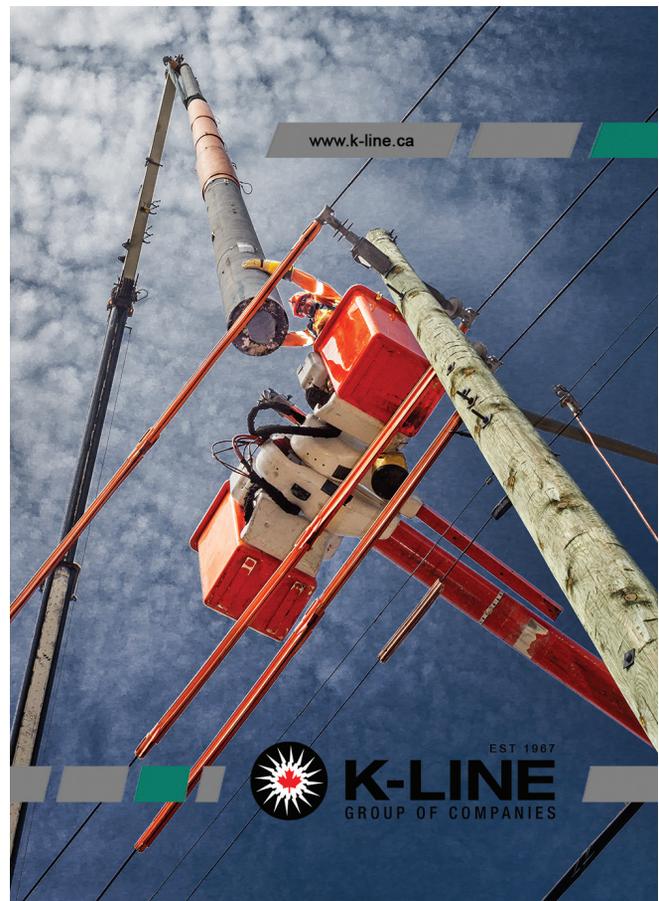


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What's new in the 2018 Canadian Electrical Code, Part I

THE TOP 15 CHANGES AND WHAT THEY MEAN FOR YOU

For over 90 years, the Canadian Electrical Code, Part I (CE Code) has been the backbone of Canada's electrical safety system – a system that works hard by design to keep installers, regulators, consumers, and their families safe from harm. Updated every three years to reflect the latest advances in technology and other major developments, this original, authentic Canadian-based safety standard aims to help maintain safety while improving productivity and facilitating innovation.

Although the importance of the CE Code remains constant, readers will notice that the content in the latest edition, which comes out this January, is quite different from the last. Over 260 updates and revisions have been made to the CE Code to:

- Reduce confusion and duplication through clearer, streamlined requirements;
- Help ensure safer installation and maintenance of electrical equipment; and
- Support the safe implementation of new technologies and clean energy systems.

The major changes you need to know

1. Now that higher power transfers over Ethernet cables are possible, sub-section 16-300 has been added to adequately address cable heating through installation and layout requirements.
2. As the number of control devices for energy management systems continues to increase, a new sub-rule requires the installation of an identified conductor at each control location to properly manage cumulative current.
3. Section 10 requirements for bonding and grounding have been reorganized into a more logical flow and significantly reduced in size.
4. Greater clarity has been provided regarding arc fault circuit interrupters (AFCI) in existing branch circuits. Exemptions have been reduced or removed for branch circuits supplying smoke alarms, carbon monoxide alarms, and bathrooms.
5. With increased use of LED lighting, disconnecting means are now required for certain LED luminaires, in addition to fluorescent ballasts.
6. In addition to dwelling units and child-care facilities, tamper

resistant receptacles are required in other areas where children may be present.

7. Equipment connected to devices having Class 2 Outputs will be approved based on voltage and application.
8. New Section 62 rules mandate ground fault circuit interrupter (GFCI) protection for electric heating devices and heating controls near wet areas.
9. Sub-rules 8-104(5) through (7) for continuous load have been distilled down to two sub-rules; one for switches and breakers marked for continuous operation at 100 per cent and one for switches and breakers marked for continuous operation at 80 per cent.
10. The “5 per cent rule” that permitted calculated load to exceed conductor ampacity by five per cent has been eliminated.
11. New sub-rule 2-100(4) requires that a caution label be applied to equipment indicating the maximum permitted continuous load.
12. To help prevent electric shock drowning, Section 78 has been extensively updated to require GFCI and ground fault protection for branch circuits and feeders respectively.
13. To help manage service capacity, demand factors have been added for electric vehicle energy management systems.
14. A separate branch circuit for kitchen wall receptacles is no longer required.
15. A separate circuit is only required for mandated refrigerator receptacles as outlined in 26-712(d)(i).

Still have questions? Consider enrolling in a CSA Group course

A lot has changed in the CE Code. And while you juggle with increased demands from your customers, new technologies, and a changing workforce – trying to understand these changes on your own may prove to be a difficult and lengthy process. CSA Group's network of experts and comprehensive training program can help you get up to speed so that you maintain your competitive edge.

Download our white paper to learn more about how training can help you navigate the CE Code.



Top Employee Benefits Plan Mistakes

By Jason Ovsenny

Employee benefit programs have become a significant cost for today's employer. As costs have grown, leading employers have realized that a more active governance model is required to best manage their costs and coverage going forward. But it is all too common for employers to have fallen asleep at the controls and put their employee benefits plan on autopilot, not realizing it is headed for a crash-course. When employers "wake up" to the new realities of growing employee benefits costs, they are discovering new best practices to invigorate both their knowledge base and their plan performance.

Are you making any of these mistakes with your employee benefits strategy?

1. Not utilizing economies of scale opportunities

An employer who has 20 employees will pay close to \$100,000 for benefits with 25-30 per cent of that being carrier administrative costs. Every year. For an expenditure of that size, why are you paying these stand alone retail costs? Many firms continue to overspend out of habit. Today's marketplace has opportunities to greatly reduce these significant excess costs, through well-established association plans (or buying groups) or alternative funding methods. You can cut this portion of your cost in half (or less) permanently, yet still maintain autonomy over your own plan design choices. There is power in numbers. Stop having to change carriers every year to get a "good" price. Reducing administration costs permanently makes sense and builds plan stability.

2. Offering a sickness plan instead of a real health plan

Today, employers realize that the majority of their employee benefits costs are driven directly by the health of their employees. Yet the majority of

employee benefit plans are built to be reactive; to pay the claim after it happens. Forward thinking employers are developing proactive wellness strategies to help prevent claims before they happen. Many wellness plans are now being offered on a complimentary basis when included in the employee benefits program.

3. Getting less for more

Many plan sponsors complain of routine cost increases year after year – without any benefits improvements. This forces them to cut coverage in order to stay cost-neutral. However, in today's competitive marketplace, insurers are willing to provide free value added benefits in order to earn your business. Today, it is not unusual to find complimentary Employee Assistant Programs, Wellness Programs, Trip Cancellation Insurance and other enticements included within the core benefits – at no additional cost. It's yet another way for an employer to get more value for their dollar without increasing their benefits expenditure.

4. Accepting Poor Service

Traditionally, your firm meets with your benefits consultant once per year to discuss trends, cost increases and review their plan design. As your spending increases on benefits – it makes more sense to review the trends, costs and reporting on a more frequent basis – yet this rarely happens.

Today's smart employer needs to be far more demanding in the level and frequency of customer service required. Written service level guarantees help meet this demand including detailed reporting, quarterly meetings, long-term rate guarantees and establishing committees to ensure good governance and compliance.

5. Your Benefits: Same as it ever was

There are a staggering number of plan designs available to the average employer. Yet, for the most part, plans can remain the same for years; sometimes decades. How can a "one size fits all" benefits program address the needs of a multi-generational workforce?

Conducting a benchmarking exercise is a good start to determine how your plan compares with the competition – and with the national averages. Understand how your plan stacks up to the competition. From there you can align your plan design with your company goals and objectives. Plan Design Optimization and Benchmarking are good ways to ensure that every penny spent on benefits is a wise expenditure.

6. Lack of Employee Engagement

Employees can be part of the solution. To be an employer of choice is to purchase a cost effective and competitive benefits plan, and then effectively communicate the value to employees. Yet many employers simply hand out employee booklets and wait for questions. A structured communications program doesn't need to be complicated; only clear. Top employers know this and create professional communications to all levels of employees.

How did you score? For most employers, the status quo is not working anymore. Find a knowledgeable consultant that can correctly steer you and your benefit plan through today's complex marketplace.

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INDUSTRY HIGHLIGHTS



COCA Annual General Meeting, February 22, 2018

ECAO was awarded a plaque for its 70 years of service to the construction industry. Dan Lancia, Holacor Installations Limited, was awarded the COCA President's award at their Annual General Meeting. Dan has been a strong advocate for prompt payment legislation both provincially and nationally. Dan sits on the COCA Board and is past president of ECAO.



ECAO receives award recognition at COCA AGM for 70 years of support for the construction industry.



Windsor Electrical Contractors Association (WECA) Ladies Night

WECA held another successful Ladies Night on ??????. Many of the door prizes were donated by local merchants.



ECAO- ANNUAL GENERAL MEETING SEPTEMBER 12 & 13 BLUE MOUNTAIN RESORT

Mark Lloyd and the ECAO Board of Directors invite you to attend this year's AGM at Blue Mountain Resort. Apart from the formal AGM, ECAO is planning an evening reception on September 12 celebrating its 70th year, with 70s music and members are encouraged to dress for the occasion.

ECAO will be inviting our Affiliate Partners to join us for this year's AGM and get an opportunity to mingle with our members in this fun, casual setting.

Following the AGM, we will have a feature speaker, Paul Radowski, from Life Recovery to provide a greater understanding and awareness of mental health in the work place. Full AGM details to follow.

Blue Mountain provides a wide variety of activities for members and partners. To register early please contact Cathy Frederickson at ECAO cfrederickson@ecao.org

Partner program/delegate activities and attractions:

- Georgian Trails
- Sunset Point Park
- Xtreme adventures, waterskiing and jetskiing
- Scandinave Spa Blue Mountain
- Blue Mountain Village spas, restaurants and shopping
- Fishing and chartered boat trips
- Golfing Monterra Golf Course





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“I engaged CSC Consulting on a recent subcontractor claim that had significant time and cost overruns. Andy and his team quickly researched, identified and organized the issues into distinct elements of delay, acceleration and winter work and using clear graphics and an easily understood and compelling narrative were able to identify entitlement, cause and effect and establish quantum.

I have always found Andy to be dedicated, passionate and non-partisan in his pursuit of the root cause issues which greatly assists in the leverage of a settlement without resorting to costly litigation.”

- *Atrium Consultants*

“Andy’s (CSC) involvement has significantly enhanced cost recovery from overruns, has forced the other side to the table by holding them accountable to timeframes and the contract. Andy (CSC) has increased the amount of the expected claim amounts and reduced the timeframe to resolution.”

- *Elliott Underground Construction*



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Vol 56 • Issue 2 • Q2 2018 • www.ecao.org

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