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The Ontario
ELECTRICAL CONTRACTOR
ECAO
ELECTRICAL CONTRACTORS ASSOCIATION OF ONTARIO

Volume 41 • Number 4

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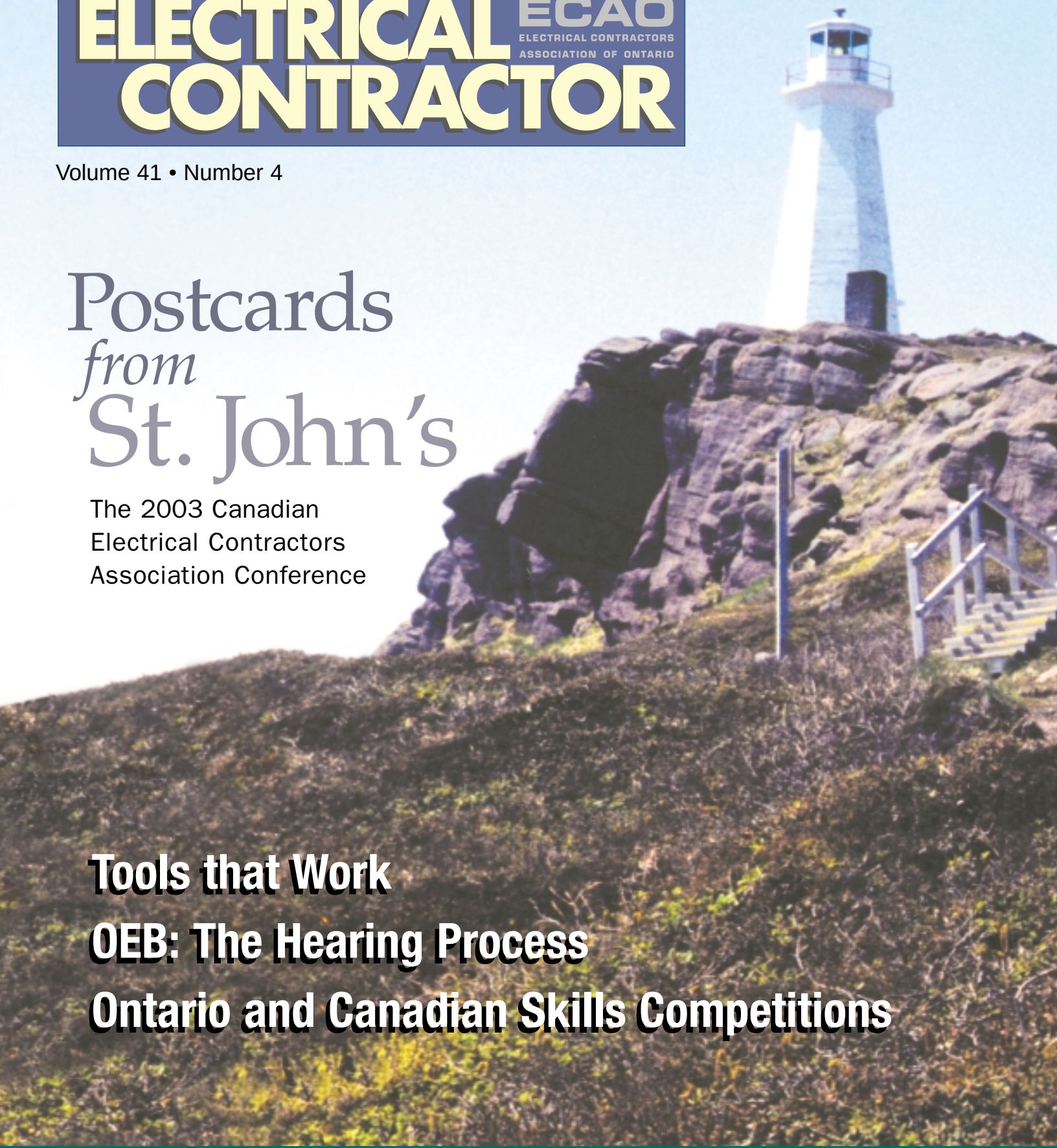

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The Ontario ELECTRICAL CONTRACTOR
Volume 41 Number 4 • September 2003

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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Lighthouse at Cape Spear, NL

Editor's Message

by Earle Goodwin

Contracting is a difficult business. Someone once told me that the way to build a $5 million electrical contracting firm is to start with $10 million. They'd probably just finished one of *those* jobs.

Brian Foster, of Revay & Associates, has been involved with construction management for more years than he'd like to admit. Over that time he's analyzed many jobs. In particular, he studied 30 projects completed over a decade that expended over 2 million man-hours. In his article, *Monitoring Construction Profitability*, he shares some of the information he gleaned from that study and gives us some bench marks you can look to when trying to assess whether your project is running on schedule and profitably.

Winston Churchill told the world, "Give us the tools and we will finish the job." Tools are supposed to help us and make us more profitable. But the poorly designed tools can cost us time and money in ways we may not have considered. In *Ergonomics and Tool Design*, Jim Mason, of Pefco Ontario, demonstrates that the proper tools can save us more than we might imagine.

ECAO is very concerned with the competitive climate in the power and utility sector. In particular we want to make sure that the utilities are competing fairly for work that our contractors have been doing for many years. Last issue, Rob Frank painted the broad brush strokes of what's involved in protecting our rights. In this issue he and Heather Landymore, of MacLeod Dixon, come back to elaborate on the details in *Protecting Line Contractors: The Ontario Energy Board's Hearing Process*.

Our conference in St. John's, Newfoundland and Labrador last June was enlightening and entertaining. As you can see from the cover, the setting was spectacular. And we have more pictures to rekindle memories for those who were there, and (maybe) inspire a bit of jealousy in those who weren't.

We also have pictures from one of my favourite annual events, the Skills Competition. This year's event was held in Waterloo at RIM park, where Ontario had its annual competition, then ended the week by hosting the nationals.

And we are pleased to recognize the winners of ECAO's D. J. B. Wright and R. H. (Hugh) Carroll awards and CSAO's Roy A. Phinnemore Award.

Rounding the issue out, we received a letter that took issue with Dave Moncur's article on safety circuits that appeared in the last issue. When I was originally approached with the story, I wondered why we should be looking at regulations and standards that came out in 1997, and was told that there was still a lot of confusion on their interpretation. Apparently there is. We've printed the letter and Mr. Moncur's response.

We do appreciate hearing from you. Your feedback helps us provide you with articles that you find interesting. So, if there's anything you enjoyed and would like to see more of, or something you're not hearing enough about, feel free to get in touch with me. In the meantime, enjoy this issue.

President's Message

by Dave Mason

This is my first message since becoming President at the end of June, and I want to take this opportunity to thank the board for their confidence in me. I'd also like to thank Hamilton's Brian Rielly and Central Ontario's Dan Moore for their service to the board over their terms. A special word of thanks goes to Case Opdam, a long time member of the board and executive, for his guidance and leadership over the years. His term as Past President expired at the annual general meeting and we wish him all the best in the future.

With people leaving, there are new faces at the board, and I'd like to extend a sincere welcome to Dan Lancia from Hamilton, John Raepple from Central Ontario and Dennis Tatasciore from Northern Ontario. I'd also like to welcome our new Second Vice President, Fred Black, to the executive. We have another busy year ahead of us, and I look forward to working with you.

The first part of this year will be particularly busy with the negotiation of a new principal agreement. As you are no doubt aware, our principal agreements run for three years. During that time we have a chance to gauge the effectiveness of new measures that were put in place in the last round of bargaining and assess the way the contract works, in general. Negotiations allow both sides to address their concerns and develop solutions to the problems that invariably arise.

This is why it is so important to be in touch with your local Electrical Trade Bargaining Agency (ETBA) representative. Although they are contractors themselves and get a good sense of the issues through working with the contract on a daily basis and counselling other contractors when problems arise, much can be learned through discussions held between contractors when a specific grievance isn't on the table and we can look at the contract dispassionately.

Naturally, negotiations aren't just one-sided and it is often difficult to achieve the changes we might like to see. But it is important, nonetheless, to have these open and frank discussions among ourselves in order to develop the vision we need to guide us.

In the meantime, the work of the association continues as we continue to meet the targets in the strategic plan. As I said, it is going to be a busy year, but the ECAO board of directors and its committees are looking forward to the challenge.

R. H. (Hugh) Carroll Safety Award

In 1999 the Board of Directors created an award to honour the memory of Hugh Carroll. Because of Hugh's concern for the safety of the province's electrical workers and ECAO's desire to foster it, the Board decided that this award would be presented to those firms who had demonstrated sound safety practices through their exemplary safety records.

This year, awards were presented in three of the Rate Group 704 categories on June 21 in St. John's before the start of ECAO's annual general meeting. ECAO is proud to recognize the following companies for their outstanding safety records:

- Gemor Electric Limited - less than 50,000 hours
- Trade-Mark Industrial Inc. - 50,001 to 200,000 hours
- Guild Electric - 500,000 + hours

Their were no entries in the 200,001 – 500,000 hour category or the Rate Group 830 categories.

FEEDBACK

We want your comments

Contact Earle Goodwin, Editor
Electrical Contractors Association
1-800 387-ECAO (3226)
email: egoodwin@ecao.org

Protecting Line Contractors:
The Ontario Energy Board's Hearing Process

By Robert Frank and Heather Landymore

Utilities can be prompted to comply with rules and regulations in an informal manner through the customer complaint and dispute resolution process (as described in the last issue of *The Ontario Electrical Contractor*). Only the Ontario Energy Board (the "Board") however can formally enforce compliance through either an order or decision. It is typical for the Board to initiate proceedings, particularly if the issue is likely to be controversial. It is also possible to request that the Board make an order or decision through a formal application to the Board. The Board will reach a decision after holding a hearing to determine the issues involved.

Even if the Board has commenced the hearing process, it is still possible to participate. The most common way of participating is as an "intervenor". Any individual, group or company that has an interest in the hearing must file a letter of intervention with the Board. The Board will review your letter, and notify you if you have been accepted as an intervenor in the proceeding. The Electrical Contractors Association of Ontario is currently intervening in the hearing on amendments to the Transmission System Code that address competitive options for construction and design of transmission connections.

Commencing a Hearing - How does the Hearing Process start?

The hearing process starts when the Board commences a proceeding on its own initiative, or when an applicant files an application with the Board. Otherwise, hearings can only be commenced if the Board receives a reference from the Minister of Energy or the Minister of Natural Resources.

Before a public hearing is held, a document called a Notice of Application or a Notice of Public Hearing is published in relevant newspapers or served on the individuals involved. If the application relates to an area that is designated as bilingual under the *French Languages Services Act*, the Notice of Application will also be published in the French daily and weekly newspapers within the service area as well.

The Notice of Application or Notice of Hearing gives a brief outline of the matters to be addressed at the hearing (including whether or not the proceeding will be written or oral). It also provides a description of the procedure to be followed should an individual, group or company wish to participate in the proceeding.

Hearings before the Board are conducted in a less formal manner than proceedings held before a court of law. The Board conducts its hearings under authority of the *Ontario Energy Board Act, 1998* and the *Statutory Powers Procedure Act* ("SPPA") which sets out the minimum rules of procedure the Board must follow. As well, under the authority of the SPPA, the Board has formulated its own Rules of Practice and Procedure to govern its proceedings.

Where the Board holds an oral hearing, two to three members are typically assigned to hear each application (termed the Hearing Panel), but two members can constitute a quorum under the Board's legislation. The Chair or Vice-Chair, may, in exceptional circumstances, authorize a single member of the Board to hear and determine a matter.

Procedures Involved in a Hearing.

1. Filing an Application.

As above, any individual, group or company other than the Board can commence the hearing process through filing an application with the Board. The application must contain a clear and concise statement of the facts, the grounds for the application, the statutory provision under which it is made and the nature of the order or decisions applied for.

As above, if you are participating as an intervenor, you must file a letter of intervention with the Board. This letter must contain your interest in the proceeding and the extent to which you intend to participate. The Board may reject your request to intervene if you fail to prove that you have a direct interest in the proceeding, or if it is clear from your letter of intervention that you do not intend to actively participate.

2. Pre-Hearing Proceedings.

Although not mandatory, the Board may, in any proceeding, direct the parties to participate in technical conferences, issues conferences and/or pre-hearing conferences, establish interrogatory procedures and/or direct the parties to participate in alternative dispute resolution. The Board typically convenes such pre-hearing proceedings in order to clarify and if possible narrow the issues.

A. Conferences.

The technical conferences are to be held for the purposes of reviewing and clarifying applications, interventions, replies, evidence of the parties or interrogatory matters.

The Board will hold an issues conference if it feels that it would assist the Board and/or the parties, or if the documents that have been filed do not sufficiently set out the matters that will be in issue in the proceeding.

The Board, either of its own accord or at the request of a party, may direct the parties to participate in a pre-hearing conference. A pre-hearing conference will be held in order to: (a) admit certain facts; (b) permit the use of documents by any party; (c) recommend the procedures to be adopted; (d) set the date and place for the hearing; (e) consider the dates by which any of the steps in the proceeding are to be taken; (f) consider the estimated duration of the hearing; or (g) deal with any other matter that might simplify or expedite the proceeding.

B. Interrogatories.

Parties have an opportunity to ask other parties questions that relate to the issues to be addressed in the hearing. The process, which is done in writing, is known as the interrogatory process.

Interrogatories are to be directed to the party from whom the information is sought, and must contain specific requests for clarification of a party's evidence, documents or other information in the possession of the party.

C. Alternative Dispute Resolution ("ADR").
The Board may establish Practice Directions for ADR, and may make participation in an ADR conference mandatory. Only parties are allowed to participate in an ADR conference, unless the Board and the parties agree otherwise, which prevents observors and individuals, groups or companies who have filed comments, but are not parties, from participating. Intervenors can participate in ADR conferences because they are considered parties to the proceedings. If the parties reach agreement, then a settlement proposal must be filed with the Board. The Board may base its findings on the settlement proposal if the Board accepts the settlement proposal as a basis for making a decision.

3. The Hearing.
The Board must hold a hearing unless: (a) the proceeding is frivolous, vexatious or commenced in bad faith; (b) the proceeding relates to matters that are outside the jurisdiction of the Board; or (c) a requirement for bringing the proceeding has not been met.

The majority of the Board's oral hearings are held in one of its two hearing rooms at its offices located on the 25th floor at 2300 Yonge Street, Toronto. In instances in which the matters under review have generated substantial interest and the Board determines that it is appropriate to encourage public participation within the service area of the utility, the Board will schedule hearings in appropriate venues within the area to facilitate the public's access to the hearing.

The hearing will be conducted in either English or French. Unless otherwise requested, the hearing will be conducted in English. Any request for a hearing to be held in French should be made to the Board Secretary as soon as possible in order to allow for the Board to make arrangements for an appropriate translator or the service of an interpreter.

4. The Decision.
The Board may issue its decision either orally or in writing. The Board must provide reasons for its decision on the request of any party. All parties to the proceeding will be advised of the time of the oral ruling.

A decision on the issues raised in the application will be made as soon as possible. Applications that contain complex issues (such as major rate cases or references) can be expected within 90 days after the conclusion of the evidentiary portion of the hearing. The time for the release of the decision for less complex hearings may be shorter.

Copies of written decisions are issued to all parties to the proceedings. All Board decisions are public documents, and therefore the major cases are published and made available to the general public. Copies may be obtained by contacting the Board's Customer Service Centre. Major decisions are also available on the Board's website at www.oeb.gov.on.ca.

Once the decision has been issued, typically the Board will shortly thereafter issue an order directing the implementation of the Board's decision.

5. The Appeal.
The Board's decisions are subject to various types of appeals. Any of the parties to the hearing may file a motion with the Board requesting that the Board rehear or review any application. The Board will review the request, and has the power to alter or amend any previous order made by it through a subsequent order.

Any Board decision may be appealed to the Ontario Divisional Court, but the scope of such an appeal is limited to matters of law and jurisdiction. No factual matters may be appealed to the Divisional Court. An appeal to the Divisional Court must be commenced within 30 days after the Board makes the order, unless the Divisional Court grants leave to extend the appeal deadline.

The final method of appeal is to the Lieutenant Governor in Council. This is a petition to the Cabinet of the Ontario Government. Any party or person interested may file a petition within 28 days of the issuance of the order with the Clerk of the Executive Council. Cabinet may confirm the Board's order, or require the Board to rehear the matter. It is unlikely that a proceeding would reach this stage, but it is nevertheless a possibility.

Robert Frank is a partner and Heather Landymore is an associate at Macleod Dixon LLP, an international law firm that specializes in national and international energy law services, with a particular emphasis on electricity, natural gas and emissions trading. Robert's practice focuses on advocacy work in the energy sector.

Ontario and National

This year, in addition to staging the 14th Ontario Technological Skills Competition, RIM Park in Waterloo hosted Skills Canada's national competitions. Skills Ontario started on May 25, with the competition on May 27 and closing ceremony on May 28. By May 30, the competition area was reset for the start of the 2-day national competition.

ECAO, through the Joint Electrical Promotion Plan, has been an active supporter of these competitions for many years, and this year was no exception.

We ran two wiring competitions, one for secondary school students and one for post-secondary students, as well as the network cabling specialist competition at the provincial level.The winner of the post-secondary competition went on to compete against nine other provincial winners at the national competition that we also ran.

Dave Spena, of Durham College, beat out Ken Rivers of Humber College and Robert Woods of Durham College in the Network Cabling Specialist competition.

In the secondary school wiring competition, gold went to Nathan Parsons of the Wellington Catholic Board. Silver was won by Darcy Martin of the Wellington District Board, and bronze went to Toronto's Andrew Bell.

At the post-secondary level, an ECAO/IBEW apprentice from Ottawa, Dave Powell, prevailed over two apprentices from Conestoga College, Scott Hickey and Ryan Rawn, who won silver and bronze, respectively.

Dave Powell went on to win the national competition. This is the second year in a row that one of our apprentices has won the Ontario event and gone on to win the nationals.

Students try their hand at a crimp connection on a telephone cord.

ECAO and the IBEW also joined with the other organized trades in the Ontario Construction Secretariat's area to provide hands-on displays for the thousands of students who visited the competition site. Visitors were able to make wire joints, bend conduit, splice communication cables and fit them with connectors, try a light bulb identification quiz and see displays of traffic control systems and advanced household wiring. For their participation, they were given an indoor frisbee and information on how to enter the trade.

Putting the pieces together in the Secondary School project

Provincial Post Secondary Inside Wiring Competitors.

Back (l-r): Dave Powell, Leonard Oosterhof, Giuliano Traetto, Mike Keddie, Matthew Curtis, Scott Hickey, Kelly Fulcher, Dave McNabb, Justin Fotheringham

Front (l-r): Steven Tonkin, Ryan Rawn, Robert Lacasse, Wojciech Furczon, James Murphy, Pierre Rochon, Bill Kirkland

Skills Competitions

Punching down the Network Cabling Specialist project.

Figuring out the Provincial Post Secondary project.

Winners of the Ontario Post Secondary Inside Wiring Competition (l-r): Scott Hickey (Bronze), Ryan Rawn (Silver), and Dave Powell (Provincial and National Gold)

National competitors.

(left to right)
Nick Burtney (Sask.),
Ed Gregory (NB),
Donald Snow (NL),
Tyler Shaver (YT),
Andrew Watt (BC),
Devin English (MB),
Dave Powell (ON),
Robert Boisvert (AB),
David Sudworth (NS),
Mike Broussard (NWT)

Ergonomics and Tool Design

by Jim Mason

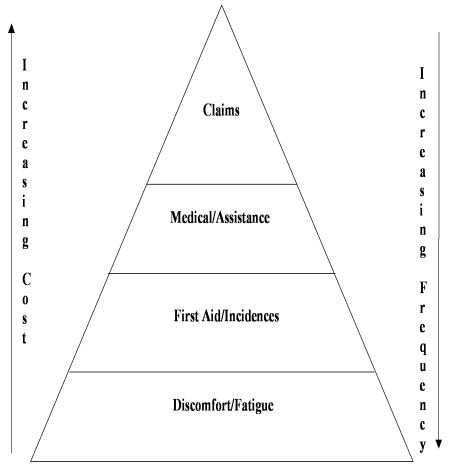
In the budget they show up as a cost. And there is no doubt that they can be costly. But tools should make you money, by allowing you to take on tasks that are beyond the limitations of the human body and/or increasing productivity.

Let's, first, look at the cost of tools.

There's the obvious purchase price, but there is more. In many cases, there is the cost of training to ensure the tool is used correctly, the cost of consumable items (drill bits, dies, fuel, etc.) and other maintenance costs. But one cost that we often neglect to assign to tools is the cost of lost productivity due to injuries.

Tools are supposed to help us and make us more productive. However, many tools demand more of the operator than they can give on a prolonged basis. They can cause you to work in awkward positions, or require a great deal of force to operate, or simply need a small amount of force but repeatedly.

The damage done can be as minor as fatigue, or can range to permanently disabling, as in carpal tunnel syndrome or other repetitive stress injuries. All injuries can be expensive, as shown in the following illustration.



As we can see, the major injuries are less frequent but more costly. Conversely, minor injuries have low costs associated with them, but the volume is higher. Fatigue, for example, not only causes a drop in output, but may require you to increase your crew size to allow workers to spell each other off to avoid wearing themselves out. Or it can result in increased costs to repair work the operator was too tired to do properly the first time (for example, insufficient pressure being applied to a crimp connection).

Contrary to the impression given above, tool designers do not intentionally set out to inflict pain on their customers. The fact of the matter is, until recently, they were focused on accomplishing the assigned task, and paid very little attention to the effects on the person who would have to work the tool. It has only been in the last fifty to sixty years that the science of ergonomics has been around to guide them in creating better tools.

Simply put, ergonomics is the science of taking human and environmental factors into account in designing safe and effective tools and processes. Ergonomists study our limits and how we interact with our work environment. For example, in designing a tool, they would look to see that it:

- Has handles that distribute pressure across the palm
- Is designed to provide the required force
- Has handle orientations that allow straight wrists
- Reduces or (ideally) eliminates hand and arm vibration
- Reduces repetitive motion requirements
- Allows operator to work in a comfortable position
- Is designed to be operated by workers of varying heights, weights, etc.

Tool designers have also been aided by technological advancements. For example, let's look at crimpers. Linemen have used a long handled tool that looks somewhat like a large pair of pruning shears for many years. The length of the handles was necessary to develop the force necessary to crimp the metal sleeve around the wires. This resulted in the lineman having to move the handles through a wide arc. If he were working alone, he'd often have to resort to resting the lower handle on his hip so that he'd have a hand free to hold the connection in place. Many times, he'd be working in an awkward position. It's not surprising, therefore, that repetitive stress injuries were not uncommon in this line of work.

Repetitive stress injuries are caused by:

- Force
- Repetition, and
- Bad posture

This one task has two of these elements and, depending on the worker's duties, has the potential for repetition, as well.

To overcome situations like this, tool designers often look to develop power tools as a solution. A well-designed ergonomic power tool all but eliminates the need for brute force, and allows the operator to work in a comfortable position.

One of the problems that come with power tools is the power source. Recently battery power has become a popular choice. Batteries are ideal because they can be used in environments where space is at a premium and electrical power might not be available. Batteries have come a long way in the last few years. They've become more powerful and more compact. They hold a charge longer, even under load. And they can be recharged in minutes where it used to take hours.

The benefits of ergonomically designed power tools are readily apparent. Productivity goes up because tasks are completed more quickly and operator fatigue is greatly reduced or eliminated. Costs for tool-induced medical claims are reduced (in fact, some disabled workers might be able to return to the workforce). Workers aren't lost to injury, which eliminates additional training costs for replacement workers. And crew sizes can often be reduced.

There is no doubt that ergonomic power tools cost more, initially, than their manual equivalent. But there is a difference between cost and value. A discussion with a reputable tool distributor could pay big dividends in the long run.

Jim Mason is President of Pefco Ontario, a distributor of tools and supplies for the electrical contractors and the utility industry.

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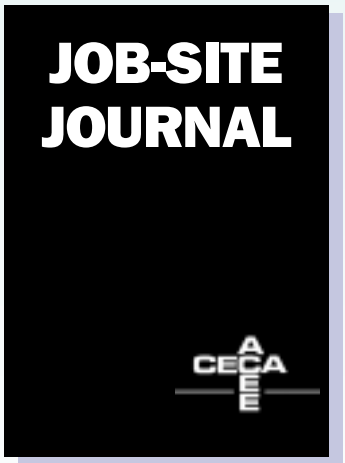

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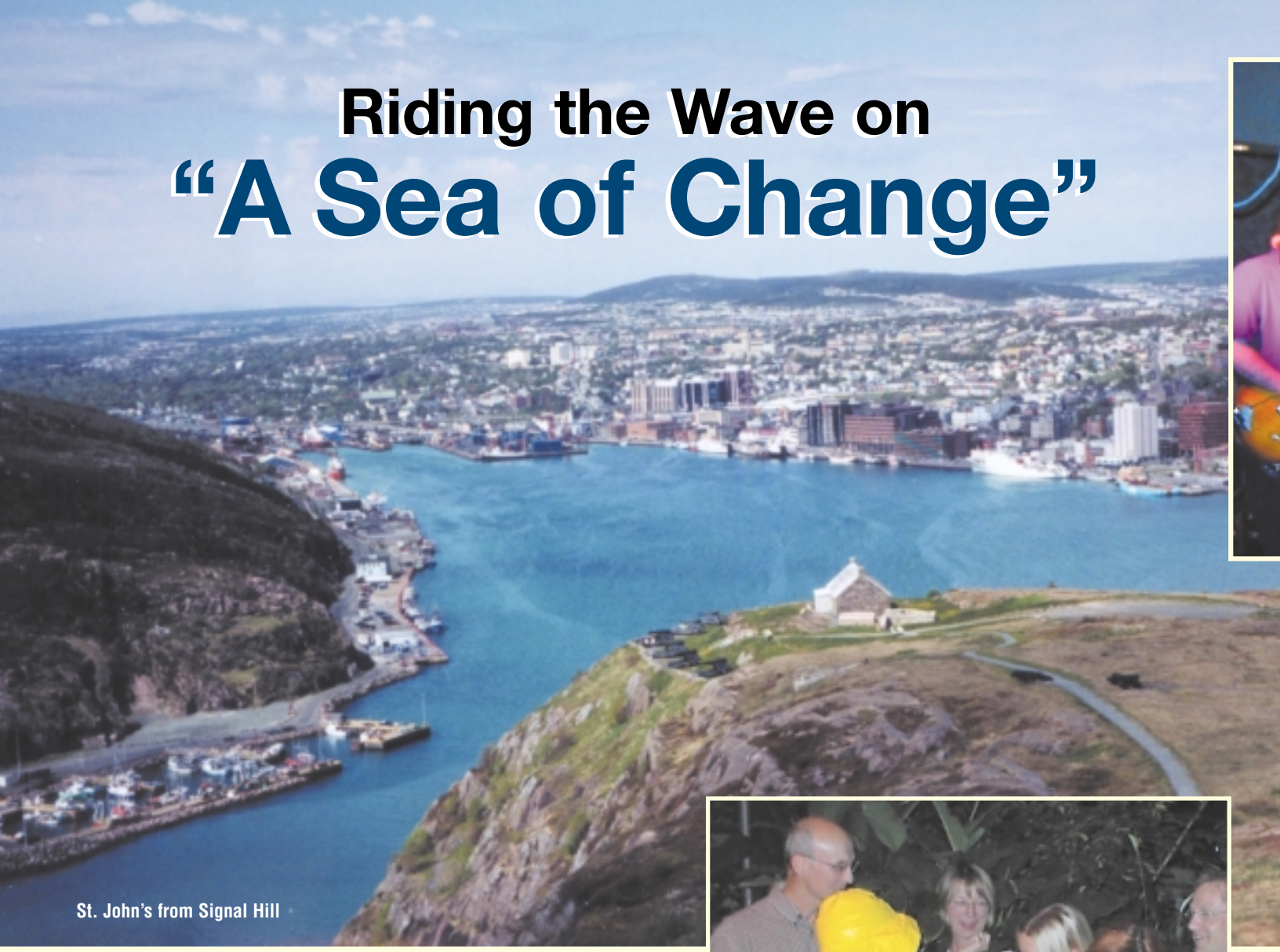
Riding the Wave on "A Sea of Change"



St. John's from Signal Hill

Kissin' the "cod". A must for a proper Screechin' In.

The bar keeps rising, year after year, according to ECA BC's executive vice president, Richard Campbell. And he should know, as British Columbia initially set the standard 3 years ago.

Everything was perfect in St. John's, Newfoundland and Labrador for this year's national Canadian Electrical Contractors Association conference, co-hosted by ECAO, June 18-21. There were icebergs and whales in the harbours, and the weather, with the exception of rain on Friday, was superb.

Appropriate to the locale, the theme of this year's conference was "A Sea of Change", which was also the title of Joe Caruso's keynote address. Mr. Caruso's business session was entitled, "If the Horse is Dead, Get Off", which looked at the futility of doing things the same way even though the reason we do them has changed.

Other speakers addressing the changes we're facing were Will Koroluk, who guided us through the pitfalls and rewards of the internet and software for contracting; Dean Roebothan and Patrick Kearney of Aliant Communications, who showed us some upcoming trends in wireless communications; and Dwight Noseworthy and Caroline Rheaume of Assante Capital Management, who gave us tips on succession planning. We were also treated to a presentation by John Efford, Member of Parliament for the federal Bona Vista-Trinity-Conception riding, who gave us a little history of the province and presented some of the current opportunities and challenges it faces.

Delegates and their guests had the opportunity to explore historic St. John's and environs through walking tours, boat tours, dinner theatre and forays into the heart of St. John's night life, George Street, with its many pubs and bands.

The conference concluded with dining and dancing at the Gala, which featured the music of Billy and the Bruisers, a ten-piece band that kept the dancers in our group on the floor all night.

Billy and the Bruisers kept the dance floor full. Canadian Idol fans may recognize the female vocalist.

John Efford, MP for Bona Vista-Trinity-Conception

Patrick Kearney demonstrates new wireless devices

Conference Chair, Brad Vollmer (right), thanks Will Koroluk for his presentation.

A local artisan demonstrates her craft at the Welcoming Reception.

CECA board members and guests. Standing (left to right): Garry Fitzpatrick, Jean Provost, Richard Campbell, Rick Lavergne, Brian Leverick, Willard Kondro, Fred Cahill, Lucy Roberts. Seated (left to right) Alain Paradis, Rick Brodhurst, Case Opdam, Eryl Roberts.

Icebergs at Cape Spear

From Layout to Lights On

Monitoring Construction Profitability

by Brian Foster

The bid got you the job and you are now holding your breath. How realistic was the bid? Should it now form the basis of the job budget and the crew size? Is there something else, something reasonably simple, that we can do to monitor our profitability, our time, our cost, as the job proceeds? This short article sets out to provide some useful suggestions and a little encouragement for those with such a predicament on their hands.

Let's assume the bid led you to anticipate the following costs:

1. Direct Materials: 37%
2. Indirect Materials:5%
3. Direct Labour: 36%
4. Indirect Labour: 10%
5. Site & Business Overhead: 5%
6. Profit: 7%

Purchasing materials (1), especially within the electrical construction industry, is an art in itself, although some often see it as a minefield with all those options and discounts, to say nothing of the minimum requirements of the specification.This is not within the particular expertise of this author, and being an almost 'fixed cost', it will not be addressed in this article. Suffice to say that all too frequently the early profits made in purchasing are agonizingly offset against losses incurred in direct labour and time related expenses. It is this aspect of our business (the *'at-risk variable costs'*) that is being put under the microscope here. How this 36% (3) fares will determine the fate of the other 27% (2+4+5+6).

Having monitored more than two million actual construction man-hours on more than 30 projects during the past decade *(incidentally where the combined bids supported only one million man-hours)*, it is possible to offer some simplistic analyses, which may prove of assistance to those charged with managing the profitability of electrical construction projects. Table 1 is the result of analysing five electrical subcontracts on which some 350,000 man-hours were expended. By its nature *(tail-end-Charlie)* the electrical sub-trade is exposed to the project's delays and disruptions, which are often caused by the preceding trades. Anyone who has kept graphs of overall project progress will know the simple guideline for establishing the coordinates for the so-called standard S-curve; when 40% of total project time has elapsed, then project progress is normally 30%; when 60% of time has elapsed, then project progress is also 60%. This however reflects

the progress of all trades. The structural trades will naturally be ahead of these coordinates and the finishing trades will be behind. But how far behind should the electrical trade be? The five jobs in Table 1 were not ideal or perfect jobs. Each was subject to changes, delays and disruptions. None of these jobs were completed on original budget, but because an independent party had closely monitored them, the changes were priced suitably, and timely notice was given concerning 'impact costs' being incurred.

Table 1

Percent Actual Time	Job A	Job B	Job C	Job D	Job E	Average of 5 Jobs
10%	3%	2%	1%	1%	2%	2%
20%	7%	4%	4%	4%	7%	5%
30%	13%	6%	12%	9%	11%	10%
40%	24%	10%	21%	15%	16%	17%
50%	38%	27%	28%	28%	28%	30%
60%	52%	48%	41%	38%	45%	45%
70%	68%	91%	60%	56%	73%	70%
80%	84%	98%	85%	70%	96%	87%
90%	96%	99%	98%	89%	99%	96%

By averaging these five jobs, it can be seen that when the electrician has been on site for 40% of the anticipated time frame only 17% of the forecast hours will have been expended. This is only an observation not a strict rule, however the intention here is to coach the electrical superintendent into making such observations throughout the life cycles of all his or her jobs. Simple calculations of time and cost can be made and considered when such in-house historical data is available.

Obviously the ability to forecast with some reliability is all-important. All too often the trade contractor is not measuring job progress with any sophistication, the periodic billing being the only indication of earned value. Is there a simple way to assess electrical job progress? During the first 10% of actual time on the jobsite the layout function is the most important activity. From this activity some vital information becomes available with which to start purchasing bulk quantities of conduit. This same information can assist in measuring progress. From experience the author suggests that, in the typical project, some 20% of electrical man-hours goes into installing the entire network of conduit. Knowing that the bid estimate carried 100,000 feet of conduit and 66,000 feet of conduit has been purchased and delivered, a tour of the jobsite might indicate that 8,000 feet is still on the deck in bundles, therefore some 58,000 feet (58%) must have been installed. Conduit historically represents approximately 20% of the overall job man-hours, therefore it follows that almost 12% of the overall electrical labour has been earned through conduit installation alone.

Table 2 sets out a simple breakdown of typical electrical subtrade scope. The eleven activities are allocated 'progress points'. This allocation can be derived either from the estimate or by personal judgement based on historical data or 'gut-feel'. In this example the conduit has earned the job some 12-progress points with another 10-progress points having been earned across the other activities.

Table 2

Activity		Progress Points	Percent Installed	Progress Points Earned
Conduit	Distribution	8	70%	5.60
	Branch	12	50%	6.00
Cable/Wire	Distribution	8	15%	1.20
	Branch	2	10%	1.20
Terminations	Distribution	7	3%	0.21
	Branch	13	2%	0.26
Equipment		8	50%	4.00
Panels		5	35%	1.75
Devices		10	16%	1.60
Lights		12	2%	0.24
Testing		5	0%	-
Totals		100	22%	22.06

Man-hours Worked 8,957
Performance Index 406
(man-hours per 1% progress)
Forecast Final Man-hours 40,600

Assessing the "Percent Installed" every other week should be done with due consideration to purchased quantities (where appropriate). Obviously terminations completed cannot be in excess of cables pulled and equipment/panels installed. Cables/wires pulled

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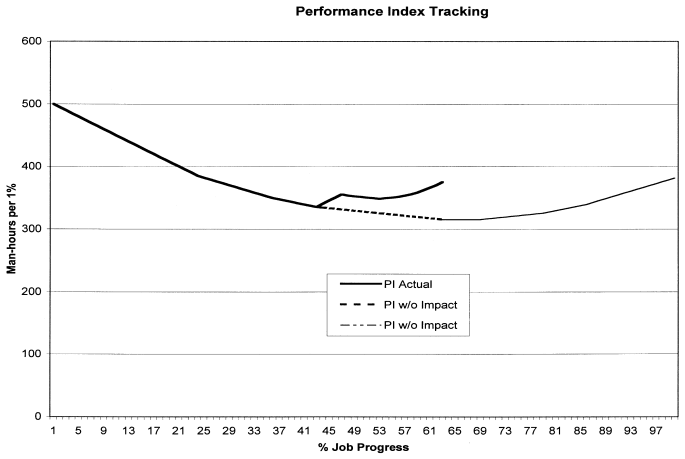
cannot be in excess of conduits installed. Normally, the superintendent can prepare the above information in no more than one or two hours of his or her time.This is a relatively minor disruption to all of the other superintending tasks that must be done.



The forecast reported in Table 2 is based on a linear extrapolation from this point in the work. However, if the Performance Index is graphed as shown in Illustration 1, then the trend can be monitored and considered throughout the life of the job. Note that the x-axis represents job progress (not time) and the y-axis represents the Performance Index (PI). The path of the trend provides a simple but reliable tool for forecasting the future path as well as provoking the questions of what is causing any off-trend(s).

This type of information is vital to effective management of the project.The budget is 32,000 hours and change orders only supplement this to 36,000 hours. Pending extras might account for another 2,000 hours. What is causing the forecast overrun of 3,000 hours? Is it the impact of the extras? Is it all the stop/start disruption being experienced? Is it the overtime being worked? Is it because the work was delayed into winter and the building is not enclosed? Is it because the bid was too low? What can be done to mitigate this situation during the remaining 78% of the job? Will the project schedule be extended, or will crew sizes be increased? Has the completion schedule been manpower loaded based on a reliable forecast or is it based on an out-of-date budget? Are we creating a project delay by being under-manned?

The electrical contractor can nominate someone in-house to ensure that this type of analysis is carried out or it may wish to consider the benefits to be gained by having an external monitor oversee the analysis and receive periodic reports explaining man-hour overruns, their causes and their impacts.

However, the most important question comes with a contractual obligation in mind — should the client be put on notice of your intent to recover impact costs that have been, and continue to be, beyond the control of the electrical contractor? Or should the pending extras and future extras be priced in such a way as to ensure recovery of impact costs?

Pictures still tell more than a thousand words, but will you have the pictures? Bitter experience tells us that once the lights go on it's too late to prepare the pictures. Layout is where it should begin.

Brian Foster is a consultant who specializes in construction labour productivity with Revay and Associates Limited, a national firm of Construction Consultants and Claims Specialists.

Letters to the Editor

Regarding our article on Safety Interlocks in the last issue, Doug Nix writes:

I read the article "Safety Interlocks – MCRs Don't Cut It" in Volume 41 Number 3 recently after one of my customers brought it to my attention.

We are also in the machinery safety business and I have been evaluating industrial equipment for many years.

In my opinion, Mr. Moncur has made some strong overstatements in his article. First the article has vastly oversimplified the subject. Second, the emergency stop circuitry in a machine, while it may be part of the safeguarding circuit in some designs, is not considered to be a safeguard and thus is not generally considered to be part of the safety related part of the control system. Let me expand on this a bit.

Safeguarding circuits are composed of safeguarding devices, such as interlock switches, safety mats, light curtains and other devices that are intended to prevent injury by detecting an intrusion into the danger zone of the machinery and stopping the hazard *before injury can result*. As such, the need for reliability in these circuits is driven by the type of hazard safeguarded and by the risk of involvement posed by the design. In order to rationally and adequately design the safeguards on a machine, knowledge of the intended use of the machine and a risk assessment is required. It is possible to reduce this work *if* a product family standard exists for the machinery. An example would be CSA Z142-02 for presses. In these cases, the technical committee that created the standard has assessed the dangers present in the machinery and prescribed minimum safeguards required.

The emergency stop circuit, however, cannot detect an intrusion into the danger zone. Instead, it is generally the first thing pressed after someone is already involved in the hazard. The next action is normally to call 911.

I will not dispute that a degree of reliability is required in this circuit, since you certainly want the power off when someone is injured, however you can also use the machine's disconnecting means to achieve the same result. The machinery safety standards do not address emergency stop circuits in the same way that they deal with interlocking for this very reason. Regulation 851, the regulation in Ontario that requires Pre-Start Health and Safety Reviews for machinery under Section 7, does not require that machinery have an emergency stop, only that it shall be clearly identified and located within reach of the operator. CSA Z432-R1999 does not require an emergency stop, but does make provisions when they are used. Two standards that do require emergency stop circuits for industrial machines are NFPA 79-00, *Electrical Standard for Industrial Machinery*, and IEC 60204-1:00 *Safety of Machinery – Electrical Equipment of Machines – PART 1: General Requirements*. Neither of these standards makes any mention of reliability in relation to the emergency stop circuit, but they do define different types of emergency stop methods.

Mr. Moncur has stated that circuits, such as that shown in Figure 2 in the article, are required on all machinery. This is simply not true. A review of some of the key standards that deal with control reliability, such as ISO 13849-1:99, *Safety Related Parts of Control Systems*, CSA Z434-03, *Industrial Robots and Robot Systems*, and ANSI RIA 15.06-99, *Industrial Robots and Robot Systems*, all show that there are degrees of reliability in these circuits and that risk assessment is a basic necessity in determining the degree of reliability required.

ISO 13849-1 provides five categories of reliability: B through 4. The robot standards use a different system, providing eight categories of reliability: R1 through R4. Depending on the component selection, which Mr. Moncur did not address at all, the circuit shown in Figure 2 could meet ISO 13849-1 Category 3 or 4 requirements. Figure 1 could meet Categories B, 1 or 2 requirements.

I think it is important that engineers, technologists, technicians and electricians working in the safety field have a strong understanding of these processes and the meanings of these categories so that we can effectively guide our designs and our customers through this thorny area.

Mr. Moncur's approach is certainly conservative, applying the highest degree of reliability in all cases. However, it may not be necessary to go to this level, nor desirable, nor cost effective. I agree that articles of this type are necessary to help educate members, but unbalanced articles like this are likely to cause an unnecessary panic, losing the desired effect of educating the reader.

Mr. Moncur responds:

By its intended nature as a primer for the professional electrical contractor, the article was intentionally generic in nature. I do not believe it was oversimplified. It was confined to a discussion of compliance to the most generic standard CSA Z432-94, Safeguarding of Machinery. It was not intended to be an in-depth treatise on the subject of compliance with the Ontario Health and Safety Act. Machine specific standards, such as the two mentioned by Mr. Nix were only alluded to.

I cannot agree with Mr. Nix's statement

Continued on the next page

Phinnemore Award for Baird

Photo courtesy of CSAO

At the Construction Safety Association of Ontario's annual general meeting held on May 3, Bill Baird was presented with the association's Roy A. Phinnemore Award, which recognizes an individual whose contributions to accident prevention have been significant. Bill served as safety director at Guild Electric and is a past president of IBEW Local Union 353 in Toronto. Bill helped establish CSAO's ECAO/IBEW Joint Labour Management Health and Safety Committee and served on their Provincial Health and Safety Committee throughout the 1990's.

The Roy A. Phinnemore Award is considered the Ontario Construction Industry's most prestigious health and safety honour.

Letters

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that "the emergency stop circuit, however, cannot detect an intrusion into the danger zone." I referenced Section 7.3 of CSA Standard Z432-94 in my article that provides a definition of an emergency stop. It states:

An emergency stop device, when operated, shall stop the machine, through actuation of a brake or other means, as quickly as is necessary to guard personnel (see Clauses 7.4 and 7.17). Where an emergency stop incorporates a friction brake, such brakes shall be of the "normally on" type and shall utilize the external power source only for the release of the brake. An emergency stop is not an alternative to guarding. Handles, bars, push buttons, etc, used for actuating the emergency stop shall be coloured red and be readily accessible. Push buttons used for emergency stop shall be of the mushroom head type.

Where there is more than one control or work station, an emergency stop push button shall be positioned at each station. It is essential that release or resetting of the emergency stopping device does not cause the machine to operate. Restarting shall only be by operation of the normal start control.

This definition is not limited to a pushbutton as Mr. Nix suggests. I would submit, in consultation with Ministry of Labour Inspectors and Regional Engineers, that the emergency stop device includes, but is not limited to, gate limit switches, light curtains, bars, and pushbuttons.

My statement that Figure 2 circuits are required on all machinery should have been expanded upon to state that, once a risk assessment has been carried out and hazards to workers defined and rated, all circuits where, in the opinion of the person performing the risk assessment:

- a worker could be injured if not for the implementation of a safety circuit in lieu of a physical guard, and
- the potential injury to the worker could be more than a minor injury,

THEN a safety circuit such as shown in Figure 2 is required. He is correct that not all safety circuits, at this time, require a circuit such as Figure 2. The article was written with Cat. 3 and Cat. 4 circuits in mind as there are very few instances where Cat. 1 or Cat. 2 risks occur in an industrial situation. However, for the cost of a safety relay, it is prudent to incorporate such a circuit as the minimum standard.

There can be a lengthy philosophical discussion as to whether or not Category 4 can ever be achieved, but I will leave that for a discussion over a few refreshments with Mr. Nix.

I will agree that the approach is conservative. As a Professional Engineer, I have a legislated duty to ensure the public safety. As such, the final test that I apply to any review of safety circuits is to consider whether I would want one of my family members to be the machine operator. After having satisfied myself that a given machine is safe enough for a loved one to operate, I then have a reasonable assurance that it is safe for any operator. I take it as a compliment that Mr. Nix agrees that by following this approach one is assured of the highest degree of reliability in all cases. To review to the minimum standards, if I understand Mr. Nix's position correctly, is not, in my opinion, always a safe practice. It is my experience that the cost of ensuring worker safety is not excessive and, in the rather litigious society that we live in, the extra capital cost is minimal compared to the legal costs of defending oneself in court should a worker be injured.

Again, I tried to present a generic primer for the professional electrical contractor and would submit that it was only that. If a result of the article was that customers start discussing the need for safety circuits with their contractor, then only good things can result from this.

D.J.B. Wright Award

ECAO's prestigious D. J. B. Wright Award was presented to Wayne Gatien, the 9th recipient since the award was created in 1992, just prior to the annual general meeting in St. John's, NL, on June 21.

The Douglas J. B. Wright Award was created in 1992 by the Electrical Contractors Association of Ontario and the Ontario Electrical Construction Co. Ltd. to pay tribute to individuals who best exemplify the dedication and commitment to the electrical contracting industry as exhibited by Doug Wright through his years of service.

His nominators pointed out Wayne's efforts over the last ten years on behalf of the line contractors in the province through his appearances before the Macdonald Committee, and meetings with successive energy ministers to secure legislated safeguards, some of which are the best in North America.

They also noted his service to the broader industry through his involvement as President of ECA Northern Ontario; President of the Electrical & Utilities Safety Commission; President of the ECAO; Chair of ECAO's Industry Conference, PR and Line Contractors committees; member of the Electrical Trade Bargaining Agency and director of the Electrical Safety Authority.

In accepting the award, Wayne smiled as he wondered whether someone was hinting that he should retire, alluding to the age of previous recipients when they received their awards. But, he said there is still much that he wants to accomplish, so he will be around for some time to come.

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