Is Your Project on Track?

Postcards from St. John’s

The 2003 Canadian Electrical Contractors Association Conference

Tools that Work

OEB: The Hearing Process

Ontario and Canadian Skills Competitions
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ONTARIO ELECTRICAL CONTRACTOR

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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 benchmark slots you can look to when trying to assess whether your project is 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.
U

ilities can be prompted to comply with rules and regulations in an informal manner through the customer complaint and

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 pro-

before a court of law. The Board conducts its proceedings held before a court of law. 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 proceed-

By Robert Frank and Heather Landymore

4

5

6
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 observers 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.
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.


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.

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.
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 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.

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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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 Rheuame 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.

St. John’s from Signal Hill

Riding the Wave on “A Sea of Change”

Kissin’ the “cod”. A must for a proper Screechin’ In.
Billy and the Bruisers kept the dance floor full. Canadian Idol fans may recognize the female vocalist.

A local artisan demonstrates her craft at the Welcoming Reception.

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

John Efford, MP for Bona Vista-Trinity-Conception

Patrick Kearney demonstrates new wireless devices

Ontario Electrical Contractor

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

Icebergs at Cape Spear
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

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

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 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

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

By averaging 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

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
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.
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 this 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 machinery’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 Z432.1-1999 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 Z335-05, 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 Z452-94, 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
Letters

Continued from page 17

that “the emergency stop circuit, how-

ever, cannot detect an intrusion into

danger zone.” I referenced Section 7.3 of CSA Standard Z432-94 in my arti-
cle 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 actu-
ating the emergency stop shall be
coloured red and be readily accessi-
ble. Push buttons used for emergency
stop shall be of the mushroom head
type.

Where there is more than one con-
trol 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 emer-
gency stop device includes, but is not
limited to, gate limit switches, light cur-
tains, 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 cir-
cuit as the minimum standard.

There can be a lengthy philo-
osophical 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 mem-
bers 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 compli-
ment that Mr. Nix agrees that by fol-
lowing 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 opin-
ion, 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 mini-
mal 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 con-
tractor, then only good things can
result from this.

D.J.B. Wright Award

ECOA’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 succes-
sive energy ministers to secure legislated safe-
guards, some of which are the best in North
America.

They also noted his service to the broader indus-
try 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 won-
dered whether someone was hinting that he
should retire, alluding to the age of previous recipi-
ents 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.

If you are interested in
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