

Electrical Business

THE AUTHORITATIVE VOICE OF CANADA'S ELECTRICAL INDUSTRY

DON'T MISS THE GANG



ON PAGE 5.

INFO NO. 1



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BCSA launches campaign that supports licensed contractors.



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Canadian lighting job wins the coveted GE Edison Award.



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CFL series provides stable light output over broad temperature range.

Hubbell Lighting's

new HQ delivers the *'Wow!'* factor!



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ELECTRICAL BUSINESS is the magazine of the Canadian electrical industry. It reports on the news and publishes articles in a manner that is informative and constructive.

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▼ From the editor



Love's Conservation Bureau won't save you any cash ...let alone the environment

Peter Love has high expectations. He's Ontario's chief energy conservation officer, serving the Conservation Bureau—a part of the Ontario Power Authority (OPA). He was appointed to this position in the spring of 2005 by the government of the day (which has just gone on to its second majority). Among his credentials are over 20 years of experience in the environmental field. We'll return to him in a second.

Taken from their own website, the Ontario Liberals—the ones who installed Peter Love—claim they "... know that our quality of life depends on the health of our natural environment. That's why we have moved forward aggressively to make Ontario a leader on the environment. We have acted decisively because we know how important it is for Ontario families to be able to enjoy a clean, safe environment. We want to be able to enjoy the wonder of nature with our families, to breathe cleaner air and depend on the water from our taps".

It is from affirmations like these that Ontario gets inspiration for its "Culture of Conservation", which led to the province to jump on the "Ban incandescents!" bandwagon earlier this year; setting a target date for their extinction and full migration to a fluorescents (i.e. CFLs) marketplace. (It should be noted, however, that Ontario has flip-flopped since its initial announcement. Love said Ontario will only ban *inefficient* bulbs, not necessarily incandescent technology.) The problem with fluorescents, however, is they contain some mercury, which we're told is bad for the environment and for those of us living in it.

I recently had the opportunity to hear Love speak and—for someone who has 20 years of experience in the environmental field and was installed by a political party that wants to make "Ontario a leader on the environment"—I was appalled to learn that Love has *no plan* when it comes to safely recycling/disposing of fluorescents. Instead, he is count-

ing on corporate good will to solve the problem for him. Specifically, he expects major retailers to step up and execute a recycling program for consumers of fluorescents. (Love said Ikea has done this, but so far no one else).

He made no mention of who is going to pay for this, but you can rest assured it's not him, nor his office, nor the province: in the end, it's just you and me. Same as those damn smart meters: I asked Love who is going to pay for them, and he quite handily replied the end user.

We should expect more from someone like Love (or whoever that person happens to be in your jurisdiction); not just nonsensical ideas that clearly haven't been thought out, and that place both responsibility and cost squarely on someone else's shoulders. **EB**

Anthony Capkun

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Pulsing with energy, the newly opened global headquarters of Hubbell Lighting Inc. in Greenville, S.C., is a state-of-the-art structure designed to mirror the company's position as a leading light among North American lighting manufacturers. *Electrical Business* was invited to attend a special media-only presentation of this new facility, and what a facility it is!

ALSO,

Be sure to flip through our entire **Lighting Showcase** section for more lighting-related stories, case studies and new products.

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The most common cause of residential electrical fires is a problem within the home's branch circuit wiring. Hidden trouble inside a branch circuit can also lead to electrocutions and the failure of sensitive electrical equipment. As such, you can identify potential hazards when you learn to troubleshoot a circuit. Learning grounding techniques is also necessary for ensuring safe and efficient branch circuits to prevent fires, electrical shock and damage to equipment.

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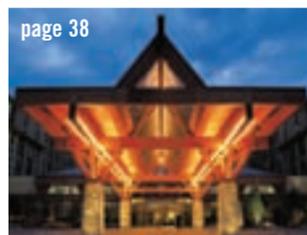
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Housing starts cooling in 2007 and 2008

Housing starts will moderate in 2007, reaching 220,000 units, a decrease of 3.2% from 2006, indicates Canada Mortgage and Housing Corp.'s (CMHC) Q3 *Housing Market Outlook, Canada Edition* report. Residential construction will continue to decline in 2008 to 207,200 units, yet will mark seven consecutive years in which housing starts exceed 200,000 units.

"Despite high employment levels, income gains and low mortgage rates, housing starts will trend downwards in 2007," said Bob Dugan, chief economist at CMHC. "The slight pull-back in housing starts this year and next will be mainly due to the continued

growth in house prices coupled with modest increases in mortgage rates. The level of new home construction will decrease in all provinces except for Manitoba, Quebec, and Saskatchewan."

Existing home sales, as measured by the Multiple Listing Service (MLS), will register their best year on record with 514,450 units in 2007, a 6.5% increase over 2006. The record activity in the Prairies will be a key factor leading to the increase in the national level of MLS sales compared to the previous year. The level of MLS sales is expected to reach 494,750 units in 2008, its second highest level on record. Growth in the average MLS price will remain high at 9.9% in 2007 mainly because of continued strong price pressures in Western Canada.

At the provincial level, British Columbia home starts will remain above historical averages but will decline slightly. Income growth, a tight labour market and high levels of consumer confidence will help to offset the dampening effect of rising mortgage carrying costs on the demand for new and existing homes in British Columbia. Housing starts will decline slightly from 36,443 units in 2006 to 35,525 units in 2007, and continue to ease to 32,500 units in 2008.

Despite the record low unemployment rate and abundance of job opportunities, Alberta will see a net drop in migrants over the next two years due to the growing difference in provincial house prices

and improved economic performances elsewhere across Canada. With lower migration and higher mortgage carrying costs, housing starts will ease from 48,962 units in 2006 to 47,300 units in 2007 and 44,500 units in 2008. Despite the decline in housing starts, 2007 will be the third best year on record.

In Saskatchewan, steady economic growth, a healthy employment situation and gains in net migration have contributed to the strong housing demand. Total housing starts are forecast to reach 5,700 units in 2007, the highest level in 24 years. Escalating costs will push housing starts down to 4,900 units in 2008, making it the second-highest level of starts since 1986.

In Manitoba, economic growth will exceed the national average, contributing to a five-year high in job creation, thus increasing net migration to levels not seen since 1982. These factors will contribute to the high levels of new home construction expected over the next two years. Total housing starts will reach 5,500 units in 2007, the best performance in 20 years, and will edge lower to 5,250 units in 2008.

An improving economic outlook in Ontario will help sustain a high level of housing demand across the province. New home construction activity will moderate over the next two years but remain near historical averages. Housing starts will decline from 73,417 units in 2006 to 66,950 units in 2007 and to 64,500 units in 2008.

Continued steady economic growth in Quebec, coupled with solid job creation, will cause housing starts to increase from 47,877 units in 2006 to 48,100 units in 2007. Starts in Quebec will slide to 45,000 units in 2008.

In New Brunswick, the positive labour market conditions will help reduce the net outflow of inter-provincial migrants in 2007 and 2008. Nevertheless, rising mortgage carrying costs and more choice in the resale market will result in lower levels of new home construction. Housing starts are forecast to decline from 4,085 units in 2006 to 3,750 units in 2007 and 3,625 units in 2008.

In Nova Scotia, slower employment and population growth, coupled with higher personal debt levels will constrain new home construction activity over the next two years. Housing starts are forecast to ease from 4,896 units in 2006 to 4,475 units in 2007 and to 4,300 units in 2008.

Prince Edward Island's economy is expected to expand at a modest pace over the two coming years, and employment will continue to grow by less than 1% per year. As a result, housing starts will decline from 738 units in 2006 to 625 units in 2007 and 590 units in 2008.

In Newfoundland, higher homeownership and construction costs and lower employment growth will dampen housing demand over the next two years. Housing starts will move lower from 2,234 units in 2006 to 2,100 units in 2007 followed by a decrease to 2,025 units in 2008.

Renovation spending will continue its upward trend through to 2008 thanks to strong growth in the Canadian economy, low mortgage and interest rates, and a solid housing sector. In 2007, renovation spending will increase by 9.8% to reach \$49.9 billion. As activity in the resale market begins to slow, growth in renovation spending will ease to 6.8% in 2008 to reach \$53.3 billion.

The dangers of counterfeit electrical products...

Do you know the risks?

With the influx of counterfeit electrical products into the marketplace, you need to know where your products come from. Buying from someone other than an authorized distributor could put you at risk, leaving you responsible should a counterfeit product cause injury or damage.

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Figuring out a building's intelligence

Continental Automated Buildings Association (CABA) has commissioned a consortium of three firms—Sustainable Environmental Solutions Inc., ECD Energy and Environment Canada and IBI Group—to develop the CABA Intelligent Building Ranking Tool, which produces a Building Intelligence Quotient (BIQ).

- The ranking tool will serve as:
- a means to evaluate and measure the 'value' of intelligent building performance
 - a design guide for integrating building intelligence in new projects
 - a building automation retrofit action plan tool
- The modular assessment will initially generate a



television industry,” said John Leverence, senior vice-president of awards for the academy. “The committee was particularly impressed by the safety features of Osram Sylvania’s lamps, which made studio lighting considerably less dangerous than the old carbon arc lights.”

Designed in 1967 by Dr. Bernard Kühl and Alexander Dobrusskin, the HMI lamp made its first public appearance in 1969 when it was used to light the first colour-TV transmission in Germany. In 1988, Osram was awarded an Oscar by the Academy of Motion Pictures Arts & Sciences for the invention and continuous improvement of HMI light sources for motion picture photography.

TCP Inc. opens new global HQ

TCP Inc. recently celebrated the opening of its new, larger global headquarters with a dedication and ribbon-cutting ceremony. The 154,000-square-foot facility houses a two-story office space, warehouse, distribution centre, product testing labs and customer service call centre. TCP employs more than 200 people at its Aurora, Ohio, HQ and expects to add as many as 40 jobs over the next year.

The building features a warehouse equipped with RF Technology, and a certified UL and NVLAP testing lab. The new



Down the road, TCP’s new building could be expanded to encompass more than 360,000 sf of combined office and distribution space, and house as many as 350 employees.

facility also serves as a showroom, featuring a mixture of lighting fixtures and colour temperatures throughout the building.

MEL boosts provincial charity

The Manitoba Electrical League (MEL) Annual Fall Classic Golf Tournament held at Pine Ridge Golf Club in September drew 162 golfers and raised over \$11,000 for Cancer Care Manitoba, bringing the total amount raised in three such events to about \$30,000. The league wishes to thank its members and sponsors for showing their community spirit with their participation and support.

Philips sets target to double sales from green products



Gerard Kleisterlee, president and CEO of Philips

Royal Philips Electronics said that, by 2012, it expects 30% of total revenues to come from green products, compared with 15% of group sales in 2006. The commitment is part of Philips’ latest EcoVision program that focuses on reducing the energy consumption of its products and facilities.

Gerard Kleisterlee, president and CEO, said in a letter to employees: “We believe that big changes start small and that every one of us should contribute to saving our planet. What’s more, we are convinced that those companies that combine the principles of economic growth and environmental stewardship will be the winners of the future and offer long-term rewards to you, our employees, and to our customers, partners and shareholders.”

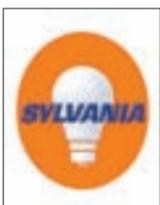
The company’s fourth EcoVision program also aims to increase the energy efficiency of its operations by 25% and double its investment in green innovations to 1 billion EUR in the next five years.

IEEE updates Gold Book standard

The Institute of Electrical and Electronics Engineers Inc. (IEEE) has updated its Gold Book standard, also known as IEEE 493, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*. The 689-page document was developed to help consulting/plant electrical engineers and technicians plan, design and operate reliable industrial and commercial electric power distribution systems.

The standard addresses the cost of plant outages when making design decisions for new systems, and provides the ability to quantify cost-versus-reliability trade-offs. This revision updates the 1997 version to reflect advances in the field and current practices, as well as the standard’s comprehensive equipment reliability database.

Topics covered include the fundamentals of evaluating power system reliability, data on the cost of power outages, and examples of reliability analysis. It also considers emergency and standby power, voltage sag analysis, electrical preventive maintenance, and evaluating and improving the reliability of existing facilities.



Osram Sylvania wins an Emmy

Osram Sylvania was honoured by The Academy of Television Arts & Sciences for its HMI metal halide lamp technology in September with a Primetime

Emmy Engineering Award.

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* Per CEC 12-3010(3), boxes over 4 in. (100 mm) wide require additional support.



Why are most university students women?

Young men are far less likely to attend university than young women, and this gap is largely associated with differences in academic performance and study habits at the age of 15, as well as parental expectations. In fact, more than three-quarters (77%) of the gap was related to differences in the characteristics of young men and women that were available in the study.

According to the new study by StatsCan, 26% of 19-year-old men had attended university in 2003. By contrast, almost two in five (39%) 19-year-old women had done so. College attendance rates, however, were about the same for young men and women. Weaker academic performance among men accounted for almost

one-half (45%) of the gap. Specifically, young men had lower overall school marks at age 15, and had poorer performance on a standardized reading test.

An additional 11% of the gap was related to the fact that boys spend less time on their homework than girls. About 9% was associated with the lower educational expectations placed upon boys by their parents. Other student characteristics played moderate roles, accounting for a further 12% of the gap collectively.

The study found that men and women have very different characteristics at age 15. For example, only about one-third (32%) of young men reported overall marks of 80% or higher at this age. In contrast, almost one-half (46%) of young girls fell in the same category.



PHOTO CONTEST

Electrical Business, in association with the Electrical Heritage Society of British Columbia—along with generous industry partners—is excited to present the Heritage “What Am I?” PHOTO CONTEST.



Pictured on the left is an item from the heritage society's collection of electrical artifacts. The contest begins when you think you know what this item is. Of course, we're not going to show the item in its entirety—that would be too easy! (You'll have to wait until next month to see the whole picture, as well as the correct answer.)

Here's how to play

Visit EBMag.com where you'll find an entry form along with a multiple choice answer form. If you've answered correctly, your name will be added to all the other correct entries, from which 10 winners will be randomly chosen before next month's installment of the “Heritage What Am I?” Photo Contest. Read the small print below for more information. Good luck!

Last month's photo: answer

Pictured here is a **220V, 7.5A household four-slice toaster**, built in Toronto, Ont. Winner to be announced.



This month's cool prize was donated by our friends at Ideal Industries (Canada) Corp. Testing branch circuit integrity has never been easier than with the SureTest Circuit Analyzer (61-165). It brings an entire array of tests—including voltage drop, line voltage, ground-to-neutral voltage, ground impedance, AFCI and GFCI—into a single unit, while its bright display makes the results easy to read.

No purchase necessary. Open to residents of Canada of age of majority, excluding Quebec. You must answer a timed skill-testing question to win. Prize valued at about \$260.00. The contest is not open to anyone affiliated with, or related to, members of Electrical Business or the Electrical Heritage Society of British Columbia. (That would be unfair.) Complete contest details online at EBMag.com.

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Young men also fared more poorly on a standardized reading test, as only 20% of them scored in the top 25% on the test. In contrast, 30% of young women did so. Young men and women are also quite different in terms of the amount of time they spend on homework. Only 30% of boys spent at least four hours per week on homework, compared with 41% of girls.

The study also found that young men had lower expectations placed upon them. Although as many as 60% had parents who expected them to complete a university degree, this was well behind the 70% of young women in the same situation. (Other factors, such as motivation and preferences, were not taken into account in the study.)

Latest electrical code published in the States

The National Electrical Code (2008 ed.) has recently been released in the United States by the NFPA, and is available from Delmar Cengage Learning (www.cengage.com). This edition, NFPA claims, responds to industry needs with expanded requirements based on research, new technologies and recent events. It has been updated for enhanced usability in the field, making it ideal for handling on-the-job electrical situations safely and effectively.

Building permits August 2007
StatsCan

The value of building permits surpassed the \$6-billion mark for the fourth consecutive month with strong performances in both residential and non-residential sectors. Municipalities issued permits worth \$6.3 billion, up 1.4% from \$6.2 billion in July, pointing to a busy fall in the construction industry. The value of permits hit its highest level on record at \$6.9 billion in both May and June.

Contrary to the situation in the United States, the residential sector remained clearly healthy in Canada. The value of housing permits was virtually unchanged from the previous month—a strong \$3.9 billion. An increase in single-family permits offset a decline in the multi-family component.

The comparison of non-seasonally adjusted data showed that municipalities authorized a total of 161,510 new dwellings between January and August 2007, up 2.5% from the same period in 2006. In the United States, during the same period, the number of privately-owned approved units plunged 24.9%.

In Canada's non-residential sector, municipalities issued \$2.4-billion worth of building permits, up 4.3% from July. The value of institutional and commercial permits increased, while industrial permits fell 8.6%. Even so, industrial intentions remained above the monthly average so far this year.

Provincially, Ontario recorded the biggest increase in the total value of permits, but this was offset by a decline in Alberta, which left room for a gain in Saskatchewan to have an impact on the overall result.

Housing sector

The value of single-family permits hit its second-highest monthly level on record in August, offsetting a decline in intentions for multi-family dwellings. Contractors took out multi-family permits worth \$1.4 billion, down 4.3%, the second consecutive monthly decline. Municipalities approved 10,334 multi-family units, a 9.1% decline. Even so, the demand for new multi-family dwellings remained 8.6% higher than the average monthly level in 2006.

On the other hand, the value of single-family permits rose 2.2% to \$2.5 billion, slightly below the previous peak attained in June 2007. This gain was fuelled by a 3.7% increase in the number of units authorized, reaching 9,975—the highest number so far this year.

Several factors continued to have a positive impact on housing demand, including strength in employment, growth in disposable income, low inflation, tight apartment vacancy rates in several centres and attractive financing options.

Provincially, the largest decline (in dollars) occurred in British Columbia, where the value of

housing permits fell 7% to \$683 million, the result of a 13.6% decrease in multi-family permits.

Residential intentions in Alberta fell 4.1% to \$808 million, the third monthly decline in the last four months. This came in the wake of a 22.4% decrease in multi-family housing, which was offset somewhat by a gain in single-family permits.

Despite the reduced pace in Alberta, the impact from the resource-based boom in the West was still present. For example, residential housing intentions for August in Saskatchewan remained virtually unchanged from July, thanks to a 12.1% increase in the value of single-family permits.

A decline in residential permits in Ontario was due to a substantial drop in multi-family permits, which was only partially offset by an increase in single-family housing.

On the other hand, strength in the multi-family component led to increases in the total values of residential permits in Quebec (+5.2% to \$778 million), Nova Scotia (+32.8% to \$99 million) and Newfoundland and Labrador (+74.9% to \$59 million).

Non-residential sector

The 4.3% increase in non-residential permits in August extended an upward trend in the sector that has been continuing almost without interruption since the beginning of 2006.



The commercial component has had a big impact on the increase in non-residential permits. Municipalities issued \$1.3-billion worth of commercial permits, up 9.9% from July. The gain followed two substantial declines in June (-16.6%) and July (-29.8%). These summertime intentions halted an upward trend in commercial permits that lasted throughout 2006 and the first half of 2007.

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The increase in commercial permits came from a wide variety of buildings such as hotels, office buildings, shopping malls and warehouses. Furthermore, the three westernmost provinces accounted for more than 80% of the increase in commercial permits.

In the institutional sector, the value of permits hit \$618 million in August, up 3.9% from July. This gain, the third over the last four months, was fuelled largely by projects for hospitals and nursing homes. Gains in institutional intentions in Ontario, British Columbia and New Brunswick more than offset the declines in all other provinces.

In the industrial sector, the value of permits fell 8.6% to \$462 million after a 24.3% gain in July. This decrease was not sufficient enough to reverse the upward trend recorded since March 2007 in the industrial intentions. The decline in August came largely from lower construction intentions for manufacturing buildings in Ontario and Alberta.

The demand for office space in several centres, strong corporate profits, healthy retail and wholesale sectors and the dynamic economy in Western Canada are among the factors that continued to drive non-residential construction intentions. Provincially, the largest increases in non-residential permits occurred in Ontario, Saskatchewan and British Columbia.

In Ontario, the gain was due solely to institutional permits. The value of permits in this category (\$390 million) was at its highest level since August 2005, thanks to projects for hospitals and schools. In Saskatchewan, the value of non-residential permits surpassed the \$100-million mark for the second time in three months, as permits in the industrial and commercial sectors surged. In British Columbia, non-residential intentions rose for the third time in the last four months, thanks to gains in all three components.

Quebec and Alberta posted the largest declines (in dollars) among the provinces in non-residential permits. In both provinces, the drop was due to marked declines in institutional permits.

Metropolitan areas

For the first eight months of 2007, the total value of building permits in Saskatoon totalled \$456 million, which already surpassed the annual record of \$421 million reached in 2006.

Toronto, Calgary and Vancouver showed the strongest year-to-date advances (in dollars) among the metropolitan areas in 2007, thanks to rises in both the residential and non-residential sectors. Windsor and Oshawa showed the largest declines. In August, 18 out of the 34 metropolitan areas showed gains in the total value of

building permits, with Edmonton, Quebec City and Saskatoon showing the largest increases (in dollars). Edmonton and Saskatoon each set a new monthly record in August.



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Sidelighting photocontrols field study: lessons learned

Daylight harvesting is a lighting control strategy that automatically adjusts electric lighting systems based on available daylight. It relies on a photocontrol system to measure ambient light levels, then switch or dim the affected electric lighting to maintain the desired level of illumination. An effective daylight harvesting system will save energy while being virtually unnoticed by occupants.

Daylight can be captured in a space through sidelighting, as through vertical windows, or toplighting, as through skylights. After studying toplight photocontrol systems and finding them to be cost-effective and persistent sources of significant energy savings, Heschong Mahone Group Inc. next studied sidelit photocontrols.

“Unfortunately, half the systems in sidelit spaces were found to be not saving any energy, and were not functioning for a wide variety of reasons,” admitted Lisa Heschong, principal. “Of the systems that were saving energy, only half of those were performing well. Thus there is a lot of room for improvement.”

The field study points to significant technical potential for this control strategy, finding the top-performing systems to be saving 1.1 kWh/sf/year, or 51% lighting energy savings, while achieving a peak net demand reduction of 0.6W/sf in controlled daylight areas.

“I was personally surprised that the best sidelit systems were performing nearly as well as the best toplight systems,” said Heschong. “This is very good news. Some of the best-performing systems were quite old—12 to 16 years old. Thus the technology from a decade ago was fully capable of success.”

The study, however, revealed that only 25% of the sidelighting photocontrol systems in the studied buildings were functioning well, whereas almost 100% of the toplighting photocontrol systems were found to be functioning well in the previous study. What went wrong?

The researchers discovered that 52% of the photocontrol systems were not functioning *at all*. The most common reason: the system had been intentionally disabled, most often due to occupant



complaints. The system also may not have been working because it had never worked (typically due to incorrect or incomplete installation), it had never been commissioned, there was not enough daylight, or the system was incompatible with a present building automation system.

The choice of dimming versus switching did not make a significant impact on the likelihood of success. Dimming systems failed less often than switching, but saved less energy when functional. "Overall, dimming and switching were equally likely to be saving energy, but the two systems have very different challenges," said Heschong. "Switching systems seem to work best in simple, very well daylit spaces, where the source of electric light is not directly visible to occupants, such as in combination with indirect luminaires. Dimming systems are more likely to be 'tuned' down to low levels where they are not saving as much energy as they could, and left continuing to function at these low levels. Dimming also generally requires more knowledgeable designers and installers, and more money. It is important to know that both can be successful, and choose the appropriate application."

Commissioning may have been a factor. Unfortunately, interviewed facility managers were unclear about the concept, and so it could not be correlated to a greater likelihood of system success or failure. The researchers did determine conclusively, however, that in buildings where the occupants had been trained on the performance of the photocontrols, the systems were more likely to be successful.

"The most common design error was trying too hard—putting photocontrols in spaces that do not have good daylighting," says Heschong. "Open office spaces with low windows and high partitions are the most common case. Or private offices that are only used infrequently, where occupancy sensors would be far more cost effective. We also saw many cases where the circuted area for photocontrols—i.e. the 'daylit zone'—was too large, and so the back or a far corner of the zone was not controlled well."

The field study found that sidelighting photocontrols were most likely to be functioning in spaces with higher daylight levels and more uniform daylight distribution. The controls performed best in owner-occupied buildings, with large open spaces and no partitions, and with daylight entering the room from more than just one wall. Systems that kept it simple, without too aggressively pursuing energy savings, were also more likely to be successful. Systems in classrooms were least likely to fail, but saved the least energy when working.

And the lessons learned? According to Heschong, demand for photocontrol systems has been increasingly dramatically, but the supply of knowledge needs to catch up. She pointed out three rules of thumb to follow:

- **Rule 1:** Make sure the space will receive sufficient daylight. "There is really no point in installing photocontrols in spaces where the daylighting is marginal, or causes visual discomfort," says Heschong.
- **Rule 2:** Keep it simple. "Elaborate integration schemes or highly complex control protocols are more likely to fail sooner or later, when someone down the line does not understand the subtleties," she says.
- **Rule 3:** Communicate system specifications, design intent and physical location very clearly. "Currently, there is not a deep reserve of common sense in the construction industry about these systems, thus you cannot rely on the contractor filling in the blanks or figuring it out on the fly," she adds. "If you can't clearly describe exactly how the system is supposed to work, chances are no one else will be able to figure it out either." **EB**

— with files from Craig DiLouie, Lighting Controls Association (LCA)

Mecag acquires Mobern Electric

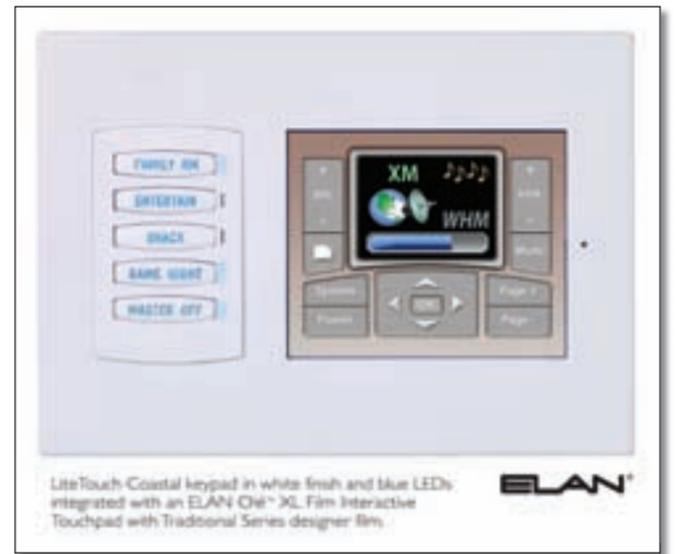
Mecag LLC has completed the acquisition of substantially all of the operating assets of Mobern Electric Corp., a manufacturer of lighting products based in Laurel, Maryland. Mecag is re-launching the company as Mobern Lighting Co., which will continue to operate out of the 150,000-sf facility with essentially the entire existing workforce.

Mecag is an investment group made up of several lighting and lighting component manufacturing players who will manage and operate the new company. It is led by Agostini Ltd., a Trinidad and Tobago conglomerate that manufactures and distributes lighting products worldwide; Jon Sayah, a lighting veteran with 15 years of experience with Lightolier and a lifetime of experience working with his father, Larry Sayah, owner of Texas Fluorescents; and FutureLite2000 Inc., a lighting company and utility independent contractor.

The new management team will be led by William C. Stone as president and David W. deMartino as managing member.

LiteTouch and ELAN with joint offering

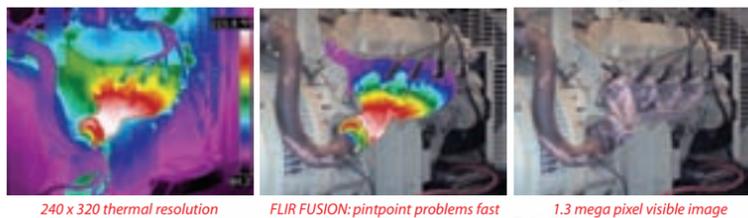
LiteTouch, a manufacturer of lighting control systems for the residential market, announced it will begin shipping a



new faceplate that includes the ELAN home audio video system. Both companies are members of the Nortek Home Technology Group. **EB**

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BCSA campaign supports licensed contractors

The popularity of DIY projects coupled with British Columbia's construction boom means more homeowners are doing their own renovations, or hiring unqualified people to do the work for them. What most of them don't realize is that electrical and gas installations pose some of the greatest safety risks.

To raise awareness about this safety concern, the British Columbia Safety Authority has launched its 'Heads Up for Safety' campaign to educate homeowners about the importance of hiring licensed contractors and ensuring the necessary permits are obtained for electrical and gas renovations.

All gas and electrical contractors doing regulated work in B.C. are required, under the Safety Standards Act, to hold a valid licence issued by the BC Safety Authority. Contractors must meet certain qualifications to be licensed, including a \$10,000 surety bond and hiring qualified tradespeople (or, in the case of an independent, being a qualified tradesperson). Licences must be renewed annually. Permits are required by law for any renovations involving regulated electrical and gas work.

The campaign is supported by a number of organizations, including the Electrical Contractors Association of B.C. Its executive director, Richard Campbell, noted, "The ECA is proud to support this initiative. Our members are highly skilled professionals, dedicated



to doing the best work in the safest possible way. We see the 'Heads Up' campaign as helping us differentiate our members, and other licensed electrical and gas contractors in B.C., from those who don't play by the rules and potentially put homeowners at great risk."

BCSA now lists all licensed electrical and gas contractors online at www.safetyauthority.ca.







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Manitoba seeks to meet labour market needs

A newly formed Apprenticeship Futures Commission will make recommendations on enhancing and expanding Manitoba's apprenticeship and certification system to better meet the needs of Manitoba's labour market.

"The commission's activities will create greater awareness of the importance of a dynamic, skilled trades workforce to the overall economic performance of the province," said Jim Rondeau, minister of competitiveness, training and trade. "At the same time, the commission will generate greater opportunities for dialogue on creative approaches for an enhanced provincial apprenticeship training and certification system."

Rondeau appointed Leonard Harapiak as chair of the commission, which comprises 12 members from key sectors. "A highly skilled workforce is vital to the overall economic future of Manitoba," Harapiak said, adding, "The input of various stakeholders will create employment opportunities for skilled tradespeople through a renewed apprenticeship training system that focuses on the needs of individual workers, employers and the public."

The commission's job is to consult with the public and stakeholders about the existing apprenticeship and related training and certification systems to identify opportunities and challenges; engage stakeholders to develop solutions and approaches focusing on flexibility, enhancement and/or expansion of existing systems; and make recommendations for improvements. Key deliverables include: consultation results and other sources of information; an inventory of identified opportunities/challenges in existing systems; and a final report with recommendations.

While Manitoba does a good job of training and certifying skilled trades workers, Rondeau said, it must find new ways to enhance the efficiency and effectiveness of the system, and attract more workers to the provincial apprenticeship program. He said the provincial government will commit the resources necessary to add 4,000 apprenticeship training spaces.

Visit www.gov.mb.ca/iedm for Manitoba Competitiveness, Training and Trade, or call (204) 945-1517 to learn more about the commission. 

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National Training Symposium

National Electrical Trade Council (NETCO)
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As NETCO's exclusive media partner, **Electrical Business** is pleased to announce that the Preliminary Program & Registration Package for the **2007 National Training Symposium** to be held in **Barrie, Ont. (November 2-4)** is ready for download!

NETCO's (National Electrical Trade Council's) mandate is to promote apprenticeship, continuous learning for journeypersons and national standards for the electrical industry in Canada. The national training symposium is just a part of its activities, and will feature keynote speakers, professional development activities and networking opportunities.

Visit **EBMag.com** and click where you see the NETCO logo to find the Preliminary Program & Registration Package.

Be sure to visit the **CSA Learning Centre at learningcentre.csa.ca** (click Electrical) to get dates and locations for the following seminars:

- 2006 Canadian Electrical Code Essentials
- 2006 CEC Changes
- Arc Flash: Measures for Prevention and Control
- CE Code: Bonding and Grounding
- Comparaison des Exigences du CCE 2006 et du NEC 2005 (French)
- Comparison of Requirements of 2006 CEC and 2005 NEC
- Conductors
- Hazardous Locations
- Motor Installations and High Voltage
- Principes Essentiels du CCE 2006 (French)
- Static Transient Voltages and Lightning Protection Systems (Fundamentals-Evaluation-Control)
- Transformers/Welders

Industrial Ethernet and IEC 61131-3 Seminar
WAGO Corp.
November 5-7
Germantown, Wis.
For details, e-mail info.us@wago.com

Remote Monitoring & Networking/Onsite Power
November 6-7
Scottsdale, Ariz.
Visit www.remotemagazine.com

Basic Electricity Course at NAIT
Alberta Electrical League (AEL)
November 7
Visit www.elecleague.ab.ca

Automation Fair
Rockwell Automation & Encompass Partners
November 14-15
Chicago, Ill.
Visit www.automationfair.com

Landscape Lighting Solutions
The Source/Cooper Lighting
November 14-16
Peachtree City, Ga.
Visit www.cooperlighting.com and click on Source, then The Source.

VDV Network Cabling Systems Inspection Course
Mississauga Training Consultants
November 20-22
Mississauga, Ont.
Visit www.fiberoptictraining.com

Lighting Essentials
Lightpoint Canada (Osram Sylvania)
November 19-21
Toronto, Ont.
Visit www.sylvania.com. Click on Learn Lighting, then Lightpoint.

Electrical Exposition 2007
OEL Essex Chapter
November 21
Windsor, Ont.
Visit www.ibsws.net/oel

Construct Canada
November 28-30
Toronto, Ont.
Visit www.constructcanada.com



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INFO NO. 11



By Ron Coleman

Managing Change Orders

It's all about the money: a typical electrical contractor makes 5% pre-tax profit on sales. When you lose out on changes to the tune of \$5,000 during a job, it equates to giving away \$100,000 in sales. Do that once a month and you will have walked away from \$1.2 million in annual sales. You have done the work and incurred the overhead; everything you get back is pure profit, so you need formal procedures to minimize your losses due to changes not being claimed or paid. Appoint a Change Order 'champion' to put procedures in place and train everyone on your team to maximize the benefits of changes.

You can often double the profits you make on a job by managing the Change Order process efficiently. Also, there will be less friction between your people and the client when everyone follows procedure. (The majority of the arguments I hear are the "He said, she said" variety—never with any proof).

The GC (general contractor)

The GC doesn't win any points with the owner when he submits claims for changes. The GC rarely makes much money with them, and the owner often expects the GC to act as a buffer and protect him from additional costs—justified or not. As a subtrade, give your GC all the ammunition he needs to submit and defend your claim. Work with the GCs that give you the most support.

The contract

Understand your contract. Know your rights and obligations. There is no substitute for reading your contract. Too often I see trade contractors working off verbal or unsigned contracts. Don't start work until the contract is signed. You do not want to be at the mercy of "common law". Change clauses you don't like then stick to your guns.

Documentation

When you don't document your changes, you don't get paid for them. The changes that are easiest to have paid are the ones that are fully documented. Know your scope of work. Keep a daily log. Whereas real estate is all about location, location, location, the mantra in the world of Change Orders is documentation, documentation, documentation.

Time extensions

You should apply for a time extension with every change, as the cumulative effect of changes to the schedule can be very costly. By getting time extensions you can claim related costs, such as extended rentals and insurances. Make sure you cover off



LOA and turnaround costs should they get extended because of changes. Had you intended to lay-off an electrician doing an out-of-town job on a Friday, but had to keep him until Monday to do a change, you should claim three days LOA.

Direct costs

These costs are the easiest to document as they are the easiest to measure. Make sure you keep the necessary backup information. Put everything possible into direct cost. Some costs, in addition to the obvious ones that should be included as direct cost, are: labour warranty; clean up; WHMIS; jobsite safety; site facilities; supervision; estimating; small tools' redoing As-Builts; additional bonding and insurance; freight; permits and inspections; site security; temporary services; consumables; and equipment rental (even for your own equipment) and supplies. Make a checklist of the items that apply to you.

Overhead and profit

Determine whether the contract has a specific percentage for these items. (It's usually far lower than a trade contractor needs.) When the figure is too low, you must get it changed before you sign the contract. By putting as much as possible into direct cost you mitigate potential loss. By increasing direct cost you lower overhead and get your mark-up on a higher cost.

Impact costs

These are very real but are difficult to document:

Ripple effect of changes to other trades	Stacking of trades
Reassignment of manpower	Crew size inefficiency
Concurrent operations	Dilution of supervision
Joint occupancy <i>(doing changes with other trades around)</i>	Beneficial occupancy <i>(doing changes in occupied building)</i>
Learning curve	Fatigue
Overtime	Weather

All can be valid costs but, because they are difficult to document, they are difficult to claim and prove successfully.

Verbal or disputed changes

You often have to proceed with the contract to avoid delay. Where you believe you are entitled to a Change Order but are obliged to proceed without written instructions, provide written notice and proceed under protest (check the terms of your contract carefully).

Recommended reading

- *Change Orders Procedures Guide*, Electrical Contractors Association of British Columbia (ECABC).
- *Guidelines for determining the costs associated with performing change in the work* (Feb. 1992), Canadian Construction Association (CCA Doc. 16, 1992).
- *Contractor's Guide to Change Orders: How to Resolve Disputes and Get Paid* (2nd ed.), Andrew M. Civitello Jr., ISBN 1-55701-427-2.
- *Managing Change Orders: Getting the money you deserve*, www.ronaldcoleman.ca.
- *National Change Notice Procedure Guide* (Nov. 2001), Canadian Mechanical Contractors Education Foundation.

Ron Coleman, B. Comm., FCCA CMC, is a member of the Institute of Certified Management Consultants of British Columbia. A noted speaker, he has completed many inter-firm financial comparisons of groups of construction companies in Canada and the United States. Ron's numerous published education programs include a 36-hour business management course specifically designed for ECABC. He is also author of the book, *Your Million Dollar System: How to Increase the Value of Your Construction Business by One Million Dollars in Three Years*.

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Harold Leviton
(1917-2007)



Donald J. Hendler



Stephen B.
Sokolow

It is with sadness that EB announces the passing of **Harold Leviton**, CEO and chair of **Leviton Manufacturing Co. Inc.** He was 90, and is survived by his wife of more than 66 years, Shirley, daughters Patricia, Adrienne and Elizabeth, sons-in-laws Donald J. Hendler, Steven B. Sokolow and Andrew Kriegman, and grandchildren and great-grandchildren.

Born in 1917 in Brooklyn, N.Y., Harold grew up with electricity, regularly accompanying his father on visits to the family's Greenpoint, Brooklyn factory, where he learned the business from the ground up. After graduating with a business degree in 1940, he began full-time employment at the company, starting in the stock room and eventually making his way to president, CEO and chair by 1965.

Under his 42-year long leadership, Leviton grew to become an electrical industry giant, with a product portfolio consisting of more than 25,000 products used in homes, businesses and industrial facilities.

Through a carefully-architected succession plan, Harold ensured the company his father started in 1906 would continue to serve the marketplace as a private, family owned and operated company. Sons-in-laws **Donald J. Hendler** and **Stephen B. Sokolow** will lead the company through its second centennial. Hendler, already serving Leviton as president since 2005, has assumed the additional role of CEO, while Sokolow—who served as vice-chair of the board since 2005—succeeds as chair of the board.

“The Leviton family business will continue to grow as we embark on our second century in business,” said Hendler, adding, “We have a number of exciting initiatives planned for the coming months, and both Steve and I look forward to the opportunity of implementing these and moving the Leviton Company forward in the same friendly, family atmosphere that has become so much a part of our heritage, philosophy and culture.”



Dania LaSpada

The **Beghelli Group** has promoted **Beghelli Canada's** president, **Dania LaSpada**, to the position of managing director of the international division for Beghelli worldwide, whose divisions include companies located in Canada, Mexico, The United States, Germany, The Czech Republic and China. She will maintain her position as president of Beghelli Canada.

Trilogy Electric Ltd. was the lucky winner in **Osso Electric's** Air Miles reward contest that took place over the summer, walking away with 25,000 Air Miles! But they were just one of the winners in Osso's Summer Fun Contest that ran from June 1 to August 15; during this promotion, each of the seven Osso branches gave away a Vermont Casting BBQ, an iPod, Super Soakers and other great prizes. Visit them at www.ossoelectric.com.



Terry Sholin

Terry Sholin has joined solar power equipment manufacturer **PV Powered Inc.** as director of business development, a new position in the company. Sholin most recently served as business development manager for SatCon Power Systems, a manufacturer of power electronics and control systems.



Danny McDonald

Lenze-AC Tech has created a new position, vice-president of North American Sales, and occupying that position is **Danny McDonald**, who was promoted from director of sales. Lenze-AC Tech develops, manufactures, supports and markets a range of motion control solutions, including servo drives and motors.



Dave Silverman

Amerlux Lighting Solutions has appointed **Dave Silverman** to central regional vice-president of sales. Reporting to **Sam Newberry**, Silverman will work with sales agencies, national accounts, architects, designers, engineers and specifiers through Eastern Canada. Prior to joining Amerlux, he served with Forum Lighting and Genlyte.

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Testing for safe and efficient branch circuits

By Jim Gregorec

The most common cause of residential electrical fires is a problem within the home's branch circuit wiring. Hidden trouble inside a branch circuit can also lead to electrocutions and the failure of sensitive electrical equipment. As such, you can identify potential hazards when you learn to troubleshoot a circuit. Learning grounding techniques is also necessary for ensuring safe and efficient branch circuits to prevent fires, electrical shock and damage to equipment.

Identifying high-resistance connections

Based on U.S. Fire Administration data, there were an estimated 412,500 residential structural fires in 2006 in the United States, resulting in 2,620 civilian deaths and 12,925 injuries. About 4,100 of these fires and 85 deaths were determined to be the consequence of problems within the electrical distribution system. High-resistance connections within a branch circuit, such as a loose or corroded connection, a bad splice or an improper installation, were overwhelmingly the culprits in these fires.

Fire hazards arise when current flows through these high-resistance connections resulting in hot spots. As more current flows through the connection, heat continues to build up. Depending on the ventilation, the heat might dissipate safely. If not, it could lead to a fire.

Most fixed wiring and receptacle hazards are hidden from inspection. A visual inspection during rough-in may identify obvious problems, such as a staple cutting through conductors, but may not identify a loose wiring connection or a bad splice. Normal instrument testing of a static circuit reveals little about the quality of wiring or the integrity of the circuit. However, testing under load and calculating the voltage drop can identify 90% of these hidden defects.

Voltage drop is a measure of how much a circuit's voltage fluctuates (or drops) once a load is applied. It can be calculated by comparing a voltage measurement with no load on the circuit to one under full load.

$$\text{Voltage Drop} = \frac{V [\text{no-load}] - V [\text{load}]}{V [\text{no-load}]}$$

The voltage drop calculation will be most accurate when no-load conditions are compared to full-load conditions. When using a digital multimeter to calculate voltage drop, remove all loads from the circuit to take the no-load measurement. For the full load measurement, use a space heater or some other appliance that will draw close to 15A.

Voltage drop can also be measured with some circuit analyzers now on the market that are capable of placing a full 15A load onto the circuit without tripping a breaker or causing any interruption to equipment on the line. These testers compare the voltage measurement at a full 15A load, along with a measurement at no-load, then calculate the voltage drop.

The Canadian Electrical Code (CEC) recommends that the combined voltage drop of the electrical system (branch circuit and feeders) not exceed 5% for optimum efficiency (CEC 8-102). Note that this is just a recommendation: the AHJ (authority having jurisdiction) may have its own acceptable levels of voltage drop.

Troubleshooting a circuit

Troubleshooting to identify the cause of the high impedance within the electrical system is actually quite simple. First, measure the voltage drop at the furthest receptacle from the panel on the branch circuit under test. When the voltage drop is high, further investigation is necessary. Testing the remaining receptacles in sequence, from next furthest from the panel to the closest to the panel, will identify the problem.

When the voltage drop reading changes significantly from one receptacle to the next, then the problem is a high impedance point at or between the two receptacles. It is usually located at a termination point, such as a bad splice or loose wire connection, but it might also be a bad receptacle.

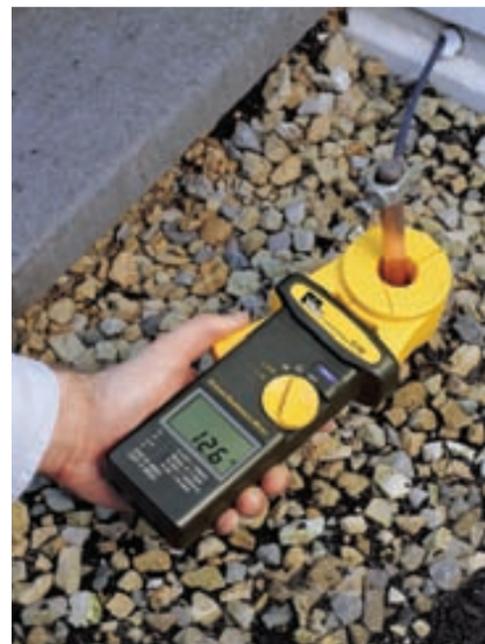
When the reading steadily decreases as you get closer to the panel—with no significant decreases between receptacles—then the wire may be undersized for the length of run or for the load on the line. Check at the panel to see whether the wire is sized per code, and measure the current on the branch circuit.

The reading may not decrease at all from the last receptacle to the first. This indicates the problem could be at the first splice, or at the panel itself. Most poor panel connections show up as hot spots on the panel. These can be checked quickly with an infrared temperature meter.

Arc Fault Circuit Interrupters [AFCIs] help protect people by monitoring the branch circuit, looking for the waveform patterns given off by an arc fault. These arc faults, which can be caused by a breakdown of insulation in wiring or small appliances, are a large contributor to residential fires.

Electrical shock

In an electrical system, the grounding system is the primary protection against electrical shock hazards, providing a low-resistance path to ground in case of electrical fault. Using proper grounding techniques, along with testing and maintaining a good electrical ground and installing protection devices, are the best ways to protect people and equipment from shock.



A ground resistance clamp meter enables you to measure the resistance of the ground electrode in a fraction of the time required when using the traditional three-point fall of potential test.

Proper grounding techniques

Maintaining a good ground starts with wiring the circuit correctly, and receptacles on the market provide only a single grounding connection. This prohibits you from wiring the device in series with the grounding circuit.

Pigtail connections

A common method of ensuring the ground remains intact is through the use of a pigtail connection. To make one, take both ground wires and join them with a 6-in. wire of the same colour that has been stripped on either end. Hold all three tightly and bind them together with a wire connector. (Be sure to use the right size connector for the size and number of wires.) You can find special connectors on the market that make this job easier.

Bonding the junction box to the grounding conductor

In many wiring applications, more than one equipment-grounding conductor enters a junction box. According to section 10-986 (4) of the CEC, where more than one equipment-grounding conductor enters a box, all such conductors shall be connected to any fitting or device that may require bonding to ground.

For metal junction boxes, the grounding conductors from each device also need to be connected to the box with a listed grounding device or screw that is not used for any other purpose.

The receptacle grounding terminal is connected to an insulated equipment grounding conductor run with the circuit conductors. This grounding conductor is permitted to pass through one or more sub-panels without connecting to the panelboard grounding terminal.

Note that the use of an isolated equipment grounding conductor does not relieve the requirement for grounding the raceway system and junction box.

Maintaining a low impedance ground

A good electrical ground is more than following code requirements; it must also be a low-impedance system. The ground path is the fault path for stray current. When electricity follows the path of least resistance, then the ground circuit must have a lower resistance than a person to be able to protect them. The rule of thumb for protecting people is to maintain a ground impedance of less than one Ohm (1 Ω).

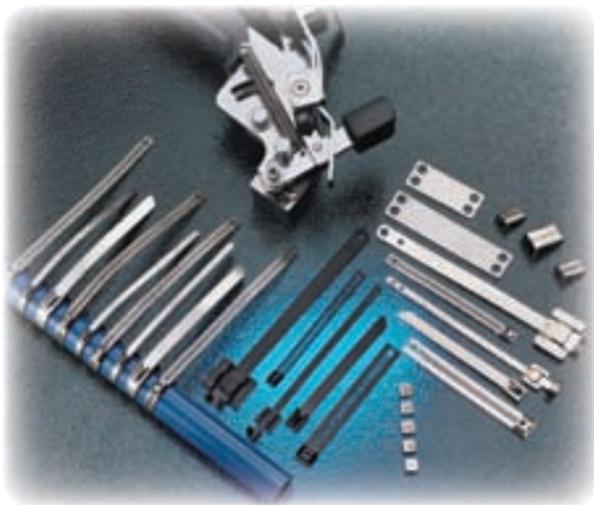
False grounds

The neutral conductor can only be bonded to the ground conductor at the main neutral buss, where a large copper conductor carries all the return and faulted current back to the earth. Sometimes,

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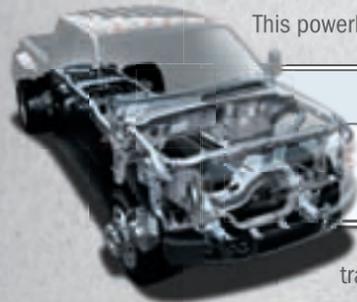
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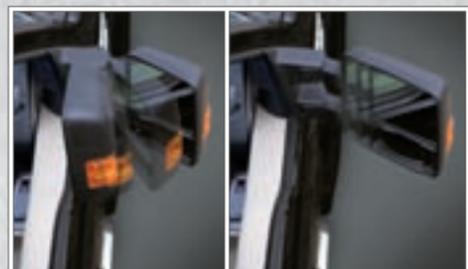


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through error or ignorance, the neutral and ground are connected upstream from the service entrance. This is called a false, or bootleg ground. When the neutral and ground are connected anywhere else in the building, all grounded metal becomes part of the neutral conductor, constantly energized and creating various voltage potentials on electronic equipment. When using common receptacle testers, this condition shows up as normally wired.

Earth ground

The pathway to ground extends beyond the main panel to the earth ground system. The earth ground could be a single ground rod, multiple ground rods, a mat or a grid system. CEC 10-700 (1) addresses the system by stating grounding electrodes shall consist of:

- (a) manufactured grounding electrodes
- (b) field-assembled grounding electrodes installed in accordance with the rule
- (c) in-situ grounding electrodes forming part of existing infrastructure.

The grounding system can be tested with a three-pole earth resistance tester, or a ground resistance clamp meter. Testing the resistance of the ground electrode after installation is not enough to ensure protection of personnel or electronic equipment.

The resistance of the ground electrode depends heavily on soil resistivity, which relates to moisture and temperature. As such, resistance of the grounding system will vary throughout the year. To ensure a low-impedance grounding system, include the ground electrode, or earth ground, as part of your standard testing procedures. A ground resistance clamp meter enables you to measure the resistance of the ground electrode in a fraction of the time required using the traditional three-point fall of potential test.

Ground fault circuit interrupters (GFCIs)

GFCIs should be tested regularly because they rely on mechanical connections that will degrade over time. According to a recent study performed by the Leviton Institute, an average of 15% of GFCIs were inoperative when tested. Voltage

surges from lightning, utility switching and other sources all take their toll on the devices, which is why Underwriters Laboratories (UL) requires that GFCIs be tested monthly.

Equipment failure

When sensitive electronic equipment fails, the initial reaction is to throw our hands up and blame it on poor power quality. This makes the problem seem unmanageable and out of our control. Most of these problems are actually under our control, because 80% of all power quality problems are found in the electrical distribution and grounding system.

In addition to preventing the possibility of fire, a good low-impedance electrical system will protect electronic equipment. A high-resistance connection, like a loose wire, will cause the voltage to fluctuate, or drop, when a large load is applied. When the voltage drops low enough, it can cause electronic equipment to lock up, reset or shut down completely.

Grounding is another concern for electronic equipment. While ground impedance of 1Ω or less may protect people from electric shock, it may be inadequate protection for electronic equipment. IEEE recommends a ground impedance to be less than 0.25Ω for proper protection.

Isolated grounds and dedicated circuits

In some cases, it is easier to isolate sensitive electronic equipment than rewire an entire circuit. This can be done by running an isolated ground or a new, dedicated circuit for the equipment in question.

An isolated ground protects the equipment from other equipment on the same grounding circuit. Electronic equipment can create noise, which can interfere with the operation of other equipment on the circuit. It is important to note that an isolated ground will not protect equipment from harmonic distortion running through a shared neutral. In some cases, running a dedicated circuit is necessary to completely isolate a piece of equipment to ensure protection.

As the name implies, transient voltage surge suppressors (TVSSs) protect power, telephone and cable lines from transient voltage. Transients are short, high-amplitude pulses caused

by a release of energy into the electrical system. These pulses can be caused by internal sources, such as a capacitor releasing energy into the system, or external sources, like lightning.

Conclusion

The hidden dangers associated with branch circuit wiring are very serious but, fortunately, the precautions are straightforward. We can protect ourselves and equipment by using certified devices and testing equipment from reputable manufacturers and implement policies on branch circuit testing. They should include verifying proper wiring, testing devices, checking the integrity of the branch circuit, and measuring the integrity of the grounding system.

Check all devices immediately after installation to verify proper wiring and test devices. Receptacles should be checked to avoid common wiring errors, such as reversed polarity or an open neutral. Checking the voltage level with a voltage tester quickly verifies that the receptacle has been correctly wired for either 120VAC or 220VAC. Checking continuity across a switch verifies that it is working correctly. A variety of testers are available on the market to test these devices quickly and accurately.

Test electrical circuits under load to verify the integrity of the branch circuit. The voltage drop test can identify high-resistance connections, which can lead to fires, breakdown in insulation, and poor efficiency of the electrical system, which can contribute to erratic equipment operation.

Test the integrity of the grounding system, which not only includes the grounding conductors, but the ground rod or grid system. A low impedance on both of these systems is essential to protect against electrical shock.

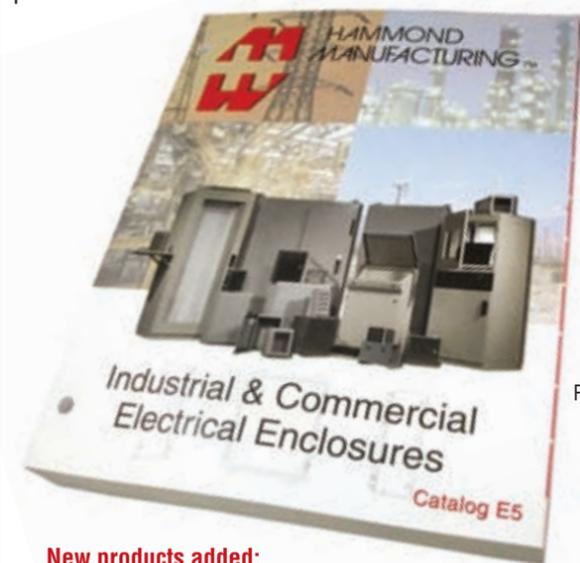
Branch circuit testing is an important part of wiring any circuit. It verifies that devices have been wired up correctly and helps you protect yourself (and others) from hidden defects in an electrical system. 

Jim Gregorec is group manager of the Test & Measurement Group of Ideal Industries Inco. (Sycamore, Ill.).

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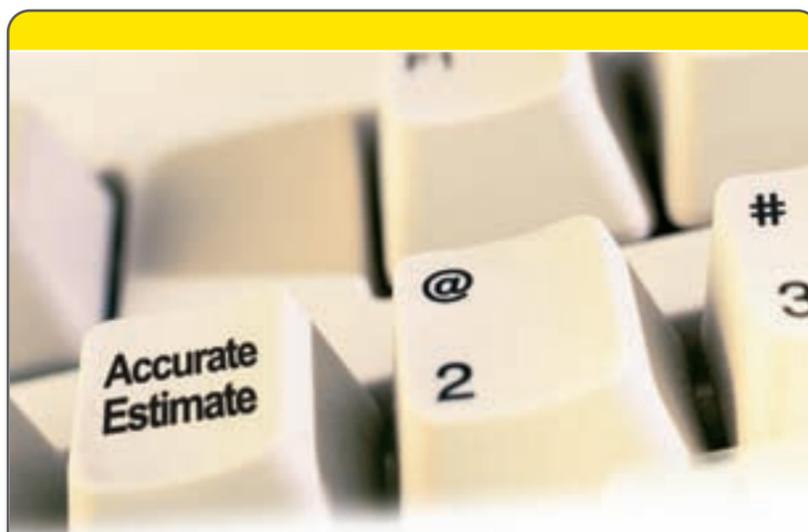
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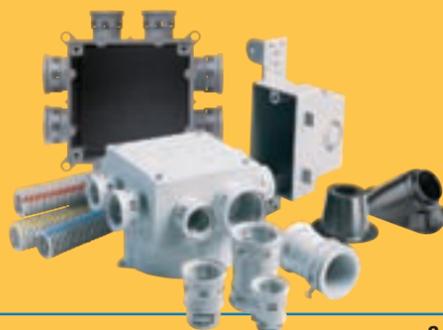
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INFO NO. 23



TOOLS that help you on the back end

◀ A wire cutter featuring patented bypass cutting technology that produces a clean, square cut—combined with a built-in lead retainer for added workplace safety—is available from **Xuron Corp.** The **9100F Micro-Shear flush cutter** with lead retainer prevents flying leads that can injure users and end up inside equipment where they can cause short circuits. Made from alloy steel with hardened cutting edges, the cutter requires less force than conventional compression-style cutters, says Xuron. Featuring cushioned Xuro-Rubber hand grips and a Light-Touch return spring, the cutter fits comfortably in large or small hands, has a glare-eliminating black finish for close-up work, and can be equipped with optional static control hand grips.



◀ **Ridgid** has expanded its line of plastic tubing cutters to include the **RC-1625 ratcheting plastic pipe and tubing cutter.** With a 1/2-in. to 1 5/8-in. o.d. capacity, the cutter easily cuts plastic pipe and tubing such as PVC and CPVC, as well as PEX, polyethylene, polybutylene and rubber hose. The blade profile and ratcheting mechanism work together to reduce the amount of hand force needed to cut through hard plastic material. Meantime, a quick-change blade pin enables you to change blades in a matter of seconds, and assures you won't lose any clips or screws. The RC-1625 is constructed of lightweight, high-strength aluminum, has ergonomic handles and a thumb latch that holds the cutter closed.

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◀ **Irwin** feels it has revolutionized the traditional adjustable wrench by replacing the thumb-wheel with a lever that adjusts the jaw twice as fast with a single motion. The **Vise-Grip Quick Adjusting Wrench** will not strip nuts, bolts or fasteners because the jaw locks securely into place. The grooved internal jaw slides forward manually for quick, one-handed sizing and locks in place for leverage and repeated use. The wrench is available in both metric and SAE versions, and all models are backed by a lifetime guarantee.



◀ With the introduction of small-diameter MC cables, **Seatek Co.** created a new **Roto-Split: RS-101AC Auto Clamping.** This cutter was designed to accommodate the full range and type of BX, AC and MC cables from 14-2-in. to 10-4-in., and will also cut 3/8-in. Flex. The RS-101AC features an exclusive auto-clamping lever with unique clamping stroke amplification; the patent-pending design eliminates the slow thumbscrew clamping adjustment needed for various cable sizes. Simply squeeze the lever to automatically clamp any cable size. Moreover, the RS-101AC clamping system prevents crushing softer aluminum casing. The tool also has a moveable lever that controls blade penetration to quickly switch from standard MC to smaller diameter MC. It includes a pushbutton to properly locate small-diameter MC in the channel that can be easily pushed back to cut standard MC cables.





■ **Ideal's patented Lil' Ripper Stripper** rips, strips and clips Romex wiring with ease. Used extensively in residential construction, Romex wire has an outer jacket with shielded conductors inside. The stripper rips and clips the wire's outer sheathing with stainless steel blades, then cleanly strips off the inside wire carriers. When finished, you can use the gauge guide marked into the side of the tool to measure strip length, as well as the built-in Accu-Loop to create looped wires for screw-on connections. Finally, the Twist-Assist wire connector wrench at the end of the tool makes fast work of tightening most wing style twist-on connectors. The Lil' Ripper Stripper sports a compact, rounded form that helps it fit into hard-to-reach places, such as crowded wiring boxes. Textured Santoprene overmoulded on the rugged plastic handle helps you achieve a comfortable, slip-resistant grip.

■ Ripley's **Cablematic** division introduced the **CT2-AS and CT2-AS-EX compression assembly tools**, which offer Ripley's patented 'split jaw' technology that assembles 59, 6, 7, and 11 'F' compression-type connectors (as well as most RCA, IEC and Mini connectors). The CT2-AS series offers you an ergonomic platform incorporating spring-loaded handles and pushbutton handle lock, keeping the tool pouch friendly. Both tools' spring-loaded split jaws position cable and connector for easy insertion/removal, and are easy to use in and around wall boxes where space and cable length may be limited. The tool requires no special adjustment nor adapter, and can be kept calibrated with a supplied gauge block. The split jaw technology secures the cable assembly a full 360°. 



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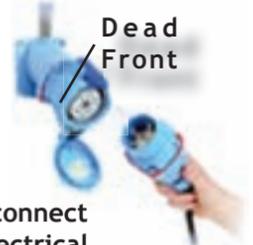
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Where is all that current coming from?

By Patrick J. Lynch, P.Eng.

Here's a really interesting case study that involves a phenomenon you don't come across every day. Our group was hired to provide technical expertise and coordination for all concerned stakeholders—which included homeowners, the cableco, electrical safety group, distribution and transmission electrical utilities—to resolve the issue you're about to read about.

Starts with a phone call

We got a call from a very frustrated cable TV engineer. Apparently, the plastic cable TV splitter boxes were melting off the wall at many homes in the neighbourhood in which he was working, in one specific part of town (Figure 1). The outside-house cable TV grounds would also generate a spark each time an attempt was made to connect them to the

outside-house electrical utility ground.

Numerous groups had been involved over the course of a year in an attempt to resolve this situation but, clearly, it remained unresolved.

These high ground currents can cause serious operational and life safety issues.

Generally, this ground current condition occurs when the electrical utility has a loose or high-resistance street neutral connection. The house neutral/ground currents then seek an alternate neutral return path. Actual measurements between these two grounds (cable and utility) at the site revealed a difference of 35 volts and over 20 amps of current flow.

The logical first step was to provide complete electrical isolation in an effort to determine this current source. The distribution utility powered

Figure 1

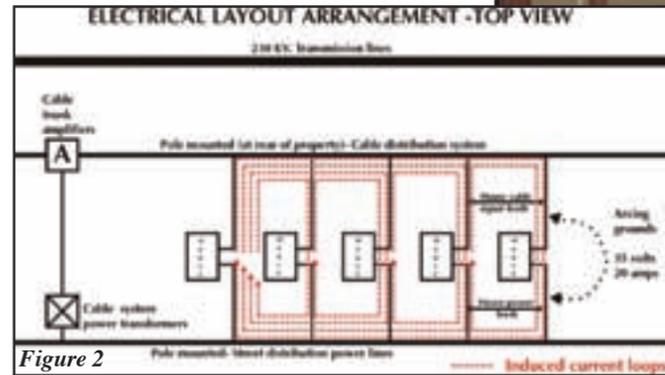
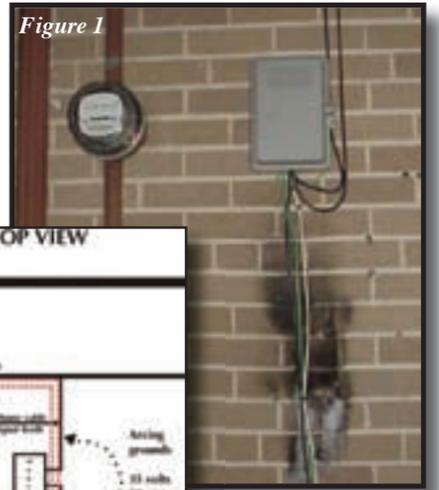


Figure 2



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down all the street transformers providing power to the 100 to 150 homes involved in the problem. In addition, the cable company powered down its trunk amplifiers and physically disconnected all wiring for power and cable signal to the entire area to rule out the possibility of any electrical backfeed into the community.

At one point during the investigation, there were over eight bucket trucks with crews, as well as 15 additional service trucks involved in the investigation. Despite all the work they put in, the 20-amp current problem hadn't gone away. So where was it coming from?

Additional engineering investigations

We then took a #4-ga copper insulated wire and electrically connected both ends together to form a 5-ft diameter loop. We measured over 1 amp of circulating current in this loop of wire at the front of the houses. Moving this same 'sensing' loop of wire to the back of the house property line produced over 2 amps of circulating loop current.

Directly behind these houses was a 230kV high-voltage transmission line corridor. It appears that the 60Hz magnetic field generated by the current flow through these transmission lines was magnetically inducing current to flow into the 5-ft diameter loop of wire.

A much larger magnetic induction loop had been inadvertently created between the electrical distribution utility power ground system and this cable TV installation. This larger loop area, perpendicular to the 230kV transmission line magnetic fields, then allowed a correspondingly higher 20 amps of circulating current to flow (Figure 2).

The solution revealed

At this particular site, cable location played a pivotal role in the proper operation of the electrical power/cable systems in the area.

To reduce this induced current loop area would require the complete relocation of this cable system for this community. This would involve the teardown and rebuild of this entire cable system. We arranged for the distribution utility to immediately grant access for this new cable system to be installed on their street utility poles. Note: normally this utility pole access permit approval process can take up to two months. All the onsite truck crews were then immediately transferred to the cable infrastructure rebuild process.

Once the rebuild was complete, the circulating current between the grounds in these two systems had now been reduced to less than 0.5 amps for the entire community. Ⓢ

Note: Visit powerlinesystems.ca/users/plynch/arcing_currents_10sec.mpg to see the sparking between the grounds.

Patrick J. Lynch, P.Eng., has been the president of Power Line Systems Engineering Inc. since 1986. He graduated in Electrical Engineering from the University of Waterloo in 1975. Lynch has successfully directed Power Line into completing over 1150 challenging electrical engineering site disturbance investigations around the globe for complex problems ranging from DC logic levels to the 15 GHz radio frequency levels.

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Whether you're focused on supplying your largest customer with what he needs for half a dozen simultaneous jobs, or dealing with the private contractor walk-in trade, for those who are in direct contact with customers on a daily basis, the importance of customer service never diminishes.

There are probably a dozen key facets to customer service including basic sales skills, credit and warranty handling, phone manner, dealing with walk-in trade, handling objections, and understanding some of the basic business math that affects pricing.

But, ask any successful distributor to describe a key reason for their success and they will say that customer service is at the top of the list. Ask them to describe what makes for first-class customer service, though, and you'll get a range of different answers.

Some will first offer that customer service is having friendly staff. Others will insist that inventory is what keeps customers happy. Most will also suggest that the experience and knowledge of the customer-facing personnel really make the operation hum. Still others talk about delivery. And, of course, there is always the price issue.

The reality is that all of these key factors, and a few others, really keep customers coming back. The common bond among them is that they all have the effect of allowing your customers to focus on the job at hand instead of your company's role in helping them accomplish it. Invisibility is what you are trying to achieve, or something close to it.

Sometimes, of course, the importance of the distributor's role comes to light.

Unfortunately, this discovery is often as a result of a shortage of inventory or unexpected delays.

While nobody likes to wait for supplies, small contractors are generally less regimented than the larger organizations. With fewer and/or smaller jobs, they don't generally have the same degree of advanced planning as their larger colleagues. This tips the balance to on-hand inventory. You need to ensure that you have small quantities of critical items on hand at all times.

For those who deal exclusively with larger customers, they know that keeping to the scheduled delivery date of products is paramount. A supply chain hiccup that idles a job for even a few hours can cost thousands of dollars, and the importance of that needs to be recognized in advance of having a problem.

As a front-line worker dealing with that possibility, you need to be on your toes. If you get a whiff of a

potential problem of even a few hours, it is important to call the contractor's office to let them know as early as possible that there might be an issue. While the risk of losing some business for that particular order might be considered — it is a possibility if the delay is too long — the risk of losing much more business down the road is worthy of strong consideration.

If a shipment that was due yesterday is a day late and you know that it takes you a full day to split the order and reship to contractors on a tight schedule, you need to inform the contractor as early as possible that there may be some short-term supply issues, and that you will do everything you can to minimize the problem.

If you have a good working relationship, one with some basis for trust, your efforts will be appreciated. You may find that your delivery drivers are forced to drop small quantities to keep things operating at the customer's site, and taking a hit on profitability as a result, but that will be appreciated.

Put yourself in their steel-toed shoes: how would you like it if you expected to have a supply order sitting on a skid, and had scheduled your workers accordingly, only to be forced to scramble and deploy workers to other tasks without any advance notice?

Of course your operation should do what they can to prevent that from occurring in the first place by working with reliable suppliers and having accurate forecasting and proactive purchasing procedures, but unexpected supply chain interruptions are a fact of life, like a freak snow storm that slows shipping, border delays, or unexpected increases in demand for certain products. (Remember Hurricane Katrina's impact on the North American building materials market?) It is how you handle them that will earn you the respect and loyalty of your customers.

Whether you are dealing with a large contractor or a small one who is buying supplies from you with the cash he just received from the last job, it is important to appreciate the impact that running short can have on their day, their week and their month.

So, let's consider that late shipment again. What do you do? Well, what you *don't* do is fret about it waiting on the loading dock, hoping against hope until five or six in the evening the day before the customer is expecting the shipment, when it's too late to call and warn the customer of the delay.

You need to look for signs that an order may be running late. Keep in touch with your receiving people about expected shipments. And, if you get a little nervous, ask questions, be honest about your concerns, and start to look for solutions before panic sets in.

Those solutions may mean finding an alternative supply of at least part of an order — enough to help the contractor get by for the short term — and then present the contractor with that potential solution. It may be a case of some substitutions, but it is always wise to present an option, rather than just a problem. It should also be noted that you should be wary of simply substituting other products or brands that may "do the same job" but are not what was originally ordered.



The customer may opt to wait for the original shipment, or choose the solution you put forth, but at least you are presenting an option, and that will lower the stress of the customer.

And that is, in essence, what fine customer service is really about — lowering the stress of the customer. Anything you can do to accomplish that goal can only benefit you, your company, and your customers.

Five keys to lowering customer stress

- 1 Be proactive about shipping schedules, particularly where large jobs might be affected by lateness.
- 2 Keep customers informed of any real issues, but always present a possible solution to help bridge the gap.
- 3 If you can employ a seamless solution — an alternative supply that they won't notice ever happened — don't tell customers that there was a problem at all. (Don't be like the delivery driver who would call his boss every time he almost had an "accident.") It just adds unnecessary stress to the customer's workday.
- 4 Use reliable suppliers; price is irrelevant if you don't have any inventory on hand to sell.
- 5 Put yourself in the customers' place; do whatever you can to help reduce any supply concerns they might have.



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It's your move... to not make a move

By Dave Smith



When we're lucky, we learn from our mistakes before they cost us dearly. But on the industrial level, not only are we *not* learning from our mistakes, we are falling behind. I have been teaching electrical safety courses since 1980, and our industry is seeing the same accidents today as back then—only with more disastrous results.

I recall an accident in 1982 where an electrician was killed when he pulled a 600V fuse out of a loaded circuit. Just hearing that makes you shake your head; every apprentice is drilled and grilled on the stupidity of that action. It is taught at tech; it is reinforced by the journeymen; it is embedded in our memories. So why on earth does it continue to happen?

Sometimes we are so busy concentrating on, or distracted by, something else that we forget otherwise obvious and well-known dangers. (Incidentally, that's why troubleshooting is so bloody dangerous, but I digress.) In the case of the electrician above, two of his coworkers were chatting with each other behind him; before they knew what was happening—and too late to do anything about it—the electrician pulled out the 600V fuse.

Had 'the puller' taken an electrical safety course just the day before the incident, and heard the instructor say, "Never pull a fuse under load!", I can guarantee he would have sat there thinking, "Yeah, tell me something I don't know". Yet he was killed, and one of his coworkers severely burned.

And we're still doing it. The exact same incident happened last year, this time on a 480V system. One guy in front and, again, two guys standing behind him, chatting. The main difference these days is our busses are enormous with available short-circuit current. The accident burned two of the electricians to death; the third suffered severe burns. I'm sure all three victims knew never to pull a fuse under load.

We've all heard the joke about safety programs, "Don't move and nobody gets hurt", but this exactly what you have to do when working with an energized circuit: don't move until you are utterly and completely 100% sure of what you are about to do and its consequences.

And when you're working with others, have a quick tailgate meeting to ensure no one makes a move unless they've okayed it with the rest of the team.

Because of the unforgiving brutality of high-voltage accidents, the *best* safety best practices have been developed primarily by the power companies. One of their best practices has been the *call system*., and it works like this: before I make a move, I call out to my coworkers—telling them what I'm about to do—then wait until I get the return call okaying my move. Everyone is ingrained with the idea that safety comes first, and that no hand moves before the brain evaluates that movement.

In either of these accidents, had 'the puller' said, "I'm about to yank this fuse", an argument—involving colourful and imaginative cussing—would have instantly ensued, and the action would not have occurred. Both accidents—involving three deaths and three serious burn injuries—could have been prevented with this safe work practice.

Take a serious look at your safety program: do you have communication procedures in place that would prevent these accidents? And have you adopted the PPE (personal protective equipment) requirements of NFPA 70E so that, should an accident occur, there are no injuries or deaths? We're in the 21st Century: let's use our 21st Century tools and know-how to end these 19th Century 'accidents'. **EB**

Dave Smith is president of Canada Training Group and has been providing consulting services to industry since 1980. This story and others can be found at www.canada-training-group.ca. Please feel free to use this information to support your safety program.



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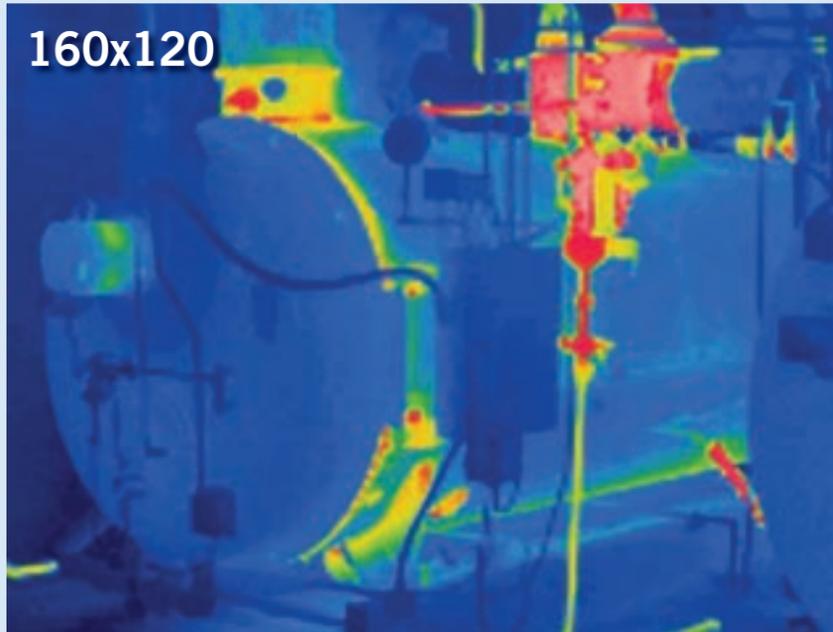


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Yes, IR camera resolution is *something* to think about



The 160x120 detector image shows lack of definition as compared to the image produced by the 320x240 detector. The 160x120's temperature resolution and accuracy are proportionally diminished as well.

When you shop for a digital camera, you weigh your options against numerous criteria, such as size, zoom, memory and the all-important pixel count.

Well, as it turns out, pixels are pretty important when it comes to selecting an infrared (IR) imaging camera. Until recently, most buyers of IR imaging cameras had to make a budgeting choice between a low-resolution 160x120-pixel camera and no camera at all. Unfortunately, you can miss a lot with a low-resolution image, which is why professional thermographers have been willing to pay for higher-end cameras employing 320x240-pixel detectors.

Pixels are the data acquisition points for thermal measurement, and this data is used to create a visual image from the thermal profile. "More data points mean more information is provided for accurate thermal interpretation," explains Jon Chynoweth, vice-president of Mikron Infrared. "More pixels also mean greater visual resolution in the thermal image so, for a given field of view, smaller details can be identified in the thermal image and accurately measured for temperature."

To get a better sense of the difference, 160x120-pixel cameras provide one-fourth the resolution of their 320x240 cousins: 19,200 pixels versus 76,800 pixels. The larger detector

of the 320x240 produces an image twice as wide and twice as high, with four times the data for a given field of view.

For the working thermographer, high-res allows a camera to work at a much greater distance from a target without loss of temperature measurement accuracy. The low-res detector interpolates a greater area between pixels and averages-in temperature readings unrelated to the target. In practice, a target that's 0.25 square inches can be accurately measured for temperature at a distance of 60 ft with the 320x240 detector, while the 160x120 detector has to be 30 ft away to achieve the same accuracy (distances based on a 25 x 19° lens).

"Resolution is even more important in infrared imaging than it is in digital photography, and everyone knows how photographers boast about the resolution of their newest digital cameras," Chynoweth says. In infrared, resolution affects temperature measurement accuracy, not just image quality. The 320x240 detector, with 76,800 temperature-measuring pixels, resolves an area smaller than a tenth of a square inch at six feet, while the 160x120 detector can't image anything smaller than twice that size. With more background averaged into temperature readings, the readings are inherently less accurate. "Likewise, the low-resolution thermal image

looks like it's made of tiny little squares, no matter what the viewing size," finishes Chynoweth.

So if you're considering an IR imaging camera, think carefully on how it is to be used, because buying cheaper isn't always better. **EB**

Comparing IR imaging cameras

Detector size	Number of pixels
320x240	76,800
160x120	19,200

Target distance (feet)	Field of view (feet)	Pixel size 320x240 (inches)	Pixel size 160x120 (inches)
1	0.38 x 0.29	0.014 x 0.014	0.029 x 0.029
6	2.30 x 1.73	0.086 x 0.086	0.173 x 0.173
10	3.83 x 2.88	0.144 x 0.144	0.288 x 0.288
20	7.67 x 5.76	0.288 x 0.288	0.575 x 0.576
50	19.17 x 14.41	0.719 x 0.720	1.437 x 1.441

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Three-speed fan control



Cooper has added a three-speed fan control to its Aspire line of designer wiring devices (an Aspire 5A fully variable fan speed control is already available). The new 1.5A control features solid construction, standard RFI suppression and a three-speed ergonomic slider with precision feel. Single-pole or three-way wiring capability coupled with back- and side-wire terminal screws simplify installation. The wide galvanized steel strap makes for secure mounting and added stability. Tri-combo screws (slot, Phillips and square) are standard. The control offers an On/Off switching function that turns the fan On to a preset fan speed level, and comes in three colour combinations with associated screwless wallplates.

101 Cooper Wiring Devices

Nickel-plated duplex floor box



Leviton has expanded its line of commercial-grade floor box assemblies with a nickel-plated, brushed-finish duplex floor box, making it ideal around other stainless steel fixtures and surfaces in offices, conference rooms, showrooms and other commercial areas. The 15A, 125V assembly is supplied ready-to-wire with a duplex receptacle, floor plate, floor box and all necessary seals. Designed

to meet UL 514A (2004 revision requirements) for metal floor boxes in wood floor and carpet installations, it features an impact-resistant thermoplastic receptacle face and body, and a 0.06-in. thick solid brass floor plate. To prevent moisture and debris from entering the assembly, threaded nickel-plated brass screw caps fit flush to the floor plate with seals at both the floor plate and cap.

102 Leviton Manufacturing Co. Inc.



Ceiling fan boxes with adjustable hanger bars

ETP, An EGS brand, launched a line of ceiling fan boxes designed to reduce installation time. Shipping fully assembled and ready to install, the boxes feature hanger bars (adjustable from 16-in. to 24-in.) that help you place a fan or lighting fixtures, even when space is tight. Direct mounting options enable side or undermount attachment to a beam or joist, while the retrofit screw hanger bars let you install the box with minimal cutting to an existing ceiling. All steel ETP boxes come complete with a non-metallic, sheathed cable connector, ground screw, hardware and instruction sheet. Each has multiple knockouts, four combination hex/Phillips installation screws and two fan/fixture bracket attachment screws. Support hangers are UL listed for up to 70 lb for fixtures and 35 lb for fans.

103 ETP (EGS Electrical Group)

Card key switches



Watt Stopper/Legrand has developed a line of card key switches for hospitality facilities that helps them curtail the waste of energy when guests leave the lights on in an empty room. The HS series switches enable/disable power to a select number of electric circuits and loads present inside a guestroom. The low-voltage HS-100 has normally Open/Closed isolated relays that allow it to interface with third-party energy and/or lighting management control systems, as well as Watt Stopper power packs. The HS-150 is a line-voltage switch that will serve as a primary or master switch at the guestroom's entrance. A common application for these card key switches is to allow them to collectively control all permanently installed luminaries and switched receptacles in a guestroom.

104 Watt Stopper/Legrand

Two-conductor connector

The 222-412 is the newest member of WAGO's Lever-Nuts 222 series of compact connectors: a two-conductor splice that joins the three- and five-conductor models in the Lever-Nuts family. The 222-412 is UL/cUL-listed up to 600V/20A and can accommodate both solid and stranded conductors ranging in size from AWG #12-28 in the same unit. Cage Clamp termination technology provides quick connections, while a maximum temperature rating of 105°C ensures 222-412 meets your needs. It protects users against shocks and employs an integral test point for testing/troubleshooting a cir-

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Telescoping outlet cover

Leviton's line of residential Raintight while-in-use covers has been expanded to include a telescoping model that makes it easy to insert plugs and cord sets into outdoor receptacles while sealing out dirt and debris when the receptacle is not being used. The covers are packaged with duplex, single and Decora wallplates and mounting hardware, and a preinstalled gasket simplifies installation. The covers are constructed of durable UV-rated thermoplastic, and are suitable for decks, patios, porches and other outdoor locations outside of the residential arena.



107 Leviton Manufacturing Co. Inc.

High-capacity poke-throughs



Mono-Systems poke-throughs are intended for power, communication, and A/V access in open-space plans, and offered in a variety of finishes to accent wood, tile or carpeted floors. They meet or exceed UL scrub-water exclusion tests, as well as fire rating requirements for two-hour rated floors. The P4 series is prewired with four 20A receptacles on two circuits, while the outlets provide isolated ground (IG), if desired. Included are four Cat 6 jacks.

108 Mono-Systems Inc.

Electronic in-wall time switches

Intermatic has released four new series of electronic in-wall time switches, all of which automatically switch loads while astronomic programming can be combined with independent programs to provide sunset On and timed Off settings. The EI15MH series is designed to replace any standard

wall switch (single or multi-gang) and automatically limit the On time of lighting loads. The solid-state design with silent operation provides two-way operation with immediate switch Off or a time-delayed Off after 15 minutes. The EI200 series provides silent operation in ranges from five minutes to 12 hours, and replace single-pole switches in various applications. The EI600 series is an easy-to-program timer that provides up to 40 On/Off operations that can be used for 24-hour or seven-day load control. A three-wire design allows the timer to be used as a single-pole or three-way (multi-way) switch. Finally, the EJ500 series seven-day timers provide up to six On/Off operations daily, and an optional random feature deters burglars by giving a home a "lived-in" look.

109 Intermatic

Parallel splices



Pan-Lug copper compression parallel splices deliver installation flexibility and reduced costs; 10 parts provide terminations of 278 UL-listed and CSA-certified conductor combinations—with dieless crimping tools. The splices feature industry-recognized colour coding and large, easy-to-read part numbering for visual verification in low-light conditions.

110 Panduit

Illuminated hospital-grade devices

Pass & Seymour/Legrand (P&S) introduced a line of illuminated hospital-grade devices to complement its PlugTail product family. The receptacles are easy to identify in the dark, and the lit receptacle faces confirm that power is connected. LEDs provide the illumination, and have a nine-year life expectancy.

111 Pass & Seymour/Legrand



cuit. Splicing is easy: simply lift the orange lever, insert the stripped conductor (check strip length with a built-in length guide) and lower the lever.

105 WAGO Corp.

Floor boxes

The new line of floor boxes from Pass & Seymour/Legrand provide convenient support to both line-voltage and low-voltage connections. The boxes come in a variety of round and rectangular styles, including single- or two-gang applications, and install in wood and concrete with a smooth, nearly flush appearance. Swing-bracket mounting, ideal for tile floors, installs without drilling for mounting screws.

The extra-deep design leaves plenty of wiring room, and four knock-out wire entries and two auto-clamp entries allow for wiring flexibility. The heavy-gauge, die-cast cover plate is compatible with a range of floor surfaces, including ceramic tile. Each box is scrub-water compliant without caulking, supplied with a foam gasket and O-ring-equipped plugs. They include receptacles, multimedia dividers, Cat 5e jacks and F-connectors.

106 Pass & Seymour/Legrand

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We've heard of Sin City, but 'LED City'?

By Anthony Capkun

While at Lightfair in the spring, I was attracted to a booth advertising something called 'LED City', so I stopped to check it out. I chatted with Ron Hall of Cree Inc., who explained LED City was a community of government and industry parties working to promote and deploy LED lighting technology across municipal infrastructure to save energy, protect the environment, reduce maintenance costs, improve light quality and save tax dollars.

Launched in December 2006 with a parking garage light pilot program in Raleigh, N.C.—and supported by Cree, Lighting Science Group, AmTech Lighting Services and Progress Energy—the LED City community is providing a guide to accelerating the deployment of LED lighting for cities worldwide.

The pilot involved replacing HPS fixtures with LED fixtures, and demonstrated a 40% energy savings. Respondents to surveys conducted before and after the transformation declared the LED light quality superior, saying the garage felt far safer and reported that their overall opinion of the garage improved significantly. The City of Raleigh is the first LED City because of its commitment to deploy LED light across its infrastructure.

But it's not the last. Back in July, the Toronto Association of Business Improvement Areas (TABIA)—through its greenTbiz program—announced that Toronto became the second North American city (and the first in Canada) to join the LED City initiative.

The most high-profile applications of LED lighting currently in Toronto include the illumination of the CN Tower, lighting for portions of Exhibition Place, complete turnkey retail store installation at Grassroots and popular LED holiday lights.

"LED technology can help us cut our energy use for lighting by more than half," said John Kiru of TABIA. "The CN Tower is a great example. Their change-out to LEDs will result in a 60% reduction in the amount of energy they use compared to 1990 consumption levels. By converting street and other public lighting, Toronto will also be able to receive the benefits from this level of efficiency."

For the City of Toronto, switching to LEDs will result in millions of dollars in savings. Just converting the city's 160,000 streetlights to LEDs will save about \$6 million annually in electricity costs, in addition to reducing greenhouse gas emissions by over 18,000 tonnes.

Gregory Merritt, Cree's director of corporate marketing, brought greetings from Raleigh Mayor Charles Meeker, who was quoted as saying: "LED lighting enables cities such as Raleigh and Toronto to save energy, preserve the environment and save our taxpayers money. LED suppliers like Cree provide a technology that gives us access to a new generation of energy-saving lighting options for our municipal infrastructure." 



Cree is a manufacturer of semiconductors and devices that enhance the value of solid-state lighting, power and communications products by increasing their energy performance and efficiency. In this photo, Cree production operators in the Advanced Device Clean Room facility inspect SiC wafers with a scanning electron microscope. Photo courtesy Cree Inc.

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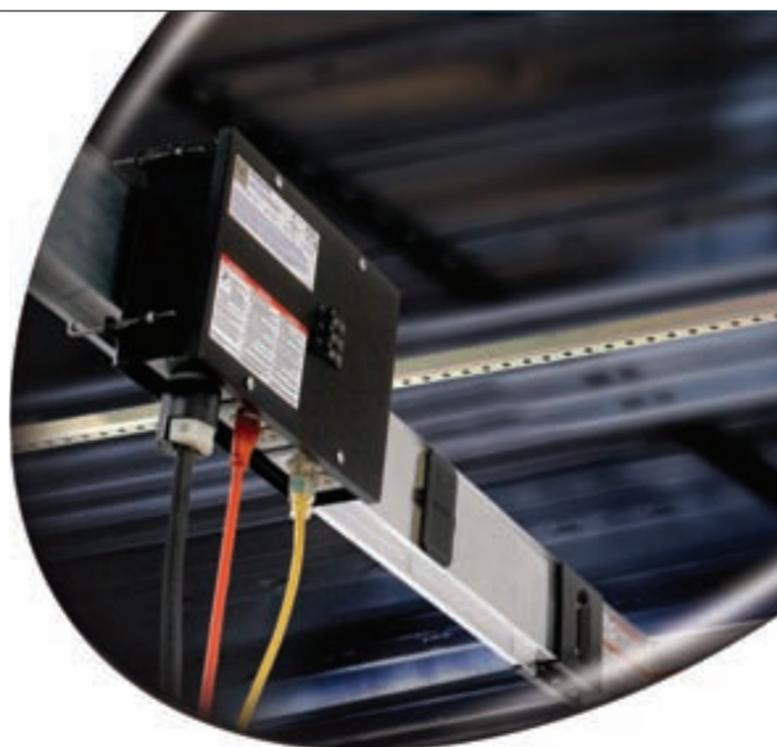
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NRG Systems realizes big energy savings

Vermont-based NRG Systems' new headquarters built in 2005 was carefully crafted to reflect the company's commitment to the environment, community and its employees. The 46,550-sf facility, which includes office, manufacturing and warehouse space for company-produced wind monitoring equipment, was designed to minimize environmental impacts and maximize energy conservation.

Project goals

The first design goal was to find ways to minimize energy needs in all areas of building operation, including heating, cooling and lighting. The second goal was to provide as much energy from renewable sources as possible. Company owners were willing to make an upfront investment to ensure significant long-term savings.

Naomi Miller of Naomi Miller Lighting Design specified the electric lighting while Andy Shapiro of Energy Balance Inc. developed the facility's daylighting plan. The two designers collaborated with partner Watt Stopper/Legrand to select energy-saving controls that would meet the ambitious criteria of the project.



The cost premium for the daylighting design, coupled with carefully selected energy-efficient luminaires and controls, is rapidly repaid in miniscule utility bills.

Daylighting contribution and controls

Careful building orientation and design allows daylighting to provide significant contributions—not only in office areas but warehouse spaces as well. Light-guiding blinds coupled with strategically placed windows and skylights bring daylight deep into the building and provide an abundance of diffuse, low-glare lighting.

Augmenting the daylight is an electric lighting system consisting primarily of high-performance, T8 fluorescents with dimming ballasts under daylighting controls. Photosensors constantly monitor outdoor lighting levels while controllers automatically adjust the fluorescent lighting to maintain desired ambient levels. A multi-zone control strategy is used in the office areas so that fixtures closest to the windows dim first as daylight contribution increases.

Occupancy sensors

Additional energy savings are achieved by using occupancy sensors throughout the building and grounds to ensure that lights are not turned on unless the space is in use. Most are set with the Manual On option selected to maximize energy savings.

Passive infrared (PIR), ultrasonic and dual-technology sensors have been installed according to the size and function of each space. Dual-technology sensors, advantageous for applications not ideally suited to either PIR or ultrasonic technology alone, are used in several offices and a large boardroom. This approach ensures the greatest sensitivity and coverage with the least threat of false triggers. Both technologies must detect occupancy before the sensor turns the lighting On, but continued sensing by just one technology will hold the lighting On.

Special weatherproof sensors are used for outdoor areas, and are rated for temperatures from -40°F to 130°F.

The spaces using natural lighting employ sensors along with the daylighting controls to maximize energy savings while at the same time helping NRG Systems keep its commitment to being a good neighbour. Community residents also benefit from the sensors as they reduce light pollution from the skylights after dark.

Lamp and ballast selection

NRG Systems' electric lighting primarily uses high-performance T8 lamps combined with programmed-start electronic ballasts for maximum light output and long life. Low-, normal- and high-output ballasts were specified for different spaces to customize the light output appropriately and squeeze every possible watt out of the lighting operation.

While this approach sounds simple, it complicated the design and construction processes. Multiple fixture tags were required for each basic fixture type, baffling suppliers who didn't understand the ballast differences, and submittal reviews became complicated. Additionally, the contractor had to be careful about putting identical-looking fixtures in specific rooms. Downlights, wall sconces and decorative pendants primarily use 32W CFLs (compact fluorescent lamps). Limiting the number of lamp types on the project simplifies maintenance and allows the owner to economize by purchasing replacement lamps in volume.



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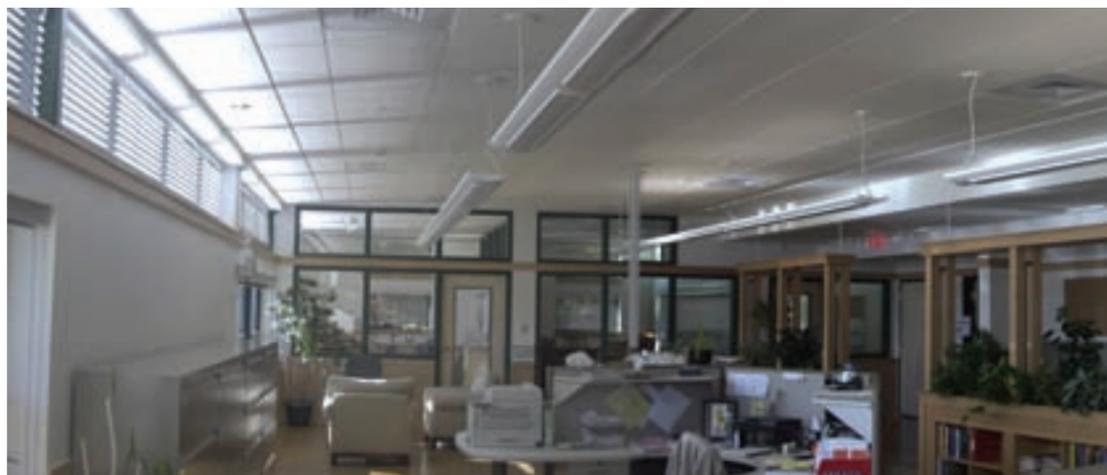
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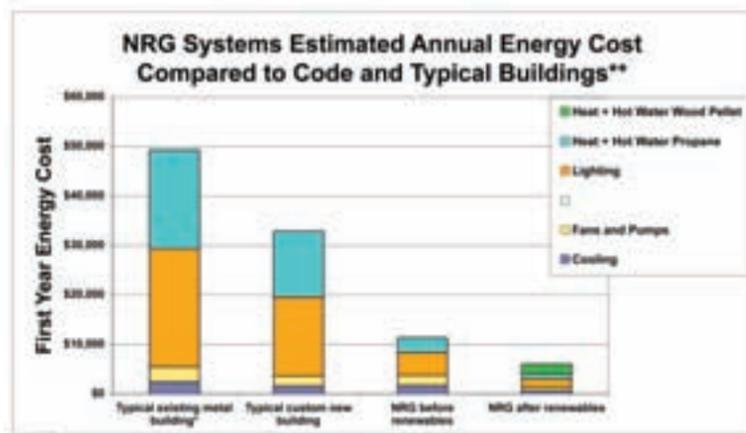
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NRG Systems limited energy use in all aspects of its building operations. The lighting uses about 1/3 the energy as that of a typical new custom building.

System tuning

When asked whether the lighting and controls systems performed perfectly right away, the designers responded, “No. There were a few compatibility issues that had to be resolved and required getting the luminaire manufacturer, ballast manufacturer, lamp manufacturer and the controls manufacturer involved in a conversation with us and the owner’s electronics guru”.

After taking field measurements, observing the behaviour of the system and waiting for laboratory test results, Shapiro and Miller discovered that certain fixtures specified with a single three-lamp ballast had been shipped with a single- and a two-lamp ballast, and the added current draw of having two ballasts per fixture was overloading the system. Additionally, the lamps provided were not compatible with the ballasts, so the fixtures had to be rebalasted to resolve these problems.

The designers also discovered a misunderstanding about the standard operation of the daylighting controller, which they intended to have switch lights Off on bright, sunny days. Once the desired

operation was communicated to engineers at the controls manufacturer, they were able to provide instructions on how to rewire the controller to produce the desired results.

Shapiro and Miller recalled that the electricians experienced some difficulty implementing systems where luminaires were controlled based on input from both daylight and multiple occupancy sensors due to the complexity of the resulting sensor/relay/ballast/switch wiring diagrams. “Commissioning the sensors took a significant amount of time,” they noted, “particularly given the owners’ desire to minimize electricity usage, which required repeated adjustment of sensitivity and Off-delay time settings. However, the time in commissioning paid off. The systems are now working as expected.”

Design achievements

All of this careful attention to detail resulted in a lighting design that is estimated to use about one-third the energy of a typical new custom building. The connected lighting load for the building is just 0.77W/sf—over 46% less than ASHRAE/IESNA 90.1-2001 allowances. Continual energy monitoring has proved the benefit of the control strategy and actual daytime lighting energy use is over 40% less than the connected load, even in winter months.

Actual electricity usage by lighting was very close to expectations, consuming 40,000 kWh from March 2005 through February 2006. The building is one of only a handful of manufacturing facilities to earn a LEED Gold certification. NRG Systems also succeeded in its goal of using low-cost energy, and is supplying 72% of the energy used from renewable sources, which include solar, wind and wood pellets.

Company founders David and Jan Blittersdorf report having paid an 8.21% premium on the \$7,833,000-project for the specialized design and construction, including a substantial investment in a photovoltaic system. According to David, “We have essentially prepaid our energy bill by relying on renewable energy and, a result, we won’t have to worry about rising energy costs in the future”.

He estimates a \$4-8 million saving over the 30-40 year projected life of the building. Of the approximately \$643,000 in premium building costs, \$460,000 was for renewables and \$183,000 (\$3.93/sf) was the LEED cost premium. Designer Andy Shapiro concludes, “The cost premium for the daylighting design, coupled with carefully selected energy-efficient luminaires and controls, is rapidly repaid in miniscule utility bills”^{EB}.



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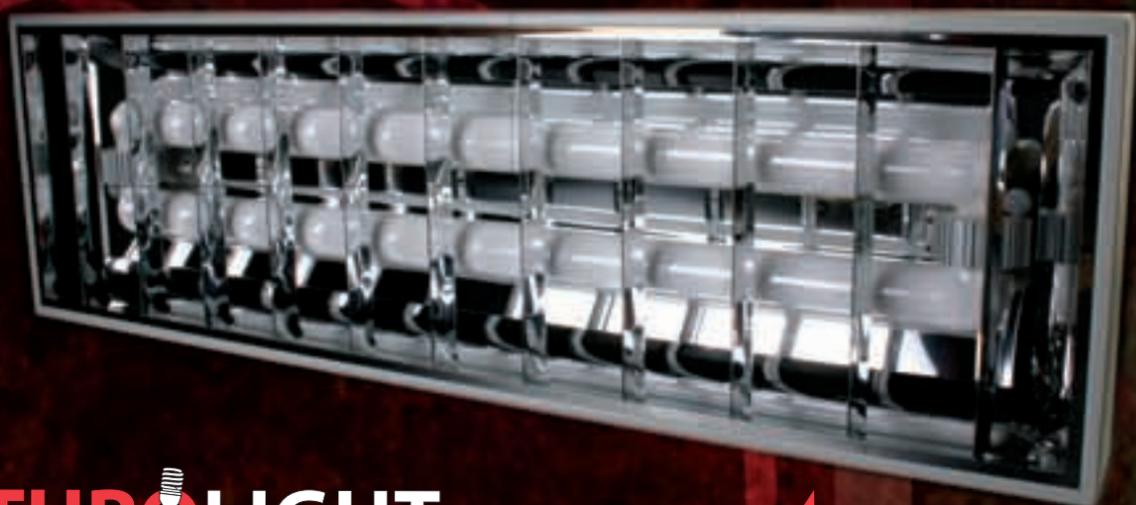
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The 'Wow!' factor: Hubbell Lighting's new HQ

A bright idea

Pulsing with energy, the newly opened global headquarters of Hubbell Lighting Inc. in Greenville, S.C., is a state-of-the-art structure designed to mirror the company's position as a leading light among North American lighting manufacturers.

Located on a 20-acre site that will readily accommodate Hubbell Lighting's future expansions, the new facility not only encompasses the company's 16 lighting brands, including Alera, Columbia Lighting, Devine Lighting, Dual-Lite, and Kim Lighting, it also serves as a gigantic lighting laboratory researching and developing industrial, institutional, commercial, roadway, outdoor, and sports-lighting products.

Lighting the way

In relocating from its sprawling multi-building facilities in Spartanburg, S.C., to the new 185,000-sf, four-story building overlooking Interstate 85, Hubbell Lighting (a division of Hubbell Inc.) teamed with the architectural firm of McMillan Smith & Partners, and the lighting design practices of Visual Terrain and Storyline Studio to fashion a unique edifice exemplifying the "Wow!" factor in stone, steel and polished glass.

In a painstaking process spanning three years from architectural plans to completion, the design elements reflect the organic feel and look sought by Hubbell's management.

The design team's key challenge: create a ground level 25,000-sf Lighting Solutions Center, destined to be one of the most innovative educational facilities in the lighting industry. Shaped by Seattle, Washington-based Storyline Studio, this space is defined by its maximum flexibility including moveable, internally illuminated walls attached to a central hub.

Visual Terrain Inc. was commissioned to craft the lighting design plan. Dawn Hollingsworth, a managing partner of the firm, and Eileen Thomas, a principal of the firm, focused on two main concepts and a primary objective: through lighting

design, reinforce the fact for anyone seeing the building that they will instantly recognize it as a lighting company; and secondly, without going overboard, to transform the building into a gigantic lighting laboratory.

Curb appeal

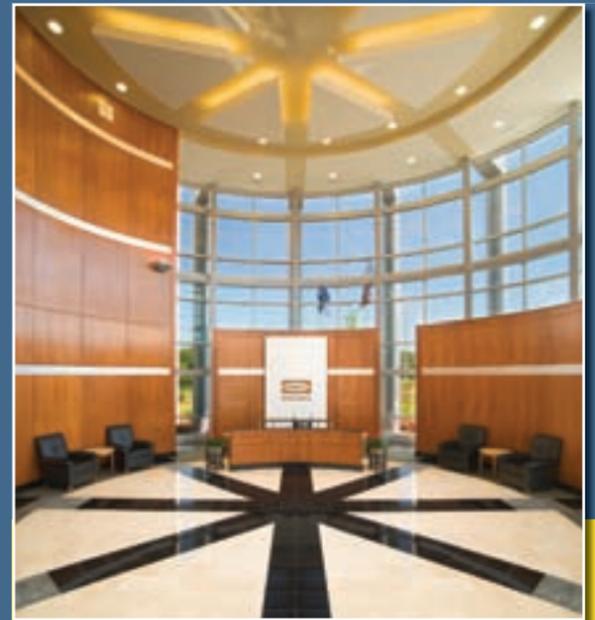
The Hubbell Lighting experience begins outside its new HQ.

A main stairwell, located behind a four-storey glass wall, is in full view from the main highway. Taking full advantage of this opportunity to 'mark' the building, the team strategically installed 4-ft one-lamp T5 fluorescent strip lights from Columbia Lighting on the underside of the stairway steps.

When the building was in the planning stages, the code name for the project was 'Starlight'. The lighting designers, wanting to create a metaphor of the code name, illuminated the rotunda's custom-designed reflector system, which also served as the exposed ceiling of the edifice. Working with Hubbell's KIM Lighting division, a new 1000W MH spotlight was used to work in tandem with 250W floodlights using blue MH lamps. The 1000W fixture, in concert with a custom-designed ceiling reflector system, created the starburst effect while the 250W floodlights created a blue wash.

KIM floodlights illuminate a flagpole, bollards light area pathways, landscaping and parking lots, while Devine Lighting Par 30 MH cylinders mounted to custom-designed back plates light the building's south side elevation.

Usually when lighting a corporate facility a lighting designer might specify a few types of fixtures, according to Hollingsworth. "In the case of Hubbell Lighting, our daunting objective was to include fixtures from as many of the 16 brands (or 150 different types of lighting fixtures) as possible that make up the lighting division," she adds.



Brian Dressler Photography

The main guest lobby/reception area in the rotunda entrance features surface-mounted accent lighting, recessed downlighting and daylight providing ambient illumination, and fluorescent cove lighting dramatically highlighting a starburst-designed ceiling treatment, which is also emulated in the grey-and-black tiled lobby floor.

Building rear. From exterior lighting of the building façade, landscape, parking lot and interior lighting of office facilities, Hubbell Lighting wanted to make a statement that reinforced for anyone seeing the building for the first time that it, indeed, houses a lighting company. Secondly, they wanted to transform the building into a giant lighting laboratory while making it inspiring and comfortable for those who work there. As a result, 4567 individual lighting fixtures and more than 150 different fixture types from all of its 16 brands illuminate the building, transforming the facility into a Greenville icon.

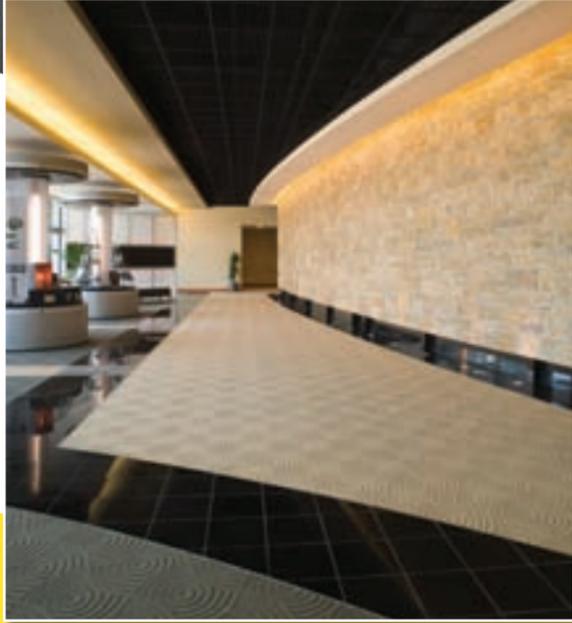
Brian Dressler Photography





Brian Dressler Photography

The Hubbell Lighting executive boardroom redefines 'a room with a view' by offering occupants a breathtaking 270-degree panorama while a surrounding balcony provides a connection with nature. With seating for 16, the meeting space features the latest in audio-visual equipment, complete with electronic, room-darkening shades.



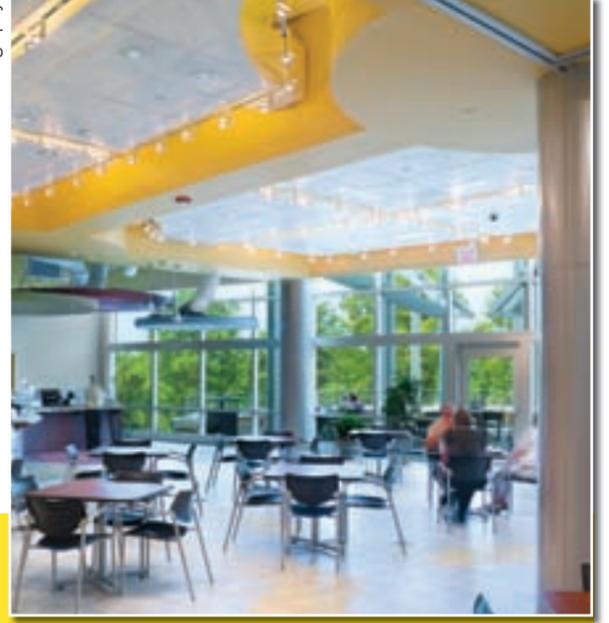
Brian Dressler Photography

This pre-function area in Hubbell Lighting's 25,000-sf Lighting Solutions Center is adjacent to the main rotunda-shaped lobby and was designed as a combination hospitality area and a company showcase. Here, guests may view an A/V presentation that provides a company overview, or see displays tracing the company's 100+ year history, its present and future.



Brian Dressler Photography

Employee break rooms on the second, third and fourth floors are framed by a wall of floor-to-ceiling glass windows that bring the outdoors inside. Each break room is intentionally designed to be different from the rest of the office environment. Providing employees with an almost whimsical space to relax, the room is complete with colourful dropped ceiling clouds and cylindrical floor designs that compliment the ceiling treatments.



Brian Dressler Photography

The employee cafeteria is bright, colourful and multi-faceted. By day it can feed the entire corporate facility staff of over 550 people. Through the use of sliding walls, the space can be changed to private dining rooms for smaller groups or additional training rooms for The Lighting Solution Center programs. In the evening, the space can be transformed to catered tablecloth dining for everything from corporate group meetings to special events.

Let there be light

Shining its lights next on Hubbell Lighting's cavernous interior, the designers devised ways to apply lighting artistically to showcase the full breadth of the company's product lines in real situations.

On the first floor, the Lighting Solutions Center — intended to communicate, demonstrate, educate and train — includes a welcoming lobby illuminated by Alera Lighting decorative compact fluorescent wall sconces with Opal acrylic shielding in a silver/grey housing finish; a pre-function area that introduces the visitor to Hubbell Lighting's rich past, present, and future; as well as a 72-seat amphitheatre. Nearby is the 3,000-

sf Lighting Solutions Lab which explores the most challenging illumination issues of the day.

Four multi-purpose private dining rooms also occupy the ground floor. At the press of a switch, walls move to transform dining areas into additional training rooms. To provide for this dual function, Visual Terrain opted for 2-ft and 4-ft, two-lamp T5 fluorescent strips from Columbia Lighting to backlight the perforated floating ceiling. Employing dimming ballasts and colored gel sleeves, the team created a glowing colour-changing backlight for the ceiling. A soothing environment for diners, the coloured ceiling, along with direct illumination from Prescolite track fixtures, is also used as an identifier for specific training.

Creativity in the workspace

Floors two through four house the company's administrative, engineering, executive, finance, operations, human resources, information technology, and sales and marketing functions. Making the working environment inspiring and comfortable for Hubbell Light's employees was another top design priority.

Private offices on levels two and three use T8 Stratus recessed indirect fluorescent lighting fixtures from Columbia, as well Alera 8-ft T5 linear fluorescent Plank fixtures. VIP offices feature Prescolite low-voltage lensed wall washers with American Matte reflectors and Zet finish. Prescolite low-voltage mirror super-adjustable downlights with Zet finish have been installed

Flexible training rooms in the Hubbell Lighting Solutions Center, a 25,000-sf facility on the first level of the company's new headquarters, allows presenters to mock-up products for customers based on their requests. In addition to the technology tools, moveable walls allow the rooms to be quickly transitioned into either one large, or two smaller teaching spaces. In all, there are six training room within The Lighting Solutions Center.

Within the new Hubbell Lighting HQ, is a 25,000-sf Lighting Solutions Center. A portion of the centre includes a flexible 3000-sf Lighting Solutions Lab designed to address challenging lighting issues. Here, in the fixture comparison module, specifiers, contractors and users alike can effectively compare performance characteristics of different luminaires.

One of the most difficult lighting challenges is daylight harvesting, and it's one of the five current topics the Lighting Solutions Center lab addresses. Within this Lab module, tracing a day from sunrise to sunset illustrates to specifiers, contractors and users how they can capture sunlight and realize energy conservation that directly translates to bottom line operating costs.



James Huff Photography



James Huff Photography



James Huff Photography

lighting showcase

in the executive office suite.

Commenting on the scale of the job, Dawn Hollingsworth said, "Doing this job is not only a source of great pride, it's the first time in my experience where there were no problems holding the spec."

Spotlight on training

Training is the quintessential service Hubbell Lighting provides its customers, primarily architects, illuminating engineers, lighting designers, electrical contractors, and sales agents. Each main floor training room feeds off of a storage area containing many of the light fixtures manufactured by Hubbell Lighting. This back-of-the-house design allows for quick and efficient shifts of training emphasis. Individual training rooms can be transformed daily to reflect specific light fixtures and illumination sources supporting educational programs going on concurrently.

In designing the company's lab, Hubbell Lighting management tagged five 'lighting champions' from its operational ranks, assigned to identify the most significant challenges facing lighting professionals. Each champion focused on specific solutions for his lighting challenge, including daylight harvesting design, maximizing energy efficiency, controlling light pollution, specifying solid-state lighting products, and the integration of life safety systems.

Champions and designers worked in tandem to create modules

addressing each challenge. Looking at an aerial view of the lighting workshop, a central hub makes each demonstration space easily accessible, while internally lit modular curvilinear walls separate the spaces and are designed to be easily reconfigured as needs arise to accommodate new lighting challenges.

Each of the five demonstration areas feature one or more unique teaching tools, such as a fixture comparison mechanism that directly compares differences in light quality, energy usage and cost savings. Other components include tailored environmental graphics, a touchscreen computer with video projection and a system in the daylight harvesting workshop that traces a day from sunrise to sunset to illustrate how daylighting energy is captured.

Visitors to the lighting workshop are exposed to a series of graphically illustrated, real world solutions and innovative demonstration tools that illustrate the differences and similarities between incandescent, fluorescent and solid-state light sources in different residential and commercial applications. Employing a ceiling electrical grid, moveable walls and easily changing graphics, lighting presentations at the Lighting Solutions Center will continually evolve and provide the latest information on cutting edge lighting topics. Architecturally and functionally, Hubbell Lighting's building and grounds will be a showcase for the application of lighting design concepts as well as a Greenville icon. 



James Huff Photography

The Solid State Technology area in the Lighting Solutions Center demonstrates the diversity of LEDs. It is one of five demonstration areas featuring unique teaching tools such as a fixture comparison mechanism that directly compares differences in light quality, energy usage and cost savings. In addition, visitors to the lighting lab are exposed to a series of graphically illustrated, real-world solutions and demonstration tools.

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- **Devine Lighting:** Surface-mounted luminaires serving architects and the broader specification market.
- **Dual-Lite:** Life safety products including emergency units, exit signs and lighting inverters for ICI, sports or residential application.
- **Hubbell Industrial Lighting:** High- and low-bay HID lighting fixtures for commercial and industrial use.
- **Hubbell Outdoor Lighting:** Wall- and ceiling-mount and floodlighting luminaires for perimeter, façade and security lighting applications.
- **KIM Lighting:** Architectural outdoor specification products including site/roadway, pedestrian pathway, landscape, parking garage and flood lighting luminaires.
- **Prescolite:** Specification-grade recessed downlighting, track lighting, and surface- and pendant-mounted lighting fixtures for commercial, institutional and residential markets.
- **Progress Lighting:** Manufacturer of residential and light commercial luminaires including chandeliers, pendants, portable lamps, hall and foyer, sconces, modular fluorescent, undercabinet, bath and vanity, recessed track, ceiling fans, bath fans and dimmers.
- **Security Lighting:** Lighting packages for national accounts in restaurant, hospitality, retail and self-storage market sectors.
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- **Whiteway:** Outdoor lighting for retail petroleum convenient store market. 

Casino Rama

hits the jackpot with energy-efficient lighting



As part of the relamping process, cluster lamping areas—such as this entrance canopy—were retrofitted with cold-cathode lamps, which last an average 25,000 hours and resist vibration damage.

Casino Rama, Ontario's only commercial First Nation's casino, welcomes guests 24-hours a day, seven days a week. First opened in July 1996, the casino offers a complete entertainment experience with more than 2,500 slot machines, 110 gaming tables, nine unique restaurants, a 5000 seat Entertainment Centre and a 300-room, all-suite, full-service hotel. It is one of Ontario's premiere entertainment destinations.

"Lighting is an essential part of our business," begins Andrei Kun, executive director of resort operations. "We use over 25,000 bulbs around the clock, 365 days a year. Attractive lighting greets guests the moment they pull up to the casino, where over 5,000 lights glitter in three overhead entrance canopies, to the suite where they rest their head at night."

It's no wonder, then, that Casino Rama had a lot to gain by finding ways to reduce energy costs. They turned to Toronto Hydro Energy Services (TH Energy) to help evaluate their current usage level and recommend ways they could increase energy efficiency.

The rules of the game

The casino primarily used incandescent and fluorescent lighting. While these systems produced adequate light, they required a great deal of upkeep, putting a strain on Casino Rama's maintenance department. After consulting with TH Energy, the casino made the decision to relamp to capitalize on potential energy savings and do its part as a corporate citizen to reduce energy consumption.

Casino Rama had four guidelines for TH Energy. First, the implementation had to be easily retrofitted, without major construction; the casino did not want to incur capital costs or disruption involved with changing out existing light fixtures, which still had 50% service life remaining. Second, it wished to alleviate bulb consumption and changes, which are very costly in terms of cost per unit and manpower.

Third, the look and feel of the casino's original design had

to be maintained. "The first- and second-generation high-efficiency lighting systems did not always reflect the 'burn' or colour characteristics of traditional incandescent light bulbs, which tends to be warmer and softer," said Kun. "It was imperative that a technology was adapted that best related to the existing light source in order to create a consistent look and feel at the property."

Finally, rising energy costs and a burgeoning grassroots movement encouraging all corporations to demonstrate energy conservation prompted the decision to relamp the areas of the lighting package that traditionally consume the most electricity. Guests expect casinos to be colourful and brightly lit, and the challenge was to maintain this image while at the same time realizing a minimum 5% energy savings across the board.

To benefit from energy savings, Casino Rama realized that an efficient, non-invasive system was needed, but paying for construction costs to retrofit the current lighting options would detract from overall cost savings. So what was the solution?

A sure bet

With all of these factors in mind, and due to the extensive maintenance and manpower associated with the bulbs, TH Energy concluded that high-quality, longer-lasting lamps were a necessary part of the solution to Casino Rama's complex problem, so it partnered with a manufacturer of energy-efficient CFLs (compact fluorescent lamps) to provide the solution.

TCP's CFLs have an average life of 10,000 hours, meaning they can last six to 10 times longer—and use about a quarter of the energy—than standard incandescents. This leads to increased energy savings, lower utility costs and greenhouse gas reduction.

To maintain the same 'warm glow' lighting appearance on the property, detailed calculations were made and measurements taken to ensure the replacement bulbs would achieve the same ambient light levels. This requirement was in line

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The entire lighting retrofit saw the replacement of over 5,000 bulbs, yet the work was completed in just seven working days with minimal disruption to Casino Rama's normal business activity.



Opened in 1996, Casino Rama uses over 25,000 bulbs around the clock, 365 days a year. It only makes sense that the casino would look into retrofitting its lighting assets with solutions that are more energy efficient.



with the guidelines provided by the client. The entire project saw the replacement of over 5,000 bulbs with over 4,000 CFLs being installed on the three massive canopies that cover casino entrances.

While CFLs were the answer to most of the relamping, TH Energy and Casino Rama also decided to use long-life LED products for the glass elevator shaft. The LED lamps are available in an array of colours and last up to 50,000 hours, so they're quite low-maintenance. By replacing the lights in the glass elevator shaft, Casino Rama also eliminated the need to hire a costly elevator company to operate the lift to change the bulbs. This replacement process, previously performed every three months, will now only have to be done once every four or five years.

To make cluster lamping areas—such as outdoor canopies—more energy efficient, TH Energy and Casino Rama chose their lighting partner's cold-cathode lamps, which last an average 25,000 hours and are recommended for rapid-cycle applications, such as signage,

amusement parks, rooflines and theatres. They also resist damage caused by vibration.

TH Energy took care of the relamping process, completing the project in just seven working days with minimal disruption to Casino Rama's normal business activity.

A big win

"We couldn't be more pleased," says Kun. "We've saved \$200,000 off our annual hydro bill, not to mention that we've reduced the number of manhours for the High Fixtures Lighting Crew by one-third. That means we've freed up valuable manpower for other important maintenance-related tasks."

In addition to the energy savings, Casino Rama is also helping the environment. The relamping is reducing harmful greenhouse gas emissions linked to global warming by 7-8% based on the total energy savings realized. In this story, it's the casino and the environment that have hit the jackpot! 

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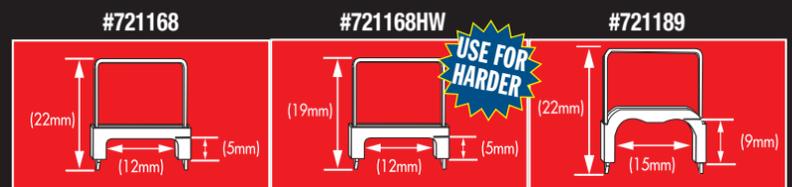


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Canucks scores prestigious Edison Award



The third-floor gallery provides exhibit space for both large and small ceramic pieces.



Knife-edge slots organize and contain the components of the lighting design.

GE recognizes Canadian lighting project as best in the world

The GE Edison Award—an annual program sponsored by GE—recognizes excellence and quality in professional lighting designs that employ significant use of GE light sources (lamps and/or LEDs). Projects from around the world are entered into this competition, from Melbourne and Los Angeles to St. Petersburg and Munich, and all points in between.

And the winner of the 2006 GE Edison Award, announced earlier this year at Lightfair, was Suzanne Powadiuk of Suzanne Powadiuk Design Inc., based in Toronto for her lighting design for The Gardiner Museum of Art in Toronto. The personalized Steuben crystal award was presented by GE Consumer & Industrial at a gala dinner reception at Rockefeller Center in New York City.

A panel of five judges selected this year's entry for its superiority in the following categories: functional excellence; architectural compatibility; effective use of state-of-the-art lighting products and techniques; appropriate colour, form and texture revelation; and energy- and cost-effectiveness.

The Gardiner Museum is one of the world's preeminent ceramic art museums. The architectural renewal builds upon the original structure designed in 1984. The lighting design complements the newly created third floor and expanded ground floor, providing an enhanced urban presence without compromising the museum's intimate scale.

The ceiling and lighting strategy for the entire project is revealed upon entry into the lobby. Knife-edge slots organize and contain the components of the lighting design. Different luminaires and light sources are selected to meet the needs of the task at hand. At the entrance, the slots house continuous recessed lensed luminaires with GE 32W T8 Starcoat Ecolux 3000K lamps.

The third-floor gallery provides exhibit space for both large and small ceramic pieces. A track system sits neatly up in the slots. Low-voltage, adjustable, lockable track heads with GE ConstantColor Precise MR16 lamps are used for exhibit lighting. They are specified because of their colour rendition, and variety of wattages and beam spreads. To light smaller objects, framing projectors with Q71MR16/C/NSP15 lamps are used. The track system offers the user maximum flexibility in terms of luminaire options and placement. The clerestory window brings in natural light during the day. At night, GE F32T8/SPX30/ECO lamps create a glow behind the sandblasted glazing.

Says Powadiuk, "With a limited number of lamp and luminaire options and dimming control systems, the user has been given a cost- and energy-effective, easily maintained lighting solution that addresses the varied needs of the public, restaurant and exhibition spaces." **EB**



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Relighting façade of historic custom house

Osram Sylvania and the Alexander Hamilton U.S. Custom House

Back in May, the Alexander Hamilton U.S. Custom House in New York City celebrated its 100th birthday with both a gala event and a newly illuminated façade—a birthday present from Osram Sylvania. Both before and after the short formal program, the Rotunda was bustling with centennial guests, just as it once did when the U.S. Customs Service conducted business within this grand space.

Attendees included key representatives of New York City's art, architectural, lighting, and preservation community, as well as building employees, members of the press and other special guests. And as we like to say, *Electrical Business was there!*

The Alexander Hamilton U.S. Custom House sits prominently on Bowling Green in New York City's Battery Park. Built between 1900-1907, the edifice is a steel-framed, seven-storey structure, intentionally designed to face the historically significant Bowling Green rather than the harbour.

The building was listed in the National Register of Historic Places in 1972 and designated a National Historic Landmark in 1976. In 1979, New York City's Landmarks Preservation Commission gave city landmark status to the exterior and public interest spaces of the building.

Why did it need new lighting?

Patricia DiMaggio, Osram Sylvania lighting engineer for the New York area, noticed the current lighting of the façade of the historic U.S. Custom House was not doing it justice, and that many of the beautiful and unique architectural details were lost in the shadows. DiMaggio contacted Peter Jacobson at Con Edison—a partner in promoting energy-efficient lighting for New York—who introduced her to John Haworth and Peter Brill at the Smithsonian, and then David Anthonie of the GSA, and the development of a new lighting design and installation was soon underway. Sylvania Lighting Services

agreed to donate installation labour for the project.

Enlisting the expertise of lighting designer Randy Sabedra of RS Lighting Design, the team went into the U.S. Custom House project with three important objectives: to maintain the historic and architectural integrity of the building; to replace older technologies with new, more energy-efficient and environmentally responsible lighting products; and to ensure the safety of those people who live and work in the vicinity of the U.S. Custom House, and to those who visit by providing illuminated grounds.

"Aside from revitalizing the lighting of the U.S. Custom House, producing energy savings was a large component of this lighting project," DiMaggio said. "Sylvania employed today's most energy-efficient light sources. According to calculations by Con Edison, the GSA will lower its electrical load by 43.1% and is projected to save approximately \$6,654.14 on its annual electricity bill."

The seven-story structure, containing 450,000 sf and sitting on three city blocks, received an exterior overhaul in lighting design. The previous lighting on the ground floor was removed and replaced with HO LED lamps from IO Lighting, which are surface-mounted linear floodlight fixtures, powered by Osram Power Supplies. A total of nine fixtures were installed in four separate ground floor sections to provide a safe, well-lit sidewalk area.

Four statues located at the front entrance of the Custom House representing Asia, America, Europe and Africa are now prominent features of the building, lit by the HO LED lamps, along with Sylvania Metalarc Ceramic 70W and 39W PAR30 lamps, which emphasize the details of these unique architectural sculptures.

The third and fourth floors received IO Lighting HO LED fixtures at each of the 13 windows. At the sixth floor, sculptures representing the great commercial and seafaring powers of world history are illuminated with Osram Sylvania Metalarc Powerball 20W PAR30s, with the beams angled to highlight the structures for recognition by viewers from the ground floor. The seventh floor received similar lighting techniques, benefiting from Metalarc Powerball 39W PAR30 and Metalarc Ceramic 70W PAR30 fixtures. Moonlighting wash across the building façade was accomplished using 4 SeLux fixtures and 1000W Metalarc Powerball lamps mounted on the roof deck of a neighbouring building.

Back at the gala

Back to the gala evening: the building was dressed to impress. The lower two stories of the Custom House façade and the Daniel Chester French sculptures, The Four Continents, were recently conserved in preparation for the new lighting and centennial celebrations.

During the brief formal program, the General Services Administration's (GSA's) regional administrator Emily Baker welcomed guests to the celebration commemorating one of GSA's finest historic buildings. Adding their welcomes to the audience were representatives of current and former major occupants of the building. A common thread through all of their comments was commitment to the building, both as current and former occupants, as well as a sense of its architectural and historic significance.

Following their welcomes, the lighting designer, Randy Sabedra, shared his vision for the new lighting scheme on the façade of the Custom House. Frank Santiago, executive vice-president and general manager of the General Lighting Division, described Osram Sylvania's mission to preserve and restore America's landmarks through illumination and presented GSA with a plaque commemorating the evening's event and the relighting project.

In her final comments thanking Osram Sylvania for their interest in illuminating the nation's landmark buildings, Baker also spoke about GSA's strong commitment to historic preservation, adding that structures such as the Alexander Hamilton U.S. Custom House are truly the nation's public buildings legacy.

Visit www.oldnycustomhouse.gov to check out pictures from the gala evening, and the building and its restoration. 



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Auditorium facilitates talks and seminars on attractive lighting



Individually addressable Optec varychrome LED spotlights bathe the projection screen in the intensive light of the entire colour spectrum. Proper illumination of the lectern with minimal glare is ensured by Parscan spotlights for low-voltage halogen lamps.



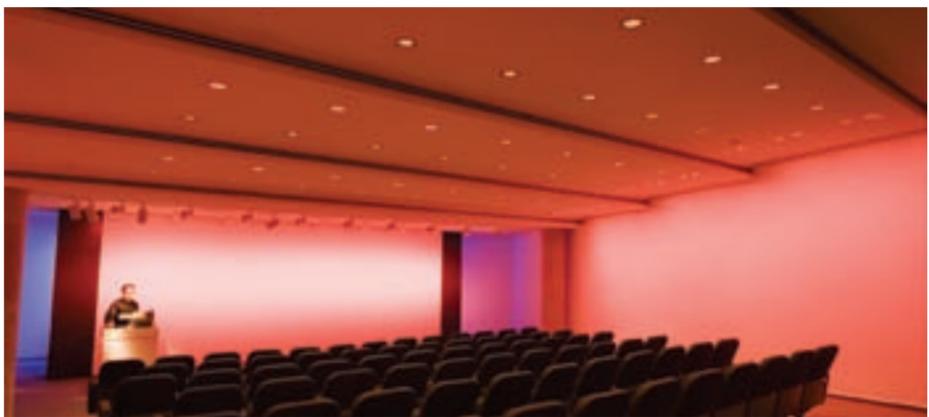
Due to LED technology, the colour-mixing luminaires provide a wide spectrum of highly saturated colours, which is optimally reproduced in true colours thanks to the colour compensation feature.



The scenographic concept includes glare-free, dimmable ambient lighting combined with varychrome luminaires for colour effects. Skim varychrome downlights provide for a neutral mood.



A multitude of complex light scenes with colour effects and dynamic progressions has been set up using the ERCO Light Studio software. The scenes can be recalled using the laptop on the lectern or via ERCO Light Changers in the wall.



Quadra varychrome wall washers evenly illuminate the side walls with light in a free choice of colours.



Due to the individual control of the varychrome rings of the Skim downlights, fascinating effects can be created. DALI control technology ensures an uncomplicated and economically efficient installation.



With a total of 375 DALI addresses, the auditorium lighting is controlled via nine Light Servers 64+ located in a single switch cabinet. For DALI installations with more than 64 addresses, the Light Servers 64+ are simply networked via Ethernet.

The auditorium in ERCO's Technical Centre (Ludenscheid, Germany) has been equipped with a new lighting installation incorporating the ERCO lighting control system: Light System DALI. It's here that, each year, visitors take part in architectural seminars, talks and other events related to lighting design. Now they can experience, first-hand, a wealth of options made possible by DALI (digital addressable lighting interface) as a tool for the scenographic lighting of architecture.

Using a laptop with ERCO Light Studio software, ERCO designers set up a range of complex light scenes with fantastic colour effects and dynamic progressions. The light scenes can be recalled from the lectern using a linked media control system. They can also be recalled via the ERCO Light Changers—compact wall control panels with user-friendly touchscreens to navigate

through the menu. With its 70 seats, the entire auditorium can be continuously reinterpreted based on functional, design and dramatic effects at the push of a button.

The scenographic concept includes glare-free, dimmable Skim low-voltage halogen downlights providing ambient lighting and Parscan spotlights with low-voltage halogen lamps attached to a DALI track to provide accent lighting for the lectern. This is supplemented with colourful effect lighting predominantly on the vertical surfaces of the room.

So, for example, Quadra varychrome wall washers with high-power LEDs illuminate the side walls evenly, while the front wall can be bathed in any required spectral colour using Optec varychrome LED spotlights. Visible from behind and on either side of the front wall, the walls are illuminated using Focalflood varychrome floodlights with T16 fluo-

rescent lamps, which provide contrasting coloured light. Even the varychrome rings of the Skim downlights containing LEDs can be controlled individually to produce any required colour.

The installation consists of 160 ERCO Light Clients, all of which have DALI-compatible lighting equipment connected via a control line through nine networked ERCO Light Servers 64+. All the Light Servers are installed in a single switch cabinet storing the system and scene data, and providing the control functions.

The new lighting system demonstrates to the audience the scenographic potential of the DALI technology. So the installation not only manages the functional requirements of the multi-purpose room, but provides interested visitors with insight into the creative possibilities and the intuitive operation of the software. **EB**



High-power architectural floodlighting

New from Hubbell Lighting's Kim Lighting is Axial Flood—a high power, aimable architectural floodlighting line for high lighting impact. The product line provides high lumen output in broadly aimable horizontal and vertical-beam flood- and spotlighting for large and very large applications. The Axial Flood family is characterized by a range of contemporary shapes of narrow depth and large-diameter round lenses; two fixture sizes with aimable, rotatable yokes; HID lamping and above-ground, pole- and building-mounting options. Housings are available in two sizes for simplified and scalable design continuity. Optical packages offer six distinct distributions and beam spreads, including wide, medium and narrow horizontal flood, vertical flood, spot and narrow spot. Mountings include stanchion, surface and wall tenon mounts; square or round pole side mounts; twin- and triple-mount tenons. Accessories include light shaping lens shields, short and large hoods, spot ring louvers or horizontal louvers. A choice of five colour filters is also available. The housings are constructed from extra-heavy-wall aluminum castings with contoured backs; heavy-wall, die-cast adjustable aluminum knuckles and mounting brackets. All models have clear tempered glass lenses. An internal, full-circumference silicone gasket and unique floating hinge design assures a watertight seal.

115 Kim Lighting



Light-level switching ballast

Universal's B214PU115S50A Ballastar light-level switching ballast is specifically designed for F14T5 lamps, providing maximum light output for 2x2 fixture applications. Switching from full to half output via wall switch or lighting relay, the Ballastar T5 is ideal for offices, classrooms and conference rooms. All Ballastar ballasts incorporate two 'hot' power leads for control with two standard switches or relays, simplifying installation. Switching on one lead provides 50% power, while having both switches on provides 100%. The unit has a ballast factor of 1.15 and can operate one or two F14T5 lamps. Programmed starting is incorporated into the design, which helps maintain long lamp life even when connected with occupancy sensors. Universal input voltage allows it to be connected to any voltage from 120 to 277 at 50 or 60 hertz.

116 Universal Lighting Technologies Inc.



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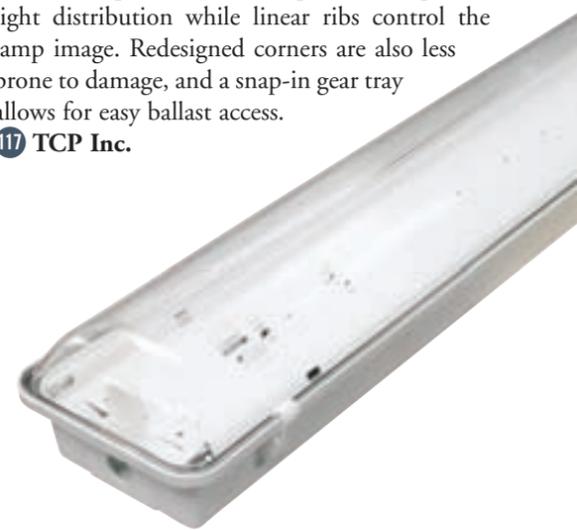
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118 Advance

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119 Ardee Lighting

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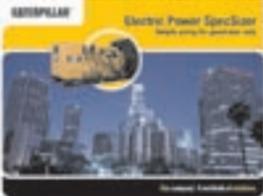
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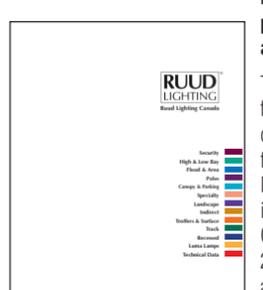


Outdoor lighting collection brochure

Beacon, a designer and manufacturer of specifications-grade outdoor area and site lighting products, has published a 16-page, full-colour brochure detailing its new Florentine Collection: a line of lighting designs capturing the spirit of Old World pole- and surface-mounted fixtures. Application photos are shown, as are close-ups of mounting and decorative options. Full specification data is clearly provided.

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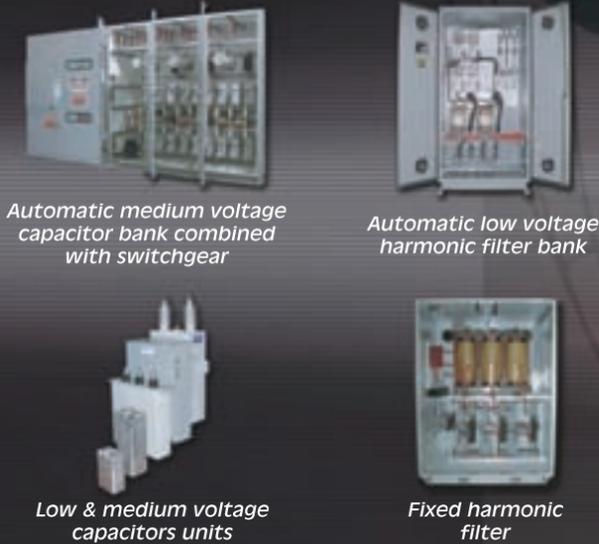
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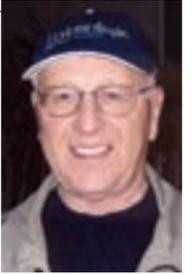
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INFO NO. 61



Substation grounding

Though of great importance, Section 10 of the Canadian Electrical Code (CEC), Grounding and Bonding, is among the least understood. Opinions abound on the absolutely correct interpretations, but almost everyone will agree that correctly installed grounding and bonding is most critical to a safe electrical installation.

Rule 10-002 lists the objectives of correctly installed grounding and bonding as:

- Protecting life from the danger of electrical shock and property from damage
- Limiting the voltage on a circuit when exposed to higher voltages than designed
- Limiting voltages-to-ground to 150 volts or less for interior wiring
- Limiting circuit voltages when exposed to lightning strikes

High-voltage substations (over 750 volts) are a special case. Here, CEC Section 36 takes us several steps further, and the requirements become more complex with the increased potential for harm. Section 36 deals with some special electrical hazards in the form of ground potential rise (GPR), and step and touch potentials that can harm us when we are in the vicinity of a substation during the occurrence of a ground fault.

Ground potential rise (GPR) is the voltage rise in the grounding system of an outdoor substation during a ground fault. The calculated GPR is simply the maximum available ground fault current (usually obtained from the electrical utility) multiplied by the measured grounding resistance of the substation grounding electrode (Ohm's

Law) under all soil conditions.

Step voltage is defined as "the potential difference between two points on the earth's surface separated by a distance of one pace, assumed to be 1 metre in the direction of the voltage gradient". Voltage gradients are the voltages produced when electrical current flows through the earth. *Touch voltage* is defined as "the potential difference between a grounded metal structure and a point on the earth's surface separated by a distance equal to normal maximum horizontal reach". GPR, step and touch voltages must be maintained within the limits prescribed in CEC Section 36 in outdoor substations operating at 7500 volts or higher.

During a ground fault, a person walking inside or in the vicinity of an outdoor substation runs the risk of an electrical shock due to step voltages in or around the substation. Similarly, a person standing inside or outside a substation and in contact with a grounded metallic object may receive an electrical shock due to a touch voltage between the person's hands and feet. For this reason, CEC Rule 36-304 specifies that the grounding systems of outdoor substations above 7,500 volts must be designed to limit the possibility of step and touch potentials to the requirements of Table 52.

Rule 36-304 requires that outdoor substations above 7,500 volts phase-to-phase must have a GPR no higher than 5,000 volts during a ground fault. (See Table 52 in the codebook to find the maximum limits of step and touch potentials both within and around the perimeter of an outdoor station.) The maximum permissible step and touch voltages are increased as the duration of a ground fault is reduced, and reduced for a longer-duration ground fault.

An outdoor substation ground electrode is normally a combination of driven ground rods and buried conductors interconnected as a mesh, covering the entire substation area and at least one metre outside the fence. Formulae and guidelines for substation grounding design are found in IEEE No. 80 and CSA C22.2 No. 41. Computer software is used to calculate the ground potential rise, step and touch voltages.

To minimize voltage differences, the code also requires that all metal objects—including structures, electrical equipment, metal piping, railway tracks, cable armour and metal sheaths, buildings and fences—be interconnected with the station grounding electrode. Concrete reinforcing steel may also be connected to help lower the station grounding resistance, but some conditions apply. Sometimes unfavourable soil conditions require supplemental grounding (interconnecting the substation grounding electrode with a remote grounding electrode so as to reduce the grounding resistance to an acceptable level).

A layer of crushed stone within and at least 1 metre outside the station fence provides further protection against step and touch potentials by isolating a person from the grounding system. Ⓜ

Les Stoch, P.Eng., is president of L. Stoch & Associates, specialists in quality management/engineering services. He is a member of PEO, OEL and IAEL, and develops and delivers electrical code and technical workshops for Dalhousie University. He also developed the Master Electrician training program and Exam (Ontario) for the Electrical Contractor Registration Agency.

Questions and answers compiled by ESA

Tackle the Code Conundrum... if you dare

So, you think you know the electrical code, eh? Well, we'll soon find out if you're an electrical code junkie or downright code-clueless. Take a look at the following questions and check your answers in November/December's Electrical Business.

Question 1

Electric vehicle charging equipment rated at ___ or more shall be supplied by a separate branch circuit that supplies no other loads except ventilation equipment intended for use with the electric vehicle supply equipment.

a) 15 amp c) 30 amp
b) 20 amp d) 60 amp

Question 2

Wiring of an essential electrical system in a patient care area shall be permitted to occupy the same raceway as non-essential wiring.

a) True b) False

Question 3

All receptacles that are part of an essential electrical system in a patient care area shall be what colour?

Answers to Code Conundrum

▼▼▼

Electrical Business September 2007

Q-1: Fences for guarding electrical equipment shall be topped with not less than two strands of barbed wire.

b) False. Rule 26-306 Barbed Wire. The fence shall be topped with not less than three strands of barbed wire.

Q-2: A conductor connection between a lightning arrester and a phase conductor shall be as short and straight as possible, with a minimum of bends and no sharp bends or turns.

a) True. Rule 26-508, Connection of Lightning Arresters. The connection between arrester and line conductor shall be: a) of copper wire or cable not smaller than No. 6 AWG; b) as short and as straight as practicable with a minimum of bends; and c) free of sharp bends and turns.

Q-3: Receptacles to which emergency lighting unit equipment is to be connected shall be not less than ___ m above the floor, where practicable.

d) 2.5 m. Rule 46-304 Supply Connections. (1) Receptacles to which unit equipment is to be connected shall be not less than 2.5 m above the floor, where practicable, and shall be not more than 1.5 m from the location of the unit equipment.

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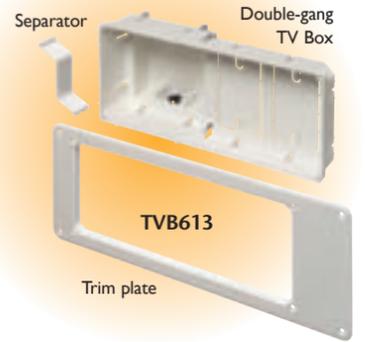
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Arlington's recessed TV BOX™ for new or old work allows LCD and plasma TVs to be placed flush against the wall.

Its two-gang design allows you to install two duplex receptacles. Or you can use the box separator to install one low voltage device and one duplex receptacle. There are two additional built-in mounts for low voltage, data/media connections (i.e. speakers, satellite TV, surround-sound).

The 13" wide, non-metallic TV BOX mounts between 16" o.c studs for a secure horizontal or vertical installation.

- Plugs stay inside the box and don't extend past the wall
- Textured, paintable trim plate covers edges of cut drywall



Patented. Patents pending

INFO NO. 64

GARD-N-POST™

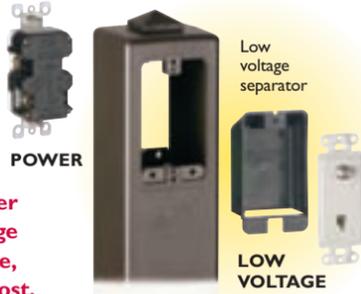
ENCLOSURE & SUPPORT

for OUTDOOR FIXTURES and DEVICES

Arlington's Gard-N-Post™ Enclosures and Supports offer the attractive, safe, and easy way to install a light fixture and/or one or two devices outdoors!

More convenient than ever!

Use the supplied separator to install power and low voltage outlets outside, in the same post.



- Non-metallic, heavy-duty UV rated plastic
- Heavy duty – resists damage from lawn equipment
- No chipping or loss of color
- New stabilizer position – post sits higher above ground
- GARD-N-POST – in a variety of styles from 9" to 73" tall



GP19B

Patented.
Other
patents
pending.



CSA listed with grounding lugs

Arlington 800/233-4717 • www.aifittings.com

INFO NO. 65

GRAB ANYBODY.™

in METAL or PLASTIC

NEW Plastic!



It Ships as an LB...

BUT IT'S ANY BODY YOU WANT IT TO BE!



T

LL

LR

C

Arlington's aluminum or plastic AnyBODY™ ships as an LB, but converts to a T, LL, LR or C by switching the covers and threaded flanges to create the style you need.

It's easy – and convenient.

Plus, it saves you the hassle, space, and cost of stocking five different conduit bodies.

They're competitively priced with LBs with NO EXTRA COST for the normally more expensive T – and UL/CSA Listed.

Plastic

- Sizes 1/2" to 4"
- Includes three flanges with glue-in pipe joint

Aluminum

- Sizes 1/2" to 4"
- Includes threaded flanges for three openings
- 1/2" to 2" are combination EMT/rigid – they're threaded for rigid, but also have a set-screw for use with EMT



Any BODY™

It's all anybody needs to save time & money!



Arlington

Scranton, PA 18517
800/233-4717 • FAX 570/562-0646
www.aifittings.com

Patents pending
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INFO NO. 66

Lighting that clears the air, and your conscience.

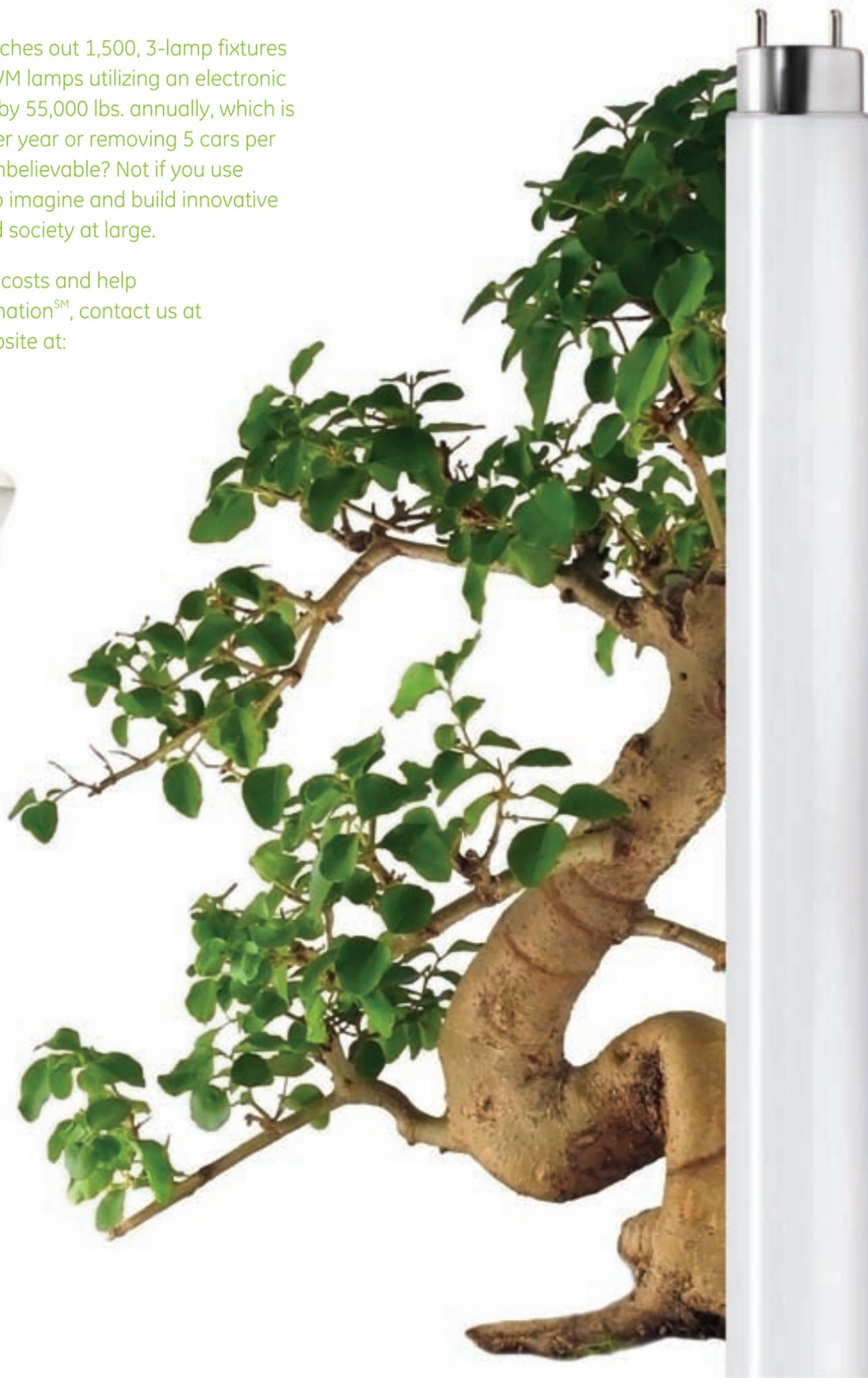
A large, high rise office building that switches out 1,500, 3-lamp fixtures from standard T8 lamps to Ultra F32T8WM lamps utilizing an electronic ballast system will avoid CO2 emissions by 55,000 lbs. annually, which is equivalent to planting 8 acres of trees per year or removing 5 cars per year from U.S. roads. Does that sound unbelievable? Not if you use ecomaginationSM. It's our commitment to imagine and build innovative solutions that benefit our customers and society at large.

To learn how your company can reduce costs and help protect the environment using ecomaginationSM, contact us at 1-877-259-0941 x2912 and visit our website at:

www.gelighting.com



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*@ 10 cents per kWh, 4,400 burn hrs., 1,000 fixtures
* Products may not be exactly as shown



imagination at work