

Fully Charged

Technological advancements and energy standards are reshaping the world of electrical and communication systems

by STACEY MCLACHLAN

Though it may not be as dramatic or glamorous as a stunning staircase or window wall, the electrical system is what truly makes or breaks an architectural project. A well-designed and up-to-date system that manages the distribution of power and lighting, conserves energy and provides secure information networks is a building's backbone. And thanks to constant updates and advancements, creating the ideal system is easier than ever. "The future is bright for the field of electrical engineering," says Brad Currie, partner at SMP Engineering. "Solid state technology has revolutionized building lighting and control systems. Power distribution advancements necessary for renewable energy source integration is on the horizon."

While buildings previously had standalone electrical systems that didn't necessarily communicate with the mechanical or security systems, these components are increasingly becoming integrated. "There is a shift, especially from developers that operate their buildings after construction, to having all of these systems on a single platform and for maintenance managers to receive updates via text or email on the whole system if there's a problem," explains Ian Grannary, electrical team lead for Williams Engineering Canada. Ultimately, integrated systems – that one single backbone for mechanical, electrical and security – make life easier for everyone, eliminating crosstalk between the different units and simplifying maintenance.

It's actually a bit analogous to the "working together" BIM system. "It incorporates all the trades and systems into one drawing where you can visualize it," says Duane Besse, president of Bridge Electric Corporation. "Architects are pushing for it; BIM will be more prominent in the future."

Steve Nemetz, CEO of Nemetz (S/A) & Associates, believes these sorts of tools will benefit the next era of designing electrical engineering and integrated communication systems. "3D programs provide more accurate co-ordination and more effective wireless solutions," says Nemetz.

EFFICIENCY IS ECONOMICAL

"The buzz word in the electrical design of institutional, commercial, industrial or multi-unit residential building is 'sustainability,'" says Currie. Photovoltaic systems, computerized lighting controls and the increased use of LED for both interior and exterior applications are all contributing to increasing efficiency.

Efficiency is a particularly pressing issue as the utility rates rise – but handily, as that's happening, the cost of solar panels has been decreasing. In the past, especially in B.C., it's too inexpensive for solar to be an investment for many building operators, but as utility rates increase and the cost of solar panels decrease, that's likely to change. Already, solar power generation has been gaining traction in Western Canada over the last few years.

Technology in the automation sector is constantly evolving, but it's also the building code and ASHRAE requirements that affect these changes. "More and more

it's about efficiency, PowerSmart and going green," says Besse. These demands for energy efficiency require constantly playing catch-up with training and making sure staff is up to date with the changes and methodology.

Overall, though, it's an exciting time in the industry. "Within the next 30 years we need to bring all buildings to net zero and energy efficiency can take us halfway there. Future advancements in electrical engineering will be to design buildings that generate as much energy as they consume."

LIGHT IT UP

Lighting is one of the key changes happening out there in "electrical land" says Besse. "LED industry standards have crept up, so we're paying more attention to lighting control, dimming requirements and auto shut-off."

There are plenty of options when it comes to increasing the efficiency of electrical systems to comply with the new ASHRAE standards. For office buildings, occupancy sensors or ones on a time function can be useful for both lighting and plug controllers. "These systems are taking control out of the hands of the independent user," says Doug Vincent, owner of PR Bridge Systems. Lighting manufacturers are producing more products that detect vacancy or even daylight, but ultimately, "in a time with rising electrical costs, it's important to be aware and control against waste," adds Vincent.

Outside of buildings, engineers can now replace halogen lamps with 50W LEDs, which give just as much light but last for 15 years; providing both energy and cost savings in the long run. And with integrated controls on these lamps, lights can come on with sensors or at a certain hour. Another benefit to LEDs is they can turn on and off instantly, unlike old halogens that often would need five or 10 minutes of cool-down time.

Advancements in LED lighting are giving designers incredible new opportunities to experiment – no longer are they restricted by the shape of a lamp. Some are even integrating lighting into the T-bar, says Grannary. He's also seeing an increase in personalized controls: "Occupants of office spaces will be able to control individual lights above their work spaces as LEDs replace fluorescents." LEDs also offer the opportunity to direct light much more intentionally, using lamps and reflectors, as uniformity in lighting is starting to be viewed with as much importance as illuminance. "This allows for a much more even spread of light and results in spaces and areas that can be lit with lower, even lighting levels that appear to be brighter than spaces that may have higher average illuminance, but many more bright and dark spots," says Grannary.

It's all a lot of change, but "the old dogs need to learn new tricks," says Vincent. He notes that the younger generation, who grew up in a computerized era, are quick learners on how to operate these controls, which are often software driven or on a programmable clock that can calculate daylight savings.



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NEEDS AND WANTS

Standard electrical features are changing as are the habits of the population. Working on a project at Camosun College, PR Bridge Systems took out network cables, because more students use WiFi today, and replaced them with data spots.

Grannary points to the newfound importance of charging locations in waiting areas. “Waiting areas in malls, airports and the like are often crowded with groups of people huddled around a single electrical outlet, as they try to recharge their phones,” he notes. “Manufacturers are supplying electrical outlets with dedicated USB outlets to address this problem and power is becoming integrated into furniture.”

Electric vehicle charging stations will likely be the next big demand, which may cause a challenge in existing multi-family residential buildings that were not designed with enough excess capacity for this need. Grannary is hopeful that this issue can be solved with some creative thinking, however, “this may be resolved with different charging schedules for occupants, similar to watering schedules in a neighbourhood during a drought; though if this is the case, it will also be a question of who pays for the power as running feeds from individually metered suites is impractical in large buildings,” says Grannary.

Electrical engineering’s greatest hurdle may be the mixed-use development. “It’s challenging to effectively and economically design electrical distribution systems for large and complex projects like these,” says Nemetz. And with the combination of shopping centres with residential high-rise buildings, engineers will be facing this problem more often.

But there are creative solutions that Nemetz and his peers utilize to make a variety of spaces functional and efficient. In offices, Nemetz points to the effectiveness of prefab floor and wall systems that come complete with electrical wiring systems. “For offices, these provide a plug and play solution versus using conventional stud wall construction rough-in,” says Nemetz. And the bonus is that these systems are hyper-effective for future space alterations.

For commercial shell spaces, electrical engineers are providing electrical distribution nodes within concentrated areas for servicing tenants. “This enables us to provide tenants the service they require rather than installing multiple services in the base building, which may not meet the tenant’s needs,” he explains.

NETWORK AND COMMUNICATIONS

But there are obviously electrical needs today beyond lighting and outlets. “All building communication systems are transitioning from isolated centralized systems to integrated IT services that live on the IT network,” says Currie. “This trend improves the flexibility of buildings and expands integration and control opportunities.”

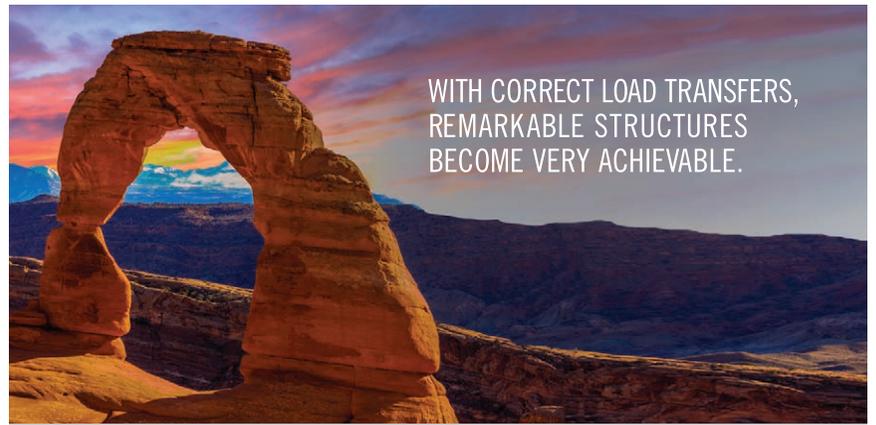
While most older analog and even digital non-IP-based systems are becoming obsolete, Internet Protocol (IP) based systems are still growing in popularity explains Levis Veilleux, business development specialist for healthcare technologies and security for Houle Corporate. One prime example? In the world of video surveillance, almost all new cameras are IP-based. “IP-based systems can now communicate on standard local area networks, wide area networks and even the internet,” says Veilleux.

And it’s only going to continue to evolve. “Exponential growth of sheer quantity of IP devices will redefine the fabric of communication infrastructure,” adds Houle’s technology manager, Gabriel Ana. “While services designed for human consumption are pushing the limits of multimedia channeling, most devices require much larger geographical coverage and very low bandwidth. We will soon live in a multi-layered communication environment – at least one for ‘humans’ and another for ‘things.’”

“By having IP-based systems now, owners and end users will be able to take advantage of the next obvious step: cloud-hosted solutions, without the need of replacing their current systems.” While there are downsides to the cloud and as Veilleux warns, “great care and attention must be made to cyber security and hacking,” ultimately, the benefits of cloud-based technologies for building operations can’t be ignored: there’s no need to maintain servers, and systems will always be kept up-to-date.

With advancements like these, the future looks bright indeed. **A**

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